A Comparison of Patient Pain during Cataract Surgery with Topical Anesthesia in Prechop Manual Phacofragmentation Versus Phacoemulsification

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Objective: *To compare the pain level and complications during cataract surgery with topical anesthesia in Prechop MPF versus phacoemulsification.*
Study design: *Prospective randomized comparative study.*
Material and Method: *One hundred patients, undergoing small incision cataract surgery under topical anesthesia, were allocated randomly to perform Prechop MPF (n = 50) or phacoemulsification (n = 50). Patients were asked to rate their pain level on a 10-point visual analog pain scale during the administration of the anesthetic, during the surgery and after surgery. The surgeon recorded his subjective assessment of patient cooperation and surgical complications.*
Results: *The mean pain score during surgery was 1.64 ± 1.48 (SD) in the prechop MPF group and 0.92 ± 1.34 (SD) in the phacoemulsification group. The difference between groups was statistically significant (p = .001). There was no significant difference in pain scores for delivery of anesthesia (p = .077), or after surgery (p = .221) and no significant difference in patient cooperation (p = .446) and surgical complications in either group.*
Conclusion: *Patients having cataract surgery under topical anesthesia in the prechop MPF group had more intraoperative pain than patients in the phacoemulsification group. However, there was no significant difference in patient cooperation and surgical complications between the groups.*

Keywords: *Small incision cataract surgery, Manual phacofragmentation, Phacoemulsification, Topical anesthesia, Pain score*

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Prechop Manual Phaco Fragmentation (Prechop MPF)[1-2] is manual small incision cataract surgery. The nucleus is divided into two pieces using prechopper forceps and the lens fragment is then removed through temporal corneal incision using simple instruments without the need for a phaco machine. Visual acuity and complication were similar after prechop MPF and phacoemulsification[3]. Originally the nucleus was divided into two pieces using prechopper forceps, but the latest technique uses very simple and inexpensive instruments such as 23 gauge disposable needles or Micro Vitreo Retinal(MVR) blades for nuclear cracking. The phacoemulsification is routinely done under topical anesthesia because it greatly reduces the risk of complications and eliminates those stemming from the needle and systemic toxicity[4-5]. Prechop MPF was performed only under retrobulbar block. There was no report of this technique with topical anesthesia. To determine whether topical anesthesia in Prechop MPF is effective and safe as topical anesthesia in phacoemulsification, the authors compared the pain level and possible complications during Prechop MPF and phacoemulsification cataract surgery.

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Material and Method

This prospective randomized comparative study comprised 100 consecutive patients having elective cataract surgery and Intra Ocular Lens (IOL) implantation by a single surgeon at the Prapokklao Hospital, Thailand from March 2004 to March 2005. Approval was obtained from the Ethics Committee of the hospital and consent was obtained from all patients. Patients recruited for the present study were both men and women between 40 and 86 years of age who were scheduled for elective cataract surgery under topical anesthesia. Patients were excluded according to the following criteria: mature cataract, previous ocular surgery, inflammation or injury, a fully dilated pupil diameter less than 5.0 mm, breakdown in communications or cooperation (eg, extreme anxiety, hearing impairment), and inability to understand the 10-point pain score.

Patients were prospectively randomized to receive cataract surgery with prechop manual phaco-fragmentation (prechop group), or phacoemulsification (phaco group)by the envelope technique. The day before surgery, the patients were informed of the details of the surgical procedure except for the type of cataract surgery they would receive. All patients had identical preoperative preparation with diclofenac 0.1%, 1 drop every 30 minutes 2 times and phenylephrine 10% and tropicamide 0.5%, 1 drop every 15 minutes 3 times. No oral premedication was used.

Anesthesia Administration

In the operating room, all patients received benoxenate hydrochloride 0.5% (Novesin) three times within 15 minutes prior to the surgery. This was repeated immediately before surgery. No additional periocular, topical, or intraocular anesthetic was given for breakthrough surgical pain. Surgery was performed after a routine preparation and draping. One surgeon (P.K.) performed all surgical procedures.

