

# Clinical Research on Lens Cortex Removal Assisted by Hydropolish

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## Research Article

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# Abstract

**Background:** This retrospective study investigated the efficiency and safety of lens cortex removal assisted by a fluid-based capsular polishing technique, hydropolish.

**Study design:** Prospective case series.

**Methods:** Sixty patients were included in this study. All these patients underwent phacoemulsification cataract surgery using different sequences of surgical steps and were divided into two groups; hydropolish before irrigation/aspiration (I/A) (Group 1, 30 eyes) and I/A before hydropolish (Group 2, 30 eyes). Hydropolish and I/A cortex time, and time of the entire procedure were noted.

**Results:** The hydropolish time was longer in group 1 than that in group 2 ( $P \leq 0.001$ ). The I/A cortex time and hydropolish and I/A cortex time together were not different between the two groups ( $P = 0.294$  and  $P = 0.258$ , respectively). However, the time of the entire procedure was shorter in group 1 ( $P = 0.002$ ).

**Conclusions:** Lens cortex removal assisted by hydropolish is a safe, time saving, and simple surgery.

## Background

Posterior capsule rupture (PCR) is a common and frequent complication of phacoemulsification cataract surgery [1]. The incidence rate of PCR in phacoemulsification surgery has been reported as 1.9–5.2% [2–5]. Most capsule tears (61%) occur during the phacoemulsification phase and 27–47% occur during the irrigation/aspiration (I/A) phase [6, 7]. Therefore, avoiding PCR in the I/A phase is essential for the entire surgery.

Hydropolish is a technique that aims to remove the residual cortex from the posterior capsule following I/A by manual injection of balanced salt solution towards the posterior capsule and bag fornices via the hydrodissection cannula [8]. In clinical applications, we found hydropolish can be done before I/A instead of after I/A. After hydropolish, cortex could be removed easily and safely. Simultaneously, due to the change in the sequence of surgical steps, the surgical process was optimised and the surgical efficiency was improved.

In this study we compared the efficiency and safety of the different sequences of surgical steps as hydropolish can be done before or after I/A.

## Methods

This retrospective study adhered to the tenets of the Declaration of Helsinki and had obtained human research ethics approval by Ethics Committee of Qingdao Xinsijie Eye Hospital. This was a retrospective study consisting of 60 eyes (60 patients) with cataracts. All of these patients underwent phacoemulsification cataract surgery with different sequences of surgical steps, hydropolish before I/A (Group 1, 30 eyes) and I/A before hydropolish (Group 2, 30 eyes) (Fig. 1). The inclusion criteria for these

patients were: 60–80 years of age, 22.0–25.0 mm axial lengths, more than 2000 endothelial cells/mm<sup>2</sup>, anterior chamber depth beyond 2.5 mm, dilated pupil diameter beyond 6 mm, cataract nucleus grade 2 to 4 (according to Emery-Little classification [9]), and no other oculopathy.

All surgeries were performed by the same surgeon (L. Y.), who was experienced in phacoemulsification, with an Oertli surgical platform Catarhex 3 (Oertli Instrumente AG, Switzerland). Hydropolish was performed by using a 5 mL syringe with a bent and blunt-tip needle from the main incision. The technique is the same as described in the previous studies [8, 10].

For each case, the following clinical data were collected: hydropolish and I/A cortex time and time of the entire procedure (from the end of removal of the nucleus to the beginning of close incisions).

The independent-samples t-test was used to compare the groups for statistical significance. Data were analysed using the Statistical Package for the Social Sciences software (version 13.0, International Business Machines Corp.). The level of significance was set to a *P*-value of 0.05.

## Results

Thirty patients in each group were evaluated. The characteristics of the patients in these two groups are shown in Table 1. There was no statistically significant difference between these two groups in any characteristic. In all 60 cases, no intraoperative complications occurred.

Table 1  
Patient characteristics.

Characteristic	Group 1 (n = 30)	Group 2 (n = 30)	<i>P</i> Value
Age (years)	71.53 ± 5.54	70.67 ± 6.14	0.568*
Sex (male/female)	14/16	13/17	0.795†
Right eye/left eye	14/16	16/14	0.606†
Preoperative visual acuity (LogMar)	0.55 ± 0.20	0.58 ± 0.17	0.537*
Mean ± SD			
*Independent-samples <i>t</i> -test			
†Chi-square test			

The time of each step and that of the entire procedure are shown in Table 2. The hydropolish time was longer in group 1 than that in group 2 ( $P \leq 0.001$ , Fig. 2A). The I/A cortex time and the hydropolish and I/A cortex time together were not different between the two groups ( $P = 0.294$  and  $P = 0.258$ , respectively, Fig. 2B, C). However, the time of the entire procedure was shorter in group 1 ( $P = 0.002$ , Fig. 2D).

