

# THE INTRACAPSULAR VERSUS THE EXTRACAPSULAR CATARACT TECHNIQUE IN RELATIONSHIP TO RETINAL PROBLEMS

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## INTRODUCTION

THE PURPOSE OF THIS PAPER IS TO ANALYZE THE INCIDENCE OF RETINAL PROBLEMS occurring after the intra vs extracapsular cataract extraction techniques. This report deals with a series of 564 consecutive eyes on which intraocular lens implantation was performed during the period January 1, 1974 through December 31, 1977. The subject of intraocular lens implantation is not considered in this paper. Initially, all cases were operated upon with the intracapsular technique but because of problems associated with intraocular lens fixation there was a trend toward the use of the extracapsular technique (Table I). This provided a unique opportunity to compare the incidence of retinal problems following these two techniques.

## SELECTION OF PATIENTS

The 564 eyes were selected on the basis of having lens opacities which were significant enough to handicap the patient's visual activities. All options of cataract surgery were discussed with the patients as well as all of the postoperative optical measures to restore vision. In the older age groups the cataracts were primarily of the senile variety while in the younger group there were some that were traumatic in nature.

Those cases not considered suitable for lens implantation were not considered for this study. These were those eyes having a myopia greater than  $-7.00$  D, a history of retinal detachment in the fellow eye, lattice degeneration in the eye or fellow eye, proliferative retinopathy and uveitis. Eyes were also excluded in which technical problems arose during surgery; such as, inability to insert a lens safely because of a shallow chamber or vitreous loss. In a few cases vitreous appeared in the anterior chamber after

TABLE I: 564 CONSECUTIVE CATARACT  
EXTRACTIONS WITH IOL IMPLANTATION  
(JANUARY 1, 1974 - DECEMBER 31, 1977)

	ICCE	ECCE
1974	25	7
1975	49	98
1976	37	147
1977	13	188
Total	124 (22%)	440 (78%)

the lens had been inserted. In these cases the vitreous was removed from the anterior chamber and the intraocular lens was left in place.

In the intracapsular series the age range was 48 to 92 years. The average age was 72.6 years, the median age 73 years. In the extracapsular series the age range was 1 year to 91 years. The average age was 68 years, the median age 67 years. The length of follow-up was 1 to 5 years, the average being 2.8 years.

#### EXAMINATION AND TREATMENT

The preoperative examination consisted of the standard ophthalmologic examination with recording of the best visual acuity. Applanation tonometry, biomicroscopic examination of the anterior segment and examination of the fundus when possible was carried out. Ultrasonography and retinal function tests were carried out when the fundus could not be well-visualized.

The patients were operated on by four surgeons who had been trained in the intracapsular technique. One of these surgeons served as the assistant surgeon in all cases. Identical techniques were used by all surgeons. The majority of patients were operated upon under local anesthesia using osmotic agents prior to surgery. The local anesthesia consisted of a mixture of equal parts of 2% lidocaine (Xylocaine) and 0.75% bupivacaine hydrochloride (Marcaine) for lid akinesia and retrobulbar anesthesia. Digital massage was carried out for a period of approximately five minutes.

TABLE II: RETINAL DETACHMENTS  
(FOLLOWED 1-5 YEARS)

	NO. OF EYES	RETINAL DETACHMENTS
ICCE	124	3 = 2.4%
ECCE	440	*2 = .45%

\*One eye pre-existing traumatic retinal dialysis.

In the intracapsular technique a standard corneal section was made. One cc of 1:5000 alpha chymotrypsin solution was injected into the anterior segment. One or two iridotomies were made in the peripheral iris. The lens was delivered by traction with the cryophake. The intraocular lens was then placed in the pupil and in most cases fixated to the iris with a suture.

In the extracapsular technique a similar corneal section was made. The anterior lens capsule was cut with the irrigating cystotome. The lens nucleus was expressed by depression on the corneal limbus at the 6 o'clock position until the equator of the nucleus presented into the incision. The Grieshaber lens spoon was then used to rotate the nucleus from the eye. No mechanical fragmentation instruments were used. The remaining lens cortex was then irrigated from the anterior segment with various irrigating instruments until the anterior segment appeared to be clear. No aspiration techniques were employed. No attempt was made to incise the posterior capsule at the time of surgery. In some cases there was unintentional rupture of the posterior capsule. The 4-loop or 2-loop Binkhorst type lens was then inserted into the capsular bag and acetylcholine chloride was used to constrict the pupil. One or two peripheral iridotomies were performed.

