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

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

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Article summary

Article focus:

1. Modern cataract surgery is a safe and quick procedure. Nonetheless it remains a stressful event from the patients' standpoint.
2. Several factors have been recognized to participate in patients' preoperative anxiety and targeted preoperative counselling has been shown to be of value.
3. Though cataract surgery duration is a frequent patient preoperative qualm it has not been properly studied and patient's perception of time is largely unknown.

Key messages:

1. Patients' perceived cataract surgery duration is rather good whatever the circumstances.
2. We encourage cataract surgeons to monitor their surgery duration and inform their patients accordingly.
3. Surgeons' experience and pain perception were the two factors independently associated with surgery duration.

Strengths and limitations:

1. The large studied population and the strict definition used for operative time provide reliable measurements of the surgery duration whether objective or patient perceived.
2. Preoperative and intraoperative anxiety score evaluation was not part of our standardized study protocol. This might have been associated with objective or patient assessed surgery duration.

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Objectives:. Surgery duration is a source of preoperative anxiety for patients undergoing cataract surgery. To better inform patients we evaluated the agreement between objective and patient perceived surgery duration.

Design: cohort study.

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

Participants During the study period, 368 cataract surgery cases performed on 286 patients were included, 9 cases/patients were excluded from the final analysis. All cases performed by phacoemulsification under topical anaesthesia were included. Cases for which any adverse event prolonged the procedure by 10 minutes or more were excluded.

Primary and secondary outcomes: Procedures were timed (objective duration) and patients were asked, immediately afterwards, to assess the duration of their surgery (patient-assessed duration). The agreement between objective and patient-assessed duration as well as influencing factors was studied.

Results: Median objective duration (13.6 minutes) and patient-assessed duration (15 minutes) were significantly correlated (Pearson's r = 0.468, *P* <.0001). Futhermore, Bland-Altman analysis and the intraclass correlation coefficient (0.44, 95%CI, 0.36-0.53) showed a fair agreement. On univariate analysis senior-performed procedures were significantly shorter (12.6 minutes) than those performed by juniors or residents, 18.2 and 17 minutes, respectively (*P* =.0001). Pain was recorded as "no sensation" (29.5 % of the cases), "mild sensation" (41%), "moderate pain" (25%), "intense pain" (3.9%) and "unbearable pain" (0.6%). Groups with high pain-score had significantly longer procedures (*P* <.00001). Multivariate analysis revealed that the only independent factors associated with both the objective and patient-assessed duration of surgery was surgeon's experience and pain-score.

Conclusions: Patients fairly estimated the duration of their surgery in our study, suggesting that emotions associated with eye surgery under topical anesthesia did not hinder patients' perception of time. We encourage cataract surgeons to monitor their own surgical duration to better inform their patients. The benefit of preoperative counseling will need further evaluation by validated anxiety scales.

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INTRODUCTION

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

study was therefore to compare the objective duration of cataract surgery with the patients' subjective assessment of this duration.

METHODS

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

All patients who had phacoemulsification under topical anaesthesia or sub-Tenon's block with placement of an intraocular lens in the capsular bag were included. The duration of the procedure, referred throughout the text as the objective duration, was timed by operating room nurses as the exposure of the patients' eye to the light of the operating microscope, from the beginning until the end of the surgery. Cases for which any adverse event prolonged the procedure by 10 minutes or more were excluded.

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

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

Other factors were also recorded: age, gender, first or second eye surgery, and best corrected preoperative visual acuity. All surgeries were performed between 8:00 AM and 2:00 PM and the patients were requested to fast from midnight on the night

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

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

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

Statistical analysis

Categorical variables are expressed as numbers (percentages) and comparisons were conducted using the Fisher-exact test. For continuous variables, mean ± standard deviation (SD) or median (interquartile range, IQR) are provided, and comparisons were conducted using the Kruskal-Wallis test.

To evaluate the agreement between objective and patient-assessed duration, a Bland-Altman plot was used.[11] The differences between the two methods (i.e. objective and patient-assessed duration) are plotted against their mean. The Bland-Altman analysis provides the mean difference (also called bias) as well as the limit of agreement corresponding to the 95% confidence interval (CI) of the mean difference. When agreement between the two methods is good, most of the differences should reside

within the agreement limit interval. We also computed the Intraclass correlation coefficient to quantitatively evaluate the agreement.

Correlation tests were conducted using the Pearson's correlation coefficient (r). Factors with *P* values <.10 in the univariate analysis were included in a multivariate model (ANCOVA) to determine the independent factors associated with either objective or patient-assessed surgery duration. P Values <0.05 were considered significant. All analyses were performed with XLSTAT 2012.2.02 software (Addinsoft, Paris, France).

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RESULTS

A total of 359 cases performed in 277 patients was analyzed after exclusion of 9 cases for intraoperative adverse event including posterior capsular break or zonular disinsertion (8 cases) and phacoemulsifier breakdown (1 case). Five out the 8 cases presenting intraoperative vitreous loss had an identifiable risk factor for this complication, two were traumatic cataracts, two were cataracts related to severe pseudoexfoliation syndrome and one was a resident-performed procedure. 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 (29.5%) cases, a mild sensation in 147 (41%) cases, moderate pain in 90 (25%) cases, intense pain in 14 (3.9%) cases and unbearable pain in 2 (0.6%) cases. The perception of pain did not significantly differ between first and second eye procedures (p=0.34).

Comparison between objective and patient-assessed duration

The median objective surgery duration was 13.6 minutes (interquartile range 11.1 to 17.5 minutes) and the median patient-assessed duration was 15 minutes (interquartile range 11 to 20 minutes). Bland-Altman plot showed a fair agreement between the objective and patient-assessed duration (fig 1). Mean difference (or bias) was only 0.92 minute (95% CI, 0.22-1.62 minute). However an agreement worsening was noted for longer procedures but error was equally distributed over and under the limits of agreement (12.3-14.2 minutes). Intraclass correlation coefficient was 0.44 (95% CI,

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

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

Factors associated with objective surgery duration

On univariate analysis, objective surgery duration was significantly correlated to preoperative VA (p=0.0004), duration of fasting (p=0.014), time interval between wake-up and surgery (p=0.0004), and waiting time in the department (p<0.0001). The corresponding Pearson's correlation coefficients are provided in table 2. Similarly, objective duration was significantly different according to surgeon experience with shorter procedures for seniors (12.6 minutes) compared to juniors or residents, 18.2 and 17 minutes respectively (fig 2). The two latter durations were not significantly different (p=0.70). Objective duration was significantly different according to pain-score group with significantly longer procedures in groups with higher pain-scores (fig 3). Conversely, objective duration was not significantly different between first and second eye procedures or according to gender (p=0.365 and p=0.925, respectively).

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

Factors associated with patient-assessed surgery duration

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

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Similarly, patient-assessed duration was also significantly different according to surgeon experience (p=0.0001) and according to pain-score group (p=0.0002). Conversely, patient-assessed duration was not significantly different between first and second eye procedures or according to gender (p=0.340 and p=0.298, respectively).

Multivariate analysis revealed patient age, surgeon experience and pain-score group to be independent factors associated with patient-assessed surgery duration (table 2).

DISCUSSION

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

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

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

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

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

Preoperative standardized grading of cataracts was not performed in our study. Patient age may however be used as a surrogate parameter influencing the grade of the cataract.[19 20] In nuclear cataracts preoperative visual acuity may also be correlated to its grade.[21] Our data confirmed that the objective duration of surgery was longer in cases with worse preoperative visual acuity, as more advanced cataracts require a longer duration of ultrasonic power release.[22] Surprisingly patient's age was not correlated with objective surgery duration but instead with patient-assessed surgery duration. The chop technique may result in quicker procedures, however the evaluation of the effect of surgical techniques on the duration of surgery was not within the scope of our study.[23]

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

Our study showed that patients overall fairly estimated the duration of their surgery. The trend in the past decades has been towards a constant reduction of the duration of procedures in eye surgery. As new technical improvements are under way, such as femtosecond laser-assisted cataract surgery, the fact that patients are rather acutely aware of the duration of procedures must be taken into consideration as an important parameter for their comfort.

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Competing interests

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

Contributorship Statement

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

Pierre-Raphael Rothschild substantially participated in the following:

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

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

3) final approval of the version to be published

Sophie Grabar substantially participated in the following:

1) conception and design, and analysis and interpretation of data

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

3) final approval of the version to be published

Brivael Le Dû substantially participated in the following:

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

3) final approval of the version to be published

Cyril Temstet substantially participated in the following:

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

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Olga Rostaqui substantially participated in the following:

1) conception and design, acquisition of data

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

3) final approval of the version to be published

Antoine P. Brézin substantially participated in the following:

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

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

3) final approval of the version to be published

Data Sharing

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

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TABLE AND FIGURE LEGENDS

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

IQR, Interquartile range

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

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)

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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Table 1 Patient population, preoperative schedule and surgical procedures

Variable	Value
Patients (n)	277
Cataract surgery cases (n)	359
Mean Age (years (± SD))	73.4 (± 9.2)
Gender (cases, n (%))	
Male	152 (42.3%)
Female	207 (57.7%)
Preoperative vision	
Mean LogMar preoperative visual acuity (± SD)	0.45 (±0.2)
Schedule on the day of surgery (hours)	
Mean duration of fasting (± SD)	14.1 (±1.8)
Mean duration between awakening and surgery (± SD)	4.7 (± 1.2)
Mean waiting time in the department (± SD)	2.4 (± 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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Table 2 Univariate and multivariate analysis of factors associated with surgery duration.