Table 2  
Time for each step in the two groups.

Time (s)	Group 1 (n = 30)	Group 2 (n = 30)	P Value*
Hydropolish	13.73 ± 4.74	8.7 ± 3.55	≤ 0.001
I/A cortex	21.93 ± 7.60	24.17 ± 8.69	0.294
Hydropolish + I/A cortex	35.67 ± 10.41	32.87 ± 8.49	0.258
The entire procedure	92.67 ± 12.48	104.27 ± 15.07	0.002
Mean ± SD			
*Independent-samples <i>t</i> -test			

## Discussion

Currently, phacoemulsification is the most common surgical technique used to treat cataracts world-wide. PCR is a common and frequent complication of this surgery. During I/A cortex, the incidence rate of PCR has been reported as 0.13–0.69% [6, 11]. According to our own experience, at a certain stage PCR was likely to occur in the I/A phase than in the phaco phase for surgery trainees [12]. Therefore, avoiding PCR is important for the entire I/A phase.

We tried to perform hydropolish before the I/A cortex, which was called the lens cortex removal assisted by hydropolish to improve the safety of the I/A cortex and avoid the occurrence of PCR. In this method of hydropolish, injection of ophthalmic viscoelastic device (OVD) and implantation of intraocular lens (IOL) were performed first. Further, I/A cortex and OVD together are performed.

Hydropolish is usually done for removing residual cortex after I/A cortex by rinsing with BBS [8]. As a previous study, we also found hydropolish could be done before I/A phase, and after hydropolish, the cortex could be removed easily [11]. The removal of cortex in the subincisional space is specifically challenging [13, 14]. Dewey has shown a cortex removal technique using the J-shaped cannula, which could be used for subincisional cortical removal [15]. However, because of the shape of J-cannula, the intraocular tissues may be hooked at the tip. In our technique, I/A cortex was done after hydropolish, injection of OVD and implantation of IOL, and the cortex in the subincisional space could be removed easily. In our surgery, hydropolish was performed just from the main incision, so the cortex in the subincisional space could not be rinsed directly. However, after injection of OVD and implantation of IOL, the cortex could be pushed from the centre to the capsular fornix, and can be easily removed by I/A. The IOL could protect the posterior capsule and avoid the occurrence of PCR. Sometimes, the loop of the IOL may suppress the cortex and cause difficulty in the cortex removal. Rotating the IOL could easily solve this difficulty. In addition, we had rinsed the cortex in the subincisional space by a side port. We did not find any difference on the cortex removal after the implantation of IOL. In our study, the IOL was one-piece hydrophilic IOL. In our clinical experience, all kinds of IOL could be fit for this method.

In our study, we found that the hydropolish time was different in both the groups. Before I/A cortex, hydropolish needed more time than hydropolish following I/A cortex. As with the existence of much cortex, hydropolish needs to rinse the central cortex, and then rinse the residual cortex on the posterior capsule. However, if hydropolish following I/A cortex is done, it just needs to rinse the residual cortex on the posterior capsule. The time of the entire procedure was shorter in group 1 significantly ( $P=0.002$ ). The main reason was that I/A cortex and I/A OVD were done in a single step. After hydropolish and implantation of IOL, I/A cortex was easily removed in group 1.

There are some limitations of this technique. First, some patients were not fit for this method, such as cataract after vitrectomy and hypermyopia. These patients were without sufficient vitreous support and after removing the nucleus, the anterior chamber could not collapse in most of them. Therefore, rinsing the posterior capsule was not easy. Second, hydropolish is not fit for polishing the anterior capsule.

## Conclusion

Lens cortex removal assisted by hydropolish is a safe, time saving, and simple surgery.

