

# Evaluation of Youtube Videos on Posterior Capsular Rent Management for Surgical Education

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## ABSTRACT

**Purpose:** Social media plays a growing role in the health system. Due to the presence of many videos with surgical content, the use of YouTube to obtain information is becoming more and more common among surgeons. This study aimed to evaluate the sufficiency and quality of YouTube videos on posterior capsular rupture (PC) management during phacoemulsification surgery according to a novel scoring system suggested by the authors.

**Materials and Methods:** A YouTube search was performed phrases “posterior capsule rupture”, “posterior capsule tear” and “posterior capsule rent”. Ninety-six videos were included in this study and evaluated. The contents of the videos were scored by the authors according to their novel scoring criteria.

**Results:** The mean score of the videos according to the novel scoring criteria was  $8.67 \pm 2.43$ , with a range of 1-14. There was a moderate correlation between the total score and views, and the total score and likes ( $p < 0.05$ ). In 77 (80%) of the videos, the surgeons did what was initially expected according to scoring criteria when the PC rupture occurred. When the videos were filtered according to the minimum surgical requirements defined by the authors’ scoring system, 10 videos (10.4%) were found to meet the requirements.

**Conclusions:** PC rupture management videos are not fully sufficient to be used in surgical training. Some of these videos can be used in surgical training, but they should be used after necessary evaluations are performed.

**Keywords:** posterior capsule rupture, surgical education, social media, YouTube

## INTRODUCTION

Modern cataract surgery (phacoemulsification) is performed commonly and safely in 95 percent of patients. The most common intraoperative complication of phacoemulsification surgery is posterior capsule (PC) rupture. It can result in nucleus drop, vitreous loss, retinal tears, retinal detachment, postoperative uveitis, endophthalmitis, and cystoid macular edema.<sup>1,2,3</sup> Therefore, an ophthalmologist needs to be able to manage PC rupture. When the PC ruptures, usually an experienced consultant surgeon takes control and completes the surgery, or the resident surgeon completes the case with the consultant’s instructions.<sup>4</sup>

The Coronavirus Disease 2019 (COVID-19) pandemic negatively impacted surgical training in most clinics as the number of elective surgeries decreased, at least for

a while. Training centers utilized wet labs, simulators, and online education to overcome this education issue.<sup>5</sup> Surgical videos on the social network might also aid resident education on complications. YouTube (www.YouTube.com) is a social network that offers its users the opportunity to upload their videos and watch the videos uploaded by other users. In particular, social media plays a growing role in the health system. Due to the presence of many videos with surgical content, the use of YouTube to obtain information is becoming more and more common among surgeons. However, the validity and reliability of this content must be verified before it can be used as educational content for surgical training in PC rupture management during ophthalmology training. This study aimed to evaluate the sufficiency and quality of YouTube videos on the management of PC rupture during

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phacoemulsification surgery according to our scoring criteria.

## MATERIALS AND METHODS

A search was performed on YouTube on September 7, 2021, without any user accounts. The following phrases were entered into the YouTube search bar; "posterior capsule rupture", "posterior capsule tear", and "posterior capsule rent". The first 100 videos for each phrase were included in the study. The links to the videos included in the study were collected in Excel 2013 (Microsoft Office, USA), and duplicate links were excluded from the study. These links were subsequently viewed by both ophthalmic surgeons (OAP and HS), and duplicate videos, anterior capsular rupture and other unrelated videos were excluded from the study. As a result, 96 videos were included in the study and evaluated. The videos were uploaded by the doctors who performed the surgery. The links to the videos included in the study are presented in the supplementary file (Supplementary file 1).

The authors scored the videos based on their own evaluation criteria and the criteria in the survey are given in Table 1. These criteria evaluate the surgeon's experience, what was done after PC rupture, how anterior vitrectomy is performed, complications, and video-related parameters. When the posterior capsule ruptures, expectations from the ophthalmic surgeon are as follows: <sup>7, 8, 9, 10, 11</sup>

- Keeping calm,
- Not pulling the phaco probe out of the anterior chamber and pulling the probe out after injecting a viscoelastic substance into the anterior chamber,
- Injecting viscoelastic below the nucleus if the nucleus is present,
- Checking for the presence of vitreous in the anterior chamber (with triamcinolone or surgical instrument or miotic agent),
- Using the side port or pars plana during anterior vitrectomy, not using the main port,
- Inserting the infusion in a different port than the cutter during anterior vitrectomy,
- Injecting intracameral antibiotics at the end of the surgery,
- Suturing the main incision at the end of surgery.

