



Patients' subjective assessment of the duration of cataract surgery: A cohort study

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Subjective assessment of the duration of cataract surgery

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3 **1 Patients' subjective assessment of the duration of cataract surgery: A**
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6 **2 cohort study**
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3 26 **Article summary**
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5 27 **Article focus:**
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- 7 28 1. Modern cataract surgery is a safe and quick procedure. Nonetheless it remains a
8
9 29 stressful event from the patients' standpoint.
10
11 30 2. Several factors have been recognized to participate in patients' preoperative
12
13 31 anxiety and targeted preoperative counselling has been shown to be of value.
14
15 32 3. Though cataract surgery duration is a frequent patient preoperative qualm it has
16
17 33 not been properly studied and patient's perception of time is largely unknown.
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21 34 **Key messages:**
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- 23 35 1. Patients' perceived cataract surgery duration is rather good whatever the
24
25 36 circumstances.
26
27 37 2. We encourage cataract surgeons to monitor their surgery duration and inform
28
29 38 their patients accordingly.
30
31 39 3. Surgeons' experience and pain perception were the two factors independently
32
33 40 associated with surgery duration.
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37 41 **Strengths and limitations:**
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- 39 42 1. The large studied population and the strict definition used for operative time
40
41 43 provide reliable measurements of the surgery duration whether objective or
42
43 44 patient perceived.
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45 46 2. Preoperative and intraoperative anxiety score evaluation was not part of our
46
47 47 standardized study protocol. This might have been associated with objective or
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49 48 patient assessed surgery duration.
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Subjective assessment of the duration of cataract surgery

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3 49 **Objectives:** Surgery duration is a source of preoperative anxiety for patients
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5 50 undergoing cataract surgery. To better inform patients we evaluated the agreement
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7 51 between objective and patient perceived surgery duration.
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10 52 **Design:** cohort study.
11
12 53 **Setting:** Public teaching university hospital (Paris, France).
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14 54 **Participants** During the study period, 368 cataract surgery cases performed on 286
15
16 55 patients were included, 9 cases/patients were excluded from the final analysis. All cases
17
18 56 performed by phacoemulsification under topical anaesthesia were included. Cases for
19
20 57 which any adverse event prolonged the procedure by 10 minutes or more were
21
22 58 excluded.
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25 59 **Primary and secondary outcomes:** Procedures were timed (objective duration) and
26
27 60 patients were asked, immediately afterwards, to assess the duration of their surgery
28
29 61 (patient-assessed duration). The agreement between objective and patient-assessed
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31 62 duration as well as influencing factors was studied.
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34 63 **Results:** Median objective duration (13.6 minutes) and patient-assessed duration (15
35
36 64 minutes) were significantly correlated (Pearson's $r = 0.468$, $P < .0001$). Furthermore,
37
38 65 Bland-Altman analysis and the intraclass correlation coefficient (0.44, 95%CI, 0.36-0.53)
39
40 66 showed a fair agreement. On univariate analysis senior-performed procedures were
41
42 67 significantly shorter (12.6 minutes) than those performed by juniors or residents, 18.2
43
44 68 and 17 minutes, respectively ($P = .0001$). Pain was recorded as "no sensation" (29.5 % of
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46 69 the cases), "mild sensation" (41%), "moderate pain" (25%), "intense pain" (3.9%) and
47
48 70 "unbearable pain" (0.6%). Groups with high pain-score had significantly longer
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50 71 procedures ($P < .00001$). Multivariate analysis revealed that the only independent
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52 72 factors associated with both the objective and patient-assessed duration of surgery was
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54 73 surgeon's experience and pain-score.
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3 74 **Conclusions:** Patients fairly estimated the duration of their surgery in our study,
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5 75 suggesting that emotions associated with eye surgery under topical anesthesia did not
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7 76 hinder patients' perception of time. We encourage cataract surgeons to monitor their
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10 77 own surgical duration to better inform their patients. The benefit of preoperative
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12 78 counseling will need further evaluation by validated anxiety scales.
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79 **INTRODUCTION**

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81 The shortened duration of cataract surgery is one of the striking features owing to the
82 improvement of surgical techniques. Live surgery events and real-time surgical video
83 recordings by elite surgeons nowadays seldom show procedures lasting more than 10
84 minutes. The quickness of modern cataract surgery by phacoemulsification has made
85 topical anaesthesia, whose effects wear off faster than previously used peribulbar
86 injections, the method of choice for analgesia.[1] Nevertheless, whatever the amount of
87 trust patients put in their surgeon, many remain apprehensive of eye surgery under full
88 consciousness or with minimal sedation by systemic administration of drugs. This
89 apprehension is often focused on the fear of involuntary eye movements during the
90 procedure, which may complicate the surgeon's task, on patients' fear of seeing their eye
91 surgery or on the fear of painful sensations. In reply, quite abundant data are now
92 available stemming from several studies focused on the impressions of patients during
93 the procedures.[2 3] Various methods to assess the perception of pain have been used
94 and have validated that cataract surgery under topical anaesthesia is by and large
95 usually a painless procedure.[4] Visual sensations experienced by patients under the
96 operating microscope have also been recorded and have mostly been found to be of no
97 concern.[5 6] In addition to these topics, patients prior to their surgery have frequent
98 qualms regarding the duration of the procedure and hence regarding their ability to
99 withstand their eye surgery under topical anaesthesia.[7] Providing information to
100 patients undergoing cataract surgery has been shown to relieve preoperative anxiety.[8]
101 This information should include data regarding the duration of the procedure. However,
102 surprisingly, in contrast to the common nature of cataract surgery by modern
103 phacoemulsification, there is scarce data regarding its duration. The purpose of this

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3 104 study was therefore to compare the objective duration of cataract surgery with the
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5 105 patients' subjective assessment of this duration.
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3 107 **METHODS**
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5 108
6 109 The study was set in the department of ophthalmology of Hôpital Cochin, a teaching
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8 110 university hospital located in Paris, France. Data were collected prospectively in
9
10 111 consecutive patients operated between May 17, 2011 and July 22, 2011.
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13 112 All patients who had phacoemulsification under topical anaesthesia or sub-
14
15 113 Tenon's block with placement of an intraocular lens in the capsular bag were included.
16
17 114 The duration of the procedure, referred throughout the text as the objective duration,
18
19 115 was timed by operating room nurses as the exposure of the patients' eye to the light of
20
21 116 the operating microscope, from the beginning until the end of the surgery. Cases for
22
23 117 which any adverse event prolonged the procedure by 10 minutes or more were
24
25 118 excluded.
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29 119 The objective duration of surgery was compared to its subjective assessment
30
31 120 obtained by questioning patients immediately after drape removal and referred
32
33 121 throughout the text as the patient-assessed duration. If the initial patients' replies were
34
35 122 imprecise, a second line of questioning was used requesting patients to assess the
36
37 123 duration of their surgery by the minute. To avoid assessment biases, patients were not
38
39 124 warned before the surgery that they would be asked to assess the duration of their
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41 125 procedure.
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45 126 The patients' perception of pain during surgery was also assessed with a
46
47 127 standard numeric scale, graded from 0 to 4: 0 (no pain), 1 (mild sensation), 2 (moderate
48
49 128 pain), 3 (intense pain), 4 (unbearable pain) as previously used in other studies.[4 9 10]
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51 129 Other factors were also recorded: age, gender, first or second eye surgery, and
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53 130 best corrected preoperative visual acuity. All surgeries were performed between 8:00
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55 131 AM and 2:00 PM and the patients were requested to fast from midnight on the night
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Subjective assessment of the duration of cataract surgery

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3 132 prior to their surgery. The patients' preoperative schedules were recorded: duration of
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5 133 fasting, time interval between wake-up and surgery, time interval between entry in the
6
7 134 department suite and surgery (waiting time in the department). All patients received 0.5
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10 135 mg/kg of hydroxyzine at their time of arrival in our department used as sedative and
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12 136 additive sedation during the surgery when necessary. The need for additional
13
14 137 anaesthetic techniques was recorded.

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17 138 Eight surgeons participated in the study. Surgeons were categorized as seniors
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19 139 when they had the experience of more than 1000 procedures performed prior to the
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21 140 study or as juniors otherwise. Procedures performed by residents (either partially or
22
23 141 fully) for teaching purposes were also distinctly analyzed.

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26 142 Three phacoemulsifiers were used: Infiniti® (Alcon, Inc), Stellaris® (Bausch &
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28 143 Lomb, USA) and Whitestar Signature® (Abbott Medical Optics Inc., Santa Anna, USA).

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31 32 145 **Statistical analysis**

33 146 Categorical variables are expressed as numbers (percentages) and comparisons were
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36 147 conducted using the Fisher-exact test. For continuous variables, mean \pm standard
37
38 148 deviation (SD) or median (interquartile range, IQR) are provided, and comparisons were
39
40 149 conducted using the Kruskal-Wallis test.

41
42
43 150 To evaluate the agreement between objective and patient-assessed duration, a Bland-
44
45 151 Altman plot was used.[11] The differences between the two methods (i.e. objective and
46
47 152 patient-assessed duration) are plotted against their mean. The Bland-Altman analysis
48
49 153 provides the mean difference (also called bias) as well as the limit of agreement
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51 154 corresponding to the 95% confidence interval (CI) of the mean difference. When
52
53 155 agreement between the two methods is good, most of the differences should reside

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3 156 within the agreement limit interval. We also computed the Intraclass correlation
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5 157 coefficient to quantitatively evaluate the agreement.
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7 158 Correlation tests were conducted using the Pearson's correlation coefficient (r). Factors
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10 159 with P values $<.10$ in the univariate analysis were included in a multivariate model
11
12 160 (ANCOVA) to determine the independent factors associated with either objective or
13
14 161 patient-assessed surgery duration. P Values <0.05 were considered significant. All
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16 162 analyses were performed with XLSTAT 2012.2.02 software (Addinsoft, Paris, France).
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3 164 **RESULTS**

4 165
5 166 A total of 359 cases performed in 277 patients was analyzed after exclusion of 9 cases
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7 167 for intraoperative adverse event including posterior capsular break or zonular
8
9 168 disinsertion (8 cases) and phacoemulsifier breakdown (1 case). Five out the 8 cases
10
11 169 presenting intraoperative vitreous loss had an identifiable risk factor for this
12
13 170 complication, two were traumatic cataracts, two were cataracts related to severe
14
15 171 pseudoexfoliation syndrome and one was a resident-performed procedure.
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17 172 Characteristics of the study population, patients' schedule on the day of surgery,
18
19 173 sequence of procedures, phacoemulsifiers used and surgery duration are shown in table
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25 175 Topical anaesthesia alone was used in 350 cases, the remaining cases required
26
27 176 the addition of sub-Tenon's block (2 cases), sub-conjunctival injection (1 case),
28
29 177 intracameral injection of lidocaine (1 case) and midazolam intravenous sedation (5
30
31 178 cases). No sensation was reported in 106 (29.5%) cases, a mild sensation in 147 (41%)
32
33 179 cases, moderate pain in 90 (25%) cases, intense pain in 14 (3.9%) cases and unbearable
34
35 180 pain in 2 (0.6%) cases. The perception of pain did not significantly differ between first
36
37 181 and second eye procedures ($p=0.34$).
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40
41 182 **Comparison between objective and patient-assessed duration**

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43 183 The median objective surgery duration was 13.6 minutes (interquartile range 11.1 to
44
45 184 17.5 minutes) and the median patient-assessed duration was 15 minutes (interquartile
46
47 185 range 11 to 20 minutes). Bland-Altman plot showed a fair agreement between the
48
49 186 objective and patient-assessed duration (fig 1). Mean difference (or bias) was only 0.92
50
51 187 minute (95% CI, 0.22-1.62 minute). However an agreement worsening was noted for
52
53 188 longer procedures but error was equally distributed over and under the limits of
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55 189 agreement (12.3-14.2 minutes). Intraclass correlation coefficient was 0.44 (95% CI,
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Subjective assessment of the duration of cataract surgery

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3 190 0.36-0.53) further suggesting a fair agreement between the objective and patient-
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5 191 assessed duration.

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7 192 A significant correlation between the objective and patient-assessed duration of the
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9 193 surgery was observed (Pearson's $r = 0.468$, $p < 0.0001$).

194 **Factors associated with objective surgery duration**

14 195 On univariate analysis, objective surgery duration was significantly correlated to
15
16 196 preoperative VA ($p = 0.0004$), duration of fasting ($p = 0.014$), time interval between wake-
17
18 197 up and surgery ($p = 0.0004$), and waiting time in the department ($p < 0.0001$). The
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20 198 corresponding Pearson's correlation coefficients are provided in table 2. Similarly,
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22 199 objective duration was significantly different according to surgeon experience with
23
24 200 shorter procedures for seniors (12.6 minutes) compared to juniors or residents, 18.2
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26 201 and 17 minutes respectively (fig 2). The two latter durations were not significantly
27
28 202 different ($p = 0.70$). Objective duration was significantly different according to pain-score
29
30 203 group with significantly longer procedures in groups with higher pain-scores (fig 3).
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32 204 Conversely, objective duration was not significantly different between first and second
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34 205 eye procedures or according to gender ($p = 0.365$ and $p = 0.925$, respectively).

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39 206 Multivariate analysis revealed patient preoperative visual acuity, waiting time in
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41 207 the department, surgeon experience and pain-score group to be independent factors
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43 208 associated with objective surgery duration (table 2).

209 **Factors associated with patient-assessed surgery duration**

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48 210 On univariate analysis, patient-assessed surgery duration was correlated to patient age
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50 211 ($p = 0.010$), time interval between wake-up and surgery ($p = 0.012$), and waiting time in
51
52 212 the department ($p < 0.029$). The corresponding Pearson's correlation coefficients are
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54 213 provided in table 2.

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3 214 Similarly, patient-assessed duration was also significantly different according to surgeon
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5 215 experience ($p=0.0001$) and according to pain-score group ($p=0.0002$). Conversely,
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7 216 patient-assessed duration was not significantly different between first and second eye
8
9 217 procedures or according to gender ($p=0.340$ and $p=0.298$, respectively).

11 218 Multivariate analysis revealed patient age, surgeon experience and pain-score
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13 219 group to be independent factors associated with patient-assessed surgery duration
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15 220 (table 2).
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222 **DISCUSSION**

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224 Our study showed that patients overall fairly estimated the duration of their surgery and
225 that the two independent factors associated with both the objective and subjective
226 surgery duration were surgeon's experience and pain-score.

227 The objective duration of cataract surgery by modern phacoemulsification has
228 not been the main outcome measure of previous studies, but has occasionally been
229 assessed mainly in analyzes of the effects of teaching or as a secondary outcome. [12 13]
230 When reported, the duration of surgery ranged from an average of 30 minutes in studies
231 published in 2003 to 15-19 minutes in more recent reports.[14-17] This shortening
232 most probably stems from improvements in the technique of cataract surgery, including
233 suture less clear corneal micro incisions. Our objective measure of procedures lasting
234 13.6 minutes (median duration) was longer than observed in the hands of some elite
235 cataract surgeons. Yet, our measures included procedures performed partially or
236 completely by residents and by junior surgeons. As shown previously, our data
237 confirmed that experienced surgeons are quicker than more junior ophthalmologists.[12
238 13] In our study, the surgeon's experience factor was independently associated with
239 both the objective and subjective surgery duration.

240 The subjective perception of time by patients undergoing cataract surgery under
241 topical anaesthesia has never been studied either. Preparations for surgery include the
242 testing of phacoemulsifiers, applying topical anaesthesia, preoperative disinfection of
243 the eye by povidone-iodine, draping and placement of a lid speculum. These steps may
244 take as long as the surgical procedure itself or even in some instances may take longer
245 than the surgery. From the patients' perspective distinguishing these preoperative
246 stages from their surgery per se may be difficult. To minimize this bias when seeking our
247 patients' subjective assessment of the duration of their surgery, we specifically asked for

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3 248 their impression of the elapsed time between the illumination of their eye under the
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5 249 operating microscope until the removal of the drapes. However, this time interval both
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7 250 subjectively assessed and clocked by nurses may have added approximately 1 or 2 extra
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10 251 minutes to the real time of the surgery, as the surgeons adjusted the focus of the
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12 252 microscope and made their final preparations for the procedure.

14 253 The assessment of pain was a secondary outcome measure in our study and we
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16 254 used the simple 5-step scale as validated in other studies.[4 9 10] A lack of sensation or a
17
18 255 mild sensation were reported in 70.2% of cases, moderate pain in 25.4% cases and
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20
21 256 intense or even unbearable pain in 4.4% of cases. These percentages are comparable to
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23 257 previous reports using the same 5-step pain-score scale.[9] Unsurprisingly, the
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26 258 perception of pain was correlated with the duration of procedures. In our study, the
27
28 259 pain-score group was independently associated with both the objective and subjective
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30 260 surgery duration. In some previous studies patients tended to report their second eye
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32 261 surgery as more painful than their first eye.[16] However, this finding was not observed
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34 262 in our study, nor in another recent report.[18]

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37 263 Preoperative standardized grading of cataracts was not performed in our study.
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39 264 Patient age may however be used as a surrogate parameter influencing the grade of the
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41 265 cataract.[19 20] In nuclear cataracts preoperative visual acuity may also be correlated to
42
43 266 its grade.[21] Our data confirmed that the objective duration of surgery was longer in
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45 267 cases with worse preoperative visual acuity, as more advanced cataracts require a
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47
48 268 longer duration of ultrasonic power release.[22] Surprisingly patient's age was not
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50 269 correlated with objective surgery duration but instead with patient-assessed surgery
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52 270 duration. The chop technique may result in quicker procedures, however the evaluation
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55 271 of the effect of surgical techniques on the duration of surgery was not within the scope
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57 272 of our study.[23]

Subjective assessment of the duration of cataract surgery

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3 273 As the majority of patients quite correctly assessed the duration of their surgery,
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5 274 we were not able to identify specific characteristics significantly associated with an
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7 275 underestimation or an overestimation of time. Although evidence suggests that fasting
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10 276 prior to cataract surgery under topical anaesthesia can be abandoned, in this series
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12 277 patients fasted from midnight on the day prior to their surgery.[24] As our patients were
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14 278 operated from 8:00 AM to 2:00 PM, fasting time varied from one case to another, but
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16 279 these variations did not influence the subjective assessment of the duration of surgery.
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18 280 Similarly, we thought that an early arrival and a subsequent long waiting in the
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21 281 department of ophthalmology prior to entry in the operating room could be a factor of
22
23 282 stress resulting in an over-assessment of the duration of their surgery by patients. Yet
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25 283 our analysis did not reveal that this factor played any role. We unexpectedly observed
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27
28 284 that the duration of fasting and the time interval between wakeup and surgery, as well
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30 285 as waiting time in the department, were associated with longer procedures. This might
31
32 286 have been linked to surgeons slowing down after a number of cases and/or a trend to
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34 287 schedule teaching cases at the end rather than at the beginning of surgical sessions.
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37 288 Although it has been suggested that handholding may reduce anxiety and the perception
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39 289 of pain during cataract surgery, this was not applied in our practice.[25]

40
41 290 Our study showed that patients overall fairly estimated the duration of their
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43 291 surgery. The trend in the past decades has been towards a constant reduction of the
44
45 292 duration of procedures in eye surgery. As new technical improvements are under way,
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48 293 such as femtosecond laser-assisted cataract surgery, the fact that patients are rather
49
50 294 acutely aware of the duration of procedures must be taken into consideration as an
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53 295 important parameter for their comfort.

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Subjective assessment of the duration of cataract surgery

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302 **Competing interests**

303 The authors have no conflict of interest related to results presented in this study.

304

305 **Contributorship Statement**

306 Only the below listed authors qualify for authorship according to the ICMJE criteria:

307 Pierre-Raphael Rothschild substantially participated in the following:

- 308 1) conception and design, acquisition of data, and analysis and interpretation of data
- 309 2) drafting the article and revising it critically for important intellectual content
- 310 3) final approval of the version to be published

311 Sophie Grabar substantially participated in the following:

- 312 1) conception and design, and analysis and interpretation of data
- 313 2) drafting the article and revising it critically for important intellectual content
- 314 3) final approval of the version to be published

315

316 Brivael Le Dû substantially participated in the following:

- 317 1) conception and design, acquisition of data, and analysis and interpretation of data
- 318 2) drafting the article and revising it critically for important intellectual content
- 319 3) final approval of the version to be published

320

321 Cyril Temstet substantially participated in the following:

1 Subjective assessment of the duration of cataract surgery

2
3 322 1) conception and design, acquisition of data, and analysis and interpretation of data

4
5 323 2) drafting the article and revising it critically for important intellectual content

6
7 324 3) final approval of the version to be published

8
9 325

10
11 326 Olga Rostaqui substantially participated in the following:

12
13 327 1) conception and design, acquisition of data

14
15 328 2) drafting the article and revising it critically for important intellectual content

16
17 329 3) final approval of the version to be published

18
19 330

20
21 331 Antoine P. Brézin substantially participated in the following:

22
23 332 1) conception and design, acquisition of data, and analysis and interpretation of data

24
25 333 2) drafting the article and revising it critically for important intellectual content

26
27 334 3) final approval of the version to be published

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31 336 **Data Sharing**

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33 337

34
35 338 Extra data can be accessed via the Dryad data repository at <http://datadryad.org/> with the

36
37 339 doi:10.5061/dryad.27sk4

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Subjective assessment of the duration of cataract surgery

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Subjective assessment of the duration of cataract surgery

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Subjective assessment of the duration of cataract surgery

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Subjective assessment of the duration of cataract surgery

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3 409 **TABLE AND FIGURE LEGENDS**

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7 411 **Table 1.** Patient population, preoperative schedule and surgical procedures.

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9 412 IQR, Interquartile range

10 413 **Table 2** Univariate and multivariate analysis of factors associated with surgery

11 414 duration.

12 415 r, Pearson's correlation coefficient; SS, sum of squares; MS, mean squares; VA, visual

13 416 acuity; NA, not applicable (factors with univariate p-values > 0.10 were not included in

14 417 the multivariate analysis (p-values are provided in the text)

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28 420 **Figure 1.** Bland-Altman plot between objective and patient-assessed surgery duration.