	Objective surgery duration				Patient-assessed surgery duration			
	Univariate	Multivariate			Univariate	Multivariate		
Factor	**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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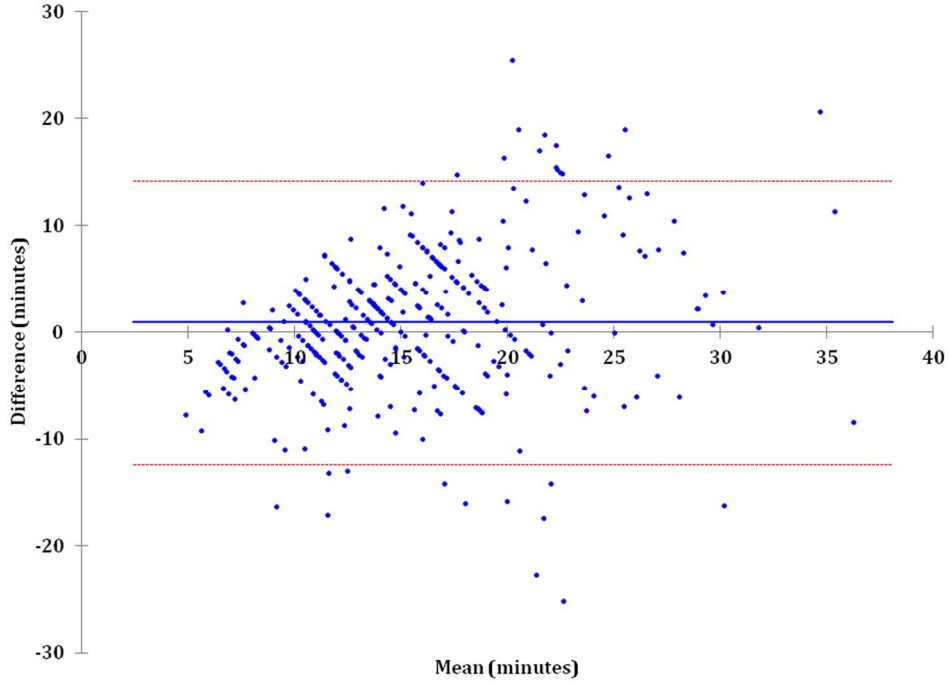

Figure 1. Bland-Altman plot between objective and patient-assessed surgery duration. The solid line indicates the mean difference (or bias); the dash line indicates the limits of agreement.

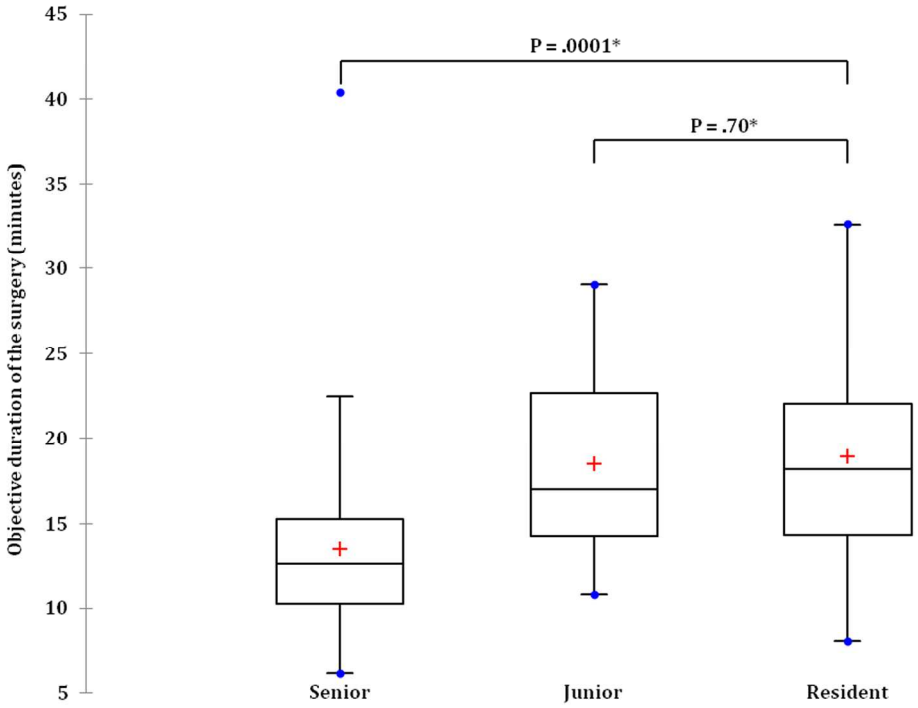

Figure 2. Objective surgery duration according to the surgeon's experience. The bar in the box indicates the median, the cross the mean and the lower and upper hinge the interquartile range. The whisker extends to the most extreme data point which is no more than 1.5 times the interquartile range. Dots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

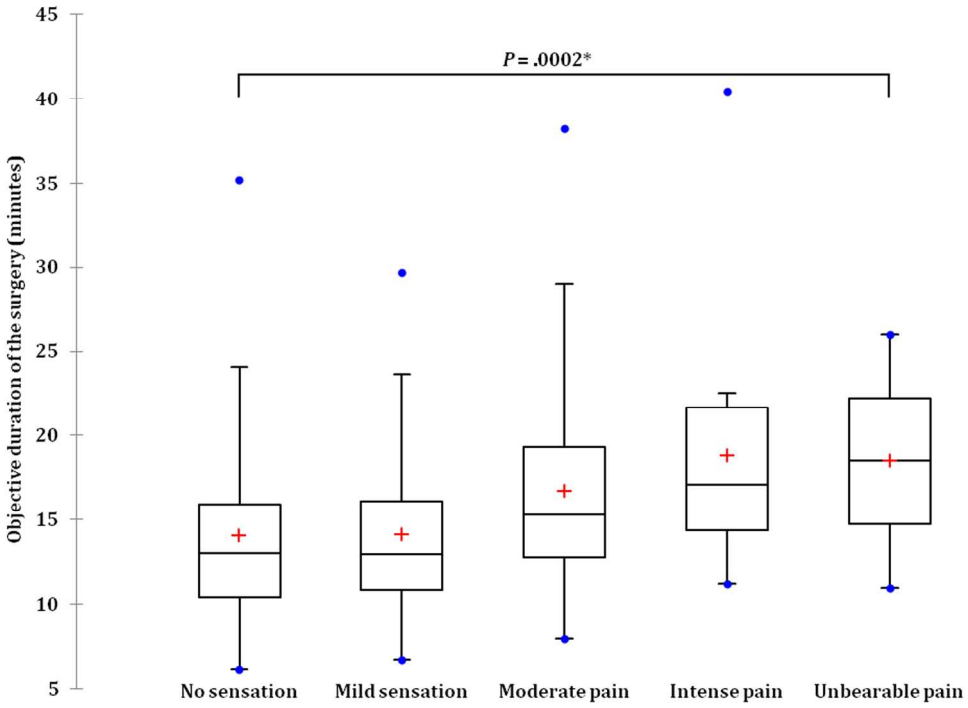

Figure 3. Objective surgery duration according to the pain-score group. The bar in the box indicates the median, the cross the mean and the lower and upper hinge the interquartile range. The whisker extends to the most extreme data point which is no more than 1.5 times the interquartile range. Dots represent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

Ref.: Ms. No. JCRS-12-698

Patients' subjective assessment of the duration of cataract surgery
Journal of Cataract & Refractive Surgery

Dear Professor Brézin,

The reviewers and the editor have completed their assessments of your manuscript Patients' subjective assessment of the duration of cataract surgery (JCRS-12-698) and the paper has unfortunately not been recommended for publication. I have enclosed the referees' comments below for your review. The journal now receives a large number of excellent manuscripts and regrettably is unable to publish all of them.

We appreciate your submitting the manuscript to JCRS and are sorry we do not have a more favorable decision. I hope you will consider submitting future manuscripts to us.

Sincerely,

Emanuel Rosen, MD, FRCSE

Editor Journal of Cataract & Refractive Surgery

Reviewers' comments:

Reviewer #1:

1. *Although an interesting study to consider the patients' comfort level through actual versus perceived duration of surgery, it does not add scientific value for the surgeon.*

We agree that the results of our study do not revolutionize the science of cataract surgery. However, we believe that a better understanding of the patients' perceptions during the surgery is a laudable goal that adds to the knowledge in the field of cataract surgery.

Indeed, the surgery duration has been recognized as one of the important factors contributing to patients' fear in the preoperative setting *(Ref 7 Nijkamp MD, Ruiter RA, Roeling M, et al. Factors related to fear in patients undergoing cataract surgery: a qualitative study focusing on factors associated with fear and reassurance among patients who need to undergo cataract surgery. Patient Educ Couns 2002;**47**(3):265).* It has also been shown that patients' information can in turn reduce anxiety and improve their satisfaction. *(Ref 8 Haripriya A, Tan CS, Venkatesh R, et al. Effect of preoperative counseling on fear from visual sensations during phacoemulsification under topical anesthesia. J Cataract Refract Surg 2011;**37**(5):814-8)*

Our literature review found only few data regarding the duration of cataract surgery and did not detect any existing articles assessing its perception by patients. The introduction section has been modified to better reflect the above.

2. *I believe the material is better suited as correspondence or case report instead of a full article.*

This brings no comment as a series based on the prospective analysis of 359 cases cannot be submitted as a case-report !

Reviewer #2:

This paper evaluates objective surgical time and its subjective perception as well as the dependency on various factors. Objective surgical time and its subjective perception were found to correlate well. Multivariate analysis revealed patient preoperative visual acuity, waiting time in the department, surgeon experience and pain-score group to be independent factors associated with objective surgery duration, and patient age, surgeon experience and pain-score group to be independent factors associated with patient-assessed surgery duration.

1. *Overall complication rate was unusually high. Most of these complications will have occurred with the less experienced surgeons. Please give details.*

Our complication rate of 2.22% did not statistically differ from the 1.92% complication rate reported by the Cataract National Dataset electronic multicentre audit of 55,567 operations *(Narendran N, Jaycock P, Johnston RL, et al. The Cataract National Dataset electronic multicentre audit of 55,567 operations: risk stratification for posterior capsule rupture and vitreous loss. Eye (Lond) 2009;23(1):31-7)*

In our study, 4 out of 8 posterior capsular ruptures occurred in the context of cataracts with risk factors : 2 traumatic cataracts and 2 pseudoexfoliation syndromes. One complication occurred in the context of a surgery performed by a resident.

2. *25% of patients experienced moderate pain. This again is judged an unusual high percentage. Was that also most common with the less experienced surgeons? Again, please give details.*

Our percentage of patients reporting moderate pain was consistent with the results published in reports using the same 5-step scale pain-score as used in our study (*Ref 9 Vielpeau I, Billotte C, Kreidie J, et al. [Comparative study between topical anesthesia and sub-Tenon's capsule anesthesia for cataract surgery]. J Fr Ophtalmol 1999;***22***(1):48-51,*). This reference is included in a recent Cochrane meta-analysis by Davison et al. *(Ref 4*

Davison M, Padroni S, Bunce C, et al. Sub-Tenon's anaesthesia versus topical anaesthesia for cataract surgery. Cochrane Database Syst Rev 2007(3):CD006291)

3. *Page 10: duration of fasting (P = .014), time interval between wakeup and surgery (P =.0004), and waiting time in the department (P <.0001) were found to influence objective surgery duration: how is this unexpected finding explained? Please discuss.*

We unexpectedly observed that the duration of fasting and the time interval between wakeup and surgery, as well as waiting time in the department, were associated with longer procedures. This might have been linked to surgeons slowing down after a number of cases and/or a trend to schedule teaching cases at the end rather than at the beginning of surgical sessions.

4. *Regarding sedation, it would have been interesting to find out if sedation influences the time perception of the patient by performing cataract surgery in one eye with and the partner eye without the use of sedation.*

This objective was not within the goal of our study and would have required a randomized controlled trial.