A single answer for each question was marked, the corresponding score was taken and the total score was obtained at the end. The average of total scores given by both authors for each video was calculated for analysis.

It was accepted that the surgical minimum requirements assessment was made in questions 2, 3, 4, 5, 6, 7, and 9 of our survey. Since the 8th question is the basic procedure

of phacoemulsification and there is no specific procedure for PC rupture, it was not evaluated as a surgical minimum requirement. The videos that received the expected answers from this evaluation were filtered in Excel. Videos describing clearly what not to do during PC rupture were not included in the statistical analysis.

The number of views, likes and dislikes, duration (second) and video definition [standard Definition (SD) or High Definition (HD)] were recorded for all videos.

All statistics were performed with SPSS software version 22 (IBM, USA). Descriptive statistics of continuous data are shown as mean  $\pm$  standard deviation and median (interquartile range 25%-75%). Descriptive statistics of categorical data are shown as percentages. Since the continuous data were not normally distributed, the Spearman rho test was used to evaluate the correlations within the data.

## RESULTS

In the scoring made according to the survey in Table 1, the mean score of the videos was  $8.67 \pm 2.43$ , with a range of 1 to 14. Correlation analysis results between views, likes, dislikes, duration and total score of the authors are presented in table 2. There was a moderate correlation between the total score and views and the total score and likes ( $p < 0.05$ ). There was a weak correlation between total scores and dislikes ( $p < 0.05$ ). Videos that clearly what not to do (3.1%) during PC rupture were not scored or included in the statistical analysis.

The percentile results of the survey in which the scoring was performed are presented in Table 3. According to these results, in 36 (37.5%) of the videos, the surgeon checked the presence of vitreous in the anterior chamber, in 41 (42.8%), vitrectomy was performed through the pars plana or side port, and in 27 (28.1%) the main port was sutured at the end of surgery. In 77 (80%) of the videos, the surgeons did what was expected of them initially when the PC ruptured. Seventy-four (77%) of the videos had a verbal or subtitle explanation for the procedure.

In the videos, it was observed that when 19 (20%) of the surgeons noticed the PC rupture, the phaco probe was removed from the anterior chamber without giving viscoelastic material, 14 (14.7%) used the main port for vitrectomy, 4 (7.3%) performed dry vitrectomy and 1 (1.8%) performed coaxial vitrectomy, 69 (71.9%) did not suture main port at the end of surgery.

The percentage results of other data evaluated in the videos are presented in Table 4. The most commonly used phacoemulsification technique was horizontal chop among

<b>Table 1: The scoring criteria for videos on posterior capsular rent management</b>	
<b>1. Was the surgeon's experience specified?</b>	
Resident	1
Consultant	1
Unspecified	0
<b>2. Did the surgeon remark how noticed or suspected the posterior capsule rupture was?</b>	
Yes	1
No	0
<b>3. Were the necessary precautions taken after the posterior capsule rupture was noticed?</b>	
Yes	1
No	0
<b>4. Was the presence of vitreous in the anterior chamber checked?</b>	
Not done	0
With triamnisolone	1
With surgical instrument	1
With miotic agent	1
<b>5. Which incision was used for vitrectomy?</b>	
Not done	0
Main port	0
Side port	1
Pars plana	1
<b>6. Was the infusion in a different port during anterior vitrectomy? (in case of vitrectomy)</b>	
Not done	0
Yes, different port	1
No, same port	0
Dry vitrectomy, no infusion	1
<b>7. In the case of nucleus drop, did the surgeon chase the nucleus to vitreous with the phaco probe?</b>	
Yes	-1
No	0
<b>8. Were antibiotics given to the anterior chamber at the end of the surgery?</b>	
Yes	1
No	0
<b>9. Was the main port sutured at the end of the surgery?</b>	
Yes	1
No	0
<b>10. Was the purpose of the video explained?</b>	
Not explained	0
A video on what to do when a PC ruptures	1
A video on what not to do when a PC ruptures	1
Both	2
<b>11. Was the precaution to be taken for PC rupture explained, if there was a predisposing cause?</b>	
There was a predisposing cause, yes, the precautions to be taken have been explained.	1
There was a predisposing cause, no, the precautions to be taken have not been explained.	0
No predisposing cause	0
<b>12. What will the resident learn from the video?</b>	
Precautions to be taken if there is a predisposing cause for PC rupture	1
What to do when PC ruptures	1
What not to do when PC ruptures	1
First and second	2
First and third	2
Second and third	2
First, second and third	3
<b>13. Was there a verbal or subtitled explanation in the video?</b>	
Verbal	1
Subtitle	1
None	0
<b>14. Was the resolution of the video sufficient for training? (capsulorhexis visible?)</b>	
Yes	1
No	0