29 421 The solid line indicates the mean difference (or bias); the dash line indicates the limits of

30 422 agreement.

31 423 **Figure 2.** Objective surgery duration according to the surgeon's experience. The bar in

32 424 the box indicates the median, the cross the mean and the lower and upper hinge the

33 425 interquartile range. The whisker extends to the most extreme data point which is no

34 426 more than 1.5 times the interquartile range. Dots represent values outside the fences

35 427 (outliers). *Kruskal-Wallis test

36 428 **Figure 3.** Objective surgery duration according to the pain-score group. The bar in the

37 429 box indicates the median, the cross the mean and the lower and upper hinge the

38 430 interquartile range. The whisker extends to the most extreme data point which is no

39 431 more than 1.5 times the interquartile range. Dots represent values outside the fences

40 432 (outliers). *Kruskal-Wallis test

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Subjective assessment of the duration of cataract surgery

Table 1 Patient population, preoperative schedule and surgical procedures

Variable	Value
Patients (n)	277
Cataract surgery cases (n)	359
Mean Age (years (\pm SD))	73.4 (\pm 9.2)
Gender (cases, n (%))	
Male	152 (42.3%)
Female	207 (57.7%)
Preoperative vision	
Mean LogMar preoperative visual acuity (\pm SD)	0.45 (\pm 0.2)
Schedule on the day of surgery (hours)	
Mean duration of fasting (\pm SD)	14.1 (\pm 1.8)
Mean duration between awakening and surgery (\pm SD)	4.7 (\pm 1.2)
Mean waiting time in the department (\pm SD)	2.4 (\pm 0.7)
Unilateral or Bilateral procedures during study period (patients, n (%))	
Unilateral	195 (70%)
Bilateral	82 (30%)
Sequence of surgery (cases, n (%))	
First eye	203 (57%)
Second eye	156 (43%)
Surgeons' experience (cases, n (%))	
Senior	259 (72%)
Junior	32 (9%)
Partial or full surgery by residents	68 (19%)
Phacoemulsifier (cases, n (%))	
Alcon Infiniti®	238 (66%)
Abbott Medical Optics Signature®	64 (18%)
Bausch & Lomb Stellaris®	57 (16%)
Duration of the procedure (minutes (IQR))	
Objective duration	13.6 (11.1-17.5)
Patient-assessed duration	15 (11-20)

IQR, Interquartile range

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Subjective assessment of the duration of cataract surgery

Table 2 Univariate and multivariate analysis of factors associated with surgery duration.

Factor	Objective surgery duration				Patient-assessed surgery duration			
	Univariate	Multivariate			Univariate	Multivariate		
	r	SS	MS	pValue	r	SS	MS	pValue
Age	NA	NA	NA	NA	0.136	253.9	253.9	0.02
Mean preoperative VA	0.185	217.1	217.1	0.003	NA	NA	NA	NA
Fasting time	0.13	17.1	17.1	0.398	NA	NA	NA	NA
Time interval between wake-up and surgery	0.184	0.03	0.03	0.972	0.132	16.3	16.3	0.555
Waiting time in the department	0.239	159.9	159.9	0.010	0.115	18.2	18.2	0.533
Surgeon	NA	1600.5	800.2	<0.0001	NA	600.1	300.0	0.002
Pain self-assessment	NA	612.6	153.1	<0.0001	NA	1036.5	259.1	0.0002

r, Pearson's correlation coefficient; SS, sum of squares; MS, mean squares; VA, visual acuity; NA, not applicable (factors with univariate p-values > 0.10 were not included in the multivariate analysis (p-values are provided in the text)

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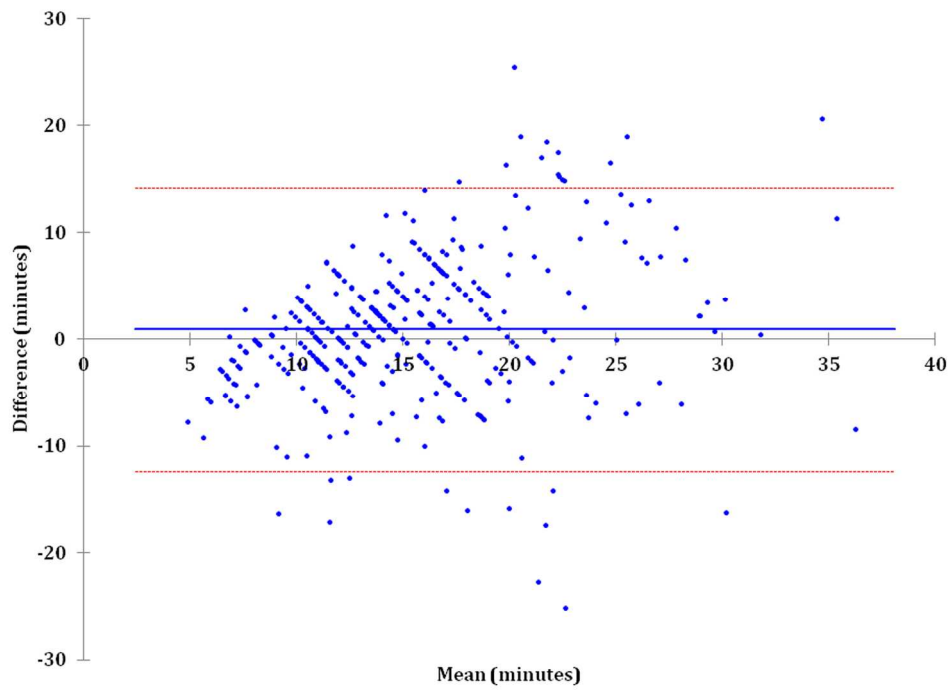


Figure 1. Bland-Altman plot between objective and patient-assessed surgery duration. The solid line indicates the mean difference (or bias); the dash line indicates the limits of agreement.

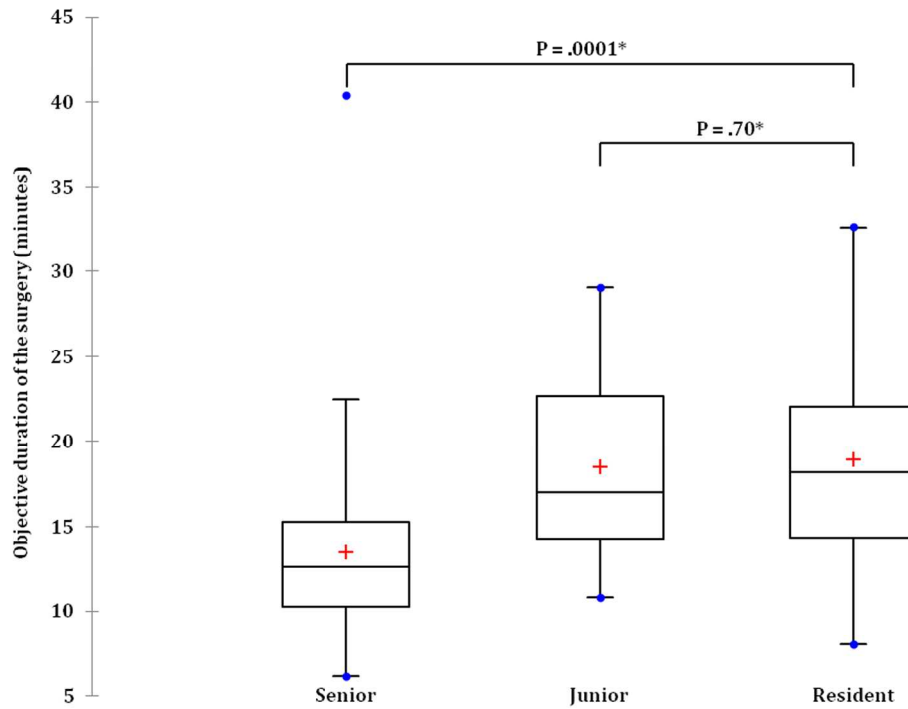


Figure 2. Objective surgery duration according to the surgeon's experience. The bar in the box indicates the median, the cross the mean and the lower and upper hinge the interquartile range. The whisker extends to the most extreme data point which is no more than 1.5 times the interquartile range. Dots represent values outside the fences (outliers). *Kruskal-Wallis test

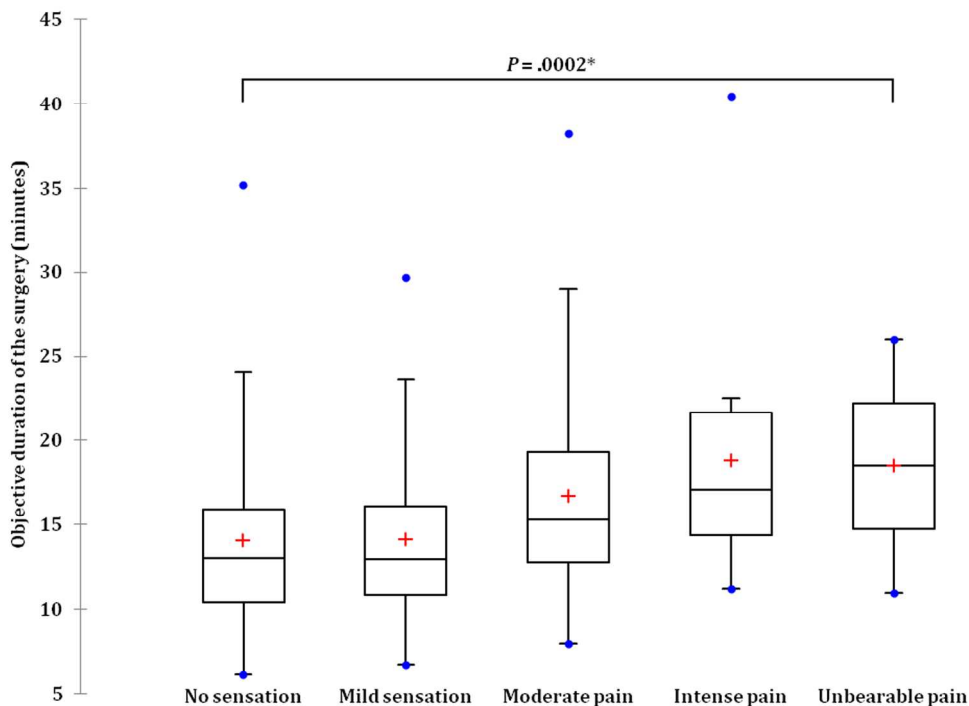


Figure 3. Objective surgery duration according to the pain-score group. The bar in the box indicates the median, the cross the mean and the lower and upper hinge the interquartile range. The whisker extends to the most extreme data point which is no more than 1.5 times the interquartile range. Dots represent values outside the fences (outliers). *Kruskal-Wallis test

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3 Ref.: Ms. No. JCRS-12-698
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5 Patients' subjective assessment of the duration of cataract surgery
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7 Journal of Cataract & Refractive Surgery
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10 Dear Professor Brézin,
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12
13 The reviewers and the editor have completed their assessments of your manuscript
14 Patients' subjective assessment of the duration of cataract surgery (JCRS-12-698) and
15 the paper has unfortunately not been recommended for publication. I have enclosed
16 the referees' comments below for your review. The journal now receives a large
17 number of excellent manuscripts and regrettably is unable to publish all of them.
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21 We appreciate your submitting the manuscript to JCRS and are sorry we do not have
22 a more favorable decision. I hope you will consider submitting future manuscripts to
23 us.
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26 Sincerely,
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29 Emanuel Rosen, MD, FRCSE
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32 Editor Journal of Cataract & Refractive Surgery
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42 Reviewers' comments:
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44 *Reviewer #1:*
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47 1. *Although an interesting study to consider the patients' comfort level through actual*
48 *versus perceived duration of surgery, it does not add scientific value for the surgeon.*
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51 We agree that the results of our study do not revolutionize the science of cataract
52 surgery. However, we believe that a better understanding of the patients'
53 perceptions during the surgery is a laudable goal that adds to the knowledge in the
54 field of cataract surgery.
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3 Indeed, the surgery duration has been recognized as one of the important factors
4 contributing to patients' fear in the preoperative setting (Ref 7 Nijkamp MD, Ruiters
5 RA, Roeling M, et al. Factors related to fear in patients undergoing cataract surgery: a
6 qualitative study focusing on factors associated with fear and reassurance among patients
7 who need to undergo cataract surgery. Patient Educ Couns 2002;47(3):265). It has also
8 been shown that patients' information can in turn reduce anxiety and improve their
9 satisfaction. (Ref 8 Haripriya A, Tan CS, Venkatesh R, et al. Effect of preoperative
10 counseling on fear from visual sensations during phacoemulsification under topical
11 anesthesia. J Cataract Refract Surg 2011;37(5):814-8)
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21 Our literature review found only few data regarding the duration of cataract surgery
22 and did not detect any existing articles assessing its perception by patients. The
23 introduction section has been modified to better reflect the above.
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- 28 2. *I believe the material is better suited as correspondence or case report instead of a full*
29 *article.*
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32 This brings no comment as a series based on the prospective analysis of 359 cases
33 cannot be submitted as a case-report !
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6 Reviewer #2:
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8 *This paper evaluates objective surgical time and its subjective perception as well as the*
9 *dependency on various factors. Objective surgical time and its subjective perception were*
10 *found to correlate well. Multivariate analysis revealed patient preoperative visual acuity,*
11 *waiting time in the department, surgeon experience and pain-score group to be independent*
12 *factors associated with objective surgery duration, and patient age, surgeon experience and*
13 *pain-score group to be independent factors associated with patient-assessed surgery duration.*
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21 1. *Overall complication rate was unusually high. Most of these complications will have*
22 *occurred with the less experienced surgeons. Please give details.*
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25 Our complication rate of 2.22% did not statistically differ from the 1.92%
26 complication rate reported by the Cataract National Dataset electronic multicentre
27 audit of 55,567 operations (Narendran N, Jaycock P, Johnston RL, et al. *The Cataract*
28 *National Dataset electronic multicentre audit of 55,567 operations: risk stratification for*
29 *posterior capsule rupture and vitreous loss. Eye (Lond) 2009;23(1):31-7)*
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34 In our study, 4 out of 8 posterior capsular ruptures occurred in the context of
35 cataracts with risk factors : 2 traumatic cataracts and 2 pseudoexfoliation syndromes.
36
37 One complication occurred in the context of a surgery performed by a resident.
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- 41
42 2. *25% of patients experienced moderate pain. This again is judged an unusual high*
43 *percentage. Was that also most common with the less experienced surgeons? Again,*
44 *please give details.*
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49 Our percentage of patients reporting moderate pain was consistent with the results
50 published in reports using the same 5-step scale pain-score as used in our study (Ref
51 9 Vielpeau I, Billotte C, Kreidie J, et al. [*Comparative study between topical anesthesia and*
52 *sub-Tenon's capsule anesthesia for cataract surgery]. J Fr Ophtalmol 1999;22(1):48-51,).*
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54
55 This reference is included in a recent Cochrane meta-analysis by Davison et al. (Ref 4
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3 Davison M, Padroni S, Bunce C, et al. Sub-Tenon's anaesthesia versus topical anaesthesia for
4 cataract surgery. *Cochrane Database Syst Rev* 2007(3):CD006291)
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11 3. Page 10: duration of fasting ($P = .014$), time interval between wakeup and surgery (P
12 $= .0004$), and waiting time in the department ($P < .0001$) were found to influence
13 objective surgery duration: how is this unexpected finding explained? Please discuss.
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17 We unexpectedly observed that the duration of fasting and the time interval between
18 wakeup and surgery, as well as waiting time in the department, were associated with
19 longer procedures. This might have been linked to surgeons slowing down after a
20 number of cases and/or a trend to schedule teaching cases at the end rather than at the
21 beginning of surgical sessions.
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27 4. Regarding sedation, it would have been interesting to find out if sedation influences
28 the time perception of the patient by performing cataract surgery in one eye with and
29 the partner eye without the use of sedation.
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33 This objective was not within the goal of our study and would have required a
34 randomized controlled trial.
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STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of cohort studies

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(a) Indicate the study’s design with a commonly used term in the title or the abstract	1 and 3
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	3
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	5
Objectives	3	State specific objectives, including any prespecified hypotheses	6
Methods			
Study design	4	Present key elements of study design early in the paper	7
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	7
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	7
		(b) For matched studies, give matching criteria and number of exposed and unexposed	Not applicable
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	7, 8
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	7
Bias	9	Describe any efforts to address potential sources of bias	7
Study size	10	Explain how the study size was arrived at	7
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	8
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	8
		(b) Describe any methods used to examine subgroups and interactions	8
		(c) Explain how missing data were addressed	8
		(d) If applicable, explain how loss to follow-up was addressed	NA
		(e) Describe any sensitivity analyses	NA
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	10
		(b) Give reasons for non-participation at each stage	NA
		(c) Consider use of a flow diagram	NA
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	Table 1
		(b) Indicate number of participants with missing data for each variable of interest	NA
		(c) Summarise follow-up time (eg, average and total amount)	NA
Outcome data	15*	Report numbers of outcome events or summary measures over time	NA
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	NA
		(b) Report category boundaries when continuous variables were categorized	NA
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	NA
Discussion			
Key results	18	Summarise key results with reference to study objectives	13
Limitations			
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	13.14.15
Generalisability	21	Discuss the generalisability (external validity) of the study results	15
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	16

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.



Patients' subjective assessment of the duration of cataract surgery: A case series

Journal:	<i>BMJ Open</i>
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Date Submitted by the Author:	12-Mar-2013
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Primary Subject Heading:	Ophthalmology
Secondary Subject Heading:	Surgery, Patient-centred medicine, Medical education and training
Keywords:	Cataract and refractive surgery < OPHTHALMOLOGY, Medical Education, Treatment Surgery

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Manuscripts

Subjective assessment of the duration of cataract surgery

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3 **1 Patients' subjective assessment of the duration of cataract surgery:**

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6 **2 A case series**

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13 Temstet¹ MD*, Olga Rostaqui¹ MD, Antoine P. Brézin¹ MD, PhD.

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15 * These 2 authors have equally contributed to this work

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Keywords: cataract; surgical procedure; time perception; self-assessment

Presented in part at the ARVO meeting, Fort Lauderdale, Florida, USA, May 2012

Word count: Abstract 298 words; text 2397 words, 25 references, 5 figures and tables

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Subjective assessment of the duration of cataract surgery

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2
3 26 **Article summary**

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5 27 **Article focus:**

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7 28 1. Modern cataract surgery is a safe and quick procedure. Nonetheless it remains a
8
9
10 29 stressful event from the patients' standpoint.
11
12 30 2. Several factors have been recognized to participate in patients' preoperative
13
14 31 anxiety and targeted preoperative counselling has been shown to be of value.
15
16 32 3. Though cataract surgery duration is a frequent patient preoperative qualm it has
17
18 33 not been properly studied and patient's perception of time is largely unknown.

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20
21 34 **Key messages:**

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23 35 1. Patients' perceived cataract surgery duration is fair whatever the circumstances.
24
25 36 2. Surgeons' experience and pain perception were the two factors independently
26
27 37 associated with surgery duration.

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30 38 **Strengths and limitations:**

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32 39 1. The large studied population and the strict definition used for operative time
33
34 40 provide reliable measurements of the surgery duration whether objective or
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36 41 patient perceived.
37
38 42 2. Anxiety status, chronic illnesses, systemic medications were not part of our
39
40 43 standardized study protocol. Moreover all our patients were on sedative
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42 44 medications at the time of surgery. This might have affected patients' perceptions
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44 45 3. The benefit in terms of patient comfort/satisfaction of preoperative information
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46 46 regarding surgery duration needs specific studied beyond the scope of the
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48 47 present study.

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Subjective assessment of the duration of cataract surgery

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3 49 **Objectives:** Surgery duration is a source of preoperative anxiety for patients undergoing
4
5 50 cataract surgery. To better inform patients we evaluated the agreement between
6
7 51 objective and patient perceived surgery duration.
8

9
10 52 **Design:** case series.

11
12 53 **Setting:** Public teaching university hospital (Paris, France).