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

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

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Subjective assessment of the duration of cataract surgery

Article summary

Article focus:

1. Modern cataract surgery is a safe and quick procedure. Nonetheless it remains a stressful event from the patients' standpoint.
2. Several factors have been recognized to participate in patients' preoperative anxiety and targeted preoperative counselling has been shown to be of value.
3. Though cataract surgery duration is a frequent patient preoperative qualm it has not been properly studied and patient's perception of time is largely unknown.

Key messages:

1. Patients' perceived cataract surgery duration is fair whatever the circumstances.
2. Surgeons' experience and pain perception were the two factors independently associated with surgery duration.

Strengths and limitations:

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

Subjective assessment of the duration of cataract surgery

Objectives: Surgery duration is a source of preoperative anxiety for patients undergoing cataract surgery. To better inform patients we evaluated the agreement between objective and patient perceived surgery duration.

Design: case series.

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

Participants: During the study period, 368 cataract surgery cases performed on 285 patients were included, 85 cases were excluded from the final analysis. All patients who had uneventful phacoemulsification were included. Cases with any significant intraoperative adverse event or cases requiring additional anaesthesia other than topical were excluded. Resident performed cases were also excluded.

Primary and secondary outcomes: Procedures were timed (objective duration) and patients were asked, immediately afterwards, to assess the duration of their surgery (patient-assessed duration). The agreement between objective and patient-assessed duration as well as influencing factors was studied.

Results: Mean objective duration (13.9 ± 5 minutes) and patient-assessed duration (15.3 ± 6.9 minutes) were significantly correlated (Spearman's r = 0.452, *P* <.0001). Furthermore, Bland-Altman analysis and the intraclass correlation coefficient (0.341, 95% CI, 0.23-0.44) showed a fair agreement. On univariate analysis senior-performed procedures were significantly shorter than those performed by juniors (13.4 versus 17.8 minutes, *P* =.0001). Pain was recorded as "no sensation" (31.5 % of the cases), "mild sensation" (41 %), "moderate pain" (23.3 %), "intense pain" (3.5 %) and "unbearable pain" (0.7 %). Groups with high pain-score had significantly longer procedures (*P* <.001). Multivariate analysis revealed that the only independent factors associated with both the objective and patient-assessed duration of surgery was surgeon's experience and pain-score.

Conclusions: Patients fairly estimated the duration of their surgery in our study, suggesting that emotions associated with eye surgery under topical anaesthesia did not hinder patients' perception of time. However, the benefit of preoperative counselling regarding the duration of surgery will need further evaluation

Subjective assessment of the duration of cataract surgery

INTRODUCTION

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

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

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

METHODS

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

All patients who had uneventful phacoemulsification under topical anaesthesia with placement of an intraocular lens in the capsular bag were included. Cases with any "significant adverse event" defined either by a major intraoperative complication such as vitreous loss or by a technical problem such as phacoemulsifier malfunction that prolonged the procedure by 10 minutes or more were excluded. Similarly, patients who required any anaesthesia in addition to topical lidocaine 2% gel, or those who required sedation in addition to the preoperatively given hydroxyzine were excluded from the analyses. Teaching cases involving resident participation were also excluded from the analyses. The duration of the procedure, referred throughout the text as the objective duration, was timed by operating room nurses as the exposure of the patients' eye to the light of the operating microscope, from the beginning until the end of the surgery.

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

Subjective assessment of the duration of cataract surgery

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

Other factors were also recorded: age, gender, first or second eye surgery, and best corrected preoperative visual acuity. All surgeries were performed between 8:00 AM and 2:00 PM and the patients were requested to fast from midnight on the night prior to their surgery. The patients' preoperative schedules were recorded: duration of fasting, time interval between wake-up and surgery, time interval between entry in the department suite and surgery (waiting time in the department). All patients received 0.5 mg/kg of hydroxyzine at their time of arrival in our department used as sedative and additive sedation during the surgery when necessary. No other drug was given preoperatively, including non-steroidal anti-inflammatory drugs. The need for additional anaesthetic techniques was recorded.

Surgeons were categorized as seniors when they had the experience of more than 1000 procedures performed prior to the study or as juniors otherwise.

Statistical analysis

Categorical variables are expressed as numbers (percentages) and comparisons were conducted using the Fisher-exact test. For continuous variables, mean ± standard deviation (SD) or median (interquartile range, IQR) are provided, and comparisons were conducted using the Kruskal-Wallis test or the student's t-test.

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

agreement corresponding respectively to the mean difference ± 2 SD or ±1 SD. When agreement between the two methods is good, most of the differences should reside within the agreement limit interval. We also computed the Intraclass correlation coefficient to quantitatively evaluate the agreement.

Correlation tests were conducted using the Spearman's correlation coefficient (r). Factors with *P* values <.10 in the univariate analysis were included in a multivariate linear regression and ANCOVA model to determine the independent factors associated with either objective or patient-assessed surgery duration. P Values <0.05 were considered significant. All analyses were performed with XLSTAT 2012.2.02 software (Addinsoft, Paris, France).

Subjective assessment of the duration of cataract surgery

RESULTS

A total of 283cases performed in 218 patients was analyzed after exclusion of 85 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, 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. No sensation was reported in 106 (31.5 %) cases, a mild sensation in 147 (41 %) cases, moderate pain in 90 (23.3 %) cases, intense pain in 14 (3.5 %) cases and unbearable pain in 2 (0.7 %) cases. The perception of pain did not significantly differ between first and second eye procedures. 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

The mean objective surgery duration was 13.9 (± 5) minutes and the mean patient-assessed duration was 15.3 (± 6.9) minutes. Bland-Altman plot showed a fair agreement between the objective and patient-assessed duration (fig 1). Mean difference (or bias) was only 1.4 minute (95% CI, 0.63-2.15 minute). However an agreement worsening was noted for longer procedures but error was equally distributed over and under the limits

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

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

Factors associated with objective surgery duration

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

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

Factors associated with patient-assessed surgery duration

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

according to pain-score group (p=0.001). Conversely, patient-assessed duration was not significantly different between first and second eye procedures or according to gender.

Multivariate analysis revealed patient age, surgeon experience and pain-score group to be independent factors associated with patient-assessed surgery duration (table 3).

DISCUSSION

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

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

The subjective perception of time by patients undergoing cataract surgery under topical anaesthesia has never been studied either. Preparations for surgery include the testing of phacoemulsifiers, applying topical anaesthesia, preoperative disinfection of the eye by povidone-iodine, draping and placement of a lid speculum. These steps may take as long as the surgical procedure itself or even in some instances may take longer than the surgery. From the patients' perspective distinguishing these preoperative stages from their surgery per se may be difficult. To minimize this bias when seeking our patients' subjective assessment of the duration of their surgery, we specifically asked for their impression of the elapsed time between the illumination of their eye under the operating microscope until the removal of the drapes. However, this time interval both

subjectively assessed and clocked by nurses may have added approximately 1 or 2 extra minutes to the real time of the surgery, as the surgeons adjusted the focus of the microscope and made their final preparations for the procedure.

The assessment of pain was a secondary outcome measure in our study and we used the simple 5-step scale as validated in other studies.[4 9 10] A lack of sensation or a mild sensation were reported in 72.4% of cases, moderate pain in 23.3% cases and intense or even unbearable pain in 4.3% of cases. These percentages are comparable to previous reports using the same 5-step pain-score scale.[9] Unsurprisingly, the perception of pain was correlated with the duration of procedures. In our study, the pain-score group was independently associated with both the objective and subjective surgery duration. In a previous study patients tended to report their second eye surgery as more painful than their first eye surgery and this finding was related to a decreased preoperative anxiety at the time of the second procedure.[16] However, this finding was not observed in our study, nor in another recent report.[18] This discrepancy could be due to the preoperative sedation given to all our patients. Such medications can alter the perception of pain as well as the perception of duration and also aim at reducing anxiety. Similarly, we did not account for the patients' systemic medications or illnesses, if any, which could also have altered their judgment and their pain thresholds.

Preoperative standardized grading of cataracts or pupil size was not recorded in our study. Patient age may however be used as a surrogate parameter influencing the grade of the cataract.[19 20] In nuclear cataracts preoperative visual acuity may also be correlated to its grade.[21] Our data confirmed that the objective duration of surgery was longer in cases with worse preoperative visual acuity, as more advanced cataracts require a longer duration of ultrasonic power release.[22] Surprisingly, the age of the patient was not correlated with objective surgery duration but with patient-assessed

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

Most patients quite correctly assessed the duration of their surgery, though the correlation with objective surgery duration was only moderate and samples were large. Hence, we were not able to identify specific characteristics significantly associated with an underestimation or an overestimation of time. Although evidence suggests that fasting prior to cataract surgery under topical anaesthesia can be abandoned, in this series patients fasted from midnight on the day prior to their surgery.[24] As our patients were operated from 8:00 AM to 2:00 PM, fasting time varied from one case to another, but these variations did not influence the subjective assessment of the duration of surgery. Similarly, we thought that an early arrival and a subsequent long waiting in the department of ophthalmology prior to entry in the operating room could be a factor of stress resulting in an over-assessment of the duration of their surgery by patients. Yet our analysis did not reveal that this factor played any role. We unexpectedly observed that the time interval between wakeup and surgery, as well as waiting time in the department, were associated with longer procedures. This might have been linked to surgeons slowing down after a number of cases. Although it has been suggested that handholding may reduce anxiety and the perception of pain during cataract surgery, this was not applied in our practice.[25]

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

important parameter for their comfort. . However, proving the benefit of preoperative counselling in terms of patient satisfaction would require a specific study beyond the scope of this report

Subjective assessment of the duration of cataract surgery

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Competing interests

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

Contributorship Statement

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

Pierre-Raphael Rothschild substantially participated in the following:

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

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

3) Final approval of the version to be published

Sophie Grabar substantially participated in the following:

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

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

3) Final approval of the version to be published

Brivael Le Dû substantially participated in the following:

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

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

3) Final approval of the version to be published

Cyril Temstet substantially participated in the following:

Subjective assessment of the duration of cataract surgery

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

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

3) Final approval of the version to be published

Olga Rostaqui substantially participated in the following:

1) Conception and design, acquisition of data

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

3) Final approval of the version to be published

Antoine P. Brézin substantially participated in the following:

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

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

3) Final approval of the version to be published

Subjective assessment of the duration of cataract surgery

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TABLE AND FIGURE LEGENDS

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

Table 2 Univariate analyses of factors associated with surgery duration.

Table 3 Multivariate analyses of factors associated with surgery duration.

Figure 1. 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.