**Table 2:** Correlation between video parameters and scores

<i>Variables</i>	<i>Views</i>	<i>Likes</i>	<i>Dislike</i>	<i>Duration</i>	<i>Total score</i>
<i>Views</i>	1	0.860**	0.779**	0.265**	0.463**
<i>Likes</i>	<0.001*	1	0.701**	0.301**	0.510**
<i>Dislikes</i>	<0.001*	<0.001*	1	0.280**	0.227**
<i>Duration</i>	0.009*	0.003*	0.006*	1	0.086
<i>Total score*</i>	<0.001*	<0.001*	0.026*	0.403	1

The values above the diagonal consisting of 1 values extending from the top left to the bottom right represent the “r” value, the values below represent the “p” value. \*p value<0.05, \*\*correlation coefficient (r) of statistically significant p values. \*: Authors’ scores for evaluation criteria

**Table 3:** Percentage distribution of evaluation criteria results

<b>Was the surgeon's experience specified?</b>	
Resident	13.50%
Consultant	82.30%
Unspecified	4.20%
<b>Did the surgeon remark how noticed or suspected the posterior capsule rupture?</b>	
Yes	74%
No	26%
<b>Were things done after the posterior capsule rupture was noticed?</b>	
Yes	80%
No	20%
<b>Was the presence of vitreous in the anterior chamber checked?</b>	
Not done	62.50%
With triamnisolone	28.10%
With surgical instrument	6.20%
With miotic agent	3.10%
<b>Where was the anterior vitrectomy performed?</b>	
Not done	42.70%
Main port	14.70%
Side port	36.40%
Pars plana	6.20%
<b>Was the infusion in a different port during anterior vitrectomy? (in case of vitrectomy)</b>	
Yes, different port	90.90%
No, same port	1.80%
Dry vitrectomy, no infusion	7.30%
<b>In the case of nucleus drop, did surgeon chase the nucleus to vitreous with the phaco probe?</b>	
Yes	0%
No	100%
<b>Were antibiotics given to the anterior chamber at the end of the surgery?</b>	
Yes	3.10%
No	96.90%
<b>Was the main port sutured at the end of the surgery?</b>	
Yes	28.10%
No	71.90%
<b>Was the purpose of the video explained?</b>	
Not explained	34.40%
A video on what to do when a PC ruptures	61.50%
A video on what not to do when a PC ruptures	3.10%
Both of them	1%
<b>Was the precaution to be taken for PC rupture explained, if there was a predisposing cause?</b>	
There was a predisposing cause, the precautions to be taken have been explained.	14.60%
There was a predisposing cause, the precautions to be taken have not been explained.	8.40%
No predisposing cause	77%
<b>What will the resident learn from the video?</b>	
Precautions to be taken if there is a predisposing cause to PC rupture	0%
What to do when PC ruptures	65.60%
What not to do when PC ruptures	4.20%
First and second	4.20%
First and third	2.10%

<b>Table 3: Continued</b>	
Second and third	22.90%
First, second and third	1%
<b>Was there a verbal or subtitled explanation in the video?</b>	
Verbal	62.50%
Subtitle	14.50%
None	23%
<b>Was the resolution of the video sufficient for training? (capsulorhexis visible?)</b>	
Yes	85.40%
No	14.60%

the techniques that could be detected during the surgical procedure (31.2%). It was observed that posterior capsule tears were more common in the phacoemulsification stage (54.2%) and in 34 (65.4%) of these, the nucleus fragment was still present in the anterior chamber. Nucleus drop was observed in 9 (9.4%) of the cases and 5 (5.2%) of the cases converted to ECCE or MSICS. Finally, the IOL was implanted in the ciliary sulcus in 53 (55.2%) of cases, while it was implanted in the capsular bag in 40 (41.7%).