13
14 54 **Participants:** During the study period, 368 cataract surgery cases performed on 285
15
16 55 patients were included, 85 cases were excluded from the final analysis. All patients who
17
18 56 had uneventful phacoemulsification were included. Cases with any significant
19
20 57 intraoperative adverse event or cases requiring additional anaesthesia other than
21
22 58 topical were excluded. Resident performed cases were also excluded.
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26 59 **Primary and secondary outcomes:** Procedures were timed (objective duration) and
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28 60 patients were asked, immediately afterwards, to assess the duration of their surgery
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30 61 (patient-assessed duration). The agreement between objective and patient-assessed
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32 62 duration as well as influencing factors was studied.
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35 63 **Results:** Mean objective duration (13.9 ± 5 minutes) and patient-assessed duration
36
37 64 (15.3 ± 6.9 minutes) were significantly correlated (Spearman's $r = 0.452$, $P < .0001$).
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39 65 Furthermore, Bland-Altman analysis and the intraclass correlation coefficient (0.341,
40
41 66 95% CI, 0.23-0.44) showed a fair agreement. On univariate analysis senior-performed
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43 67 procedures were significantly shorter than those performed by juniors (13.4 versus 17.8
44
45 68 minutes, $P = .0001$). Pain was recorded as "no sensation" (31.5 % of the cases), "mild
46
47 69 sensation" (41 %), "moderate pain" (23.3 %), "intense pain" (3.5 %) and "unbearable
48
49 70 pain" (0.7 %). Groups with high pain-score had significantly longer procedures (P
50
51 71 $< .001$). Multivariate analysis revealed that the only independent factors associated with
52
53 72 both the objective and patient-assessed duration of surgery was surgeon's experience
54
55 73 and pain-score.
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Subjective assessment of the duration of cataract surgery

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3 74 **Conclusions:** Patients fairly estimated the duration of their surgery in our study,
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5 75 suggesting that emotions associated with eye surgery under topical anaesthesia did not
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7 76 hinder patients' perception of time. However, the benefit of preoperative counselling
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10 77 regarding the duration of surgery will need further evaluation
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Subjective assessment of the duration of cataract surgery

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78 **INTRODUCTION**

79

80 The shortened duration of cataract surgery is one of the striking features owing to the
81 improvement of surgical techniques. Live surgery events and real-time surgical video
82 recordings by elite surgeons nowadays seldom show procedures lasting more than 10
83 minutes. The quickness of modern cataract surgery by phacoemulsification has made
84 topical anaesthesia, whose effects wear off faster than previously used peribulbar
85 injections, the method of choice for analgesia.[1] Nevertheless, whatever the amount of
86 trust patients put in their surgeon, many remain apprehensive of eye surgery under full
87 consciousness or with minimal sedation by systemic administration of drugs. This
88 apprehension is often focused on the fear of involuntary eye movements during the
89 procedure, which may complicate the surgeon's task, on patients' fear of seeing their eye
90 surgery or on the fear of painful sensations. In reply, quite abundant data are now
91 available stemming from several studies focused on the impressions of patients during
92 the procedures.[2 3] Various methods to assess the perception of pain have been used
93 and have validated that cataract surgery under topical anaesthesia is by and large
94 usually a painless procedure.[4] Visual sensations experienced by patients under the
95 operating microscope have also been recorded and have mostly been found to be of no
96 concern.[5 6] In addition to these topics, patients prior to their surgery have frequent
97 qualms regarding the duration of the procedure and hence regarding their ability to
98 withstand their eye surgery under topical anaesthesia.[7] Providing additional targeted
99 information to patients undergoing cataract surgery has been shown to improve their
100 satisfaction.[8]

101 This information could include data regarding the duration of the procedure. However,
102 surprisingly, in contrast to the common nature of cataract surgery by modern

Subjective assessment of the duration of cataract surgery

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3 103 phacoemulsification, there is scarce data regarding its duration. The purpose of this
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5 104 study was therefore to compare the objective duration of cataract surgery with the
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7 105 patients' subjective assessment of this duration.
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Subjective assessment of the duration of cataract surgery

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3 107 **METHODS**
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5 108
6 109 The study was set in the department of ophthalmology of Hôpital Cochin, a teaching
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8 110 university hospital located in Paris, France. Data were collected prospectively in
9
10 111 consecutive patients operated between May 17, 2011 and July 22, 2011.
12

13 112 All patients who had uneventful phacoemulsification under topical anaesthesia
14
15 113 with placement of an intraocular lens in the capsular bag were included. Cases with any
16
17 114 “significant adverse event” defined either by a major intraoperative complication such
18
19 115 as vitreous loss or by a technical problem such as phacoemulsifier malfunction that
20
21 116 prolonged the procedure by 10 minutes or more were excluded. Similarly, patients who
22
23 117 required any anaesthesia in addition to topical lidocaine 2% gel, or those who required
24
25 118 sedation in addition to the preoperatively given hydroxyzine were excluded from the
26
27 119 analyses. Teaching cases involving resident participation were also excluded from the
28
29 120 analyses. The duration of the procedure, referred throughout the text as the objective
30
31 121 duration, was timed by operating room nurses as the exposure of the patients’ eye to the
32
33 122 light of the operating microscope, from the beginning until the end of the surgery.
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38 123 The objective duration of surgery was compared to its subjective assessment
39
40 124 obtained by questioning patients immediately after drape removal and referred
41
42 125 throughout the text as the patient-assessed duration. If the initial patients’ replies were
43
44 126 imprecise, a second line of questioning was used requesting patients to assess the
45
46 127 duration of their surgery by the minute. To avoid assessment biases, patients were not
47
48 128 warned before the surgery that they would be asked to assess the duration of their
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50 129 procedure.
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Subjective assessment of the duration of cataract surgery

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3 130 The patients' perception of pain during surgery was also assessed with a
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5 131 standard numeric scale, graded from 0 to 4: 0 (no pain), 1 (mild sensation), 2 (moderate
6
7 132 pain), 3 (intense pain), 4 (unbearable pain) as previously used in other studies.[4 9 10]
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9
10 133 Other factors were also recorded: age, gender, first or second eye surgery, and
11
12 134 best corrected preoperative visual acuity. All surgeries were performed between 8:00
13
14 135 AM and 2:00 PM and the patients were requested to fast from midnight on the night
15
16 136 prior to their surgery. The patients' preoperative schedules were recorded: duration of
17
18 137 fasting, time interval between wake-up and surgery, time interval between entry in the
19
20 138 department suite and surgery (waiting time in the department). All patients received 0.5
21
22 139 mg/kg of hydroxyzine at their time of arrival in our department used as sedative and
23
24 140 additive sedation during the surgery when necessary. No other drug was given
25
26 141 preoperatively, including non-steroidal anti-inflammatory drugs. The need for
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28 142 additional anaesthetic techniques was recorded.
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32 143 Surgeons were categorized as seniors when they had the experience of more than
33
34 144 1000 procedures performed prior to the study or as juniors otherwise.
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38 146 **Statistical analysis**

39 147 Categorical variables are expressed as numbers (percentages) and comparisons were
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41
42 148 conducted using the Fisher-exact test. For continuous variables, mean \pm standard
43
44 149 deviation (SD) or median (interquartile range, IQR) are provided, and comparisons were
45
46 150 conducted using the Kruskal-Wallis test or the student's t-test.
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48

49 151 To evaluate the agreement between objective and patient-assessed duration, a Bland-
50
51 152 Altman plot was used.[11] The differences between the two methods (i.e. objective and
52
53 153 patient-assessed duration) are plotted against their mean. The Bland-Altman analysis
54
55 154 provides the mean difference (also called bias) as well as the 95% or the 68% limits of
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Subjective assessment of the duration of cataract surgery

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3 155 agreement corresponding respectively to the mean difference ± 2 SD or ± 1 SD. When
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5 156 agreement between the two methods is good, most of the differences should reside
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7 157 within the agreement limit interval. We also computed the Intraclass correlation
8
9 158 coefficient to quantitatively evaluate the agreement.
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11 159 Correlation tests were conducted using the Spearman's correlation coefficient (r).
12
13 160 Factors with P values $<.10$ in the univariate analysis were included in a multivariate
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15 161 linear regression and ANCOVA model to determine the independent factors associated
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17 162 with either objective or patient-assessed surgery duration. P Values <0.05 were
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19 163 considered significant. All analyses were performed with XLSTAT 2012.2.02 software
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21 164 (Addinsoft, Paris, France).
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Subjective assessment of the duration of cataract surgery

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3 166 **RESULTS**

4 167
5 168 A total of 283 cases performed in 218 patients was analyzed after exclusion of 85 cases
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7 169 (65 patients). Nine cases were excluded for significant intraoperative adverse event
8
9
10 170 including posterior capsular break or zonular disinsertion (8 cases) and phacoemulsifier
11
12 171 breakdown (1 case). Four out the 8 cases presenting intraoperative vitreous loss had an
13
14 172 identifiable risk factor for this complication, two were traumatic cataracts, and two were
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16 173 cataracts related to severe pseudoexfoliation syndrome. Thirteen other cases required
17
18 174 additional anaesthesia or sedation and were therefore excluded. Those included sub-
19
20
21 175 Tenon's block (5 cases), sub-conjunctival injection (1 case), intracameral injection of
22
23 176 lidocaine (1 case) and midazolam intravenous sedation (6 cases). Finally 70 cases
24
25 177 involving resident participation were excluded. Characteristics of the study population,
26
27 178 patients' schedule on the day of surgery, sequence of procedures, phacoemulsifiers used
28
29 179 and surgery duration are shown in table 1. No sensation was reported in 106 (31.5 %)
30
31 180 cases, a mild sensation in 147 (41 %) cases, moderate pain in 90 (23.3 %) cases, intense
32
33 181 pain in 14 (3.5 %) cases and unbearable pain in 2 (0.7 %) cases. The perception of pain
34
35 182 did not significantly differ between first and second eye procedures. Out of 155 patients
36
37 183 operated in their first eye 113 patients (73%), reported low pain [no or mild sensation
38
39 184 (score 0 or 1)], while 92 of 128 patients (72%) operated on their second eye rated their
40
41 185 sensations similarly (p=0.9).

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46 186 **Comparison between objective and patient-assessed duration**

47
48 187 The mean objective surgery duration was 13.9 (\pm 5) minutes and the mean patient-
49
50 188 assessed duration was 15.3 (\pm 6.9) minutes. Bland-Altman plot showed a fair agreement
51
52 189 between the objective and patient-assessed duration (fig 1). Mean difference (or bias)
53
54 190 was only 1.4 minute (95% CI, 0.63-2.15 minute). However an agreement worsening was
55
56 191 noted for longer procedures but error was equally distributed over and under the limits
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Subjective assessment of the duration of cataract surgery

192 of agreement (-11.3-14.1 minutes). Intraclass correlation coefficient was 0.341 (95% CI,
193 0.23-0.44) suggesting moderate agreement between the objective and patient-assessed
194 duration.

195 A significant correlation between the objective and patient-assessed duration of the
196 surgery was observed (Spearman's $r = 0.452$, $P < .0001$).

197 **Factors associated with objective surgery duration**

198 On univariate analysis, objective surgery duration was significantly correlated to
199 preoperative VA ($p=0.001$), time interval between wake-up and surgery ($p=0.041$), and
200 to the waiting time in the department ($p=0.006$). The corresponding regression
201 coefficients and 95 % CI are provided in table 2. Similarly, objective duration was
202 significantly different according to surgeon experience with shorter procedures for
203 seniors (13.4 ± 4.8 minutes) compared to juniors (17.8 ± 4.7)(fig 2). Objective duration
204 was significantly different according to pain-score group with significantly longer
205 procedures in groups with high pain-scores (score 4, 3 and 2) compared to groups with
206 low pain scores (score 0 or 1) with mean surgery durations of $15.5 (\pm 5.7)$ and 13.2
207 (± 4.5) respectively (fig 3). Objective duration was significantly different between first
208 and second eye procedures but not according to gender (table 2).

209 Multivariate analysis revealed patient preoperative visual acuity, waiting time in
210 the department, surgeon experience and pain-score group to be independent factors
211 associated with objective surgery duration (table 3).

212 **Factors associated with patient-assessed surgery duration**

213 On univariate analysis, patient-assessed surgery duration was correlated to patient age
214 ($p=0.011$), and time interval between wake-up and surgery ($p=0.03$). The corresponding
215 regression coefficients and 95% CI are provided in table 2. Similarly, patient-assessed
216 duration was also significantly different according to surgeon experience ($p=0.032$) and

Subjective assessment of the duration of cataract surgery

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3 217 according to pain-score group (p=0.001). Conversely, patient-assessed duration was not
4
5 218 significantly different between first and second eye procedures or according to gender.
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7 219 Multivariate analysis revealed patient age, surgeon experience and pain-score
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9 220 group to be independent factors associated with patient-assessed surgery duration
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11 221 (table 3).
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Subjective assessment of the duration of cataract surgery

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3 223 **DISCUSSION**

4 224
5 225 Our study showed that patients overall fairly estimated the duration of their surgery and
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7 226 that the two independent factors associated with both the objective and subjective
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10 227 surgery duration were surgeon's experience and pain-score.

11 228 The objective duration of cataract surgery by modern phacoemulsification has
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14 229 not been the main outcome measure of previous studies, but has occasionally been
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16 230 assessed mainly in analyzes of the effects of teaching or as a secondary outcome. [12 13]
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18 231 When reported, the duration of surgery ranged from an average of 30 minutes in studies
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21 232 published in 2003 to 15-19 minutes in more recent reports.[14-17]. Our objective
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23 233 measure of procedures lasting 13 minutes is in line with this shortening that most
24
25 234 probably stems from improvements in the technique of cataract surgery, including
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28 235 suture less clear corneal micro incisions. As shown previously, our data confirmed that
29
30 236 experienced surgeons are quicker than more junior ophthalmologists.[12 13] In our
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32 237 study, the surgeon's experience factor was independently associated with both the
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35 238 objective and subjective surgery duration.

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37 239 The subjective perception of time by patients undergoing cataract surgery under
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39 240 topical anaesthesia has never been studied either. Preparations for surgery include the
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41 241 testing of phacoemulsifiers, applying topical anaesthesia, preoperative disinfection of
42
43 242 the eye by povidone-iodine, draping and placement of a lid speculum. These steps may
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46 243 take as long as the surgical procedure itself or even in some instances may take longer
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48 244 than the surgery. From the patients' perspective distinguishing these preoperative
49
50 245 stages from their surgery per se may be difficult. To minimize this bias when seeking our
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53 246 patients' subjective assessment of the duration of their surgery, we specifically asked for
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55 247 their impression of the elapsed time between the illumination of their eye under the
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57 248 operating microscope until the removal of the drapes. However, this time interval both
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Subjective assessment of the duration of cataract surgery

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3 249 subjectively assessed and clocked by nurses may have added approximately 1 or 2 extra
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5 250 minutes to the real time of the surgery, as the surgeons adjusted the focus of the
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7 251 microscope and made their final preparations for the procedure.
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10 252 The assessment of pain was a secondary outcome measure in our study and we
11
12 253 used the simple 5-step scale as validated in other studies.[4 9 10] A lack of sensation or a
13
14 254 mild sensation were reported in 72.4% of cases, moderate pain in 23.3% cases and
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16 255 intense or even unbearable pain in 4.3% of cases. These percentages are comparable to
17
18 256 previous reports using the same 5-step pain-score scale.[9] Unsurprisingly, the
19
20 257 perception of pain was correlated with the duration of procedures. In our study, the
21
22 258 pain-score group was independently associated with both the objective and subjective
23
24 259 surgery duration. In a previous study patients tended to report their second eye surgery
25
26 260 as more painful than their first eye surgery and this finding was related to a decreased
27
28 261 preoperative anxiety at the time of the second procedure.[16] However, this finding was
29
30 262 not observed in our study, nor in another recent report.[18] This discrepancy could be
31
32 263 due to the preoperative sedation given to all our patients. Such medications can alter the
33
34 264 perception of pain as well as the perception of duration and also aim at reducing anxiety.
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36 265 Similarly, we did not account for the patients' systemic medications or illnesses, if any,
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38 266 which could also have altered their judgment and their pain thresholds.
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43 267 Preoperative standardized grading of cataracts or pupil size was not recorded in
44
45 268 our study. Patient age may however be used as a surrogate parameter influencing the
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47 269 grade of the cataract.[19 20] In nuclear cataracts preoperative visual acuity may also be
48
49 270 correlated to its grade.[21] Our data confirmed that the objective duration of surgery
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51 271 was longer in cases with worse preoperative visual acuity, as more advanced cataracts
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53 272 require a longer duration of ultrasonic power release.[22] Surprisingly, the age of the
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55 273 patient was not correlated with objective surgery duration but with patient-assessed
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Subjective assessment of the duration of cataract surgery

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3 274 surgery duration, though weakly. The chop technique may result in quicker procedures,
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5 275 however the evaluation of the effect of surgical techniques on the duration of surgery
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7 276 was not within the scope of our study.[23]
8

9
10 277 Most patients quite correctly assessed the duration of their surgery, though the
11
12 278 correlation with objective surgery duration was only moderate and samples were large.
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14 279 Hence, we were not able to identify specific characteristics significantly associated with
15
16 280 an underestimation or an overestimation of time. Although evidence suggests that
17
18 281 fasting prior to cataract surgery under topical anaesthesia can be abandoned, in this
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20 282 series patients fasted from midnight on the day prior to their surgery.[24] As our
21
22 283 patients were operated from 8:00 AM to 2:00 PM, fasting time varied from one case to
23
24 284 another, but these variations did not influence the subjective assessment of the duration
25
26 285 of surgery. Similarly, we thought that an early arrival and a subsequent long waiting in
27
28 286 the department of ophthalmology prior to entry in the operating room could be a factor
29
30 287 of stress resulting in an over-assessment of the duration of their surgery by patients. Yet
31
32 288 our analysis did not reveal that this factor played any role. We unexpectedly observed
33
34 289 that the time interval between wakeup and surgery, as well as waiting time in the
35
36 290 department, were associated with longer procedures. This might have been linked to
37
38 291 surgeons slowing down after a number of cases. Although it has been suggested that
39
40 292 handholding may reduce anxiety and the perception of pain during cataract surgery, this
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42 293 was not applied in our practice.[25]
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48 294 Our study showed that patients overall fairly estimated the duration of their
49
50 295 surgery. The trend in the past decades has been towards a constant reduction of the
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52 296 duration of procedures in eye surgery. As new technical improvements are under way,
53
54 297 such as femtosecond laser-assisted cataract surgery, the fact that patients are rather
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56 298 acutely aware of the duration of procedures must be taken into consideration as an
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Subjective assessment of the duration of cataract surgery

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3 299 important parameter for their comfort. . However, proving the benefit of preoperative
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5 300 counselling in terms of patient satisfaction would require a specific study beyond the
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7 301 scope of this report
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1 Subjective assessment of the duration of cataract surgery

2
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4
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6
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10
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12
13 308 **Competing interests**

14
15 309 The authors have no conflict of interest related to results presented in this study.

16
17 310

18
19 311 **Contributorship Statement**

20
21 312 Only the below listed authors qualify for authorship according to the ICMJE criteria:

22
23 313 Pierre-Raphael Rothschild substantially participated in the following:

- 24
25 314 1) Conception and design, acquisition of data, and analysis and interpretation of data
26
27 315 2) Drafting the article and revising it critically for important intellectual content
28
29 316 3) Final approval of the version to be published

30
31 317 Sophie Grabar substantially participated in the following:

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35 319 2) Drafting the article and revising it critically for important intellectual content
36
37 320 3) Final approval of the version to be published

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39 321

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41 322 Brivael Le Dû substantially participated in the following:

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43 323 1) Conception and design, acquisition of data, and analysis and interpretation of data
44
45 324 2) Drafting the article and revising it critically for important intellectual content
46
47 325 3) Final approval of the version to be published

48
49 326

50
51 327 Cyril Temstet substantially participated in the following:

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Subjective assessment of the duration of cataract surgery

328 1) Conception and design, acquisition of data, and analysis and interpretation of data

329 2) Drafting the article and revising it critically for important intellectual content

330 3) Final approval of the version to be published

331

332 Olga Rostaqui substantially participated in the following:

333 1) Conception and design, acquisition of data

334 2) Drafting the article and revising it critically for important intellectual content

335 3) Final approval of the version to be published

336

337 Antoine P. Brézin substantially participated in the following:

338 1) Conception and design, acquisition of data, and analysis and interpretation of data

339 2) Drafting the article and revising it critically for important intellectual content

340 3) Final approval of the version to be published

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Subjective assessment of the duration of cataract surgery

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Subjective assessment of the duration of cataract surgery

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3 411 **TABLE AND FIGURE LEGENDS**
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10 413 **Table 1.** Patient population, preoperative schedule and surgical procedures.

11 414 **Table 2** Univariate analyses of factors associated with surgery duration.

12 415 **Table 3** Multivariate analyses of factors associated with surgery duration.
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418 **Figure 1.** Bland-Altman plot between objective and patient-assessed surgery duration.

419 The solid line indicates the mean difference (or bias); the blue and red dash lines

420 indicate the 95% and 68% limits of agreement respectively.

421 **Figure 2.** Objective surgery duration according to the surgeons' experience. The bar in

422 the box indicates the median, the cross the mean and the lower and upper hinge the

423 interquartile range. The whisker extends to the most extreme data point which is no

424 more than 1.5 times the interquartile range. Dots represent values outside the fences

425 (outliers). *Student's t-test

426 **Figure 3.** Objective surgery duration according to the pain-score group. The bar in the

427 box indicates the median, the cross the mean and the lower and upper hinge the

428 interquartile range. The whisker extends to the most extreme data point which is no

429 more than 1.5 times the interquartile range. Dots represent values outside the fences

430 (outliers). *Kruskal-Wallis test

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Table 1 Patient population, preoperative schedule and surgical procedures

Variable	Value
Patients (n)	218
Cataract surgery cases (n)	283
Age (mean years (\pm SD))	73.2 (\pm 9.3)
Gender (cases, n (%))	
Male	132 (46.6%)
Female	151 (53.4%)
Preoperative visual acuity (Mean LogMAR (\pm SD))	0.4 (\pm0.2)
Schedule on the day of surgery (hours)	
Fasting time, mean (\pm SD)	14 (\pm 1.8)
Time interval between wake-up and surgery, mean (\pm SD)	4.6 (\pm 1.2)
Waiting time in the department, mean (\pm SD)	2.3 (\pm 0.7)
Sequence of surgery (cases, n (%))	
First eye	155 (54.8%)
Second eye	128 (45.2%)
Surgeons' experience (cases, n (%))	
Senior	253 (89.4%)
Junior	30 (10.6%)
Pain assessment	
Low pain-score	205 (72,4%)
High pain-score	78 (27,6%)

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Subjective assessment of the duration of cataract surgery

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Table 2 Univariate analyses of factors associated with surgery duration.

Variable	Objective surgery duration		Patient-assessed surgery duration	
	Regression		Regression	
	coefficient (95% CI)		coefficient (95% CI)	
	or	P	or	P
	mean (\pm SD)	Value*	mean (\pm SD)	Value*
Age	0.02 (-0.04-0.86)	0.469	0.11 (0.03-0.2)	0.011
Gender				
Male	14.2 (\pm 5.2)	0.317	15.8 (\pm 6.2)	0.184
Female	13.6 (\pm 4.8)		14.8 (\pm 7.4)	
Preoperative visual acuity	4.23 (1.75-6.72)	0.001	0 (-3.5-3.5)	1.00
Schedule on the day of surgery				
Fasting time	0.27 (-0.04-0.59)	0.091	0.16 (-0.28-0.60)	0.477
Time interval between wake-up and surgery	0.49 (0.02-0.95)	0.041	0.71 (0.07-1.36)	0.03
Waiting time in the department	1.15 (0.34-1.96)	0.006	1.05 (-0.07-2.17)	0.066
Sequence of surgery				
First eye	14.1 (\pm 5.4)	0.036*	15.1 (\pm 6.8)	0.632
Second eye	13.6 (\pm 4.4)		15.5 (\pm 7.0)	
Surgeons' experience				
Senior	13.4 (\pm 4.8)	<0.0001*	15.0 (\pm 6.7)	0.032*
Junior	17.8 (\pm 4.7)		17.8 (\pm 7.4)	
Pain assessment				
Low pain-score	13.2 (\pm 4.5)	0.001*	14.4 (\pm 6.5)	<0.001*
High pain-score	15.5 (\pm 5.7)		17.6 (\pm 7.3)	

435

*Linear regression for continuous variables and Students' t-test for categorical variables.