Surgical Technique

With the prechop MPF technique, two paracenteses, at the 1- and 5-o'clock meridians in the left eye or at the 7- and 11-o'clock meridians in the right eye, were made with a 15-degree stab knife. A temporal clear corneal incision was then made with a 3.0-mm keratome. A large capsulorhexis was performed after injection of the viscoelastic.

Hydrodissection followed by hydrodelineation were performed. The viscoelastic was then re-injected for optimal visualization and stability of the anterior chamber. With the left eye, a nuclear chopper was passed through one side port and placed at the 9-o'clock meridian under the anterior capsule to stabilize the nucleus. The 23G disposable needle or MVR blade was inserted through the temporal corneal wound and gently passed into the center of the nucleus core. The nucleus was fragmented into two pieces. The corneal incision was then enlarged to 5 to 6 mm with a 3.0-mm disposable keratome. Each piece was prolapsed into the anterior chamber and extracted with 2 Sinskey hooks via a 5- to 6-mm temporal clear corneal incision. The cortex was removed through the side port incisions by a single-lumen cortex extractor and anterior chamber maintainer. A 5.5-mm polymethylmethacrylate posterior chamber intraocular lens (IOL) was implanted in the capsular bag, and the wound was sutured with a stitch 10-0 nylon.

With phacoemulsification, a self-sealing, temporal clear corneal incision was constructed and the anterior chamber was entered with a 3.0-mm keratome. The viscoelastic agent was injected into the anterior chamber. A paracentesis was made at the 2-o'clock meridian. A continuous curvilinear capsulorhexis was created, and hydrodissection and hydrodelineation were performed. The nucleus was removed using the divide-and-conquer or the stop-and-chop technique. The cortex was aspirated with an automated irrigation/aspiration hand piece, and a 5.5-mm polymethyl-methacrylate posterior chamber IOL was implanted in the capsular bag, after which the wound was sutured with 10-0 nylon.

Evaluation of pain

Immediately after the surgery, patients were taken to the postoperative area, where they were asked to rate their pain level from a constant nurse. The nurse was masked to the anesthetic technique used. Each patient was shown a ten-point visual analog pain scale in the Thai language with both written and numeric indices. Patients were asked to grade the level of pain during the administration of anesthetic drop, intraoperatively and 2 hours postoperatively. Their discomfort or pain on the scale ranges from 0 (no pain) to 10 (maximum pain). If the patient was unable to see the scale or read the accompanying text, the scale was described and a verbal response was obtained.

Patient Cooperation and Complications

The surgeon completed a standardized written form rating patient cooperation (3 = excellent; 2 = good; 1 = fair; 0 = poor) and complications (squeezing of

eyelids, miosis, inadvertent eye movement, capsule rupture, vitreous loss, hyphema, iris prolapse). The surgeon (P.K.) examined all patients on the first postoperative day to assess early postoperative complications.

Statistical analysis

Mean scores for pain were calculated for each type of surgery, and Mann-Whitney U test of statistical significance were used to compare the mean scores of the 2 groups. The proportion of patients having no pain or slight discomfort was then calculated for each group. The rates of surgical complications were calculated and comparisons between 2 groups were performed by Fisher exact test. A p-value, less than 0.05, was considered statistically significant.

Results

The present study comprised 100 eyes of 100 patients undergoing cataract surgery under topical anesthesia, with 50 eyes having prechop manual phacofragmentation and 50 eyes having phacoemulsification. The mean age was 66.8 years (range 44-80 years) in the prechop group, 68.1 years(range 47-86 years) in the phaco group. The percentage of women was 40.0% and 42.0%, respectively. There were no dropouts in the present study.