The postoperative care was nearly identical in both groups; the difference being that 1% pilocarpine was used in the extracapsular cases for a period of approximately three days. In the extracapsular series attempts were made to mobilize the pupil after one week.

## RESULTS

In 124 eyes operated on with the intracapsular technique there were three rhegmatogenous retinal detachments (2.4%) (Table II). In 440 eyes operated on with the extracapsular technique there were two retinal detachments (0.43%). In the intracapsular series (Table III) the onset of symptoms was 2 weeks to 24 months postoperatively. The holes were superior and temporal in location, round in nature, and located between the ora serrata and the equator. The ages of the patients were 60, 65 and 73. The pupils could be widely dilated and the fundi well-visualized. The detachments

TABLE III: RETINAL DETACHMENT IN ICCE

AGE	ONSET POSTOP	QUAD	LOCATION	TYPE OF HOLE	TYPE OF DETACHMENT	POSTOP VISION
60	2 weeks	ST	Between ora & equator	2 round	Bullous	20/20
65	24 mos.	ST	"	1 large	"	20/20
73	16 mos.	ST	"	1 round	"	HM

TABLE IV: RETINAL DETACHMENT IN ECCE

AGE	ONSET POSTOP	QUAD	LOCATION	TYPE OF HOLE	TYPE OF DETACHMENT	POSTOP VISION
58	4 mos.	INF	Near ora	Round	Flat	HM
46	26 mos.	INF	Ora	Dialysis	Flat	20/40
		Temporal				

were all bullous in shape. Following surgery all three patients had anatomical reattachment of the retina. In two cases the vision was restored to 20/20 and in the third hand movements due to a macular pucker.

In the extracapsular series (Table IV) a 58-year-old woman was suffering from long-standing chronic wide angle glaucoma. Four months after her cataract surgery she developed blurring of vision. The fundus could not be well-visualized because of the intraocular lens and capsule remnants in the pupil. A capsulotomy was carried out and a suspected hole was visualized near the ora serrata in the 6 o'clock position. This was confirmed later at the time of surgical repair with a scleral buckling procedure. Three months later a large macular pucker developed. A pars plana vitrectomy was then performed. The retina redetached and a second encircling procedure was performed. This finally resulted in anatomical reattachment with vision limited to hand movements.

The second patient, a 46-year-old white man had a history of traumatic cataract. A dialysis of the retina could be seen in the inferior temporal quadrant. The retina posterior to the dialysis was treated by cryotherapy. Two months after cryotherapy an extracapsular cataract extraction with intraocular lens implantation was carried out. Six months postoperatively the patient developed blurring of vision. The retina could not be well-visualized because of the capsule remnants. A capsulotomy was subsequently performed and an extension of the original dialysis could be visualized. This patient was treated surgically by encircling buckling procedure with subsequent reattachment of the retina and restoration of vision to 20/40.

TABLE V: ICCE 87 EYES, CME 7 EYES = 8%

AGE	BEST POSTOP VISION	POSTOP INTER-VAL DEVELOP CME	WORST VISION	FINAL VISION	SUBSEQUENT OPERATIVE PROCEDURE
78	20/30	6 months	20/200	20/50	
69	20/50+	4 months	20/200	20/200	
78	20/30-	6 months	20/200	20/40	Remove iris suture 7 mos. Postop
74	20/50-	4 months	20/100	20/100	
58	20/30-	3 months	20/200	20/25-	
68	20/20	5 months	20/60-	20/100	
67	20/25	3 months	20/200	20/20	

Of the 564 total eyes 414 eyes were included to study the incidence of cystoid macular edema (CME). One hundred and fifty eyes (27%) in this study were excluded because vision could not be improved better than 20/40. The reasons for exclusion were previously existing macular disease, optic atrophy, amblyopia and anterior segment problems. The major cause for exclusion was senile macular degeneration.

The diagnosis of CME was based upon reduction of vision to 20/70 or less, a typical appearance of the cystoid changes in the macula, a positive fluorescein angiogram, and a central scotoma on the entoptic test. The diagnosis of CME in the intracapsular series was easily made because of readily dilatable pupils with good visualization of the fundus. The diagnosis in the extracapsular series was more difficult because of the problems of visualization associated with the reflexes from the implant lens and the capsular remnants in the pupil. In the extracapsular series 99 (24%) required secondary capsulotomy. No treatment was given for the CME.