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Subjective assessment of the duration of cataract surgery

437 **Table 3** Multivariate analyses of factors associated with surgery duration.

Variable	Objective surgery duration			Patient-assessed surgery duration		
	Adjusted	95%	P	Adjusted	95%	P
	Regression Coefficient*	Confidence Interval	Value	Regression Coefficient*	Confidence Interval	Value
Age	-	-	-	0.1	0 ; 0.2	0.022
Preoperative visual acuity	3.6	1.2; 5.9	0.002	-	-	-
Waiting time in the department	0.8	0.1; 1.6	0.03	-	-	-
Junior vs. senior Surgeon	4.1	2.4; 5.9	0.0001	3.3	0.8; 5.8	0.01
Low vs. high Pain score	-2.3	-3.5; -1.1	0.0002	-3.1	-4.8; -1.4	0.0004

438 *Regression coefficients adjusted for variables with p values < 0.10 in the univariate analysis.

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Subjective assessment of the duration of cataract surgery

Patients' subjective assessment of the duration of cataract surgery:

A cohort study **A case series**

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Temstet¹ MD*, Olga Rostaqui¹ MD, Antoine P. Brézin¹ MD, PhD.

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7 **26 Article summary**

8 **27 Article focus:**

- 9
10 1. Modern cataract surgery is a safe and quick procedure. Nonetheless it remains a
11 stressful event from the patients' standpoint.
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13 29
14 30 2. Several factors have been recognized to participate in patients' preoperative
15 anxiety and targeted preoperative counselling has been shown to be of value.
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17 31
18 32 3. Though cataract surgery duration is a frequent patient preoperative qualm it has
19 not been properly studied and patient's perception of time is largely unknown.
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21 33

22 **34 Key messages:**

- 23
24 35 1. Patients' perceived cataract surgery duration is ~~rather good~~fair whatever the
25 circumstances.
26
27 36
28 37 ~~2. We encourage cataract surgeons to monitor their surgery duration and inform~~
29 ~~their patients accordingly.~~
30
31 38
32 39 ~~3.2.~~ Surgeons' experience and pain perception were the two factors
33 independently associated with surgery duration.
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35 40

36 **41 Strengths and limitations:**

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38 42 1. The large studied population and the strict definition used for operative time
39 provide reliable measurements of the surgery duration whether objective or
40
41 43 patient perceived.
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43 44
44 45 ~~2. Preoperative and intraoperative Anxiety status, chronic illnesses, systemic~~
45 ~~medications score evaluation~~ ~~were~~as not part of our standardized study protocol.
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47 46
48 47 ~~Moreover all our patients were on sedative medications at the time of surgery.~~
49
50 48 This might have ~~been associated with objective or~~affected patients' perceptions
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52 49 ~~assessed surgery duration.~~
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7 50 | 2.3. The benefit in terms of patient comfort/satisfaction of preoperative
8 | information regarding surgery duration needs specific studied beyond the scope
9 | of the present study.
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7 54 **Objectives:** Surgery duration is a source of preoperative anxiety for patients undergoing
8
9 55 cataract surgery. To better inform patients we evaluated the agreement between
10
11 56 objective and patient perceived surgery duration.

12 57 **Design:** ~~cohort study~~ case series.

13
14 58 **Setting:** Public teaching university hospital (Paris, France).

15
16 59 **Participants:** During the study period, 368 cataract surgery cases performed on 285
17
18 60 286 patients were included, 985 cases/patients were excluded from the final analysis.

19
20 61 All patients who had uneventful phacoemulsification were included. Cases with any
21
22 62 significant intraoperative adverse event or cases requiring additional anaesthesia other
23
24 63 than topical were excluded. Resident performed cases were also excluded. All cases
25
26 64 performed by phacoemulsification under topical anaesthesia were included. Cases for
27
28 65 which any adverse event prolonged the procedure by 10 minutes or more were
29
30 66 excluded.

31
32 67 **Primary and secondary outcomes:** Procedures were timed (objective duration) and
33
34 68 patients were asked, immediately afterwards, to assess the duration of their surgery
35
36 69 (patient-assessed duration). The agreement between objective and patient-assessed
37
38 70 duration as well as influencing factors was studied.

39
40 71 **Results:** Median objective duration (13.9 ± 5.6 minutes) and patient-assessed
41
42 72 duration (15.3 ± 6.9 minutes) were significantly correlated (Pearson's Spearman's $r =$
43
44 73 0.45268, $P < .0001$). ~~Furthermore~~ Furthermore, Bland-Altman analysis and the intraclass
45
46 74 correlation coefficient (0.34144, 95% CI, 0.2336-0.4453) showed a fair agreement. On
47
48 75 univariate analysis senior-performed procedures were significantly shorter (12.6
49
50 76 minutes) than those performed by juniors (13.4 versus 17.8 minutes, $P = .0001$) ~~or~~
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52 77 residents, 18.2 and 17 minutes, respectively ($P = .0001$). Pain was recorded as "no
53
54 78 sensation" (29.531.5 % of the cases), "mild sensation" (41%), "moderate pain" (2523.3

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7 79 | %), “intense pain” (3.3.5.9%) and “unbearable pain” (0.7.6%). Groups with high pain-
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9 80 | score had significantly longer procedures ($P < .00001$). Multivariate analysis revealed
10
11 81 | that the only independent factors associated with both the objective and patient-
12
13 82 | assessed duration of surgery was surgeon’s experience and pain-score.

14 83 | **Conclusions:** Patients fairly estimated the duration of their surgery in our study,

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16 84 | suggesting that emotions associated with eye surgery under topical

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18 85 | ~~anesthesia anaesthesia~~ did not hinder patients’ perception of time. ~~We encourage~~

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20 86 | ~~cataract surgeons to monitor their own surgical duration to better inform their patients.~~

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22 87 | However, the benefit of preoperative counselling regarding the duration of surgery will

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24 88 | need further evaluation. The benefit of preoperative counseling will need further

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26 89 | evaluation by validated anxiety scales.

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7 90 **INTRODUCTION**
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10 92 The shortened duration of cataract surgery is one of the striking features owing to the
11 93 improvement of surgical techniques. Live surgery events and real-time surgical video
12 94 recordings by elite surgeons nowadays seldom show procedures lasting more than 10
13 95 minutes. The quickness of modern cataract surgery by phacoemulsification has made
14 96 topical anaesthesia, whose effects wear off faster than previously used peribulbar
15 97 injections, the method of choice for analgesia.[1] Nevertheless, whatever the amount of
16 98 trust patients put in their surgeon, many remain apprehensive of eye surgery under full
17 99 consciousness or with minimal sedation by systemic administration of drugs. This
18 100 apprehension is often focused on the fear of involuntary eye movements during the
19 101 procedure, which may complicate the surgeon's task, on patients' fear of seeing their eye
20 102 surgery or on the fear of painful sensations. In reply, quite abundant data are now
21 103 available stemming from several studies focused on the impressions of patients during
22 104 the procedures.[2 3] Various methods to assess the perception of pain have been used
23 105 and have validated that cataract surgery under topical anaesthesia is by and large
24 106 usually a painless procedure.[4] Visual sensations experienced by patients under the
25 107 operating microscope have also been recorded and have mostly been found to be of no
26 108 concern.[5 6] In addition to these topics, patients prior to their surgery have frequent
27 109 qualms regarding the duration of the procedure and hence regarding their ability to
28 110 withstand their eye surgery under topical anaesthesia.[7] Providing **additional targeted**
29 111 information to patients undergoing cataract surgery has been shown to **relieve**
30 112 **preoperative anxiety** **improve their satisfaction**.[8]
31 113 This information **should-could** include data regarding the duration of the procedure.
32 114 However, surprisingly, in contrast to the common nature of cataract surgery by modern

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7 115 phacoemulsification, there is scarce data regarding its duration. The purpose of this
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9 116 study was therefore to compare the objective duration of cataract surgery with the
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11 117 patients' subjective assessment of this duration.
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7 119 **METHODS**

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10 121 The study was set in the department of ophthalmology of Hôpital Cochin, a teaching
11 122 university hospital located in Paris, France. Data were collected prospectively in
12 123 consecutive patients operated between May 17, 2011 and July 22, 2011.

15 124 All patients who had uneventful phacoemulsification under topical anaesthesia ~~or~~
16 125 ~~sub-Tenon's block~~ with placement of an intraocular lens in the capsular bag were
17 126 included. Cases with any "significant adverse event" defined either by a major
18 127 intraoperative complication such as vitreous loss or by a technical problem such as
19 128 phacoemulsifier malfunction that prolonged the procedure by 10 minutes or more were
20 129 excluded. Similarly, patients who required any anaesthesia in addition to topical
21 130 lidocaine 2% gel, or those who required sedation in addition to the preoperatively given
22 131 hydroxyzine were excluded from the analyses. Teaching cases involving resident
23 132 participation were also excluded from the analyses. -The duration of the procedure,
24 133 referred throughout the text as the objective duration, was timed by operating room
25 134 nurses as the exposure of the patients' eye to the light of the operating microscope, from
26 135 the beginning until the end of the surgery. ~~Cases for which any adverse event prolonged~~
27 136 ~~the procedure by 10 minutes or more were excluded.~~

28 137 The objective duration of surgery was compared to its subjective assessment
29 138 obtained by questioning patients immediately after drape removal and referred
30 139 throughout the text as the patient-assessed duration. If the initial patients' replies were
31 140 imprecise, a second line of questioning was used requesting patients to assess the
32 141 duration of their surgery by the minute. To avoid assessment biases, patients were not
33 142 warned before the surgery that they would be asked to assess the duration of their
34 143 procedure.

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7 144 The patients' perception of pain during surgery was also assessed with a
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9 145 standard numeric scale, graded from 0 to 4: 0 (no pain), 1 (mild sensation), 2 (moderate
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11 146 pain), 3 (intense pain), 4 (unbearable pain) as previously used in other studies.[4 9 10]

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13 147 Other factors were also recorded: age, gender, first or second eye surgery, and
14
15 148 best corrected preoperative visual acuity. All surgeries were performed between 8:00
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17 149 AM and 2:00 PM and the patients were requested to fast from midnight on the night
18
19 150 prior to their surgery. The patients' preoperative schedules were recorded: duration of
20
21 151 fasting, time interval between wake-up and surgery, time interval between entry in the
22
23 152 department suite and surgery (waiting time in the department). All patients received 0.5
24
25 153 mg/kg of hydroxyzine at their time of arrival in our department used as sedative and
26
27 154 additive sedation during the surgery when necessary. No other drug was given
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29 155 preoperatively, including non-steroidal anti-inflammatory drugs. The need for
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31 156 additional anaesthetic techniques was recorded.

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33 157 ~~Eight surgeons participated in the study.~~ Surgeons were categorized as seniors
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35 158 when they had the experience of more than 1000 procedures performed prior to the
36
37 159 study or as juniors otherwise. ~~Procedures performed by residents (either partially or~~
38
39 160 ~~fully) for teaching purposes were also distinctly analyzed.~~

40
41 161 ~~Three phacoemulsifiers were used: Infiniti® (Alcon, Inc), Stellaris® (Bausch &~~
42
43 162 ~~Lomb, USA) and Whitestar Signature® (Abbott Medical Optics Inc., Santa Anna, USA).~~

44 163

45 46 164 **Statistical analysis**

47 165 Categorical variables are expressed as numbers (percentages) and comparisons were
48
49 166 conducted using the Fisher-exact test. For continuous variables, mean \pm standard
50
51 167 deviation (SD) or median (interquartile range, IQR) are provided, and comparisons were
52
53 168 conducted using the Kruskal-Wallis test or the student's t-test.

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7 169 To evaluate the agreement between objective and patient-assessed duration, a Bland-
8
9 170 Altman plot was used,^[11] The differences between the two methods (i.e. objective and
10
11 171 patient-assessed duration) are plotted against their mean. The Bland-Altman analysis
12
13 172 provides the mean difference (also called bias) as well as the ~~95% or the 68%~~ limits of
14
15 173 agreement corresponding ~~respectively to the mean -difference ± 2 SD or ±1 SD~~ the 95%
16
17 174 ~~confidence interval (CI) of the mean difference~~. When agreement between the two
18
19 175 methods is good, most of the differences should reside within the ~~agreement limit~~
20
21 176 interval. We also computed the Intraclass correlation coefficient to quantitatively
22
23 177 evaluate the agreement.

24
25 178 Correlation tests were conducted using the ~~Pearson's-Spearman's~~ correlation coefficient
26
27 179 (r). Factors with *P* values <.10 in the univariate analysis were included in a multivariate
28
29 180 ~~linear regression and model (ANCOVA)~~ model to determine the independent factors
30
31 181 associated with either objective or patient-assessed surgery duration. *P* Values <0.05
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33 182 were considered significant. All analyses were performed with XLSTAT 2012.2.02
34
35 183 software (Addinsoft, Paris, France).

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Subjective assessment of the duration of cataract surgery

RESULTS

A total of ~~283359~~ cases performed in ~~218277~~ patients was analyzed after exclusion of ~~985 cases (65 patients)~~. ~~Nine cases were excluded for significant intraoperative adverse event including posterior capsular break or zonular disinsertion (8 cases) and phacoemulsifier breakdown (1 case)~~. ~~Four~~ out the 8 cases presenting intraoperative vitreous loss had an identifiable risk factor for this complication, two were traumatic cataracts, ~~two~~ and two were cataracts related to severe pseudoexfoliation syndrome. ~~Thirteen other cases required additional anaesthesia or sedation and were therefore excluded. Those included sub-Tenon's block (5 cases), sub-conjunctival injection (1 case), intracameral injection of lidocaine (1 case) and midazolam intravenous sedation (6 cases)~~. ~~Finally 70 cases involving resident participation were excluded~~. Characteristics of the study population, patients' schedule on the day of surgery, sequence of procedures, phacoemulsifiers used and surgery duration are shown in table 1.

~~Topical anaesthesia alone was used in 350 cases, the remaining cases required the addition of sub-Tenon's block (2 cases), sub-conjunctival injection (1 case), intracameral injection of lidocaine (1 case) and midazolam intravenous sedation (5 cases)~~. No sensation was reported in 106 (~~29~~31.5%) cases, a mild sensation in 147 (41%) cases, moderate pain in 90 (~~22~~3.5%) cases, intense pain in 14 (3.59%) cases and unbearable pain in 2 (0.76%) cases. The perception of pain did not significantly differ between first and second eye procedures (~~p=0.34~~). ~~Out of 155 patients operated in their first eye 113 patients (73%), reported low pain [no or mild sensation (score 0 or 1)], while 92 of 128 patients (72%) operated on their second eye rated their sensations similarly (p=0.9)~~.

Comparison between objective and patient-assessed duration

Subjective assessment of the duration of cataract surgery

210 The ~~median-mean~~ objective surgery duration was 13.9 (\pm 5)-6 minutes (~~interquartile~~
 211 ~~range 11.1 to 17.5 minutes~~) and the ~~meandian~~ patient-assessed duration was 15.3 (\pm
 212 ~~6.9~~) minutes (~~interquartile range 11 to 20 minutes~~). Bland-Altman plot showed a fair
 213 agreement between the objective and patient-assessed duration (fig 1). Mean difference
 214 (or bias) was only 1.40-92 minute (95% CI, 0.6322-2.151-62 minute). However an
 215 agreement worsening was noted for longer procedures but error was equally
 216 distributed over and under the limits of agreement (~~-11.312-3~~-14.12 minutes). Intraclass
 217 correlation coefficient was 0.34144 (95% CI, 0.2336-0.4453) ~~further~~-suggesting a
 218 ~~fair~~moderate agreement between the objective and patient-assessed duration.

219 A significant correlation between the objective and patient-assessed duration of the
 220 surgery was observed (~~Spearman's r = 0.452, P <.0001~~~~Pearson's r = 0.468, p<0.0001~~).

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221 Factors associated with objective surgery duration

222 On univariate analysis, objective surgery duration was significantly correlated to
 223 preoperative VA (p=0.001-0004), ~~duration of fasting (p=0.014)~~, time interval between
 224 wake-up and surgery (p=0.041004), and ~~to the~~ waiting time in the department
 225 (p=0.006<0.0001). The corresponding ~~Pearson's regression correlation~~-coefficients ~~and~~
 226 ~~95 % CI~~ are provided in table 2. Similarly, objective duration was significantly different
 227 according to surgeon experience with shorter procedures for seniors (13.4 \pm 4.82-6
 228 minutes) compared to juniors (17.8 \pm 4.7) ~~or residents, 18.2 and 17 minutes respectively~~
 229 (fig 2). ~~The two latter durations were not significantly different (p=0.70)~~. Objective
 230 duration was significantly different according to pain-score group with significantly
 231 longer procedures in groups with higher pain-scores (~~score 4, 3 and 2~~) compared to
 232 ~~groups with low pain scores (score 0 or 1) with mean surgery durations of 15.5 (\pm 5.7)~~
 233 ~~and 13.2 (\pm 4.5) respectively~~ (fig 3). ~~Conversely, objective~~Objective duration was not

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7 234 | significantly different between first and second eye procedures ~~but not~~ according to
8 235 | gender (table 2). ~~(p=0.365 and p=0.925, respectively).~~

9
10 236 | Multivariate analysis revealed patient preoperative visual acuity, waiting time in
11
12 237 | the department, surgeon experience and pain-score group to be independent factors
13
14 238 | associated with objective surgery duration (table 32).

15
16 239 | **Factors associated with patient-assessed surgery duration**

17
18 240 | On univariate analysis, patient-assessed surgery duration was correlated to patient age
19
20 241 | (p=0.0110), and time interval between wake-up and surgery (p=0.0312), and waiting
21
22 242 | time in the department (p<0.029). The corresponding Pearson's correlation regression
23
24 243 | coefficients and 95% CI are provided in table 2.

25
26 244 | Similarly, patient-assessed duration was also significantly different according to surgeon
27
28 245 | experience (p=0.032001) and according to pain-score group (p=0.00102).
29
30 246 | Conversely, patient-assessed duration was not significantly different between first and
31
32 247 | second eye procedures or according to gender. ~~(p=0.340 and p=0.298, respectively).~~

33
34 248 | Multivariate analysis revealed patient age, surgeon experience and pain-score
35
36 249 | group to be independent factors associated with patient-assessed surgery duration
37
38 250 | (table 32).

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4 Subjective assessment of the duration of cataract surgery
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6
7 252 **DISCUSSION**
8 253

9 254 Our study showed that patients overall fairly estimated the duration of their surgery and
10 255 that the two independent factors associated with both the objective and subjective
11 256 surgery duration were surgeon's experience and pain-score.
12

13
14 257 The objective duration of cataract surgery by modern phacoemulsification has
15 258 not been the main outcome measure of previous studies, but has occasionally been
16 259 assessed mainly in analyzes of the effects of teaching or as a secondary outcome. [12 13]

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20 260 When reported, the duration of surgery ranged from an average of 30 minutes in studies
21 261 published in 2003 to 15-19 minutes in more recent reports,[14-17]. Our objective

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23 262 measure of procedures lasting 13 minutes is in line with tThis shortening that most
24 263 probably stems from improvements in the technique of cataract surgery, including
25 264

26 264 ~~suture less clear corneal micro incisions. Our objective measure of procedures lasting~~
27 265 ~~13.6 minutes (median duration) was longer than observed in the hands of some elite~~
28 266 ~~cataract surgeons. Yet, our measures included procedures performed partially or~~
29 267 ~~completely by residents and by junior surgeons.~~ As shown previously, our data

30 268 confirmed that experienced surgeons are quicker than more junior ophthalmologists.[12
31 269 13] In our study, the surgeon's experience factor was independently associated with
32 270 both the objective and subjective surgery duration.
33

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34 271 The subjective perception of time by patients undergoing cataract surgery under
35 272 topical anaesthesia has never been studied either. Preparations for surgery include the
36 273 testing of phacoemulsifiers, applying topical anaesthesia, preoperative disinfection of
37 274 the eye by povidone-iodine, draping and placement of a lid speculum. These steps may
38 275 take as long as the surgical procedure itself or even in some instances may take longer
39 276 than the surgery. From the patients' perspective distinguishing these preoperative
40 277 stages from their surgery per se may be difficult. To minimize this bias when seeking our
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4 Subjective assessment of the duration of cataract surgery

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7 278 patients' subjective assessment of the duration of their surgery, we specifically asked for
8
9 279 their impression of the elapsed time between the illumination of their eye under the
10
11 280 operating microscope until the removal of the drapes. However, this time interval both
12
13 281 subjectively assessed and clocked by nurses may have added approximately 1 or 2 extra
14
15 282 minutes to the real time of the surgery, as the surgeons adjusted the focus of the
16
17 283 microscope and made their final preparations for the procedure.