When the videos were filtered according to the surgical minimum requirements, it was found that 10 videos (10.4%) met all the requirements defined by the authors at the beginning of the study. The mean total score of these ten videos was  $12.1 \pm 1.3$ . The URL of these videos is provided in Supplementary File 1.

When the authors evaluated the quality of the videos according to the visualization of the edge of continuous curvilinear capsulorhexis (CCC), the CCC edge was visualized in 82 (85.4%) of the videos. The mean number of views of 96 videos was 6488, with a range of 8-84889 times. In the data obtained from YouTube, 24 (25%) of the videos were SD and 72 (75%) HD.

## DISCUSSION

Cataract surgery is not free from complications, even in eyes without risk factors, and even with due care. Muhtaseb et al. reported a complication rate between 4.1% and 32% in cataract surgery. It was also reported that the complication rate was statistically similar with all grade surgeons (consultant, resident, fellow) and the most common complication was rupture of the PC.<sup>12</sup>

One of the most critical steps, when a PC rupture occurred, is the management of vitreous prolapse. Postoperative vitreous in the anterior chamber can cause elevated intraocular pressure, vitreous Wick syndrome, corneal edema, and retinal traction which may lead to retinal detachment.<sup>13</sup> Therefore, it is recommended to prevent vitreous prolapses in the anterior chamber with an adequate injection of viscoelastic substance into the PC defect without withdrawing the phaco probe or irrigation cannula. If the surgeon suspects vitreous prolapse, the vitreous can be visualized with triamcinolone injection

<b>Table 4: Percentage distribution of other results</b>	
<b>Which phaco technique did the surgeon perform?</b>	
Divide Conquer	4.20%
Stop Chop	6.20%
Flip Chop	11.50%
Horizontal Chop	31.20%
Vertical Chop	12.50%
Others or Unspecified	34.40%
<b>At which stage of the operation did the pc ruptured?</b>	
Pre-existing condition	7.30%
Hydrodissection	4.20%
Phacoemulsification	54.20%
I/A	28.10%
IOL implantation	6.20%
<b>How much of the nucleus was present at the time the PC ruptured?</b>	
None	57.30%
Complete	14.60%
Half	10.40%
Quarter	3.10%
Less than a quarter	14.60%
<b>Nucleus Drop?</b>	
Yes	9.40%
No	90.60%
<b>Posterior asisted levitation?</b>	
Yes	1%
No	99%
<b>How was the surgery proceeded?</b>	
Continued with phaco	94.80%
Convert to ECCE	2.10%
Convert to MSICS	3.10%
<b>Was ppv performed in the same session?</b>	
Yes	3.10%
No	96.90%
<b>Where was the IOL implanted?</b>	
Not implanted	1%
Sulcus	55.20%
Bag	41.70%
AC or iris claw	2.10%
<b>Does the case have risk factors for PC rupture?</b>	
No	77.10%
Posterior polar cataract	11.50%
Small pupil	5.20%
Trauma	4.20%
Siliconized eye	1%
Pediatric cataract	1%

and adequate anterior vitrectomy should be performed from side ports or pars plana after lowering the bottle height or infusion pressure.<sup>14</sup> The main incision should not be used as the anterior chamber depth can fluctuate and fluid escape from the main incision may increase vitreous incarceration in the port.<sup>14</sup> However in the videos, when 19 (20%) of the surgeons noticed the PC rupture, the phaco probe was removed from the anterior chamber without giving viscoelastic material, 14 (14.7%) used the main port for vitrectomy and 1 (1.8%) performed coaxial vitrectomy (Fig. 1). To prevent postoperative anterior chamber collapse and vitreous incarceration risk, suturing the main port is recommended.<sup>13</sup> But, in 69 (71.9%) videos, the surgeon did not suture the main port at the end of surgery.