In the intracapsular series there were 7 (8%) of 87 eyes which developed CME (Table V). The average time of onset of the deterioration of vision postoperatively was 4.43 months. Four eyes (57%) had final vision of 20/50 or better.

In the extracapsular series there were 4 (1.2%) of 327 eyes which developed CME (Table VI). In two eyes the posterior capsule was intact. The two eyes requiring discission developed CME five and three months post-discission. Three eyes (75%) regained vision of 20/50 or better.

#### DISCUSSION

A review of the literature on the incidence of retinal detachment and cystoid macular edema in cataract extraction is shown in Tables VII and VIII. These cases include intracapsular cataract extraction with intraocular lens implantation and the use of phacoemulsification with and without lens implantation. Deliberate capsulotomy was performed in most cases of

TABLE VI: ECCE TOTAL 327 EYES, CME 4 EYES = 1.2%

AGE	BEST POSTOP VISION	POSTOP INTERVAL DEVELOP CME	WORST VISION	FINAL VISION	CAPSULE STATUS
66	20/30	7 months	20/400	20/50	Intact
63	20/25	5 months post Disc.	20/70-	20/25-	Discission
73	20/50-	2 months	20/400-	20/30	Intact
58	20/50	3 months post Disc.	20/400	20/100	Discission

TABLE VII: RETINAL DETACHMENT

	ICCE		ECCE	
	NO.	%	NO.	%
This study	3/124	2.4	2/440	0.45
Worst	32/1,519	2.1	3/199	1.5
Chambless			8/1,055	0.7
Draeger	8/350	2.3		
Maida	4/130	3	7/870	0.8
Fung			9/344	2.6
Wilkinson			54/1,500	3.6
Sorr			29/1,476	2.0

extracapsular cataract extraction. High-risk cases were included. The occurrence of vitreous loss was not excluded. Since the present study eliminates high risk cases and cases of vitreous loss, comparison in relationship to retinal detachment cannot be made.

In the cataract phacoemulsification survey Troutman, et al<sup>1</sup> found that in the entire series 1.4% had retinal detachments; however, if there was vitreous loss the rate increased by 5 times to 6.8%. Jaffe<sup>2</sup> estimates that the incidence of retinal detachment following cataract surgery is 1.3%.

In this study selection of patients was identical. The only difference in the surgical technique was the use of alpha chymotrypsin in the intracapsular cataract extractions and the postoperative use of pilocarpine in the extracapsular cataract extractions. It seems unlikely that these widely-used drugs would play a role in the production of retinal detachment. The basic difference therefore is the total removal of the posterior lens capsule. This may lead to a structural alteration or weakening of the vitreous base.

The diagnosis of cystoid macular edema in the series reported in the literature is based on fluorescein angiographic evidence of cystoid macular edema with and without visual loss. In this study angiography was not performed routinely, only when cystoid macular edema was suspected of being the cause of the visual loss. A comparison therefore cannot be made between this study and those cases reported in the literature.

TABLE VIII: CYSTOID MACULAR EDEMA

	ICCE		ECCE	
	NO.	%	NO.	%
This study	7/87	8	4/327	1.2
Worst	63/1,519	4.1	2/199	1.0
Allen 4 mos.	13/72	18.1	2/24	8.3
8 mos.	4/23	17.4	1/19	5.3
Draeger	12/350	3.5		
Winslow			34/406	9.0

In the extracapsular series only 2 (0.6%) eyes with intact posterior capsule developed cystoid macular edema. In two eyes cystoid macular edema occurred shortly after discission. This may suggest that disruption of the posterior lens capsule plays a role in the etiology of cystoid macular edema.

#### SUMMARY

Five hundred and sixty-four consecutive eyes after cataract surgery with intraocular lens implantation were studied in relationship to the incidence of retinal detachment and cystoid macular edema in the intra vs the extracapsular extraction technique. In 124 eyes undergoing intracapsular cataract extraction, three (2.4%) developed retinal detachment. In 440 eyes undergoing extracapsular cataract extraction two (0.45%) developed retinal detachment.

In 87 eyes undergoing intracapsular cataract extraction 7 (8%) developed cystoid macular edema. In 327 eyes undergoing extracapsular cataract extraction 4 (1.2%) developed cystoid macular edema. This study cannot be compared with other series in the literature because high risk cases and those with vitreous loss were excluded.