Figure 2. 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

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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Table 1 Patient population, preoperative schedule and surgical procedures

Variable	Value
Patients (n)	**218**
Cataract surgery cases (n)	**283**
Age (mean years (± SD))	**73.2 (± 9.3)**
Gender (cases, n (%))	
Male	**132 (46.6%)**
Female	**151 (53.4%)**
Preoperative visual acuity (Mean LogMAR (± SD))	**0.4 (±0.2)**
Schedule on the day of surgery (hours)	
Fasting time, mean (± SD)	**14 (±1.8)**
Time interval between wake-up and surgery, mean (± SD)	**4.6 (±1.2)**
Waiting time in the department, mean (± SD)	**2.3 (±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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Table 2 Univariate analyses of factors associated with surgery duration.

	Objective surgery duration		Patient-assessed surgery duration	
Variable	**Regression coefficient (95% CI) or mean (±SD)**	**P Value***	**Regression coefficient (95% CI) 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)	

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

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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

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

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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Subjective assessment of the duration of cataract surgery

Article summary

Article focus:

1. Modern cataract surgery is a safe and quick procedure. Nonetheless it remains a stressful event from the patients' standpoint.
2. Several factors have been recognized to participate in patients' preoperative anxiety and targeted preoperative counselling has been shown to be of value.
3. Though cataract surgery duration is a frequent patient preoperative qualm it has not been properly studied and patient's perception of time is largely unknown.

Key messages:

1. Patients' perceived cataract surgery duration is ~~rather good~~fair whatever the circumstances.

~~2. We encourage cataract surgeons to monitor their surgery duration and inform their patients accordingly.~~

~~3.~~2. Surgeons' experience and pain perception were the two factors independently associated with surgery duration.

Strengths and limitations:

1. The large studied population and the strict definition used for operative time provide reliable measurements of the surgery duration whether objective or patient perceived.

2. ~~Preoperative and intraoperative A~~anxiety status, chronic illnesses, systemic medications ~~score evaluation~~ were~~as~~ not part of our standardized study protocol. Moreover all our patients were on sedative medications at the time of surgery. This might have ~~been associated with objective or~~affected patients' perceptions ~~assessed surgery duration.~~

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~~2.~~3. The benefit in terms of patient comfort/satisfaction of preoperative information regarding surgery duration needs specific studied beyond the scope of the present study.

Subjective assessment of the duration of cataract surgery

Objectives: Surgery duration is a source of preoperative anxiety for patients undergoing cataract surgery. To better inform patients we evaluated the agreement between objective and patient perceived surgery duration.

Design: ~~cohort study~~case series.

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

Participants~~:~~ During the study period, 368 cataract surgery cases performed on 285 ~~286~~ patients were included, ~~9~~85 ~~-~~cases~~/patients~~ were excluded from the final analysis. All patients who had uneventful phacoemulsification were included. ~~-~~Cases with any significant intraoperative adverse event or cases requiring additional anaesthesia other than topical were excluded. Resident performed cases were also excluded.~~All cases performed by phacoemulsification under topical anaesthesia were included. Cases for which any adverse event prolonged the procedure by 10 minutes or more were excluded.~~

Primary and secondary outcomes: Procedures were timed (objective duration) and patients were asked, immediately afterwards, to assess the duration of their surgery (patient-assessed duration). The agreement between objective and patient-assessed duration as well as influencing factors was studied.

Results: Me~~dian~~an objective duration (13.9 ± 5 ~~6~~ minutes) and patient-assessed duration (15.3 ± 6.9 ~~-~~minutes) were significantly correlated (~~Pearson's~~ Spearman's r = 0.452~~68~~, *P* <.0001). ~~Futhermore~~Furthermore, Bland-Altman analysis and the intraclass correlation coefficient (0.3414~~4~~, 95% CI, 0.23~~36~~-0.44~~53~~) showed a fair agreement. On univariate analysis senior-performed procedures were significantly shorter ~~(12.6 minutes)~~ than those performed by juniors ~~(~~13.4 versus 17.8 minutes, *P* =.0001)~~or residents, 18.2 and 17 minutes, respectively (*P* =.0001)~~. Pain was recorded as "no sensation" (~~29.5~~31.5 % of the cases), "mild sensation" (41 %), "moderate pain" (~~25~~23.3

%), “intense pain” (~~3.~~3.5 ~~9~~%) and “unbearable pain” (0.7 ~~6~~%). Groups with high pain-score had significantly longer procedures (*P* <.~~00~~001). Multivariate analysis revealed that the only independent factors associated with both the objective and patient-assessed duration of surgery was surgeon’s experience and pain-score.

Conclusions: Patients fairly estimated the duration of their surgery in our study, suggesting that emotions associated with eye surgery under topical ~~anesthesia~~anaesthesia did not hinder patients’ perception of time. ~~We encourage cataract surgeons to monitor their own surgical duration to better inform their patients.~~ However, the benefit of preoperative counselling regarding the duration of surgery will need further evaluation. ~~The benefit of preoperative counseling will need further evaluation by validated anxiety scales.~~

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Subjective assessment of the duration of cataract surgery

INTRODUCTION

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

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

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

Subjective assessment of the duration of cataract surgery

METHODS

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

All patients who had uneventful phacoemulsification under topical anaesthesia ~~or sub-Tenon's block~~ with placement of an intraocular lens in the capsular bag were included. Cases with any "significant adverse event" defined either by a major intraoperative complication such as vitreous loss or by a technical problem such as phacoemulsifier malfunction that prolonged the procedure by 10 minutes or more were excluded. Similarly, patients who required any anaesthesia in addition to topical lidocaine 2% gel, or those who required sedation in addition to the preoperatively given hydroxyzine were excluded from the analyses. Teaching cases involving resident participation were also excluded from the analyses. The duration of the procedure, referred throughout the text as the objective duration, was timed by operating room nurses as the exposure of the patients' eye to the light of the operating microscope, from the beginning until the end of the surgery. ~~Cases for which any adverse event prolonged the procedure by 10 minutes or more were excluded.~~

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

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

Other factors were also recorded: age, gender, first or second eye surgery, and best corrected preoperative visual acuity. All surgeries were performed between 8:00 AM and 2:00 PM and the patients were requested to fast from midnight on the night prior to their surgery. The patients' preoperative schedules were recorded: duration of fasting, time interval between wake-up and surgery, time interval between entry in the department suite and surgery (waiting time in the department). All patients received 0.5 mg/kg of hydroxyzine at their time of arrival in our department used as sedative and additive sedation during the surgery when necessary. No other drug was given preoperatively, including non-steroidal anti-inflammatory drugs. The need for additional anaesthetic techniques was recorded.

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

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

Statistical analysis

Categorical variables are expressed as numbers (percentages) and comparisons were conducted using the Fisher-exact test. For continuous variables, mean ± standard deviation (SD) or median (interquartile range, IQR) are provided, and comparisons were conducted using the Kruskal-Wallis test or the student's t-test.

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To evaluate the agreement between objective and patient-assessed duration, a Bland-Altman plot was used.[11] The differences between the two methods (i.e. objective and patient-assessed duration) are plotted against their mean. The Bland-Altman analysis provides the mean difference (also called bias) as well as the- 95% or the 68% limits of agreement corresponding respectively to the mean -difference ± 2 SD or ±1 SD~~the 95% confidence interval (CI) of the mean difference~~. When agreement between the two methods is good, most of the differences should reside within the– agreement limit interval. We also computed the Intraclass correlation coefficient to quantitatively evaluate the agreement.

Correlation tests were conducted using the ~~Pearson's~~ Spearman's correlation coefficient (r). Factors with *P* values <.10 in the univariate analysis were included in a multivariate linear regression and ~~model (~~ANCOVA~~)~~ model to determine the independent factors associated with either objective or patient-assessed surgery duration. P Values <0.05 were considered significant. All analyses were performed with XLSTAT 2012.2.02 software (Addinsoft, Paris, France).

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RESULTS

A total of 283~~359~~ cases performed in 218~~277~~ patients was analyzed after exclusion of ~~9~~85 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~~ive~~ 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~~3.3 ~~5~~%) cases, intense pain in 14 (3.5 ~~9~~%) cases and unbearable pain in 2 (0.7 ~~6~~%) 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

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The ~~median~~ mean objective surgery duration was 13.9 (± 5)~~.6~~ minutes ~~(interquartile range 11.1 to 17.5 minutes)~~ and the me~~an~~dian~~~~ patient-assessed duration was 15.3 (± 6.9) minutes ~~(interquartile range 11 to 20 minutes)~~. Bland-Altman plot showed a fair agreement between the objective and patient-assessed duration (fig 1). Mean difference (or bias) was only 1.4~~0.92~~ minute (95% CI, 0.63~~22~~-2.15~~1.62~~ minute). However an agreement worsening was noted for longer procedures but error was equally distributed over and under the limits of agreement (-11.3~~12.3~~-14.1~~2~~ minutes). Intraclass correlation coefficient was 0.341~~44~~ (95% CI, 0.23~~36~~-0.44~~53~~) ~~further~~ suggesting ~~a fair~~moderate agreement between the objective and patient-assessed duration.

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

Factors associated with objective surgery duration

On univariate analysis, objective surgery duration was significantly correlated to preoperative VA (p=0.001~~.0004~~), ~~duration of fasting (p=0.014),~~ time interval between wake-up and surgery (p=0.041~~004~~), and to the waiting time in the department (p=0.006~~<0.0001~~). The corresponding ~~Pearson's~~ regression ~~correlation~~ coefficients and 95 % CI are provided in table 2. Similarly, objective duration was significantly different according to surgeon experience with shorter procedures for seniors (13.4 ± 4.8~~2.6~~ minutes) compared to juniors (17.8 ± 4.7)~~or residents, 18.2 and 17 minutes respectively~~ (fig 2). ~~The two latter durations were not significantly different (p=0.70).~~ Objective duration was significantly different according to pain-score group with significantly longer procedures in groups with high~~er~~ pain-scores (score 4, 3 and 2) compared to groups with low pain scores (score 0 or 1) with mean surgery durations of 15.5 (±5.7) and 13.2 (±4.5) respectively (fig 3). ~~Conversely, objective~~Objective duration was ~~not~~

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

Multivariate analysis revealed patient preoperative visual acuity, waiting time in the department, surgeon experience and pain-score group to be independent factors associated with objective surgery duration (table 3~~2~~).

Factors associated with patient-assessed surgery duration

On univariate analysis, patient-assessed surgery duration was correlated to patient age (p=0.011~~0~~), and time interval between wake-up and surgery (p=0.03~~12~~)~~, and waiting time in the department (p<0.029).~~ . The corresponding ~~Pearson's correlation~~regression coefficients and 95% CI are provided in table 2.