18 284 The assessment of pain was a secondary outcome measure in our study and we
19
20 285 used the simple 5-step scale as validated in other studies.[4 9 10] A lack of sensation or a
21
22 286 mild sensation were reported in ~~72.40.2%~~ of cases, moderate pain in ~~23.35.4%~~ cases
23
24 287 and intense or even unbearable pain in ~~4.34%~~ of cases. These percentages are
25
26 288 comparable to previous reports using the same 5-step pain-score scale,[9]

27
28 289 Unsurprisingly, the perception of pain was correlated with the duration of procedures.
29
30 290 In our study, the pain-score group was independently associated with both the objective
31
32 291 and subjective surgery duration. In ~~asome~~ previous studies ~~ies~~ patients tended to report
33
34 292 their second eye surgery as more painful than their first eye ~~surgery and this finding was~~
35
36 293 ~~related to a decreased preoperative anxiety at the time of the second procedure.~~[16]

37
38 294 However, this finding was not observed in our study, nor in another recent report,[18]
39
40 295 ~~This discrepancy could be due to the preoperative sedation given to all our patients.~~
41
42 296 ~~Such medications can alter the perception of pain as well as the perception of duration~~
43
44 297 ~~and also aim at reducing anxiety. Similarly, we did not account for the patients' systemic~~
45
46 298 ~~medications or illnesses, if any, which could also have altered their judgment and their~~
47
48 299 ~~pain thresholds.~~

49
50 300 Preoperative standardized grading of cataracts ~~or pupil size was not was not~~
51
52 301 ~~performed in recorded in~~ our study. Patient age may however be used as a surrogate
53
54 302 parameter influencing the grade of the cataract,[19 20] In nuclear cataracts preoperative

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7 303 visual acuity may also be correlated to its grade,[21] Our data confirmed that the

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8
9 304 objective duration of surgery was longer in cases with worse preoperative visual acuity,

10
11 305 as more advanced cataracts require a longer duration of ultrasonic power release,[22]

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12
13 306 ~~Surprisingly, the age of the patient was not correlated with objective surgery duration~~

14
15 307 ~~but with patient-assessed surgery duration, though weakly~~ Surprisingly patient's age

16
17 308 ~~was not correlated with objective surgery duration but instead with patient-assessed~~

18
19 309 ~~surgery duration.~~ The chop technique may result in quicker procedures, however the

20
21 310 evaluation of the effect of surgical techniques on the duration of surgery was not within

22
23 311 the scope of our study,[23]

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24
25 312 ~~Most patients quite correctly assessed the duration of their surgery, though the~~

26
27 313 ~~correlation with objective surgery duration was only moderate and samples were large.~~

28
29 314 ~~As the majority of patients quite correctly assessed the duration of their surgery, Hence,~~

30
31 315 we were not able to identify specific characteristics significantly associated with an

32
33 316 underestimation or an overestimation of time. Although evidence suggests that fasting

34
35 317 prior to cataract surgery under topical anaesthesia can be abandoned, in this series

36
37 318 patients fasted from midnight on the day prior to their surgery,[24] As our patients were

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38
39 319 operated from 8:00 AM to 2:00 PM, fasting time varied from one case to another, but

40
41 320 these variations did not influence the subjective assessment of the duration of surgery.

42
43 321 Similarly, we thought that an early arrival and a subsequent long waiting in the

44
45 322 department of ophthalmology prior to entry in the operating room could be a factor of

46
47 323 stress resulting in an over-assessment of the duration of their surgery by patients. Yet

48
49 324 our analysis did not reveal that this factor played any role. We unexpectedly observed

50
51 325 that ~~the duration of fasting and~~ the time interval between wakeup and surgery, as well

52
53 326 as waiting time in the department, were associated with longer procedures. This might

54
55 327 have been linked to surgeons slowing down after a number of ~~cases-cases and/or a trend~~

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6 328 ~~to schedule teaching cases at the end rather than at the beginning of surgical sessions,~~
7

8 329 Although it has been suggested that handholding may reduce anxiety and the perception
9

10 330 of pain during cataract surgery, this was not applied in our practice.[25]

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11 331 Our study showed that patients overall fairly estimated the duration of their
12

13 332 surgery. The trend in the past decades has been towards a constant reduction of the
14

15 333 duration of procedures in eye surgery. As new technical improvements are under way,
16

17 334 such as femtosecond laser-assisted cataract surgery, the fact that patients are rather
18

19 335 acutely aware of the duration of procedures must be taken into consideration as an
20

21 336 important parameter for their comfort. ~~. However, proving the benefit of preoperative~~
22

23 337 ~~counselling in terms of patient satisfaction would require a specific study beyond the~~
24

25 338 ~~scope of this report~~
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7 **340 Acknowledgments**

8
9 **341** Jean-Baptiste Daudin, MD and Dominique Monnet MD, PhD provided and cared for study
10
11 **342** patients.

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13
14 **344** The study was supported by the Association d'Ophtalmologie de Cochin, Paris, France

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15
16 **345 Competing interests**

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17
18 **346** The authors have no conflict of interest related to results presented in this study.
19

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20 **347**

21
22 **348 Contributorship Statement**

23
24 **349** Only the below listed authors qualify for authorship according to the ICMJE criteria:

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25
26 **350** Pierre-Raphael Rothschild substantially participated in the following:

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27
28 **351** 1) ~~conception~~Conception and design, acquisition of data, and analysis and interpretation

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30 **352** of data

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32 **353** 2) ~~drafting~~Drafting the article and revising it critically for important intellectual content

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34 **354** 3) ~~final~~Final approval of the version to be published

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36 **355** Sophie Grabar substantially participated in the following:

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38 **356** 1) ~~conception~~Conception and design, and analysis and interpretation of data

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44 **359**

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46 **360** Brivael Le Dû substantially participated in the following:

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48 **361** 1) ~~conception~~Conception and design, acquisition of data, and analysis and interpretation

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Subjective assessment of the duration of cataract surgery

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Cyril Temstet substantially participated in the following:

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1) ~~conception~~Conception and design, acquisition of data, and analysis and interpretation

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of data

2) ~~drafting~~Drafting the article and revising it critically for important intellectual content

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3) ~~final~~Final approval of the version to be published

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Olga Rostaqui substantially participated in the following:

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2) ~~drafting~~Drafting the article and revising it critically for important intellectual content

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Antoine P. Brézin substantially participated in the following:

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Subjective assessment of the duration of cataract surgery

452 **TABLE AND FIGURE LEGENDS**

453

454 **Table 1.** Patient population, preoperative schedule and surgical procedures.

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455 **Table 2.** Univariate analysis of factors associated with surgery duration.

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456 **Table 3.** Multivariate analysis of factors associated with surgery duration.

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459 **Figure 1.** Bland-Altman plot between objective and patient-assessed surgery duration.

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460 The solid line indicates the mean difference (or bias); the blue and red dash lines

461 indicate ~~the limit of agreement of respectively~~ the 95% and 68% limits of agreement

462 respectively confidence interval of the differences.

463 **Figure 2.** Objective surgery duration according to the surgeons' experience. The bar in

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464 the box indicates the median, the cross the mean and the lower and upper hinge the

465 interquartile range. The whisker extends to the most extreme data point which is no

466 more than 1.5 times the interquartile range. Dots represent values outside the fences

467 (outliers). *Student's t-test

468 **Figure 3.** Objective surgery duration according to the pain-score group. The bar in the

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469 box indicates the median, the cross the mean and the lower and upper hinge the

470 interquartile range. The whisker extends to the most extreme data point which is no

471 more than 1.5 times the interquartile range. Dots represent values outside the fences

472 (outliers). *Kruskal-Wallis test

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Subjective assessment of the duration of cataract surgery

Table 1 Patient population, preoperative schedule and surgical procedures

Variable	Value
Patients (n)	218
Cataract surgery cases (n)	283
Age (mean years (\pm SD))	73.2 (\pm 9.3)
Gender (cases, n (%))	
Male	132 (46.6%)
Female	151 (53.4%)
Preoperative visual acuity (Mean LogMAR (\pm SD))	0.4 (\pm 0.2)
Schedule on the day of surgery (hours)	
Fasting time, mean (\pm SD)	14 (\pm 1.8)
Time interval between wake-up and surgery, mean (\pm SD)	4.6 (\pm 1.2)
Waiting time in the department, mean (\pm SD)	2.3 (\pm 0.7)
Sequence of surgery (cases, n (%))	
First eye	155 (54.8%)
Second eye	128 (45.2%)
Surgeons' experience (cases, n (%))	
Senior	253 (89.4%)
Junior	30 (10.6%)
Pain assessment	
Low pain-score	205 (72.4%)
High pain-score	78 (27.6%)

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Subjective assessment of the duration of cataract surgery

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Table 2 Univariate analyses of factors associated with surgery duration.

Variable	Objective surgery duration		Patient-assessed surgery duration	
	Regression coefficient (95% CI)		Regression coefficient (95% CI)	
	or mean (±SD)	P Value*	or mean (±SD)	P Value*
Age	0.02 (-0.04-0.86)	0.469	0.11 (0.03-0.2)	0.011
Gender				
Male	14.2 (±5.2)	0.317	15.8 (±6.2)	0.184
Female	13.6 (±4.8)		14.8 (±7.4)	
Preoperative visual acuity	4.23 (1.75-6.72)	0.001	0 (-3.5-3.5)	1.00
Schedule on the day of surgery				
Fasting time	0.27 (-0.04-0.59)	0.091	0.16 (-0.28-0.60)	0.477
Time interval between wake-up and surgery	0.49 (0.02-0.95)	0.041	0.71 (0.07-1.36)	0.03
Waiting time in the department	1.15 (0.34-1.96)	0.006	1.05 (-0.07-2.17)	0.066
Sequence of surgery				
First eye	14.1 (±5.4)	0.036*	15.1 (±6.8)	0.632
Second eye	13.6 (±4.4)		15.5 (±7.0)	
Surgeons' experience				
Senior	13.4 (±4.8)	<0.0001*	15.0 (±6.7)	0.032*
Junior	17.8 (±4.7)		17.8 (±7.4)	
Pain assessment				
Low pain-score	13.2 (±4.5)	0.001*	14.4 (±6.5)	<0.001*
High pain-score	15.5 (±5.7)		17.6 (±7.3)	

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*Linear regression for continuous variables and Students' t-test for categorical variables.

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Subjective assessment of the duration of cataract surgery

479 Table 3. Multivariate analysis of factors associated with surgery duration.

480 Table 3. Multivariate analyses of factors associated with surgery duration.

Variable	Objective surgery duration			Patient-assessed surgery duration		
	Adjusted Regression Coefficient*	95% Confidence Interval	P Value	Adjusted Regression Coefficient*	95% Confidence Interval	P Value
Age	-	-	-	0.1	0 ; 0.2	0.022
Preoperative visual acuity	3.6	1.2; 5.9	0.002	-	-	-
Waiting time in the department	0.8	0.1; 1.6	0.03	-	-	-
Junior vs. senior Surgeon	4.1	2.4; 5.9	0.0001	3.3	0.8; 5.8	0.01
Low vs. high Pain score	-2.3	-3.5; -1.1	0.0002	-3.1	-4.8; -1.4	0.0004

481 *Regression coefficients adjusted for variables with p values < 0.10 in the univariate analysis.

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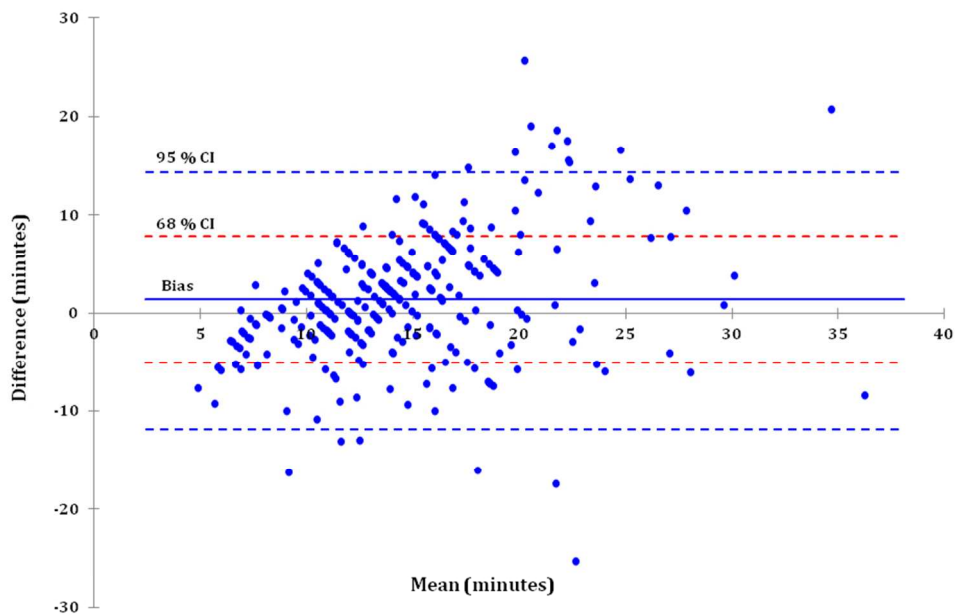
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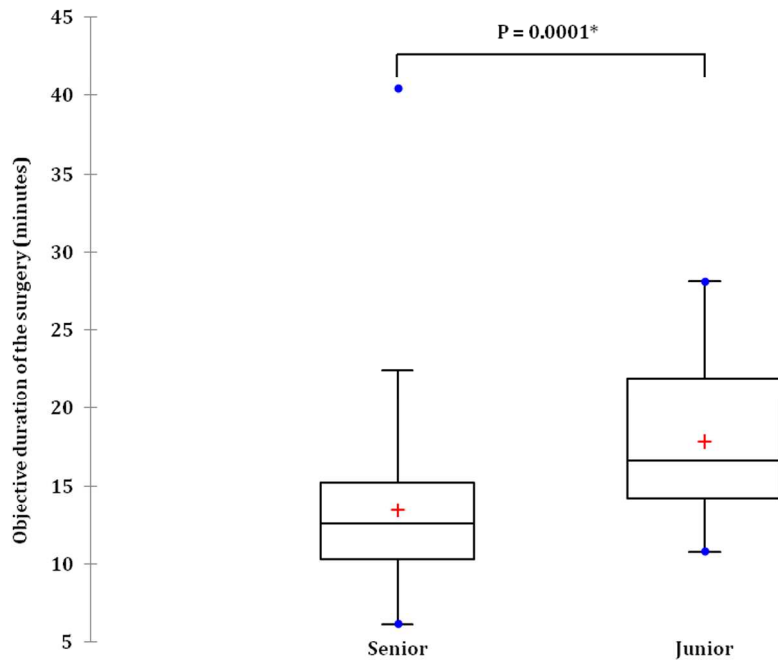
Bland-Altman plot between objective and patient-assessed surgery duration. The solid line indicates the mean difference (or bias); the blue and red dash lines indicate the 95% and 68% limits of agreement respectively.

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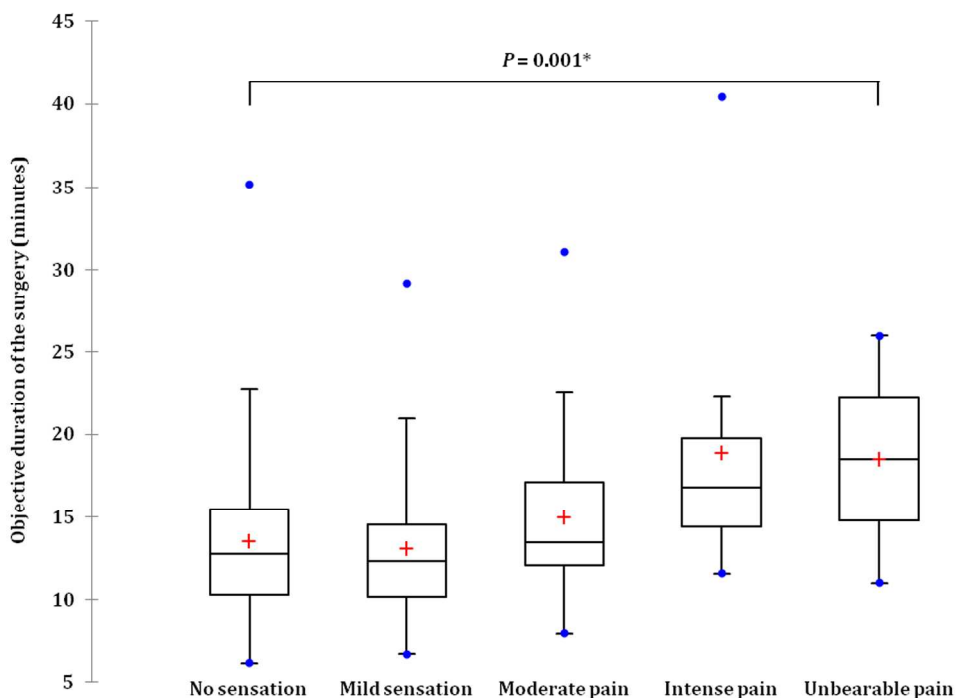
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Objective surgery duration according to the surgeons' experience. The bar in the box indicates the median, the cross the mean and the lower and upper hinge the interquartile range. The whisker extends to the most extreme data point which is no more than 1.5 times the interquartile range. Dots represent values outside the fences (outliers). *Student's t-test

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Objective surgery duration according to the pain-score group. The bar in the box indicates the median, the cross the mean and the lower and upper hinge the interquartile range. The whisker extends to the most extreme data point which is no more than 1.5 times the interquartile range. Dots represent values outside the fences (outliers). *Kruskal-Wallis test

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STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of cohort studies

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(a) Indicate the study’s design with a commonly used term in the title or the abstract	1 and 3
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	3
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	5
Objectives	3	State specific objectives, including any prespecified hypotheses	6
Methods			
Study design	4	Present key elements of study design early in the paper	7
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	7
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	7
		(b) For matched studies, give matching criteria and number of exposed and unexposed	Not applicable
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	7, 8
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	7
Bias	9	Describe any efforts to address potential sources of bias	7
Study size	10	Explain how the study size was arrived at	7
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	8
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	8
		(b) Describe any methods used to examine subgroups and interactions	8
		(c) Explain how missing data were addressed	8
		(d) If applicable, explain how loss to follow-up was addressed	NA
		(e) Describe any sensitivity analyses	NA
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	10
		(b) Give reasons for non-participation at each stage	NA
		(c) Consider use of a flow diagram	NA
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	Table 1
		(b) Indicate number of participants with missing data for each variable of interest	NA
		(c) Summarise follow-up time (eg, average and total amount)	NA
Outcome data	15*	Report numbers of outcome events or summary measures over time	NA
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	NA
		(b) Report category boundaries when continuous variables were categorized	NA
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	NA
Discussion			
Key results	18	Summarise key results with reference to study objectives	13
Limitations			
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	13.14.15
Generalisability	21	Discuss the generalisability (external validity) of the study results	15
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	16

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.



Patients' subjective assessment of the duration of cataract surgery: A case series

Journal:	<i>BMJ Open</i>
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Keywords:	Cataract and refractive surgery < OPHTHALMOLOGY, Medical Education, Treatment Surgery

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Subjective assessment of the duration of cataract surgery

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3 **1 Patients' subjective assessment of the duration of cataract surgery:**

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6 **2 A case series**

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11 Pierre-Raphael Rothschild¹ MD, Sophie Grabar² MD, PhD, Brivael Le Dû¹ MD*, Cyril
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38 Presented in part at the ARVO meeting, Fort Lauderdale, Florida, USA, May 2012

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Subjective assessment of the duration of cataract surgery

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3 26 **Article summary**
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5 27 **Article focus:**
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- 7 28 1. Modern cataract surgery is a safe and quick procedure. Nonetheless it remains a
8
9 29 stressful event from the patients' standpoint.
10
11 30 2. Several factors have been recognized to participate in patients' preoperative
12
13 31 anxiety and targeted preoperative counselling has been shown to be of value.
14
15 32 3. Though cataract surgery duration is a frequent patient preoperative qualm it has
16
17 33 not been properly studied and patient's perception of time is largely unknown.
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20
21 34 **Key messages:**
22

- 23 35 1. Patients' perceived cataract surgery duration is reasonably accurate whatever
24
25 36 the circumstances.
26
27 37 2. Surgeons' experience and pain perception were the two factors independently
28
29 38 associated with surgery duration.
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31

32 39 **Strengths and limitations:**
33

- 34 40 1. The large studied population and the strict definition used for operative time
35
36 41 provide reliable measurements of the surgery duration whether objective or
37
38 42 patient perceived.
39
40 43 2. Anxiety status, chronic illnesses, systemic medications were not part of our
41
42 44 standardized study protocol. Moreover all our patients were on sedative
43
44 45 medications at the time of surgery. This might have affected patients' perceptions
45
46 46 3. The benefit in terms of patient comfort/satisfaction of preoperative information
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48 47 regarding surgery duration needs specific studies beyond the scope of the
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50 48 present report.
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Subjective assessment of the duration of cataract surgery

1
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3 50 **Abstract**

4
5 51 **Objectives:** Surgery duration is a source of preoperative anxiety for patients undergoing
6
7 52 cataract surgery. To better inform patients we evaluated the agreement between
8
9 53 objective and patient perceived surgery duration.

10
11 54 **Design:** Case series.

12
13 55 **Setting:** Public teaching university hospital (Paris, France).

14
15 56 **Participants:** During the study period, 368 cataract surgery cases performed on 285
16
17 57 patients were included, 85 cases were excluded from the final analysis. All patients who
18
19 58 had uneventful phacoemulsification were included. Cases with any significant
20
21 59 intraoperative adverse event or cases requiring additional anaesthesia other than
22
23 60 topical were excluded. Resident performed cases were also excluded.

24
25 61 **Primary and secondary outcomes:** Procedures were timed (objective duration) and
26
27 62 patients were asked, immediately afterwards, to assess the duration of their surgery
28
29 63 (patient-assessed duration). The agreement between objective and patient-assessed
30
31 64 duration as well as influencing factors was studied.