All the videos we evaluated had posterior capsule rupture and it was remarkable that only 21 (22.9%) of them had risk factors. Posterior polar cataract was the most common risk factor in the evaluated videos. The literature has reported that the incidence of posterior capsular rupture varies between 7.1% and 36% in eyes with posterior polar cataracts.<sup>15</sup> In addition, the approach to posterior polar cataract cases, traumatized PC rupture, small pupil and other risky cases could be observed in videos.

Perioperative isolation of the eyelid and eyelashes and the use of sterile preparatory procedures on the ocular surface are effective in limiting the incidence of postoperative endophthalmitis. In addition, in clinical studies, intracameral administration of antibiotics was found to be effective in preventing endophthalmitis. In addition, clinical studies have shown that intracameral antibiotics can be used safely in eyes with PC rupture and are effective in preventing endophthalmitis.<sup>9, 16</sup> In the videos we evaluated, the rate of antibiotic use was observed as 3.2%. The low rate of antibiotic use in the videos may be because if the surgeon said that there was injected intracameral antibiotic, it was recorded as "yes".

In a study conducted in the UK, it was observed that 63% of PC ruptures were in the phacoemulsification stage and 23% of PC ruptures were in the I/A stage. In addition, 12% of these surgeries were converted to ECCE or ICCE.<sup>17</sup> Our findings are consistent with the literature. In PC tears that occur in the phacoemulsification stage, viscoelastic material is expected to be injected into the anterior chamber and rather behind the nuclear fragments. Depending on the surgeon's experience, there is conversion to ECCE or continuation of phacoemulsification. Another technique that can be applied is the IOL (intraocular lens) scaffold technique.<sup>18, 19</sup> In the videos evaluated, various techniques mentioned were demonstrated. The procedures to be followed when the PC ruptures in other stages were also included in the videos.

The videos also contained surgical maneuvers that "not to do". These videos can be used in surgical training as a secondary aim to teach what "not to do". To be able to follow surgical details in the video we suggested that the CCC should be visible and focused on the surgical field. In 82 (85.4%) of the videos, the CCC was easily visible, and 72 (75%) of the videos had HD, allowing good quality resolution.

Surgical skills are acquired with practice, and surgical training is an exposure training. In this case, surgical complications may occur. It may not always be possible to perform a lot of surgeries and cope with complications in residency training. According to previous studies, residents tend to have higher rates of complications in phacoemulsification surgery.<sup>20, 21</sup> With education and greater surgical experience, these complications can decrease. In a survey of ophthalmology residents in the UK, only 9.1% of participants reported that they would complete a case involving a PC rupture without support. Other participants reported that they would either need their supervisors to take over the case or follow the instructions of their supervisors.<sup>4</sup> This shows that residents feel insecure or inadequate about what to do when the PC ruptures. Resolving this situation can be possible with multimedia-supported education. Multimedia-supported education has been reported to have a developmental effect on surgical learning.<sup>22</sup> YouTube, which is a multimedia platform, has great potential in this regard since many videos are available, and it is easily accessible. In addition, some videos have a VR (virtual reality) option which enables 3D (3-dimensional) viewing of the videos with VR goggles, which provides good stereopsis of surgery, similar to that seen in the surgical microscope. However, the YouTube videos about posterior capsular rent have not been evaluated for content sufficiency and quality.

The use of YouTube as a source of medical information has recently been investigated. A study evaluating YouTube videos about cataract surgery was found insufficient for patients.<sup>23</sup> Another study found that 23% of videos related to eye movement disorders were sufficient.<sup>24</sup> Another study evaluated the videos about refractive surgery and found that there was not enough information.<sup>25</sup> In a study evaluating keratoconus videos, 58% of the videos were found useful.<sup>26</sup> Few of YouTube videos generally seem useful as an educational resource about ocular disorders.

In conclusion, this study is the first study evaluating YouTube videos on PC rupture management and has shown that PC rupture videos are not fully sufficient to be used in surgical training, but some videos can be quite useful. The intervention to be performed may vary depending on the type of complication. However, only 10 (10.4%) of the

evaluated videos met all the requirements according to our evaluation criteria. Some of these videos can be used in surgical training, but they should be used after necessary evaluations are performed.