Similarly, patient-assessed duration was also significantly different according to surgeon experience (p=0.032~~001~~) and ~~according~~according to pain-score group (p=0.001~~02~~). Conversely, patient-assessed duration was not significantly different between first and second eye procedures or according to gender. ~~(p=0.340 and p=0.298, respectively).~~

Multivariate analysis revealed patient age, surgeon experience and pain-score group to be independent factors associated with patient-assessed surgery duration (table 3~~2~~).

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DISCUSSION

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

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

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

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patients' subjective assessment of the duration of their surgery, we specifically asked for their impression of the elapsed time between the illumination of their eye under the operating microscope until the removal of the drapes. However, this time interval both subjectively assessed and clocked by nurses may have added approximately 1 or 2 extra minutes to the real time of the surgery, as the surgeons adjusted the focus of the microscope and made their final preparations for the procedure.

The assessment of pain was a secondary outcome measure in our study and we used the simple 5-step scale as validated in other studies.[4 9 10] A lack of sensation or a mild sensation were reported in 72.4~~0.2~~% of cases, moderate pain in 23.3~~5.4~~% cases and intense or even unbearable pain in 4.3~~4~~% of cases. These percentages are comparable to previous reports using the same 5-step pain-score scale.[9] Unsurprisingly, the perception of pain was correlated with the duration of procedures. In our study, the pain-score group was independently associated with both the objective and subjective surgery duration. In a~~some~~ previous study~~ies~~ patients tended to report their second eye surgery as more painful than their first eye surgery and this finding was related to a decreased preoperative anxiety at the time of the second procedure.[16] However, this finding was not observed in our study, nor in another recent report.[18] This discrepancy could be due to the preoperative sedation given to all our patients. Such medications can alter the perception of pain as well as the perception of duration and also aim at reducing anxiety. Similarly, we did not account for the patients' systemic medications or illnesses, if any, which could also have altered their judgment and their pain thresholds.

Preoperative standardized grading of cataracts or pupil size was not ~~was not performed in~~recorded in our study. Patient age may however be used as a surrogate parameter influencing the grade of the cataract.[19 20] In nuclear cataracts preoperative

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visual acuity may also be correlated to its grade.[21] Our data confirmed that the objective duration of surgery was longer in cases with worse preoperative visual acuity, as more advanced cataracts require a longer duration of ultrasonic power release.[22] Surprisingly, the age of the patient was not correlated with objective surgery duration but with patient-assessed surgery duration, though weakly~~Surprisingly patient's age was not correlated with objective surgery duration but instead with patient-assessed surgery duration~~. The chop technique may result in quicker procedures, however the evaluation of the effect of surgical techniques on the duration of surgery was not within the scope of our study.[23]

Most patients quite correctly assessed the duration of their surgery, though the correlation with objective surgery duration was only moderate and samples were large. ~~As the majority of patients quite correctly assessed the duration of their surgery,~~ Hence, we were not able to identify specific characteristics significantly associated with an underestimation or an overestimation of time. Although evidence suggests that fasting prior to cataract surgery under topical anaesthesia can be abandoned, in this series patients fasted from midnight on the day prior to their surgery.[24] As our patients were operated from 8:00 AM to 2:00 PM, fasting time varied from one case to another, but these variations did not influence the subjective assessment of the duration of surgery. Similarly, we thought that an early arrival and a subsequent long waiting in the department of ophthalmology prior to entry in the operating room could be a factor of stress resulting in an over-assessment of the duration of their surgery by patients. Yet our analysis did not reveal that this factor played any role. We unexpectedly observed that ~~the duration of fasting and~~ the time interval between wakeup and surgery, as well as waiting time in the department, were associated with longer procedures. This might have been linked to surgeons slowing down after a number of ~~cases~~ cases~~and/or a trend~~

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~~to schedule teaching cases at the end rather than at the beginning of surgical sessions.~~. Although it has been suggested that handholding may reduce anxiety and the perception of pain during cataract surgery, this was not applied in our practice.[25]

Our study showed that patients overall fairly estimated the duration of their surgery. The trend in the past decades has been towards a constant reduction of the duration of procedures in eye surgery. As new technical improvements are under way, such as femtosecond laser-assisted cataract surgery, the fact that patients are rather acutely aware of the duration of procedures must be taken into consideration as an important parameter for their comfort. . However, proving the benefit of preoperative counselling in terms of patient satisfaction would require a specific study beyond the scope of this report

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Subjective assessment of the duration of cataract surgery

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Competing interests

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

Contributorship Statement

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

Pierre-Raphael Rothschild substantially participated in the following:

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

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

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

Sophie Grabar substantially participated in the following:

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

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

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

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

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

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Subjective assessment of the duration of cataract surgery

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

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

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

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

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

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

Antoine P. Brézin substantially participated in the following:

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

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

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

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TABLE AND FIGURE LEGENDS

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

Table 2 Univariate analysis of factors associated with surgery duration.

Table 3 Multivariate analysis of factors associated with surgery duration.

Figure 1. 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.

Figure 2. 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

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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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 (± SD))	73.2 (± 9.3)
Gender (cases, n (%))	
Male	132 (46.6%)
Female	151 (53.4%)
Preoperative visual acuity (Mean LogMAR (± SD))	0.4 (±0.2)
Schedule on the day of surgery (hours)	
Fasting time, mean (± SD)	14 (±1.8)
Time interval between wake-up and surgery, mean (± SD)	4.6 (±1.2)
Waiting time in the department, mean (± SD)	2.3 (±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%)

Subjective assessment of the duration of cataract surgery

Table 2 Univariate analysis of factors associated with surgery duration.

Variable	Objective surgery duration: Regression coefficient (95% CI) or mean (±SD)	Objective surgery duration: P Value*	Patient-assessed surgery duration: Regression coefficient (95% CI) or mean (±SD)	Patient-assessed surgery duration: 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)	

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

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Subjective assessment of the duration of cataract surgery

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

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

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

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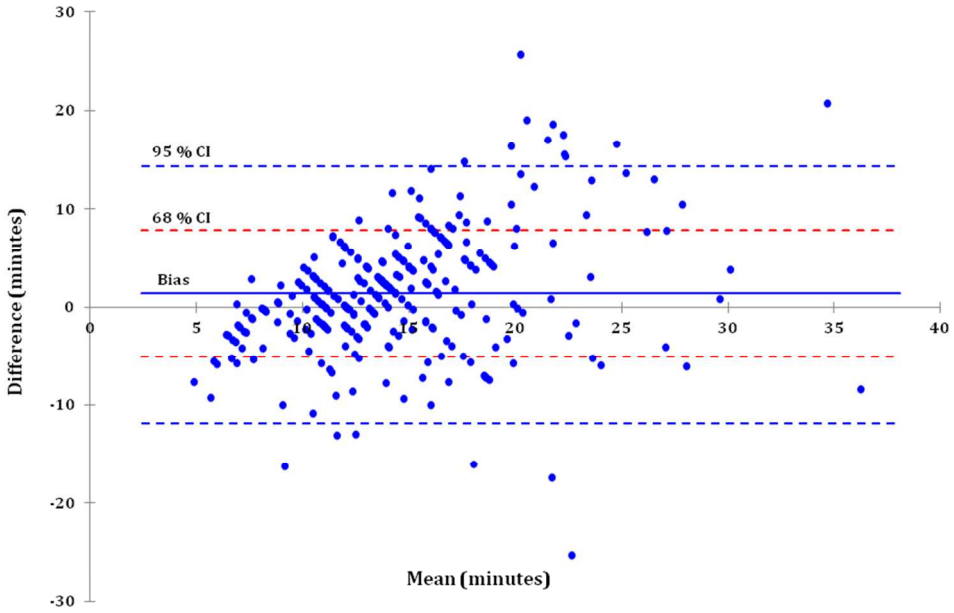
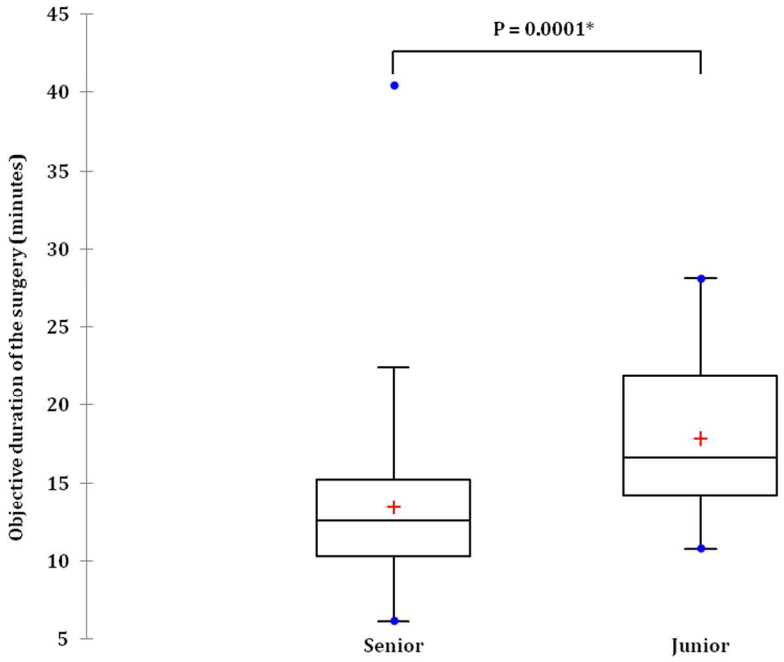
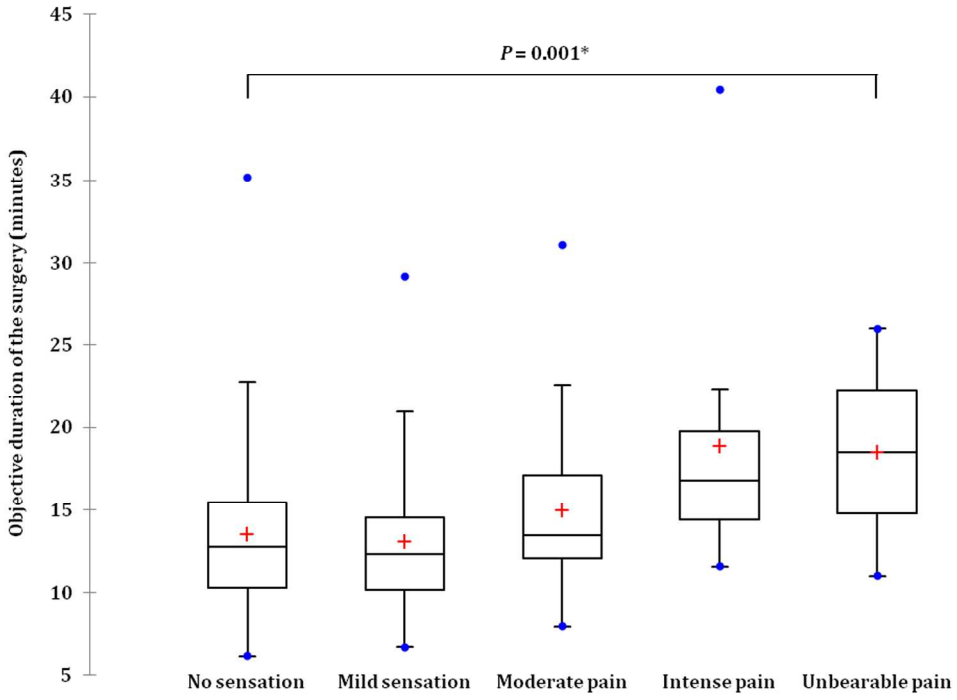


Bland-Altman plot between objective and patient-assessed surgery duration. The solid line indicates the mean difference (or bias); the blue and red dash lines indicate the 95% and 68% limits of agreement respectively.
254x190mm (96 x 96 DPI)



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



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

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

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

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Subjective assessment of the duration of cataract surgery

Article summary

Article focus:

1. Modern cataract surgery is a safe and quick procedure. Nonetheless it remains a stressful event from the patients' standpoint.
2. Several factors have been recognized to participate in patients' preoperative anxiety and targeted preoperative counselling has been shown to be of value.
3. Though cataract surgery duration is a frequent patient preoperative qualm it has not been properly studied and patient's perception of time is largely unknown.