## Abbreviations

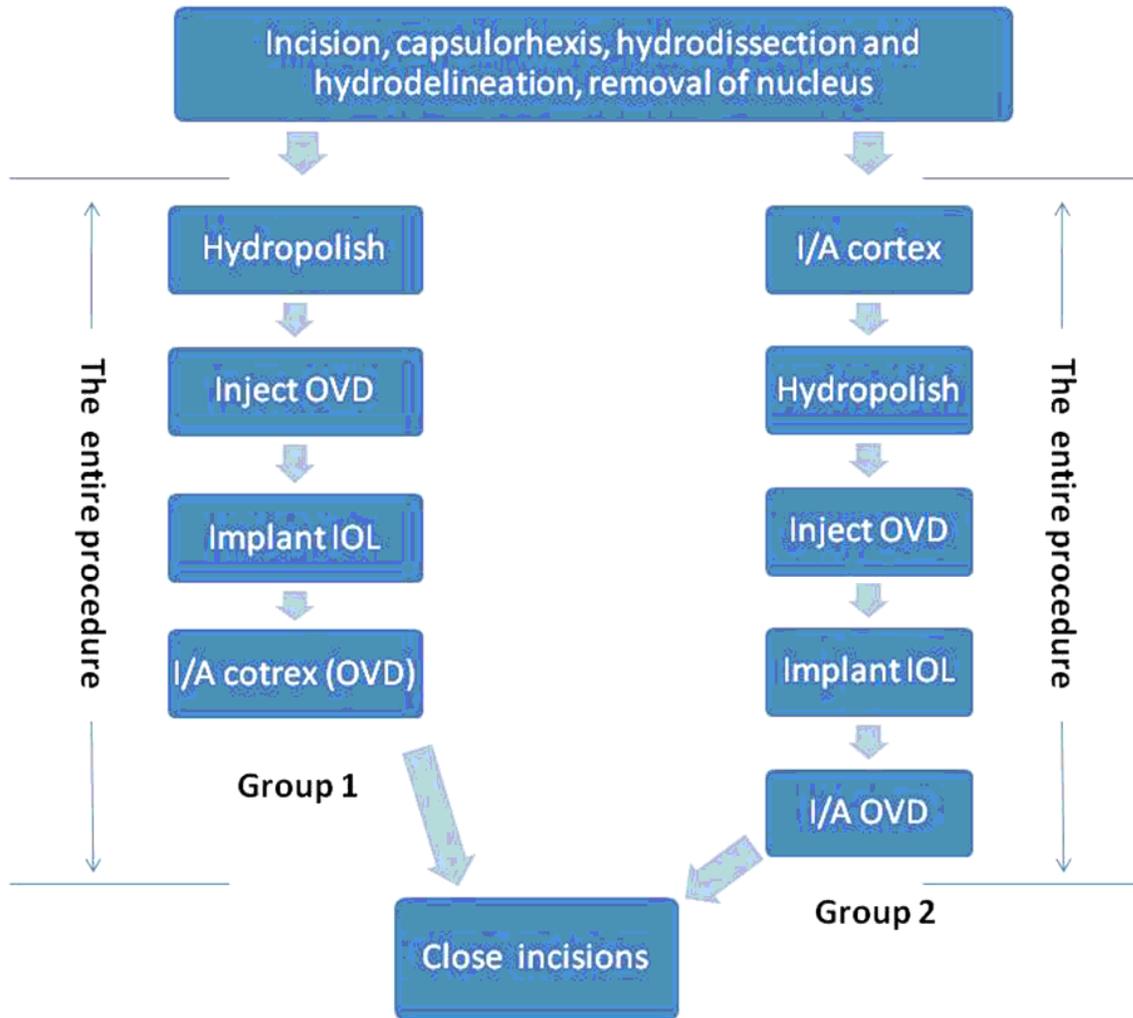
PCR, posterior capsule rupture; I/A, irrigation/aspiration; OVD, ophthalmic viscoelastic device; IOL, intraocular lens.

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## Figures



**Figure 1**

The different sequence of surgical steps in both groups.