32
33 65 **Results:** Mean objective duration (13.9 ± 5 minutes) and patient-assessed duration
34
35 66 (15.3 ± 6.9 minutes) were significantly correlated (Spearman's $r = 0.452$, $P < .0001$).
36
37 67 Furthermore, Bland-Altman analysis and the intraclass correlation coefficient (0.341,
38
39 68 95% CI, 0.23-0.44) were quite in agreement. On univariate analysis senior-performed
40
41 69 procedures were significantly shorter than those performed by juniors (13.4 versus 17.8
42
43 70 minutes, $P = .0001$). Pain was recorded as "no sensation" (31.5 % of the cases), "mild
44
45 71 sensation" (41 %), "moderate pain" (23.3 %), "intense pain" (3.5 %) and "unbearable
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47 72 pain" (0.7 %). Groups with high pain-score had significantly longer procedures (P
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49 73 $< .001$). Multivariate analysis revealed that the only independent factors associated with
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Subjective assessment of the duration of cataract surgery

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3 74 both the objective and patient-assessed duration of surgery was surgeon's experience
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5 75 and pain-score.
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7 76 **Conclusions:** In our study, patients' estimated and real duration of the surgery showed
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9
10 77 moderate agreement, suggesting that emotions associated with eye surgery under
11
12 78 topical anaesthesia did not dramatically hinder patients' perception of time. However,
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14 79 the benefit of preoperative counselling regarding the duration of surgery will need
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16 80 further evaluation
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Subjective assessment of the duration of cataract surgery

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81 **INTRODUCTION**

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83 The shortened duration of cataract surgery is one of the striking features owing to the
84 improvement of surgical techniques. Live surgery events and real-time surgical video
85 recordings by elite surgeons nowadays seldom show procedures lasting more than 10
86 minutes. The quickness of modern cataract surgery by phacoemulsification has made
87 topical anaesthesia, whose effects wear off faster than previously used peribulbar
88 injections, the method of choice for analgesia.[1] Nevertheless, whatever the amount of
89 trust patients put in their surgeon, many remain apprehensive of eye surgery under full
90 consciousness or with minimal sedation by systemic administration of drugs. This
91 apprehension is often focused on the fear of involuntary eye movements during the
92 procedure, which may complicate the surgeon's task, on patients' fear of seeing their eye
93 surgery or on the fear of painful sensations. In reply, quite abundant data are now
94 available stemming from several studies focused on the impressions of patients during
95 the procedures.[2 3] Various methods to assess the perception of pain have been used
96 and have validated that cataract surgery under topical anaesthesia is by and large
97 usually a painless procedure.[4] Visual sensations experienced by patients under the
98 operating microscope have also been recorded and have mostly been found to be of no
99 concern.[5 6] In addition to these topics, patients prior to their surgery have frequent
100 qualms regarding the duration of the procedure and hence regarding their ability to
101 withstand their eye surgery under topical anaesthesia.[7] Providing additional targeted
102 information to patients undergoing cataract surgery has been shown to improve their
103 satisfaction.[8]

104 This information could include data regarding the duration of the procedure. However,
105 surprisingly, in contrast to the common nature of cataract surgery by modern

Subjective assessment of the duration of cataract surgery

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3 106 phacoemulsification, there is scarce data regarding its duration. The purpose of this
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5 107 study was therefore to compare the objective duration of cataract surgery with the
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7 108 patients' subjective assessment of this duration.
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Subjective assessment of the duration of cataract surgery

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3 110 **METHODS**
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6 111
7 112 The study was set in the department of ophthalmology of Hôpital Cochin, a teaching
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9 113 university hospital located in Paris, France. Data were collected prospectively in
10
11 114 consecutive patients operated between May 17, 2011 and July 22, 2011 and was
12
13 115 approved by the Institutional Review Board.
14

15 All patients who had uneventful phacoemulsification under topical anaesthesia
16
17 with placement of an intraocular lens in the capsular bag were included. Cases with any
18
19 “significant adverse event” defined either by a major intraoperative complication such
20
21 as vitreous loss or by a technical problem such as phacoemulsifier malfunction that
22
23 prolonged the procedure by 10 minutes or more were excluded. Similarly, patients who
24
25 required any anaesthesia in addition to topical lidocaine 2% gel, or those who required
26
27 sedation in addition to the preoperatively given hydroxyzine were excluded from the
28
29 analyses. Teaching cases involving resident participation were also excluded from the
30
31 analyses. The duration of the procedure, referred throughout the text as the objective
32
33 duration, was timed by operating room nurses as the exposure of the patients’ eye to the
34
35 light of the operating microscope, from the beginning until the end of the surgery.
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40 The objective duration of surgery was compared to its subjective assessment
41
42 obtained by questioning patients immediately after drape removal and referred
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44 throughout the text as the patient-assessed duration. If the initial patients’ replies were
45
46 imprecise, a second line of questioning was used requesting patients to assess the
47
48 duration of their surgery by the minute. To avoid assessment biases, patients were not
49
50 warned before the surgery that they would be asked to assess the duration of their
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52 procedure.
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Subjective assessment of the duration of cataract surgery

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3 134 The patients' perception of pain during surgery was also assessed with a
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5 135 standard numeric scale, graded from 0 to 4: 0 (no pain), 1 (mild sensation), 2 (moderate
6
7 136 pain), 3 (intense pain), 4 (unbearable pain) as previously used in other studies.[4 9 10]
8

9
10 137 Other factors were also recorded: age, gender, first or second eye surgery, and
11
12 138 best corrected preoperative visual acuity. All surgeries were performed between 8:00
13
14 139 AM and 2:00 PM and the patients were requested to fast from midnight on the night
15
16 140 prior to their surgery. The patients' preoperative schedules were recorded: duration of
17
18 141 fasting, time interval between wake-up and surgery, time interval between entry in the
19
20 142 department suite and surgery (waiting time in the department). All patients received 0.5
21
22 143 mg/kg of hydroxyzine at their time of arrival in our department used as sedative and
23
24 144 additive sedation during the surgery when necessary. No other drug was given
25
26 145 preoperatively, including non-steroidal anti-inflammatory drugs. The need for
27
28 146 additional anaesthetic techniques was recorded.
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32 147 Surgeons were categorized as seniors when they had the experience of more than
33
34 148 1000 procedures performed prior to the study or as juniors otherwise.
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39 **Statistical analysis**

40 151 Categorical variables are expressed as numbers (percentages) and comparisons were
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42 152 conducted using the Fisher-exact test. For continuous variables, mean \pm standard
43
44 153 deviation (SD) or median (interquartile range, IQR) are provided, and comparisons were
45
46 154 conducted using the Kruskal-Wallis test or the student's t-test.
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48

49 155 To evaluate the agreement between objective and patient-assessed duration, a Bland-
50
51 156 Altman plot was used.[11] The differences between the two methods (i.e. objective and
52
53 157 patient-assessed duration) are plotted against their mean. The Bland-Altman analysis
54
55 158 provides the mean difference (also called bias) as well as the 95% or the 68% limits of
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Subjective assessment of the duration of cataract surgery

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3 159 agreement corresponding respectively to the mean difference ± 2 SD or ± 1 SD. When
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5 160 agreement between the two methods is good, most of the differences should reside
6
7 161 within the agreement limit interval. We also computed the Intraclass correlation
8
9 162 coefficient to quantitatively evaluate the agreement.
10
11 163 Correlation tests were conducted using the Spearman's correlation coefficient (r).
12
13 164 Factors with P values $<.10$ in the univariate analysis were included in a multivariate
14
15 165 linear regression and ANCOVA model to determine the independent factors associated
16
17 166 with either objective or patient-assessed surgery duration. P Values <0.05 were
18
19 167 considered significant. All analyses were performed with XLSTAT 2012.2.02 software
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21 168 (Addinsoft, Paris, France).
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Subjective assessment of the duration of cataract surgery

1
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3 170 **RESULTS**

4 171
5 172 A total of 283 cases performed in 218 patients were analyzed after exclusion of 85 cases
6
7 173 (65 patients) which met one or more exclusion criteria as detailed herein. Resident
8
9
10 174 participation was the most frequent motive for exclusion (70 cases). Other causes were
11
12 175 significant intraoperative adverse events including posterior capsular break or zonular
13
14 176 disinsertion (8 cases) and phacoemulsifier breakdown (1 case). Four out the 8 cases
15
16 177 presenting intraoperative vitreous loss had an identifiable risk factor for this
17
18 178 complication: two were traumatic cataracts and two were cataracts related to severe
19
20
21 179 pseudoexfoliation syndrome. Thirteen cases required additional anaesthesia or sedation
22
23 180 including sub-Tenon's block (5 cases), sub-conjunctival injection (1 case), intracameral
24
25 181 injection of lidocaine (1 case) and/or midazolam intravenous sedation (6 cases).
26
27
28 182 Characteristics of the study population, patients' schedule on the day of surgery,
29
30 183 sequence of procedures, phacoemulsifiers used and surgery duration are shown in table
31
32 184 1. No sensation was reported in 106 (31.5 %) cases, a mild sensation in 147 (41 %)
33
34 185 cases, moderate pain in 90 (23.3 %) cases, intense pain in 14 (3.5 %) cases and
35
36 186 unbearable pain in 2 (0.7 %) cases. The perception of pain did not significantly differ
37
38 187 between first and second eye procedures. Out of 155 patients operated in their first eye
39
40 188 113 patients (73%), reported low pain [no or mild sensation (score 0 or 1)], while 92 of
41
42 189 128 patients (72%) operated on their second eye rated their sensations similarly
43
44 190 (p=0.9).

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48 191 **Comparison between objective and patient-assessed duration**

49
50 192 The mean objective surgery duration was 13.9 (\pm 5) minutes and the mean patient-
51
52 193 assessed duration was 15.3 (\pm 6.9) minutes. Bland-Altman plot showed a fair agreement
53
54 194 between the objective and patient-assessed duration (fig 1). Mean difference (or bias)
55
56 195 was only 1.4 minute (95% CI, 0.63-2.15 minute). However an agreement worsening was
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Subjective assessment of the duration of cataract surgery

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3 196 noted for longer procedures but error was equally distributed over and under the limits
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5 197 of agreement (-11.3-14.1 minutes). Intraclass correlation coefficient was 0.341 (95% CI,
6
7 198 0.23-0.44) suggesting moderate agreement between the objective and patient-assessed
8
9 199 duration.

10
11 200 A significant correlation between the objective and patient-assessed duration of the
12
13 201 surgery was observed (Spearman's $r = 0.452$, $P < .0001$).

202 **Factors associated with objective surgery duration**

18
19 203 On univariate analysis, objective surgery duration was significantly correlated to
20
21 204 preoperative VA ($p=0.001$), time interval between wake-up and surgery ($p=0.041$), and
22
23 205 to the waiting time in the department ($p=0.006$). The corresponding regression
24
25 206 coefficients and 95 % CI are provided in table 2. Similarly, objective duration was
26
27 207 significantly different according to surgeon experience with shorter procedures for
28
29 208 seniors (13.4 ± 4.8 minutes) compared to juniors (17.8 ± 4.7)(fig 2). Objective duration
30
31 209 was significantly different according to pain-score group with significantly longer
32
33 210 procedures in groups with high pain-scores (score 4, 3 and 2) compared to groups with
34
35 211 low pain scores (score 0 or 1) with mean surgery durations of 15.5 (± 5.7) and 13.2
36
37 212 (± 4.5) respectively (fig 3). Objective duration was significantly different between first
38
39 213 and second eye procedures but not according to gender (table 2).

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43 214 Multivariate analysis revealed patient preoperative visual acuity, waiting time in
44
45 215 the department, surgeon experience and pain-score group to be independent factors
46
47 216 associated with objective surgery duration (table 3).

217 **Factors associated with patient-assessed surgery duration**

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49
50
51 218 On univariate analysis, patient-assessed surgery duration was correlated to patient age
52
53 219 ($p=0.011$), and time interval between wake-up and surgery ($p=0.03$). The corresponding
54
55 220 regression coefficients and 95% CI are provided in table 2. Similarly, patient-assessed
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Subjective assessment of the duration of cataract surgery

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3 221 duration was also significantly different according to surgeon experience ($p=0.032$) and
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5 222 according to pain-score group ($p=0.001$). Conversely, patient-assessed duration was not
6
7 223 significantly different between first and second eye procedures or according to gender.
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9
10 224 Multivariate analysis revealed patient age, surgeon experience and pain-score
11
12 225 group to be independent factors associated with patient-assessed surgery duration
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14 226 (table 3).
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Subjective assessment of the duration of cataract surgery

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3 228 **DISCUSSION**

4 229
5 230 Our study showed that patients overall fairly estimated the duration of their surgery and
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7 231 that the two independent factors associated with both the objective and subjective
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9
10 232 surgery duration were surgeon's experience and pain-score.

11 233 The objective duration of cataract surgery by modern phacoemulsification has
12
13
14 234 not been the main outcome measure of previous studies, but has occasionally been
15
16 235 assessed mainly in analyzes of the effects of teaching or as a secondary outcome. [12 13]
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18 236 When reported, the duration of surgery ranged from an average of 30 minutes in studies
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20
21 237 published in 2003 to 15-19 minutes in more recent reports.[14-17]. Our objective
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23 238 measure of procedures lasting 13 minutes is in line with this shortening that most
24
25 239 probably stems from improvements in the technique of cataract surgery, including
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27
28 240 suture less clear corneal micro incisions. As shown previously, our data confirmed that
29
30 241 experienced surgeons are quicker than more junior ophthalmologists.[12 13] In our
31
32 242 study, the surgeon's experience factor was independently associated with both the
33
34
35 243 objective and subjective surgery duration.

36
37 244 The subjective perception of time by patients undergoing cataract surgery under
38
39 245 topical anaesthesia has never been studied either. Preparations for surgery include the
40
41 246 testing of phacoemulsifiers, applying topical anaesthesia, preoperative disinfection of
42
43 247 the eye by povidone-iodine, draping and placement of a lid speculum. These steps may
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46 248 take as long as the surgical procedure itself or even in some instances may take longer
47
48 249 than the surgery. From the patients' perspective distinguishing these preoperative
49
50 250 stages from their surgery per se may be difficult. To minimize this bias when seeking our
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52
53 251 patients' subjective assessment of the duration of their surgery, we specifically asked for
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55 252 their impression of the elapsed time between the illumination of their eye under the
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58 253 operating microscope until the removal of the drapes. However, this time interval both
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Subjective assessment of the duration of cataract surgery

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3 254 subjectively assessed and clocked by nurses may have added approximately 1 or 2 extra
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5 255 minutes to the real time of the surgery, as the surgeons adjusted the focus of the
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7 256 microscope and made their final preparations for the procedure.
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9
10 257 The assessment of pain was a secondary outcome measure in our study and we
11
12 258 used the simple 5-step scale as validated in other studies.[4 9 10] A lack of sensation or a
13
14 259 mild sensation were reported in 72.4% of cases, moderate pain in 23.3% cases and
15
16 260 intense or even unbearable pain in 4.3% of cases. These percentages are comparable to
17
18 261 previous reports using the same 5-step pain-score scale.[9] Unsurprisingly, the
19
20 262 perception of pain was correlated with the duration of procedures. In our study, the
21
22 263 pain-score group was independently associated with both the objective and subjective
23
24 264 surgery duration. In a previous study patients tended to report their second eye surgery
25
26 265 as more painful than their first eye surgery and this finding was related to a decreased
27
28 266 preoperative anxiety at the time of the second procedure.[16] However, this finding was
29
30 267 not observed in our study, nor in another recent report.[18] This discrepancy could be
31
32 268 due to the preoperative sedation given to all our patients. Such medications can alter the
33
34 269 perception of pain as well as the perception of duration and also aim at reducing anxiety.
35
36 270 Similarly, we did not account for the patients' systemic medications or illnesses, if any,
37
38 271 which could also have altered their judgment and their pain thresholds.
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43 272 Preoperative standardized grading of cataracts or pupil size was not recorded in
44
45 273 our study. Patient age may however be used as a surrogate parameter influencing the
46
47 274 grade of the cataract.[19 20] In nuclear cataracts preoperative visual acuity may also be
48
49 275 correlated to its grade.[21] Our data confirmed that the objective duration of surgery
50
51 276 was longer in cases with worse preoperative visual acuity, as more advanced cataracts
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53 277 require a longer duration of ultrasonic power release.[22] Surprisingly, the age of the
54
55 278 patient was not correlated with objective surgery duration but with patient-assessed
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Subjective assessment of the duration of cataract surgery

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3 279 surgery duration, though weakly. The chop technique may result in quicker procedures,
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5 280 however the evaluation of the effect of surgical techniques on the duration of surgery
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7 281 was not within the scope of our study.[23]
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9
10 282 Most patients quite correctly assessed the duration of their surgery, though the
11
12 283 correlation with objective surgery duration was only moderate and samples were large.
13
14 284 Hence, we were not able to identify specific characteristics significantly associated with
15
16 285 an underestimation or an overestimation of time. Although evidence suggests that
17
18 286 fasting prior to cataract surgery under topical anaesthesia can be abandoned, in this
19
20 287 series patients fasted from midnight on the day prior to their surgery.[24] As our
21
22 288 patients were operated from 8:00 AM to 2:00 PM, fasting time varied from one case to
23
24 289 another, but these variations did not influence the subjective assessment of the duration
25
26 290 of surgery. Similarly, we thought that an early arrival and a subsequent long waiting in
27
28 291 the department of ophthalmology prior to entry in the operating room could be a factor
29
30 292 of stress resulting in an over-assessment of the duration of their surgery by patients. Yet
31
32 293 our analysis did not reveal that this factor played any role. We unexpectedly observed
33
34 294 that the time interval between wakeup and surgery, as well as waiting time in the
35
36 295 department, were associated with longer procedures. This might have been linked to
37
38 296 surgeons slowing down after a number of cases. Although it has been suggested that
39
40 297 handholding may reduce anxiety and the perception of pain during cataract surgery, this
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42 298 was not applied in our practice.[25]
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48 299 Our study showed that patients overall fairly estimated the duration of their
49
50 300 surgery. The trend in the past decades has been towards a constant reduction of the
51
52 301 duration of procedures in eye surgery. As new technical improvements are under way,
53
54 302 such as femtosecond laser-assisted cataract surgery, the fact that patients are rather
55
56 303 acutely aware of the duration of procedures must be taken into consideration as an
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Subjective assessment of the duration of cataract surgery

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2
3 304 important parameter for their comfort. . However, proving the benefit of preoperative
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5 305 counselling in terms of patient satisfaction would require a specific study beyond the
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7 306 scope of this report
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1 Subjective assessment of the duration of cataract surgery

2
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6
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8
9
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12
13 313 **Competing interests**

14 314 The authors have no conflict of interest related to results presented in this study.

15 315

16
17
18 316 **Contributorship Statement**

19 317 Only the below listed authors qualify for authorship according to the ICMJE criteria:

20 318 Pierre-Raphael Rothschild substantially participated in the following:

- 21 319 1) Conception and design, acquisition of data, and analysis and interpretation of data
22 320 2) Drafting the article and revising it critically for important intellectual content
23 321 3) Final approval of the version to be published

24 322 Sophie Grabar substantially participated in the following:

- 25 323 1) Conception and design, and analysis and interpretation of data
26 324 2) Drafting the article and revising it critically for important intellectual content
27 325 3) Final approval of the version to be published

28 326

29 327 Brivael Le Dû substantially participated in the following:

- 30 328 1) Conception and design, acquisition of data, and analysis and interpretation of data
31 329 2) Drafting the article and revising it critically for important intellectual content
32 330 3) Final approval of the version to be published

33 331

34 332 Cyril Temstet substantially participated in the following:

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Subjective assessment of the duration of cataract surgery

333 1) Conception and design, acquisition of data, and analysis and interpretation of data

334 2) Drafting the article and revising it critically for important intellectual content

335 3) Final approval of the version to be published

336

337 Olga Rostaqui substantially participated in the following:

338 1) Conception and design, acquisition of data

339 2) Drafting the article and revising it critically for important intellectual content

340 3) Final approval of the version to be published

341

342 Antoine P. Brézin substantially participated in the following:

343 1) Conception and design, acquisition of data, and analysis and interpretation of data

344 2) Drafting the article and revising it critically for important intellectual content

345 3) Final approval of the version to be published

346 **Data sharing:**

347 Extra data can be accessed via the Dryad data repository at <http://datadryad.org/> with the
348 doi:10.5061/dryad.27sk4

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Subjective assessment of the duration of cataract surgery

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3 418 **TABLE AND FIGURE LEGENDS**
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7 419

8 **Table 1.** Patient population, preoperative schedule and surgical procedures.
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10 **Table 2** Univariate analyses of factors associated with surgery duration.
11

12 **Table 3** Multivariate analyses of factors associated with surgery duration.
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20 **Figure 1.** Bland-Altman plot between objective and patient-assessed surgery duration.
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22 The solid line indicates the mean difference (or bias); the blue and red dash lines
23

24 indicate the 95% and 68% limits of agreement respectively.
25

26 **Figure 2.** Objective surgery duration according to the surgeons' experience. The bar in
27

28 the box indicates the median, the cross the mean and the lower and upper hinge the
29

30 interquartile range. The whisker extends to the most extreme data point which is no
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32 more than 1.5 times the interquartile range. Dots represent values outside the fences
33

34 (outliers). *Student's t-test
35

36 **Figure 3.** Objective surgery duration according to the pain-score group. The bar in the
37

38 box indicates the median, the cross the mean and the lower and upper hinge the
39

40 interquartile range. The whisker extends to the most extreme data point which is no
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42 more than 1.5 times the interquartile range. Dots represent values outside the fences
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44 (outliers). *Kruskal-Wallis test
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Subjective assessment of the duration of cataract surgery

Table 1 Patient population, preoperative schedule and surgical procedures

Variable	Value
Patients (n)	218
Cataract surgery cases (n)	283
Age (mean years (\pm SD))	73.2 (\pm 9.3)
Gender (cases, n (%))	
Male	132 (46.6%)
Female	151 (53.4%)
Preoperative visual acuity (Mean LogMAR (\pm SD))	0.4 (\pm0.2)
Schedule on the day of surgery (hours)	
Fasting time, mean (\pm SD)	14 (\pm 1.8)
Time interval between wake-up and surgery, mean (\pm SD)	4.6 (\pm 1.2)
Waiting time in the department, mean (\pm SD)	2.3 (\pm 0.7)
Sequence of surgery (cases, n (%))	
First eye	155 (54.8%)
Second eye	128 (45.2%)
Surgeons' experience (cases, n (%))	
Senior	253 (89.4%)
Junior	30 (10.6%)
Pain assessment	
Low pain-score	205 (72,4%)
High pain-score	78 (27,6%)

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Subjective assessment of the duration of cataract surgery

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Table 2 Univariate analyses of factors associated with surgery duration.