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## Videos that meet all requirements

### URL

<http://www.youtube.com/watch/fQ-6TMFpGd4>  
[http://www.youtube.com/watch/-GAKEzDrc\\_s](http://www.youtube.com/watch/-GAKEzDrc_s)  
<http://www.youtube.com/watch/fDvEUKOjei8>  
[http://www.youtube.com/watch/N9w\\_KHhWkvs](http://www.youtube.com/watch/N9w_KHhWkvs)  
<http://www.youtube.com/watch/AHI85dSGu2g>  
<http://www.youtube.com/watch/1INul08b0Ac>  
[http://www.youtube.com/watch/J3uv\\_9-L1s4](http://www.youtube.com/watch/J3uv_9-L1s4)  
<http://www.youtube.com/watch/bXVkhJoR3gI>  
<http://www.youtube.com/watch/fgmooyntzgtg>  
<http://www.youtube.com/watch/YDGv1w16hJY>

## All evaluated videos

### URL

<http://www.youtube.com/watch/qF1ewdQ4X9A>  
<http://www.youtube.com/watch/5bZUhtL0liM>  
<http://www.youtube.com/watch/cgaICFg686o>  
[http://www.youtube.com/watch/NZnzdzk\\_Gil](http://www.youtube.com/watch/NZnzdzk_Gil)  
<http://www.youtube.com/watch/vTKMqFLsQLc>  
<http://www.youtube.com/watch/1pDYuwIEe3I>  
<http://www.youtube.com/watch/23GMJRBYrqU>  
<http://www.youtube.com/watch/akN30SBIEGo>  
<http://www.youtube.com/watch/fQ-6TMFpGd4>  
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Posterior Capsule Rupture during Hydro-dissection & Anterior Vitrectomy in Cataract Surgery  
 how to recover from a ruptured posterior capsule during cataract surgery  
 CataractCoach 1219: posterior polar capsule rupture / anterior vitrectomy  
 How to rescue this Cataract Surgery: Dense White Cataract with Ruptured Posterior Capsule  
 posterior chamber deepens as the posterior capsule is ruptured  
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 Cataract Quiz: What do you do now that the posterior capsule has been ruptured?

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 Tough Cataract Surgery: Ruptured Capsule, Anterior Vitrectomy, Sulcus IOL, Great Outcome  
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 Posterior Capsular rupture during hydrodissection - Total management  
 Posterior Polar Cataract and Posterior Capsular Rupture ( Catarata Polar Posterior)  
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 Posterior Capsule Rupture during Hydro-dissection & Anterior Vitrectomy in Cataract Surgery  
 Posterior capsular rupture : PCCC, Intact anterior hyaloid, Mistake in IA Dr Sourabh Patwardhan  
 Posterior Capsular Rupture During Phacoemulsification  
 how to recover from a ruptured posterior capsule during cataract surgery  
 CataractCoach 1219: posterior polar capsule rupture / anterior vitrectomy  
 Posterior Polar Cataract & Posterior Capsular Rupture  
 Posterior Capsule Rupture: Strategies to Minimize Vitreous Loss, Single Piece IOL in the Bag  
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 Poor management of posterior capsule tear during nuclear disassembly  
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 Management of Posterior Capsule Rupture during Phacoemulsification  
 PC Rupture During Phaco  
 Posterior Capsular Tear management in a case of Posterior Polar Cataract- Dr Deepak Megur  
 Posterior capsular rupture  
 Phaco complicated by Posterior Capsular rupture with dropped nucleus  
 Nucleus management in PCR (Posterior capsular rupture) Dr Sourabh Patwardhan  
 Open Posterior Capsule with Trifocal IOL. Ahmed Assaf  
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 How to rescue this Cataract Surgery: Dense White Cataract with Ruptured Posterior Capsule  
 Open Posterior Capsule before IOL Implantation. Ahmed Assaf.  
 Rupture Posterior Capsule  
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 Posterior capsule rupture during I/A. Surprise!  
 Posterior capsular rupture(Rent):How to insert IOL in bag thinking process Dr Sourabh Patwardhan  
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 punctured posterior capsule and anterior vitrectomy  
 Symphony toric lens placement with posterior capsular tear and posterior capsulotomy in 4K.  
 Traumatic Cataract With Ruptured Posterior Capsule



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- Posterior Capsular (PC) tear during IOL Implantation
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