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#### DISCUSSION

DR RICHARD C. TROUTMAN. Since the introduction of phacoemulsification as an

alternative procedure for the removal of cataract, extracapsular cataract extraction has enjoyed a renaissance. In addition to allowing an earlier return to sex and tennis it has been suggested by some that extracapsular extraction may protect the eye against two of the major complications of intracapsular surgery, aphakic retinal detachment, and cystoid macular edema. Extracapsular extraction has received further impetus since Binkhorst has advocated the use of the capsular bag as a fixation device for intraocular lenses. More recently such hardened advocates of intracapsular cataract extraction with intraocular lens implantation as Jaffe have begun to use extracapsular techniques to ensure improved intraocular lens fixation, especially with the use of the new posterior chamber lenses.

Doctor Wetzig presents us with some interesting new data in favor of the extracapsular technique in an interlocking consecutive series of cataract cases fitted also with intraocular lenses. His study is of great interest since he is primarily a posterior segment surgeon, better equipped than most to detect and deal directly with the retinal and vitreous complications of cataract surgery. As such his experience and opinion can be of great value to the ophthalmic community provided his results are substantiated and duplicated. There are however some flaws in his data evaluation which will require correction before validity can be assumed. First and foremost, and extremely important in this type of study, as shown in the Academy evaluation of phacoemulsification, it is an absolute necessity in a cataract surgical series to age match and disease match the study population. Doctor Wetzig's extracapsular patients are an average of six years younger than his intracapsular patients. In neither series have the patients been broken down in decades nor have they been separated as to the concurrent systemic diseases. Though he has excluded a number of patients with ocular diseases known to be a contraindication to intraocular lens implantation the numbers or proportion of such cases in each group is not given.

A second possible statistical error is introduced by the obvious differences in the length of follow-up of the two groups. The length of follow-up of both groups is listed only as one to five years. Looking carefully at the numbers in his follow-up table we find that only 105 of his 440 extracapsular patients have been followed for two years or longer, while in his intracapsular series, 74 of 124 patients have been followed more than two years. These numbers assume greater statistical importance when one examines the times of occurrence of the retinal detachments in the sub groups. Two of the three intracapsular detachments occurred after 16 months. One of the retinal detachments in the extracapsular group appeared only after 26 months. A correction of these data may well change the incidence.

With regard to cystoid maculopathy, this problem seemed always to occur from two to seven months postoperatively, averaging about four months in the two groups. This complication rate should be tested for significance since it appears that there is a definite increase in this complication in the intracapsular group. I would be interested to know, however, what lens types were used and especially if any in the intracapsular series had metal loops, especially if a greater number showed maculopathy. Such lenses are now well known to precipitate macular edema.

Finally, even with the large sample from which Doctor Wetzig has drawn his



data, the proportions are such that valid statistical conclusions are difficult to draw.

Several statements made by Doctor Wetzig in his discussion I believe are worthy of note. He states that if retinal problems were anticipated, the eyes were excluded from the study. This probably means also that he did not subject such eyes to intraocular lenses. Such careful exclusion is laudable. If more cataract surgeons would follow his example fewer retinal and other complications would result. Second, he indicates that he has used no mechanical fragmentation device for lens removal, preferring to use conventional techniques. We could surmise therefore that the conventional method may be superior to fragmentation methods, since Kelman reports no difference in his retinal detachment rates from a concurrent intracapsular series average of about 1.4%. His caution in the face of vitreous loss is well justified. Unfortunately many implant surgeons still implant a lens in the face of vitreous loss inviting unnecessary problems. Doctor Wetzig is to be congratulated on an excellent paper which is one of the first which seems to give some hard evidence that extracapsular extraction may serve to limit one of the most dreaded complications of cataract surgery, cystoid maculopathy.

DR PAUL WETZIG. I would like to thank Doctor Troutman for discussing this paper. He and I have been close friends for many years and he actually taught me how to do the intracapsular cataract extraction procedure, so I feel like sort of a "turncoat" on changing methods this way. I certainly agree with his observation regarding the statistical data on these cases. I didn't have a statistician available to evaluate them and the only way that this will be solved is with the passage of time. His point about the metal loop lenses is something that I overlooked and it really should be stressed as a possible cause of complications. Sometime ago Doctor Troutman stirred up a big hornet's nest among the intraocular lens surgeons by referring to these lenses as a "time bomb" which are now exploding all over like a string of fire crackers. These metal loop lenses have caused a tremendous number of problems and complications in the anterior segment, and it is certainly conceivable that they could also cause trouble in the posterior segment. Fortunately, in most of my cases these loops are buried in the capsular bag, and therefore didn't cause a lot of trouble.