Variable	Objective surgery duration		Patient-assessed surgery duration	
	Regression		Regression	
	coefficient (95% CI)	P	coefficient (95% CI)	P
	or	P	or	P
	mean (\pm SD)	Value*	mean (\pm SD)	Value*
Age	0.02 (-0.04-0.86)	0.469	0.11 (0.03-0.2)	0.011
Gender				
Male	14.2 (\pm 5.2)	0.317	15.8 (\pm 6.2)	0.184
Female	13.6 (\pm 4.8)		14.8 (\pm 7.4)	
Preoperative visual acuity	4.23 (1.75-6.72)	0.001	0 (-3.5-3.5)	1.00
Schedule on the day of surgery				
Fasting time	0.27 (-0.04-0.59)	0.091	0.16 (-0.28-0.60)	0.477
Time interval between wake-up and surgery	0.49 (0.02-0.95)	0.041	0.71 (0.07-1.36)	0.03
Waiting time in the department	1.15 (0.34-1.96)	0.006	1.05 (-0.07-2.17)	0.066
Sequence of surgery				
First eye	14.1 (\pm 5.4)	0.036*	15.1 (\pm 6.8)	0.632
Second eye	13.6 (\pm 4.4)		15.5 (\pm 7.0)	
Surgeons' experience				
Senior	13.4 (\pm 4.8)	<0.0001*	15.0 (\pm 6.7)	0.032*
Junior	17.8 (\pm 4.7)		17.8 (\pm 7.4)	
Pain assessment				
Low pain-score	13.2 (\pm 4.5)	0.001*	14.4 (\pm 6.5)	<0.001*
High pain-score	15.5 (\pm 5.7)		17.6 (\pm 7.3)	

442 ** Linear regression for correlation tests and Student's t-test for mean comparison. .

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Subjective assessment of the duration of cataract surgery

444 **Table 3** Multivariate analyses of factors associated with surgery duration.

Variable	Objective surgery duration			Patient-assessed surgery duration		
	Adjusted	95%	P	Adjusted	95%	P
	Regression Coefficient*	Confidence Interval	Value	Regression Coefficient*	Confidence Interval	Value
Age	-	-	-	0.1	0 ; 0.2	0.022
Preoperative visual acuity	3.6	1.2; 5.9	0.002	-	-	-
Waiting time in the department	0.8	0.1; 1.6	0.03	-	-	-
Junior vs. senior Surgeon	4.1	2.4; 5.9	0.0001	3.3	0.8; 5.8	0.01
Low vs. high Pain score	-2.3	-3.5; -1.1	0.0002	-3.1	-4.8; -1.4	0.0004

445 *Regression coefficients adjusted for variables with p values < 0.10 in the univariate analysis.

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7 **1 Patients' subjective assessment of the duration of cataract surgery:**

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9 **2 A case series**
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4 Subjective assessment of the duration of cataract surgery
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7 **26 Article summary**

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9 **27 Article focus:**

- 10
11 28 1. Modern cataract surgery is a safe and quick procedure. Nonetheless it remains a
12
13 29 stressful event from the patients' standpoint.
14
15 30 2. Several factors have been recognized to participate in patients' preoperative
16
17 31 anxiety and targeted preoperative counselling has been shown to be of value.
18
19 32 3. Though cataract surgery duration is a frequent patient preoperative qualm it has
20
21 33 not been properly studied and patient's perception of time is largely unknown.

22 **34 Key messages:**

- 23
24 35 1. Patients' perceived cataract surgery duration is ~~fair~~reasonably accurate
25
26 36 whatever the circumstances.
27
28 37 2. Surgeons' experience and pain perception were the two factors independently
29
30 38 associated with surgery duration.
31

32 **39 Strengths and limitations:**

- 33
34 40 1. The large studied population and the strict definition used for operative time
35
36 41 provide reliable measurements of the surgery duration whether objective or
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38 42 patient perceived.
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40 43 2. Anxiety status, chronic illnesses, systemic medications were not part of our
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42 44 standardized study protocol. Moreover all our patients were on sedative
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44 45 medications at the time of surgery. This might have affected patients' perceptions
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46 46 3. The benefit in terms of patient comfort/satisfaction of preoperative information
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48 47 regarding surgery duration needs specific ~~studied~~studies beyond the scope of
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50 48 the present studyreport.
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7 50 **Objectives:** Surgery duration is a source of preoperative anxiety for patients undergoing
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9 51 cataract surgery. To better inform patients we evaluated the agreement between
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11 52 objective and patient perceived surgery duration.

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13 53 **Design:** ~~case~~ Case series.

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15 54 **Setting:** Public teaching university hospital (Paris, France).

16
17 55 **Participants:** During the study period, 368 cataract surgery cases performed on 285
18
19 56 patients were included, 85 cases were excluded from the final analysis. All patients who
20
21 57 had uneventful phacoemulsification were included. Cases with any significant
22
23 58 intraoperative adverse event or cases requiring additional anaesthesia other than
24
25 59 topical were excluded. Resident performed cases were also excluded.

26
27 60 **Primary and secondary outcomes:** Procedures were timed (objective duration) and
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29 61 patients were asked, immediately afterwards, to assess the duration of their surgery
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31 62 (patient-assessed duration). The agreement between objective and patient-assessed
32
33 63 duration as well as influencing factors was studied.

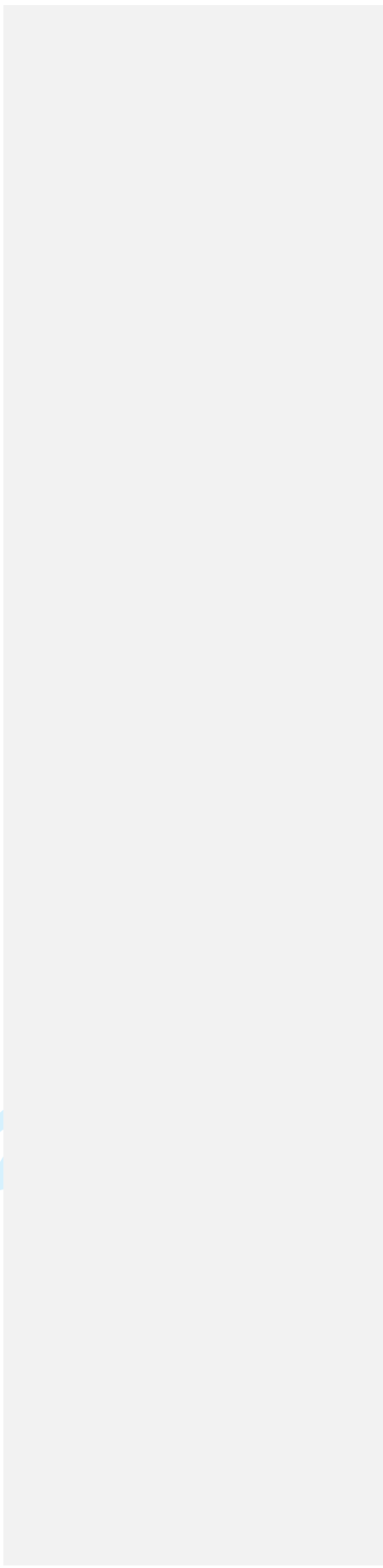
34
35 64 **Results:** Mean objective duration (13.9 ± 5 minutes) and patient-assessed duration
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37 65 (15.3 ± 6.9 minutes) were significantly correlated (Spearman's $r = 0.452$, $P < .0001$).
38
39 66 Furthermore, Bland-Altman analysis and the intraclass correlation coefficient (0.341,
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41 67 95% CI, 0.23-0.44) ~~showed a fair~~ were quite in agreement. On univariate analysis senior-
42
43 68 performed procedures were significantly shorter than those performed by juniors (13.4
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45 69 versus 17.8 minutes, $P = .0001$). Pain was recorded as "no sensation" (31.5 % of the
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47 70 cases), "mild sensation" (41 %), "moderate pain" (23.3 %), "intense pain" (3.5 %) and
48
49 71 "unbearable pain" (0.7 %). Groups with high pain-score had significantly longer
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51 72 procedures ($P < .001$). Multivariate analysis revealed that the only independent factors
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53 73 associated with both the objective and patient-assessed duration of surgery was
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55 74 surgeon's experience and pain-score.

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Subjective assessment of the duration of cataract surgery

75 **Conclusions:** In our study, patients' fairly estimated and real the duration of their
76 surgery in our study showed moderate agreement, suggesting that emotions associated
77 with eye surgery under topical anaesthesia did not dramatically hinder patients'
78 perception of time. However, the benefit of preoperative counselling regarding the
79 duration of surgery will need further evaluation

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7 80 **INTRODUCTION**
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9 81
10 82 The shortened duration of cataract surgery is one of the striking features owing to the
11 83 improvement of surgical techniques. Live surgery events and real-time surgical video
12 84 recordings by elite surgeons nowadays seldom show procedures lasting more than 10
13 85 minutes. The quickness of modern cataract surgery by phacoemulsification has made
14 86 topical anaesthesia, whose effects wear off faster than previously used peribulbar
15 87 injections, the method of choice for analgesia.[1] Nevertheless, whatever the amount of
16 88 trust patients put in their surgeon, many remain apprehensive of eye surgery under full
17 89 consciousness or with minimal sedation by systemic administration of drugs. This
18 90 apprehension is often focused on the fear of involuntary eye movements during the
19 91 procedure, which may complicate the surgeon's task, on patients' fear of seeing their eye
20 92 surgery or on the fear of painful sensations. In reply, quite abundant data are now
21 93 available stemming from several studies focused on the impressions of patients during
22 94 the procedures.[2 3] Various methods to assess the perception of pain have been used
23 95 and have validated that cataract surgery under topical anaesthesia is by and large
24 96 usually a painless procedure.[4] Visual sensations experienced by patients under the
25 97 operating microscope have also been recorded and have mostly been found to be of no
26 98 concern.[5 6] In addition to these topics, patients prior to their surgery have frequent
27 99 qualms regarding the duration of the procedure and hence regarding their ability to
28 100 withstand their eye surgery under topical anaesthesia.[7] Providing additional targeted
29 101 information to patients undergoing cataract surgery has been shown to improve their
30 102 satisfaction.[8]

31 103 This information could include data regarding the duration of the procedure. However,
32 104 surprisingly, in contrast to the common nature of cataract surgery by modern
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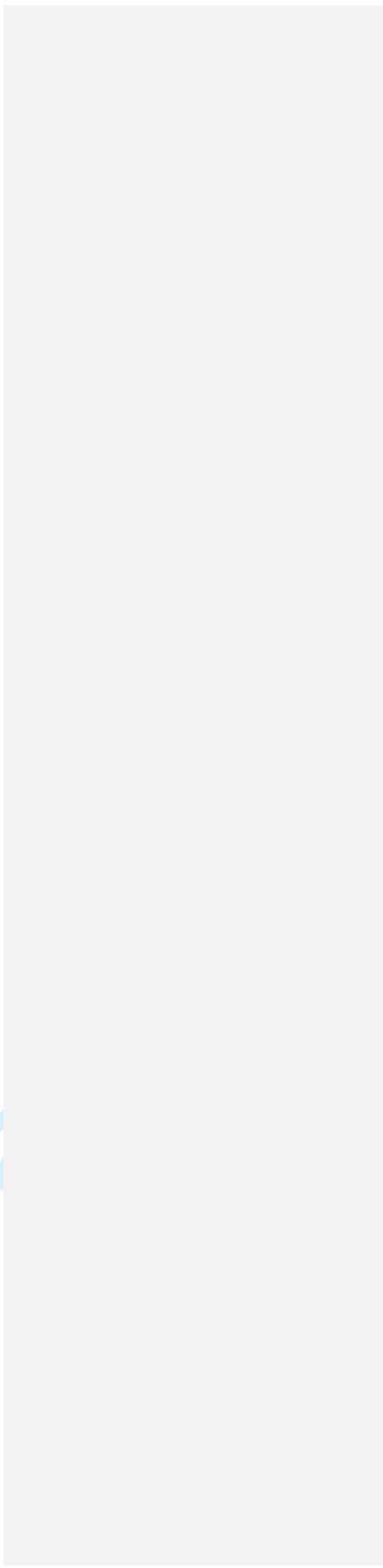
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Subjective assessment of the duration of cataract surgery

105 phacoemulsification, there is scarce data regarding its duration. The purpose of this
106 study was therefore to compare the objective duration of cataract surgery with the
107 patients' subjective assessment of this duration.

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7 109 **METHODS**

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10 111 The study was set in the department of ophthalmology of Hôpital Cochin, a teaching
11 112 university hospital located in Paris, France. Data were collected prospectively in
12 113 consecutive patients operated between May 17, 2011 and July 22, 2011— and was
13 114 approved by the Institutional Review Board.

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17 115 All patients who had uneventful phacoemulsification under topical anaesthesia
18 116 with placement of an intraocular lens in the capsular bag were included. Cases with any
19 117 “significant adverse event” defined either by a major intraoperative complication such
20 118 as vitreous loss or by a technical problem such as phacoemulsifier malfunction that
21 119 prolonged the procedure by 10 minutes or more were excluded. Similarly, patients who
22 120 required any anaesthesia in addition to topical lidocaine 2% gel, or those who required
23 121 sedation in addition to the preoperatively given hydroxyzine were excluded from the
24 122 analyses. Teaching cases involving resident participation were also excluded from the
25 123 analyses. The duration of the procedure, referred throughout the text as the objective
26 124 duration, was timed by operating room nurses as the exposure of the patients’ eye to the
27 125 light of the operating microscope, from the beginning until the end of the surgery.

28
29 126 The objective duration of surgery was compared to its subjective assessment
30 127 obtained by questioning patients immediately after drape removal and referred
31 128 throughout the text as the patient-assessed duration. If the initial patients’ replies were
32 129 imprecise, a second line of questioning was used requesting patients to assess the
33 130 duration of their surgery by the minute. To avoid assessment biases, patients were not
34 131 warned before the surgery that they would be asked to assess the duration of their
35 132 procedure.

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7 133 The patients' perception of pain during surgery was also assessed with a
8
9 134 standard numeric scale, graded from 0 to 4: 0 (no pain), 1 (mild sensation), 2 (moderate
10
11 135 pain), 3 (intense pain), 4 (unbearable pain) as previously used in other studies.[4 9 10]

12
13 136 Other factors were also recorded: age, gender, first or second eye surgery, and
14
15 137 best corrected preoperative visual acuity. All surgeries were performed between 8:00
16
17 138 AM and 2:00 PM and the patients were requested to fast from midnight on the night
18
19 139 prior to their surgery. The patients' preoperative schedules were recorded: duration of
20
21 140 fasting, time interval between wake-up and surgery, time interval between entry in the
22
23 141 department suite and surgery (waiting time in the department). All patients received 0.5
24
25 142 mg/kg of hydroxyzine at their time of arrival in our department used as sedative and
26
27 143 additive sedation during the surgery when necessary. No other drug was given
28
29 144 preoperatively, including non-steroidal anti-inflammatory drugs. The need for
30
31 145 additional anaesthetic techniques was recorded.

32
33 146 Surgeons were categorized as seniors when they had the experience of more than
34
35 147 1000 procedures performed prior to the study or as juniors otherwise.

36 148

38 149 **Statistical analysis**

39 150 Categorical variables are expressed as numbers (percentages) and comparisons were
40
41 151 conducted using the Fisher-exact test. For continuous variables, mean \pm standard
42
43 152 deviation (SD) or median (interquartile range, IQR) are provided, and comparisons were
44
45 153 conducted using the Kruskal-Wallis test or the student's t-test.

46
47 154 To evaluate the agreement between objective and patient-assessed duration, a Bland-
48
49 155 Altman plot was used.[11] The differences between the two methods (i.e. objective and
50
51 156 patient-assessed duration) are plotted against their mean. The Bland-Altman analysis
52
53 157 provides the mean difference (also called bias) as well as the 95% or the 68% limits of

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7 158 agreement corresponding respectively to the mean difference ± 2 SD or ± 1 SD. When
8
9 159 agreement between the two methods is good, most of the differences should reside
10
11 160 within the agreement limit interval. We also computed the Intraclass correlation
12
13 161 coefficient to quantitatively evaluate the agreement.
14
15 162 Correlation tests were conducted using the Spearman's correlation coefficient (r).
16
17 163 Factors with P values $<.10$ in the univariate analysis were included in a multivariate
18
19 164 linear regression and ANCOVA model to determine the independent factors associated
20
21 165 with either objective or patient-assessed surgery duration. P Values <0.05 were
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23 166 considered significant. All analyses were performed with XLSTAT 2012.2.02 software
24
25 167 (Addinsoft, Paris, France).
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7 **RESULTS**

8
9 A total of 283 cases performed in 218 patients ~~were~~ analyzed after exclusion of 85
10 cases (65 patients) which met one or more exclusion criteria as detailed herein.
11 Resident participation was the most frequent motive for exclusion (70 cases). Other
12 causes were significant intraoperative adverse events including posterior capsular
13 break or zonular disinsertion (8 cases) and phacoemulsifier breakdown (1 case). Four
14 out the 8 cases presenting intraoperative vitreous loss had an identifiable risk factor for
15 this complication: two were traumatic cataracts and two were cataracts related to
16 severe pseudoexfoliation syndrome. Thirteen cases required additional anaesthesia or
17 sedation including sub-Tenon's block (5 cases), sub-conjunctival injection (1 case),
18 intracameral injection of lidocaine (1 case) and/or midazolam intravenous sedation (6
19 cases). Nine cases were excluded for significant intraoperative adverse event including
20 posterior capsular break or zonular disinsertion (8 cases) and phacoemulsifier
21 breakdown (1 case). Four out the 8 cases presenting intraoperative vitreous loss had an
22 identifiable risk factor for this complication, two were traumatic cataracts, and two were
23 cataracts related to severe pseudoexfoliation syndrome. Thirteen other cases required
24 additional anaesthesia or sedation and were therefore excluded. Those included sub-
25 Tenon's block (5 cases), sub conjunctival injection (1 case), intracameral injection of
26 lidocaine (1 case) and midazolam intravenous sedation (6 cases). Finally 70 cases
27 involving resident participation were excluded. Characteristics of the study population,
28 patients' schedule on the day of surgery, sequence of procedures, phacoemulsifiers used
29 and surgery duration are shown in table 1. No sensation was reported in 106 (31.5 %)
30 cases, a mild sensation in 147 (41 %) cases, moderate pain in 90 (23.3 %) cases, intense
31 pain in 14 (3.5 %) cases and unbearable pain in 2 (0.7 %) cases. The perception of pain
32 did not significantly differ between first and second eye procedures. Out of 155 patients
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7 195 operated in their first eye 113 patients (73%), reported low pain [no or mild sensation
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9 196 (score 0 or 1)], while 92 of 128 patients (72%) operated on their second eye rated their
10
11 197 sensations similarly ($p=0.9$).

12 198 **Comparison between objective and patient-assessed duration**

13
14 199 The mean objective surgery duration was 13.9 (± 5) minutes and the mean patient-
15
16 200 assessed duration was 15.3 (± 6.9) minutes. Bland-Altman plot showed a fair agreement
17
18 201 between the objective and patient-assessed duration (fig 1). Mean difference (or bias)
19
20 202 was only 1.4 minute (95% CI, 0.63-2.15 minute). However an agreement worsening was
21
22 203 noted for longer procedures but error was equally distributed over and under the limits
23
24 204 of agreement (-11.3-14.1 minutes). Intraclass correlation coefficient was 0.341 (95% CI,
25
26 205 0.23-0.44) suggesting moderate agreement between the objective and patient-assessed
27
28 206 duration.

29
30 207 A significant correlation between the objective and patient-assessed duration of the
31
32 208 surgery was observed (Spearman's $r = 0.452$, $P < .0001$).

33 209 **Factors associated with objective surgery duration**

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36 210 On univariate analysis, objective surgery duration was significantly correlated to
37
38 211 preoperative VA ($p=0.001$), time interval between wake-up and surgery ($p=0.041$), and
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40 212 to the waiting time in the department ($p=0.006$). The corresponding regression
41
42 213 coefficients and 95 % CI are provided in table 2. Similarly, objective duration was
43
44 214 significantly different according to surgeon experience with shorter procedures for
45
46 215 seniors (13.4 ± 4.8 minutes) compared to juniors (17.8 ± 4.7)(fig 2). Objective duration
47
48 216 was significantly different according to pain-score group with significantly longer
49
50 217 procedures in groups with high pain-scores (score 4, 3 and 2) compared to groups with
51
52 218 low pain scores (score 0 or 1) with mean surgery durations of 15.5 (± 5.7) and 13.2

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6 219 (± 4.5) respectively (fig 3). Objective duration was significantly different between first
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8 220 and second eye procedures but not according to gender (table 2).

9
10 221 Multivariate analysis revealed patient preoperative visual acuity, waiting time in
11
12 222 the department, surgeon experience and pain-score group to be independent factors
13
14 223 associated with objective surgery duration (table 3).

15
16 224 **Factors associated with patient-assessed surgery duration**

17
18 225 On univariate analysis, patient-assessed surgery duration was correlated to patient age
19
20 226 ($p=0.011$), and time interval between wake-up and surgery ($p=0.03$). The corresponding
21
22 227 regression coefficients and 95% CI are provided in table 2. Similarly, patient-assessed
23
24 228 duration was also significantly different according to surgeon experience ($p=0.032$) and
25
26 229 according to pain-score group ($p=0.001$). Conversely, patient-assessed duration was not
27
28 230 significantly different between first and second eye procedures or according to gender.

29
30 231 Multivariate analysis revealed patient age, surgeon experience and pain-score
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32 232 group to be independent factors associated with patient-assessed surgery duration
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34 233 (table 3).