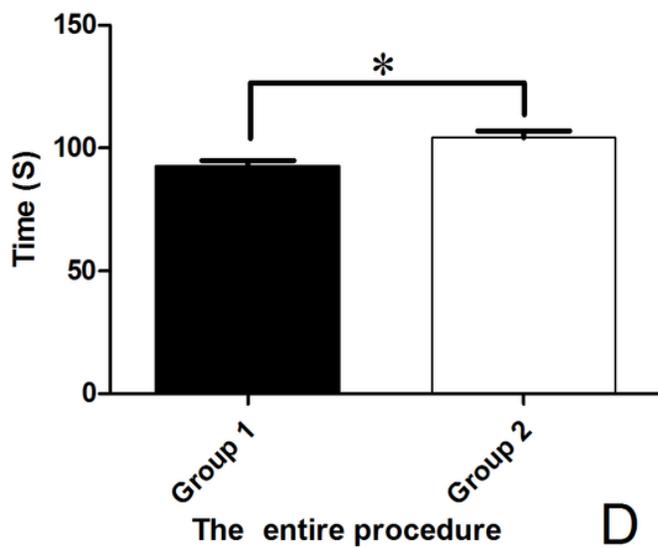
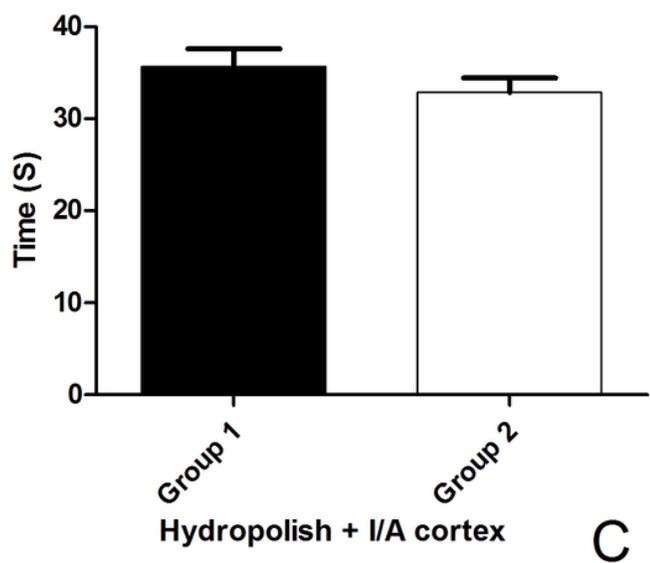
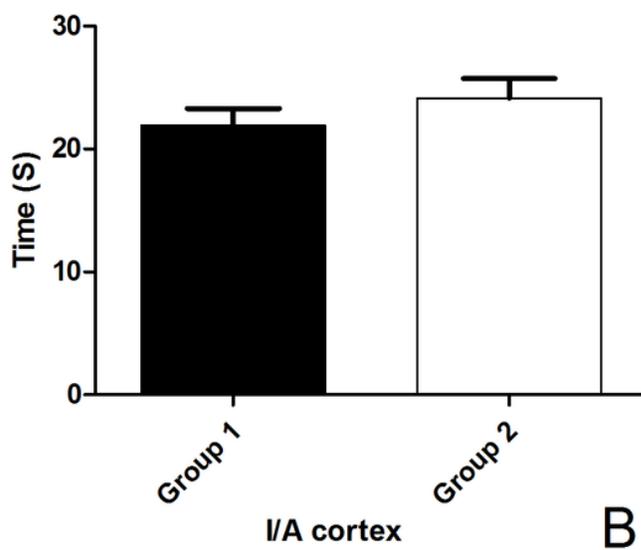
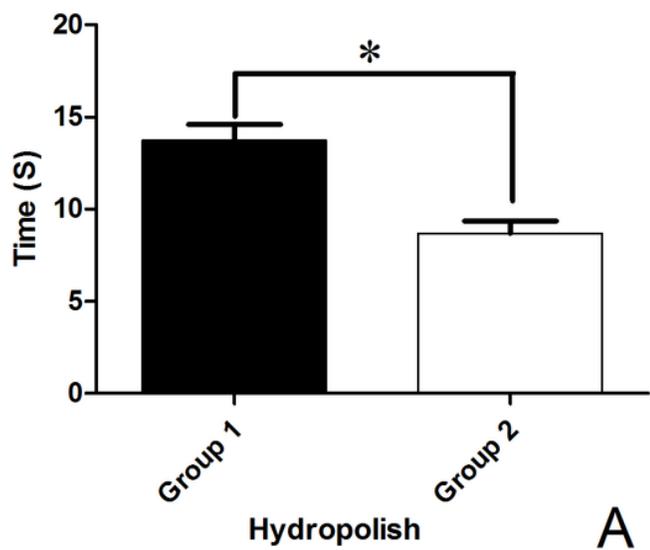


Figure 2

The time of each step and the entire procedure.