Key messages:

1. Patients' perceived cataract surgery duration is reasonably accurate whatever the circumstances.
2. Surgeons' experience and pain perception were the two factors independently associated with surgery duration.

Strengths and limitations:

1. The large studied population and the strict definition used for operative time provide reliable measurements of the surgery duration whether objective or patient perceived.
2. Anxiety status, chronic illnesses, systemic medications were not part of our standardized study protocol. Moreover all our patients were on sedative medications at the time of surgery. This might have affected patients' perceptions
3. The benefit in terms of patient comfort/satisfaction of preoperative information regarding surgery duration needs specific studies beyond the scope of the present report.

Subjective assessment of the duration of cataract surgery

Abstract

Objectives: Surgery duration is a source of preoperative anxiety for patients undergoing cataract surgery. To better inform patients we evaluated the agreement between objective and patient perceived surgery duration.

Design: Case series.

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

Participants: During the study period, 368 cataract surgery cases performed on 285 patients were included, 85 cases were excluded from the final analysis. All patients who had uneventful phacoemulsification were included. Cases with any significant intraoperative adverse event or cases requiring additional anaesthesia other than topical were excluded. Resident performed cases were also excluded.

Primary and secondary outcomes: Procedures were timed (objective duration) and patients were asked, immediately afterwards, to assess the duration of their surgery (patient-assessed duration). The agreement between objective and patient-assessed duration as well as influencing factors was studied.

Results: Mean objective duration (13.9 ± 5 minutes) and patient-assessed duration (15.3 ± 6.9 minutes) were significantly correlated (Spearman's r = 0.452, *P* <.0001). Furthermore, Bland-Altman analysis and the intraclass correlation coefficient (0.341, 95% CI, 0.23-0.44) were quite in agreement. On univariate analysis senior-performed procedures were significantly shorter than those performed by juniors (13.4 versus 17.8 minutes, *P* =.0001). Pain was recorded as "no sensation" (31.5 % of the cases), "mild sensation" (41 %), "moderate pain" (23.3 %), "intense pain" (3.5 %) and "unbearable pain" (0.7 %). Groups with high pain-score had significantly longer procedures (*P* <.001). Multivariate analysis revealed that the only independent factors associated with

both the objective and patient-assessed duration of surgery was surgeon's experience and pain-score.

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

Subjective assessment of the duration of cataract surgery

INTRODUCTION

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

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

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

METHODS

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

All patients who had uneventful phacoemulsification under topical anaesthesia with placement of an intraocular lens in the capsular bag were included. Cases with any "significant adverse event" defined either by a major intraoperative complication such as vitreous loss or by a technical problem such as phacoemulsifier malfunction that prolonged the procedure by 10 minutes or more were excluded. Similarly, patients who required any anaesthesia in addition to topical lidocaine 2% gel, or those who required sedation in addition to the preoperatively given hydroxyzine were excluded from the analyses. Teaching cases involving resident participation were also excluded from the analyses. The duration of the procedure, referred throughout the text as the objective duration, was timed by operating room nurses as the exposure of the patients' eye to the light of the operating microscope, from the beginning until the end of the surgery.

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

Subjective assessment of the duration of cataract surgery

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

Other factors were also recorded: age, gender, first or second eye surgery, and best corrected preoperative visual acuity. All surgeries were performed between 8:00 AM and 2:00 PM and the patients were requested to fast from midnight on the night prior to their surgery. The patients' preoperative schedules were recorded: duration of fasting, time interval between wake-up and surgery, time interval between entry in the department suite and surgery (waiting time in the department). All patients received 0.5 mg/kg of hydroxyzine at their time of arrival in our department used as sedative and additive sedation during the surgery when necessary. No other drug was given preoperatively, including non-steroidal anti-inflammatory drugs. The need for additional anaesthetic techniques was recorded.

Surgeons were categorized as seniors when they had the experience of more than 1000 procedures performed prior to the study or as juniors otherwise.

Statistical analysis

Categorical variables are expressed as numbers (percentages) and comparisons were conducted using the Fisher-exact test. For continuous variables, mean ± standard deviation (SD) or median (interquartile range, IQR) are provided, and comparisons were conducted using the Kruskal-Wallis test or the student's t-test.

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

agreement corresponding respectively to the mean difference ± 2 SD or ±1 SD. When agreement between the two methods is good, most of the differences should reside within the agreement limit interval. We also computed the Intraclass correlation coefficient to quantitatively evaluate the agreement.

Correlation tests were conducted using the Spearman's correlation coefficient (r). Factors with *P* values <.10 in the univariate analysis were included in a multivariate linear regression and ANCOVA model to determine the independent factors associated with either objective or patient-assessed surgery duration. P Values <0.05 were considered significant. All analyses were performed with XLSTAT 2012.2.02 software (Addinsoft, Paris, France).

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RESULTS

A total of 283 cases performed in 218 patients were analyzed after exclusion of 85 cases (65 patients) which met one or more exclusion criteria as detailed herein. Resident participation was the most frequent motive for exclusion (70 cases). Other causes were significant intraoperative adverse events 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 and two were cataracts related to severe pseudoexfoliation syndrome. Thirteen cases required additional anaesthesia or sedation including sub-Tenon's block (5 cases), sub-conjunctival injection (1 case), intracameral injection of lidocaine (1 case) and/or midazolam intravenous sedation (6 cases). 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. No sensation was reported in 106 (31.5 %) cases, a mild sensation in 147 (41 %) cases, moderate pain in 90 (23.3 %) cases, intense pain in 14 (3.5 %) cases and unbearable pain in 2 (0.7 %) cases. The perception of pain did not significantly differ between first and second eye procedures. 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

The mean objective surgery duration was 13.9 (± 5) minutes and the mean patient-assessed duration was 15.3 (± 6.9) minutes. Bland-Altman plot showed a fair agreement between the objective and patient-assessed duration (fig 1). Mean difference (or bias) was only 1.4 minute (95% CI, 0.63-2.15 minute). However an agreement worsening was

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

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

Factors associated with objective surgery duration

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

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

Factors associated with patient-assessed surgery duration

On univariate analysis, patient-assessed surgery duration was correlated to patient age (p=0.011), and time interval between wake-up and surgery (p=0.03). The corresponding regression coefficients and 95% CI are provided in table 2.Similarly, patient-assessed

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duration was also significantly different according to surgeon experience (p=0.032) and according to pain-score group (p=0.001). Conversely, patient-assessed duration was not significantly different between first and second eye procedures or according to gender.

Multivariate analysis revealed patient age, surgeon experience and pain-score group to be independent factors associated with patient-assessed surgery duration (table 3).

DISCUSSION

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

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

The subjective perception of time by patients undergoing cataract surgery under topical anaesthesia has never been studied either. Preparations for surgery include the testing of phacoemulsifiers, applying topical anaesthesia, preoperative disinfection of the eye by povidone-iodine, draping and placement of a lid speculum. These steps may take as long as the surgical procedure itself or even in some instances may take longer than the surgery. From the patients' perspective distinguishing these preoperative stages from their surgery per se may be difficult. To minimize this bias when seeking our patients' subjective assessment of the duration of their surgery, we specifically asked for their impression of the elapsed time between the illumination of their eye under the operating microscope until the removal of the drapes. However, this time interval both

subjectively assessed and clocked by nurses may have added approximately 1 or 2 extra minutes to the real time of the surgery, as the surgeons adjusted the focus of the microscope and made their final preparations for the procedure.

The assessment of pain was a secondary outcome measure in our study and we used the simple 5-step scale as validated in other studies.[4 9 10] A lack of sensation or a mild sensation were reported in 72.4% of cases, moderate pain in 23.3% cases and intense or even unbearable pain in 4.3% of cases. These percentages are comparable to previous reports using the same 5-step pain-score scale.[9] Unsurprisingly, the perception of pain was correlated with the duration of procedures. In our study, the pain-score group was independently associated with both the objective and subjective surgery duration. In a previous study patients tended to report their second eye surgery as more painful than their first eye surgery and this finding was related to a decreased preoperative anxiety at the time of the second procedure.[16] However, this finding was not observed in our study, nor in another recent report.[18] This discrepancy could be due to the preoperative sedation given to all our patients. Such medications can alter the perception of pain as well as the perception of duration and also aim at reducing anxiety. Similarly, we did not account for the patients' systemic medications or illnesses, if any, which could also have altered their judgment and their pain thresholds.