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7 235 **DISCUSSION**
8 236

9 237 Our study showed that patients overall fairly estimated the duration of their surgery and
10 238 that the two independent factors associated with both the objective and subjective
11 239 surgery duration were surgeon's experience and pain-score.
12

13
14 240 The objective duration of cataract surgery by modern phacoemulsification has
15 241 not been the main outcome measure of previous studies, but has occasionally been
16 242 assessed mainly in analyzes of the effects of teaching or as a secondary outcome. [12 13]
17
18 243 When reported, the duration of surgery ranged from an average of 30 minutes in studies
19 244 published in 2003 to 15-19 minutes in more recent reports.[14-17]. Our objective
20 245 measure of procedures lasting 13 minutes is in line with this shortening that most
21 246 probably stems from improvements in the technique of cataract surgery, including
22 247 suture less clear corneal micro incisions. As shown previously, our data confirmed that
23 248 experienced surgeons are quicker than more junior ophthalmologists.[12 13] In our
24 249 study, the surgeon's experience factor was independently associated with both the
25 250 objective and subjective surgery duration.
26

27
28 251 The subjective perception of time by patients undergoing cataract surgery under
29 252 topical anaesthesia has never been studied either. Preparations for surgery include the
30 253 testing of phacoemulsifiers, applying topical anaesthesia, preoperative disinfection of
31 254 the eye by povidone-iodine, draping and placement of a lid speculum. These steps may
32 255 take as long as the surgical procedure itself or even in some instances may take longer
33 256 than the surgery. From the patients' perspective distinguishing these preoperative
34 257 stages from their surgery per se may be difficult. To minimize this bias when seeking our
35 258 patients' subjective assessment of the duration of their surgery, we specifically asked for
36 259 their impression of the elapsed time between the illumination of their eye under the
37 260 operating microscope until the removal of the drapes. However, this time interval both
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7 261 subjectively assessed and clocked by nurses may have added approximately 1 or 2 extra
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9 262 minutes to the real time of the surgery, as the surgeons adjusted the focus of the
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11 263 microscope and made their final preparations for the procedure.

12 264 The assessment of pain was a secondary outcome measure in our study and we
13
14 265 used the simple 5-step scale as validated in other studies.[4 9 10] A lack of sensation or a
15
16 266 mild sensation were reported in 72.4% of cases, moderate pain in 23.3% cases and
17
18 267 intense or even unbearable pain in 4.3% of cases. These percentages are comparable to
19
20 268 previous reports using the same 5-step pain-score scale.[9] Unsurprisingly, the
21
22 269 perception of pain was correlated with the duration of procedures. In our study, the
23
24 270 pain-score group was independently associated with both the objective and subjective
25
26 271 surgery duration. In a previous study patients tended to report their second eye surgery
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28 272 as more painful than their first eye surgery and this finding was related to a decreased
29
30 273 preoperative anxiety at the time of the second procedure.[16] However, this finding was
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32 274 not observed in our study, nor in another recent report.[18] This discrepancy could be
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34 275 due to the preoperative sedation given to all our patients. Such medications can alter the
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36 276 perception of pain as well as the perception of duration and also aim at reducing anxiety.
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38 277 Similarly, we did not account for the patients' systemic medications or illnesses, if any,
39
40 278 which could also have altered their judgment and their pain thresholds.

41
42 279 Preoperative standardized grading of cataracts or pupil size was not recorded in
43
44 280 our study. Patient age may however be used as a surrogate parameter influencing the
45
46 281 grade of the cataract.[19 20] In nuclear cataracts preoperative visual acuity may also be
47
48 282 correlated to its grade.[21] Our data confirmed that the objective duration of surgery
49
50 283 was longer in cases with worse preoperative visual acuity, as more advanced cataracts
51
52 284 require a longer duration of ultrasonic power release.[22] Surprisingly, the age of the
53
54 285 patient was not correlated with objective surgery duration but with patient-assessed

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7 286 surgery duration, though weakly. The chop technique may result in quicker procedures,
8
9 287 however the evaluation of the effect of surgical techniques on the duration of surgery
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11 288 was not within the scope of our study.[23]

12
13 289 Most patients quite correctly assessed the duration of their surgery, though the
14
15 290 correlation with objective surgery duration was only moderate and samples were large.
16
17 291 Hence, we were not able to identify specific characteristics significantly associated with
18
19 292 an underestimation or an overestimation of time. Although evidence suggests that
20
21 293 fasting prior to cataract surgery under topical anaesthesia can be abandoned, in this
22
23 294 series patients fasted from midnight on the day prior to their surgery.[24] As our
24
25 295 patients were operated from 8:00 AM to 2:00 PM, fasting time varied from one case to
26
27 296 another, but these variations did not influence the subjective assessment of the duration
28
29 297 of surgery. Similarly, we thought that an early arrival and a subsequent long waiting in
30
31 298 the department of ophthalmology prior to entry in the operating room could be a factor
32
33 299 of stress resulting in an over-assessment of the duration of their surgery by patients. Yet
34
35 300 our analysis did not reveal that this factor played any role. We unexpectedly observed
36
37 301 that the time interval between wakeup and surgery, as well as waiting time in the
38
39 302 department, were associated with longer procedures. This might have been linked to
40
41 303 surgeons slowing down after a number of cases. Although it has been suggested that
42
43 304 handholding may reduce anxiety and the perception of pain during cataract surgery, this
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45 305 was not applied in our practice.[25]

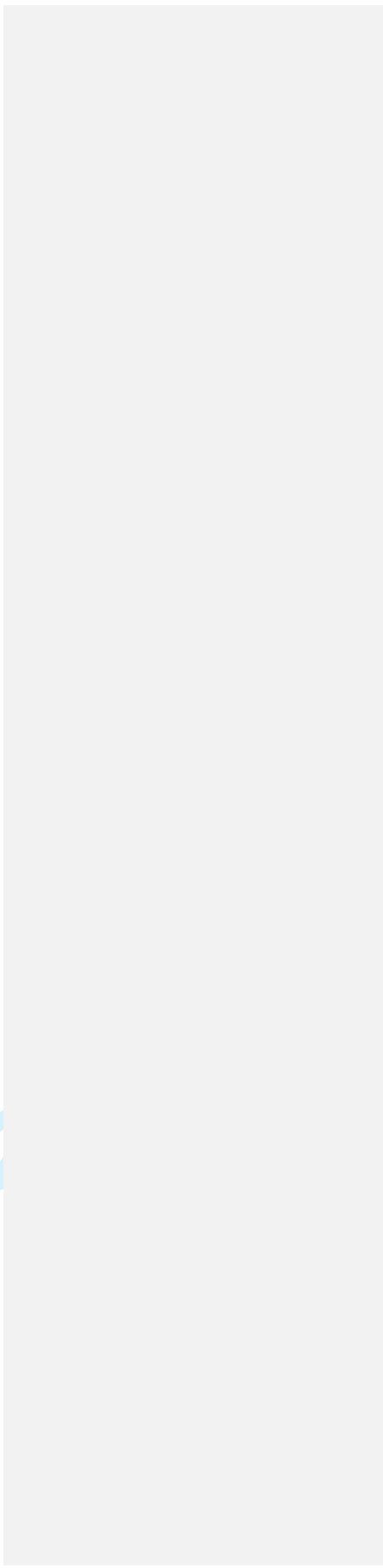
46
47 306 Our study showed that patients overall fairly estimated the duration of their
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49 307 surgery. The trend in the past decades has been towards a constant reduction of the
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51 308 duration of procedures in eye surgery. As new technical improvements are under way,
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53 309 such as femtosecond laser-assisted cataract surgery, the fact that patients are rather
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55 310 acutely aware of the duration of procedures must be taken into consideration as an

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Subjective assessment of the duration of cataract surgery

311 important parameter for their comfort. . However, proving the benefit of preoperative
312 counselling in terms of patient satisfaction would require a specific study beyond the
313 scope of this report
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10
11
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15
16 320 | **Competing interests**

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17 321 The authors have no conflict of interest related to results presented in this study.
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22 323 | **Contributorship Statement**

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23
24 324 Only the below listed authors qualify for authorship according to the ICMJE criteria:

25
26 325 Pierre-Raphael Rothschild substantially participated in the following:

- 27
28 326 1) Conception and design, acquisition of data, and analysis and interpretation of data
29
30 327 2) Drafting the article and revising it critically for important intellectual content
31
32 328 3) Final approval of the version to be published

33
34 329 Sophie Grabar substantially participated in the following:

- 35
36 330 1) Conception and design, and analysis and interpretation of data
37
38 331 2) Drafting the article and revising it critically for important intellectual content
39
40 332 3) Final approval of the version to be published

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42 333
43 334 Brivael Le Dû substantially participated in the following:

- 44
45 335 1) Conception and design, acquisition of data, and analysis and interpretation of data
46
47 336 2) Drafting the article and revising it critically for important intellectual content
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49 337 3) Final approval of the version to be published

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53 339 Cyril Temstet substantially participated in the following:
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- 340 1) Conception and design, acquisition of data, and analysis and interpretation of data
341 2) Drafting the article and revising it critically for important intellectual content
342 3) Final approval of the version to be published

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344 Olga Rostaqui substantially participated in the following:

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346 2) Drafting the article and revising it critically for important intellectual content
347 3) Final approval of the version to be published

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349 Antoine P. Brézin substantially participated in the following:

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351 2) Drafting the article and revising it critically for important intellectual content
352 3) Final approval of the version to be published

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4 Subjective assessment of the duration of cataract surgery
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6 423 **TABLE AND FIGURE LEGENDS**
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10 425 **Table 1.** Patient population, preoperative schedule and surgical procedures.
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12 426 **Table 2** Univariate analyses of factors associated with surgery duration.
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14 427 **Table 3** Multivariate analyses of factors associated with surgery duration.
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20 430 **Figure 1.** Bland-Altman plot between objective and patient-assessed surgery duration.
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22 431 The solid line indicates the mean difference (or bias); the blue and red dash lines
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24 432 indicate the 95% and 68% limits of agreement respectively.
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26 433 **Figure 2.** Objective surgery duration according to the surgeons' experience. The bar in
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28 434 the box indicates the median, the cross the mean and the lower and upper hinge the
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30 435 interquartile range. The whisker extends to the most extreme data point which is no
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32 436 more than 1.5 times the interquartile range. Dots represent values outside the fences
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34 437 (outliers).*Student's t-test
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36 438 **Figure 3.** Objective surgery duration according to the pain-score group. The bar in the
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38 439 box indicates the median, the cross the mean and the lower and upper hinge the
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40 440 interquartile range. The whisker extends to the most extreme data point which is no
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42 441 more than 1.5 times the interquartile range. Dots represent values outside the fences
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44 442 (outliers).*Kruskal-Wallis test
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7 **Table 1 Patient population, preoperative schedule and surgical**
8 **procedures**

Variable	Value
Patients (n)	218
Cataract surgery cases (n)	283
Age (mean years (\pm SD))	73.2 (\pm 9.3)
Gender (cases, n (%))	
Male	132 (46.6%)
Female	151 (53.4%)
Preoperative visual acuity (Mean LogMAR (\pm SD))	0.4 (\pm 0.2)
Schedule on the day of surgery (hours)	
Fasting time, mean (\pm SD)	14 (\pm 1.8)
Time interval between wake-up and surgery, mean (\pm SD)	4.6 (\pm 1.2)
Waiting time in the department, mean (\pm SD)	2.3 (\pm 0.7)
Sequence of surgery (cases, n (%))	
First eye	155 (54.8%)
Second eye	128 (45.2%)
Surgeons' experience (cases, n (%))	
Senior	253 (89.4%)
Junior	30 (10.6%)
Pain assessment	
Low pain-score	205 (72,4%)
High pain-score	78 (27,6%)

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Subjective assessment of the duration of cataract surgery

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446 **Table 2** Univariate analyses of factors associated with surgery duration.

Variable	Objective surgery duration		Patient-assessed surgery duration	
	Regression		Regression	
	coefficient (95% CI)		coefficient (95% CI)	
	or	P	or	P
	mean (\pm SD)	Value*	mean (\pm SD)	Value*
Age	0.02 (-0.04-0.86)	0.469	0.11 (0.03-0.2)	0.011
Gender				
Male	14.2 (\pm 5.2)	0.317	15.8 (\pm 6.2)	0.184
Female	13.6 (\pm 4.8)		14.8 (\pm 7.4)	
Preoperative visual acuity	4.23 (1.75-6.72)	0.001	0 (-3.5-3.5)	1.00
Schedule on the day of surgery				
Fasting time	0.27 (-0.04-0.59)	0.091	0.16 (-0.28-0.60)	0.477
Time interval between wake-up and surgery	0.49 (0.02-0.95)	0.041	0.71 (0.07-1.36)	0.03
Waiting time in the department	1.15 (0.34-1.96)	0.006	1.05 (-0.07-2.17)	0.066
Sequence of surgery				
First eye	14.1 (\pm 5.4)	0.036*	15.1 (\pm 6.8)	0.632
Second eye	13.6 (\pm 4.4)		15.5 (\pm 7.0)	
Surgeons' experience				
Senior	13.4 (\pm 4.8)	<0.0001*	15.0 (\pm 6.7)	0.032*
Junior	17.8 (\pm 4.7)		17.8 (\pm 7.4)	
Pain assessment				
Low pain-score	13.2 (\pm 4.5)	0.001*	14.4 (\pm 6.5)	<0.001*
High pain-score	15.5 (\pm 5.7)		17.6 (\pm 7.3)	

447 ****** Linear regression for correlation tests and Student's t-test for mean comparison.

448 Linear regression for continuous variables and Students' t-test for categorical variables.

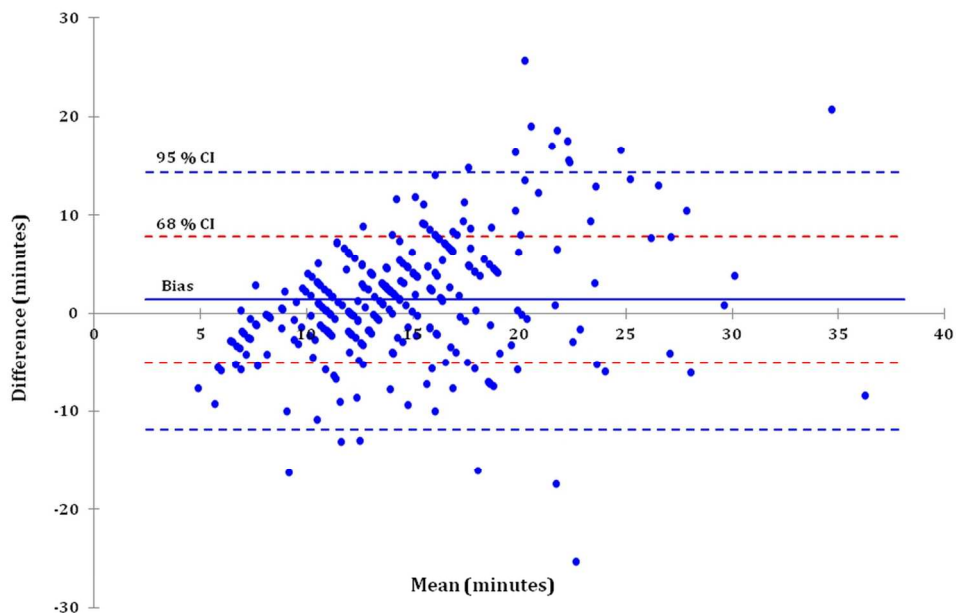
Subjective assessment of the duration of cataract surgery

450 **Table 3** Multivariate analyses of factors associated with surgery duration.

Variable	Objective surgery duration			Patient-assessed surgery duration		
	Adjusted Regression Coefficient*	95% Confidence Interval	P Value	Adjusted Regression Coefficient*	95% Confidence Interval	P Value
Age	-	-	-	0.1	0 ; 0.2	0.022
Preoperative visual acuity	3.6	1.2; 5.9	0.002	-	-	-
Waiting time in the department	0.8	0.1; 1.6	0.03	-	-	-
Junior vs. senior Surgeon	4.1	2.4 ; 5.9	0.0001	3.3	0.8 ; 5.8	0.01
Low vs. high Pain score	-2.3	-3.5 ; -1.1	0.0002	-3.1	-4.8 ; -1.4	0.0004

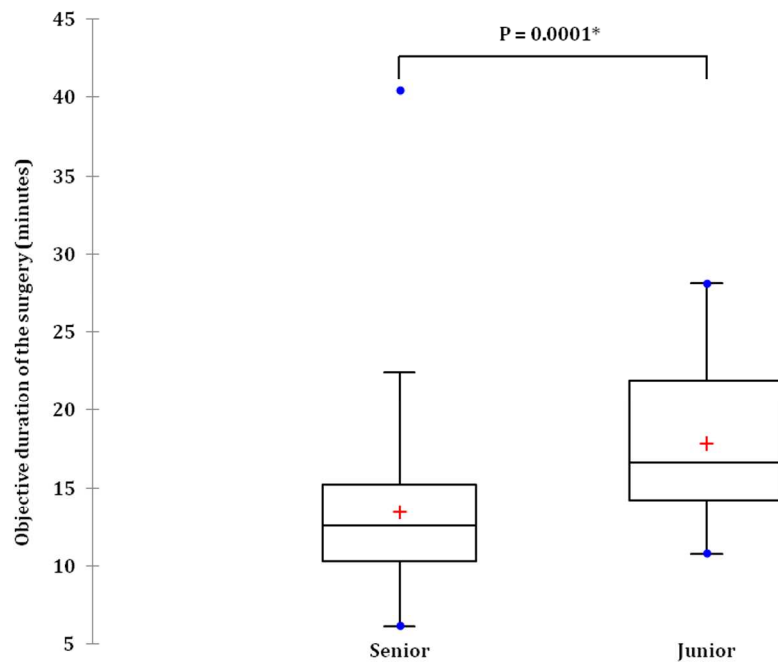
451 *Regression coefficients adjusted for variables with p values < 0.10 in the univariate analysis.
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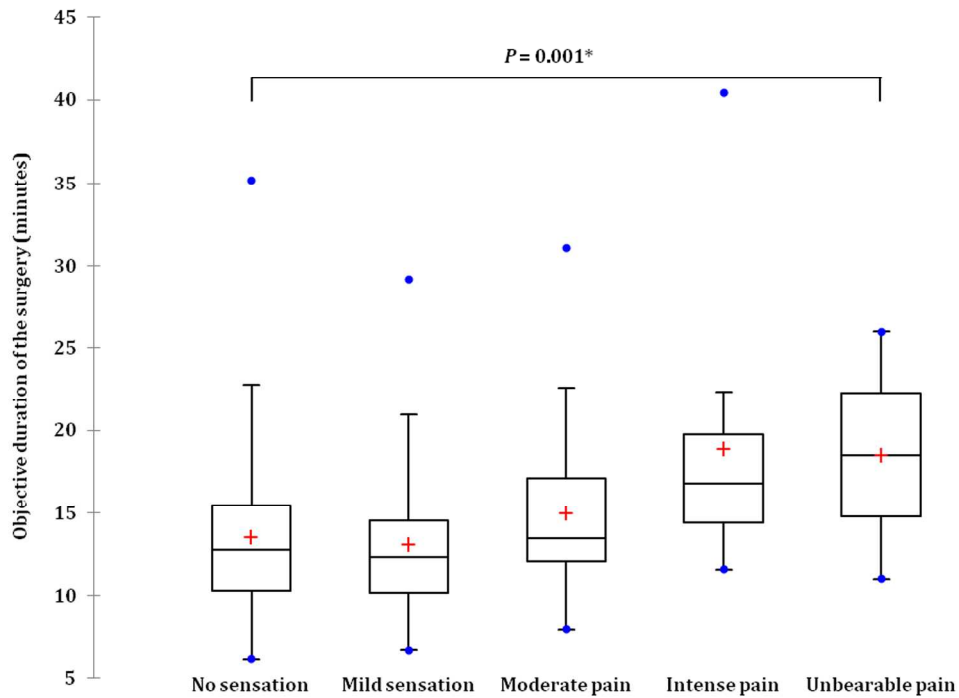
Bland-Altman plot between objective and patient-assessed surgery duration. The solid line indicates the mean difference (or bias); the blue and red dash lines indicate the 95% and 68% limits of agreement respectively.
119x90mm (300 x 300 DPI)

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Objective surgery duration according to the surgeons' experience. The bar in the box indicates the median, the cross the mean and the lower and upper hinge the interquartile range. The whisker extends to the most extreme data point which is no more than 1.5 times the interquartile range. Dots represent values outside the fences (outliers). *Student's t-test

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Objective surgery duration according to the pain-score group. The bar in the box indicates the median, the cross the mean and the lower and upper hinge the interquartile range. The whisker extends to the most extreme data point which is no more than 1.5 times the interquartile range. Dots represent values outside the fences (outliers). *Kruskal-Wallis test

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STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cohort studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	1 and 3
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	3
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	5
Objectives	3	State specific objectives, including any prespecified hypotheses	6
Methods			
Study design	4	Present key elements of study design early in the paper	7
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	7
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	7
		(b) For matched studies, give matching criteria and number of exposed and unexposed	Not applicable
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	7, 8
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	7
Bias	9	Describe any efforts to address potential sources of bias	7
Study size	10	Explain how the study size was arrived at	7
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	8
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	8
		(b) Describe any methods used to examine subgroups and interactions	8
		(c) Explain how missing data were addressed	8
		(d) If applicable, explain how loss to follow-up was addressed	NA
		(e) Describe any sensitivity analyses	NA
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	10
		(b) Give reasons for non-participation at each stage	NA
		(c) Consider use of a flow diagram	NA
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	Table 1
		(b) Indicate number of participants with missing data for each variable of interest	NA
		(c) Summarise follow-up time (eg, average and total amount)	NA
Outcome data	15*	Report numbers of outcome events or summary measures over time	NA
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	NA
		(b) Report category boundaries when continuous variables were categorized	NA
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	NA
Discussion			
Key results	18	Summarise key results with reference to study objectives	13
Limitations			
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	13.14.15
Generalisability	21	Discuss the generalisability (external validity) of the study results	15
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	16

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.