Preoperative standardized grading of cataracts or pupil size was not recorded in our study. Patient age may however be used as a surrogate parameter influencing the grade of the cataract.[19 20] In nuclear cataracts preoperative visual acuity may also be correlated to its grade.[21] Our data confirmed that the objective duration of surgery was longer in cases with worse preoperative visual acuity, as more advanced cataracts require a longer duration of ultrasonic power release.[22] Surprisingly, the age of the patient was not correlated with objective surgery duration but with patient-assessed

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

Most patients quite correctly assessed the duration of their surgery, though the correlation with objective surgery duration was only moderate and samples were large. Hence, we were not able to identify specific characteristics significantly associated with an underestimation or an overestimation of time. Although evidence suggests that fasting prior to cataract surgery under topical anaesthesia can be abandoned, in this series patients fasted from midnight on the day prior to their surgery.[24] As our patients were operated from 8:00 AM to 2:00 PM, fasting time varied from one case to another, but these variations did not influence the subjective assessment of the duration of surgery. Similarly, we thought that an early arrival and a subsequent long waiting in the department of ophthalmology prior to entry in the operating room could be a factor of stress resulting in an over-assessment of the duration of their surgery by patients. Yet our analysis did not reveal that this factor played any role. We unexpectedly observed that the time interval between wakeup and surgery, as well as waiting time in the department, were associated with longer procedures. This might have been linked to surgeons slowing down after a number of cases. Although it has been suggested that handholding may reduce anxiety and the perception of pain during cataract surgery, this was not applied in our practice.[25]

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

important parameter for their comfort. . However, proving the benefit of preoperative counselling in terms of patient satisfaction would require a specific study beyond the scope of this report

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Competing interests

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

Contributorship Statement

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

Pierre-Raphael Rothschild substantially participated in the following:

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

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

3) Final approval of the version to be published

Sophie Grabar substantially participated in the following:

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3) Final approval of the version to be published

Data sharing:
Extra data can be accessed via the Dryad data repository at http://datadryad.org/ with the doi:10.5061/dryad.27sk4

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TABLE AND FIGURE LEGENDS

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

Table 2 Univariate analyses of factors associated with surgery duration.

Table 3 Multivariate analyses of factors associated with surgery duration.

Figure 1. 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.

Figure 2. 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

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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Table 1 Patient population, preoperative schedule and surgical procedures

Variable	Value
Patients (n)	**218**
Cataract surgery cases (n)	**283**
Age (mean years (± SD))	**73.2 (± 9.3)**
Gender (cases, n (%))	
Male	**132 (46.6%)**
Female	**151 (53.4%)**
Preoperative visual acuity (Mean LogMAR (± SD))	**0.4 (±0.2)**
Schedule on the day of surgery (hours)	
Fasting time, mean (± SD)	**14 (±1.8)**
Time interval between wake-up and surgery, mean (± SD)	**4.6 (±1.2)**
Waiting time in the department, mean (± SD)	**2.3 (±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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Table 2 Univariate analyses of factors associated with surgery duration.

	Objective surgery duration		Patient-assessed surgery duration	
Variable	**Regression coefficient (95% CI) or mean (±SD)**	**P Value***	**Regression coefficient (95% CI) 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)	

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

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

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

Subjective assessment of the duration of cataract surgery

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

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Subjective assessment of the duration of cataract surgery

Article summary

Article focus:

1. Modern cataract surgery is a safe and quick procedure. Nonetheless it remains a stressful event from the patients' standpoint.
2. Several factors have been recognized to participate in patients' preoperative anxiety and targeted preoperative counselling has been shown to be of value.
3. Though cataract surgery duration is a frequent patient preoperative qualm it has not been properly studied and patient's perception of time is largely unknown.

Key messages:

1. Patients' perceived cataract surgery duration is ~~fair~~ reasonably accurate whatever the circumstances.
2. Surgeons' experience and pain perception were the two factors independently associated with surgery duration.

Strengths and limitations:

1. The large studied population and the strict definition used for operative time provide reliable measurements of the surgery duration whether objective or patient perceived.
2. Anxiety status, chronic illnesses, systemic medications were not part of our standardized study protocol. Moreover all our patients were on sedative medications at the time of surgery. This might have affected patients' perceptions
3. The benefit in terms of patient comfort/satisfaction of preoperative information regarding surgery duration needs specific ~~studied~~ studies beyond the scope of the present ~~study~~report.

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Objectives: Surgery duration is a source of preoperative anxiety for patients undergoing cataract surgery. To better inform patients we evaluated the agreement between objective and patient perceived surgery duration.

Design: ~~case~~ Case series.

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

Participants: During the study period, 368 cataract surgery cases performed on 285 patients were included, 85 cases were excluded from the final analysis. All patients who had uneventful phacoemulsification were included. Cases with any significant intraoperative adverse event or cases requiring additional anaesthesia other than topical were excluded. Resident performed cases were also excluded.

Primary and secondary outcomes: Procedures were timed (objective duration) and patients were asked, immediately afterwards, to assess the duration of their surgery (patient-assessed duration). The agreement between objective and patient-assessed duration as well as influencing factors was studied.

Results: Mean objective duration (13.9 ± 5 minutes) and patient-assessed duration (15.3 ± 6.9 minutes) were significantly correlated (Spearman's r = 0.452, *P* <.0001). Furthermore, Bland-Altman analysis and the intraclass correlation coefficient (0.341, 95% CI, 0.23-0.44) ~~showed a fair~~ were quite in agreement. On univariate analysis senior-performed procedures were significantly shorter than those performed by juniors (13.4 versus 17.8 minutes, *P* =.0001). Pain was recorded as "no sensation" (31.5 % of the cases), "mild sensation" (41 %), "moderate pain" (23.3 %), "intense pain" (3.5 %) and "unbearable pain" (0.7 %). Groups with high pain-score had significantly longer procedures (*P* <.001). Multivariate analysis revealed that the only independent factors associated with both the objective and patient-assessed duration of surgery was surgeon's experience and pain-score.

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

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INTRODUCTION

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

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

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

METHODS

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

All patients who had uneventful phacoemulsification under topical anaesthesia with placement of an intraocular lens in the capsular bag were included. Cases with any "significant adverse event" defined either by a major intraoperative complication such as vitreous loss or by a technical problem such as phacoemulsifier malfunction that prolonged the procedure by 10 minutes or more were excluded. Similarly, patients who required any anaesthesia in addition to topical lidocaine 2% gel, or those who required sedation in addition to the preoperatively given hydroxyzine were excluded from the analyses. Teaching cases involving resident participation were also excluded from the analyses. The duration of the procedure, referred throughout the text as the objective duration, was timed by operating room nurses as the exposure of the patients' eye to the light of the operating microscope, from the beginning until the end of the surgery.

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

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

Other factors were also recorded: age, gender, first or second eye surgery, and best corrected preoperative visual acuity. All surgeries were performed between 8:00 AM and 2:00 PM and the patients were requested to fast from midnight on the night prior to their surgery. The patients' preoperative schedules were recorded: duration of fasting, time interval between wake-up and surgery, time interval between entry in the department suite and surgery (waiting time in the department). All patients received 0.5 mg/kg of hydroxyzine at their time of arrival in our department used as sedative and additive sedation during the surgery when necessary. No other drug was given preoperatively, including non-steroidal anti-inflammatory drugs. The need for additional anaesthetic techniques was recorded.

Surgeons were categorized as seniors when they had the experience of more than 1000 procedures performed prior to the study or as juniors otherwise.

Statistical analysis

Categorical variables are expressed as numbers (percentages) and comparisons were conducted using the Fisher-exact test. For continuous variables, mean ± standard deviation (SD) or median (interquartile range, IQR) are provided, and comparisons were conducted using the Kruskal-Wallis test or the student's t-test.

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

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agreement corresponding respectively to the mean difference ± 2 SD or ±1 SD. When agreement between the two methods is good, most of the differences should reside within the agreement limit interval. We also computed the Intraclass correlation coefficient to quantitatively evaluate the agreement.

Correlation tests were conducted using the Spearman's correlation coefficient (r). Factors with *P* values <.10 in the univariate analysis were included in a multivariate linear regression and ANCOVA model to determine the independent factors associated with either objective or patient-assessed surgery duration. P Values <0.05 were considered significant. All analyses were performed with XLSTAT 2012.2.02 software (Addinsoft, Paris, France).

RESULTS

A total of 283 cases performed in 218 patients were~~as~~ analyzed after exclusion of 85 cases (65 patients) which met one or more exclusion criteria as detailed herein. Resident participation was the most frequent motive for exclusion (70 cases). Other causes were significant intraoperative adverse events 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 and two were cataracts related to severe pseudoexfoliation syndrome. Thirteen cases required additional anaesthesia or sedation including sub-Tenon's block (5 cases), sub-conjunctival injection (1 case), intracameral injection of lidocaine (1 case) and/or midazolam intravenous sedation (6 cases).~~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, 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. No sensation was reported in 106 (31.5 %) cases, a mild sensation in 147 (41 %) cases, moderate pain in 90 (23.3 %) cases, intense pain in 14 (3.5 %) cases and unbearable pain in 2 (0.7 %) cases. The perception of pain did not significantly differ between first and second eye procedures. Out of 155 patients

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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

The mean objective surgery duration was 13.9 (± 5) minutes and the mean patient-assessed duration was 15.3 (± 6.9) minutes. Bland-Altman plot showed a fair agreement between the objective and patient-assessed duration (fig 1). Mean difference (or bias) was only 1.4 minute (95% CI, 0.63-2.15 minute). However an agreement worsening was noted for longer procedures but error was equally distributed over and under the limits of agreement (-11.3-14.1 minutes). Intraclass correlation coefficient was 0.341 (95% CI, 0.23-0.44) suggesting moderate agreement between the objective and patient-assessed duration.

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

Factors associated with objective surgery duration

On univariate analysis, objective surgery duration was significantly correlated to preoperative VA (p=0.001), time interval between wake-up and surgery (p=0.041), and to the waiting time in the department (p=0.006). The corresponding regression coefficients and 95 % CI are provided in table 2. Similarly, objective duration was significantly different according to surgeon experience with shorter procedures for seniors (13.4 ± 4.8 minutes) compared to juniors (17.8 ± 4.7)(fig 2). Objective duration was significantly different according to pain-score group with significantly longer procedures in groups with high pain-scores (score 4, 3 and 2) compared to groups with low pain scores (score 0 or 1) with mean surgery durations of 15.5 (±5.7) and 13.2

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

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

Factors associated with patient-assessed surgery duration

On univariate analysis, patient-assessed surgery duration was correlated to patient age (p=0.011), and time interval between wake-up and surgery (p=0.03). The corresponding regression coefficients and 95% CI are provided in table 2.Similarly, patient-assessed duration was also significantly different according to surgeon experience (p=0.032) and according to pain-score group (p=0.001). Conversely, patient-assessed duration was not significantly different between first and second eye procedures or according to gender.

Multivariate analysis revealed patient age, surgeon experience and pain-score group to be independent factors associated with patient-assessed surgery duration (table 3).

DISCUSSION

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

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

The subjective perception of time by patients undergoing cataract surgery under topical anaesthesia has never been studied either. Preparations for surgery include the testing of phacoemulsifiers, applying topical anaesthesia, preoperative disinfection of the eye by povidone-iodine, draping and placement of a lid speculum. These steps may take as long as the surgical procedure itself or even in some instances may take longer than the surgery. From the patients' perspective distinguishing these preoperative stages from their surgery per se may be difficult. To minimize this bias when seeking our patients' subjective assessment of the duration of their surgery, we specifically asked for their impression of the elapsed time between the illumination of their eye under the operating microscope until the removal of the drapes. However, this time interval both

subjectively assessed and clocked by nurses may have added approximately 1 or 2 extra minutes to the real time of the surgery, as the surgeons adjusted the focus of the microscope and made their final preparations for the procedure.

The assessment of pain was a secondary outcome measure in our study and we used the simple 5-step scale as validated in other studies.[4 9 10] A lack of sensation or a mild sensation were reported in 72.4% of cases, moderate pain in 23.3% cases and intense or even unbearable pain in 4.3% of cases. These percentages are comparable to previous reports using the same 5-step pain-score scale.[9] Unsurprisingly, the perception of pain was correlated with the duration of procedures. In our study, the pain-score group was independently associated with both the objective and subjective surgery duration. In a previous study patients tended to report their second eye surgery as more painful than their first eye surgery and this finding was related to a decreased preoperative anxiety at the time of the second procedure.[16] However, this finding was not observed in our study, nor in another recent report.[18] This discrepancy could be due to the preoperative sedation given to all our patients. Such medications can alter the perception of pain as well as the perception of duration and also aim at reducing anxiety. Similarly, we did not account for the patients' systemic medications or illnesses, if any, which could also have altered their judgment and their pain thresholds.

Preoperative standardized grading of cataracts or pupil size was not recorded in our study. Patient age may however be used as a surrogate parameter influencing the grade of the cataract.[19 20] In nuclear cataracts preoperative visual acuity may also be correlated to its grade.[21] Our data confirmed that the objective duration of surgery was longer in cases with worse preoperative visual acuity, as more advanced cataracts require a longer duration of ultrasonic power release.[22] Surprisingly, the age of the patient was not correlated with objective surgery duration but with patient-assessed

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

Most patients quite correctly assessed the duration of their surgery, though the correlation with objective surgery duration was only moderate and samples were large. Hence, we were not able to identify specific characteristics significantly associated with an underestimation or an overestimation of time. Although evidence suggests that fasting prior to cataract surgery under topical anaesthesia can be abandoned, in this series patients fasted from midnight on the day prior to their surgery.[24] As our patients were operated from 8:00 AM to 2:00 PM, fasting time varied from one case to another, but these variations did not influence the subjective assessment of the duration of surgery. Similarly, we thought that an early arrival and a subsequent long waiting in the department of ophthalmology prior to entry in the operating room could be a factor of stress resulting in an over-assessment of the duration of their surgery by patients. Yet our analysis did not reveal that this factor played any role. We unexpectedly observed that the time interval between wakeup and surgery, as well as waiting time in the department, were associated with longer procedures. This might have been linked to surgeons slowing down after a number of cases. Although it has been suggested that handholding may reduce anxiety and the perception of pain during cataract surgery, this was not applied in our practice.[25]

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

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
314

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Competing interests

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

Contributorship Statement

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

Pierre-Raphael Rothschild substantially participated in the following:

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

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

3) Final approval of the version to be published

Sophie Grabar substantially participated in the following:

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

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

3) Final approval of the version to be published

Brivael Le Dû substantially participated in the following:

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

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

3) Final approval of the version to be published

Cyril Temstet substantially participated in the following:

Subjective assessment of the duration of cataract surgery

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

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

3) Final approval of the version to be published

Olga Rostaqui substantially participated in the following:

1) Conception and design, acquisition of data

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

3) Final approval of the version to be published

Antoine P. Brézin substantially participated in the following:

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

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

3) Final approval of the version to be published

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TABLE AND FIGURE LEGENDS

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

Table 2 Univariate analyses of factors associated with surgery duration.

Table 3 Multivariate analyses of factors associated with surgery duration.

Figure 1. 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.

Figure 2. 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

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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Table 1 Patient population, preoperative schedule and surgical procedures

Variable	Value
Patients (n)	**218**
Cataract surgery cases (n)	**283**
Age (mean years (± SD))	**73.2 (± 9.3)**
Gender (cases, n (%))	
Male	**132 (46.6%)**
Female	**151 (53.4%)**
Preoperative visual acuity (Mean LogMAR (± SD))	**0.4 (±0.2)**
Schedule on the day of surgery (hours)	
Fasting time, mean (± SD)	**14 (±1.8)**
Time interval between wake-up and surgery, mean (± SD)	**4.6 (±1.2)**
Waiting time in the department, mean (± SD)	**2.3 (±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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Table 2 Univariate analyses of factors associated with surgery duration.

	Objective surgery duration		Patient-assessed surgery duration	
Variable	**Regression coefficient (95% CI) or mean (±SD)**	**P Value***	**Regression coefficient (95% CI) 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)	

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

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

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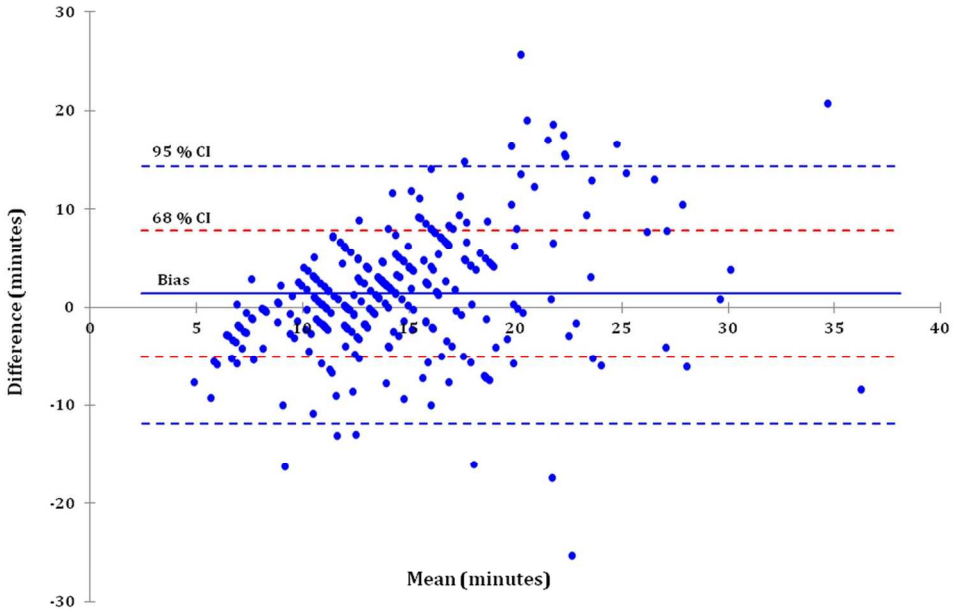
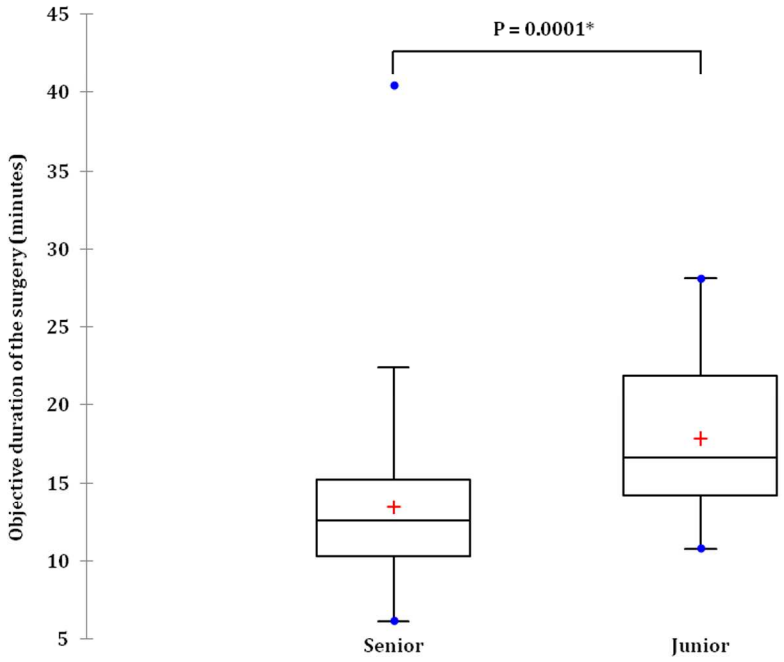
Table 3 Multivariate analyses of factors associated with surgery duration.

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

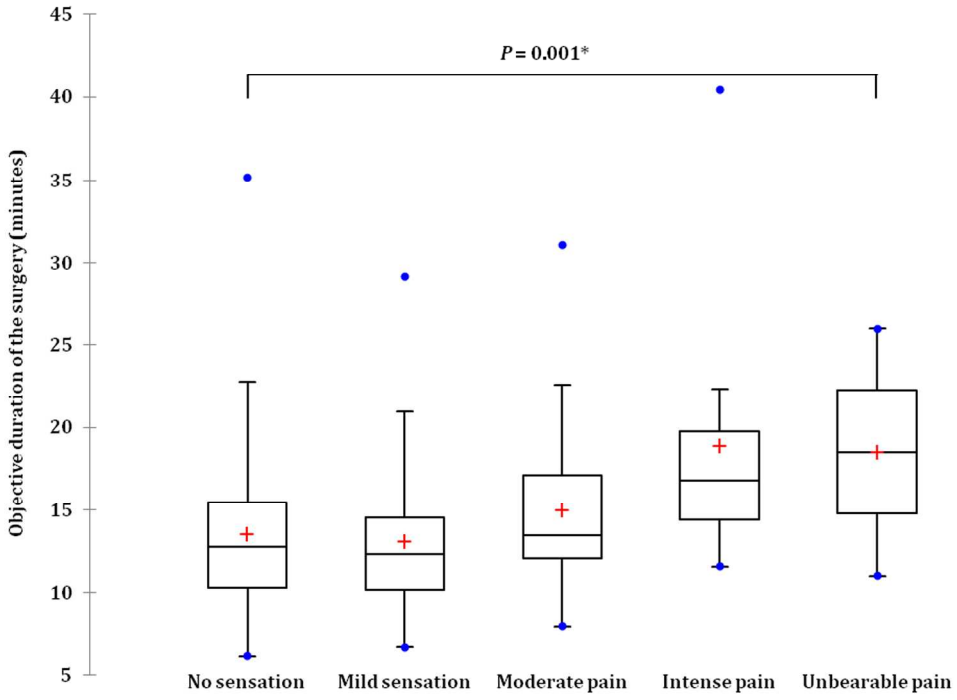
*Regression coefficients adjusted for variables with p values < 0.10 in the univariate analysis.



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)



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



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

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.