The pain scores recorded for delivery of anesthesia are shown in Fig. 1; during surgery, in Fig. 2; and 2 hours postoperatively, in Fig. 3. Ninety percent in the prechop group and ninety-six percent in the phaco group reported no pain or slight discomfort during the delivery of the anesthetic agent. Two patients in the prechop group and no patient in the phaco group reported more than level 3 pain. The mean pain score was 0.62 ± 1.01 in the prechop group and 0.30 ± 0.54 in the phaco group ($p = .077$).

Sixty-six percent in the prechop group and eighty-two percent in the phaco group reported no pain or slight discomfort during surgery. Six patients in the prechop group and two patients in the phaco group reported more than level 3 pain. The mean pain score was 1.64 ± 1.48 in the prechop group and 0.92 ± 1.34 in the phaco group. The difference in the mean pain scores between groups was statistically significant ($p = .001$). Supplement anesthesia was required in three cases in the prechop group and two cases in the phaco group, but no case converted to retrobulbar anesthesia.

Eighty-four percent in the prechop group and

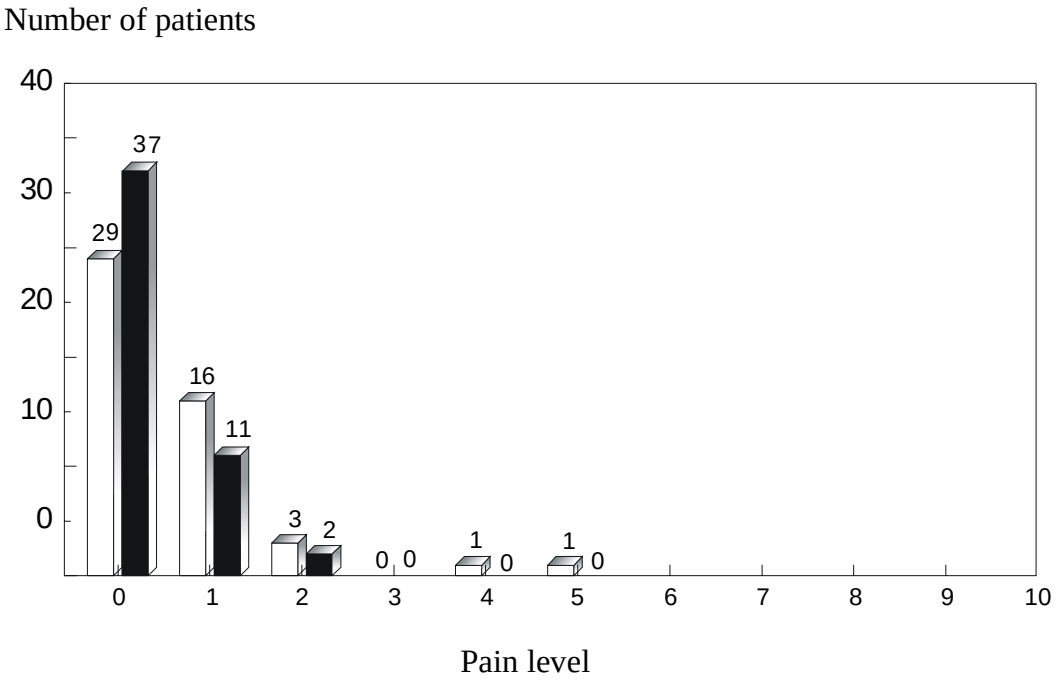

Fig. 1 Pain scores recorded for delivery of anesthetic agent. (White bars = prechop group; dark bars = phaco group). Pain scale: 0 = none; 1 = slight discomfort; 2 = slight; 3 = light; 4 = light to moderate; 5 = moderate; 6 = moderate to severe; 7 = severe; 8 = very severe; 9 = excruciating; 10 = unbearable

Fig. 2 Pain scores recorded for surgery. (White bars = prechop group;dark bars = phaco group). Pain scale: 0 = none; 1 = slight discomfort; 2 = slight; 3 = light; 4 = light to moderate; 5 = moderate; 6 = moderate to severe; 7 = severe; 8 = very severe ; 9 = excruciating; 10 = unbearable

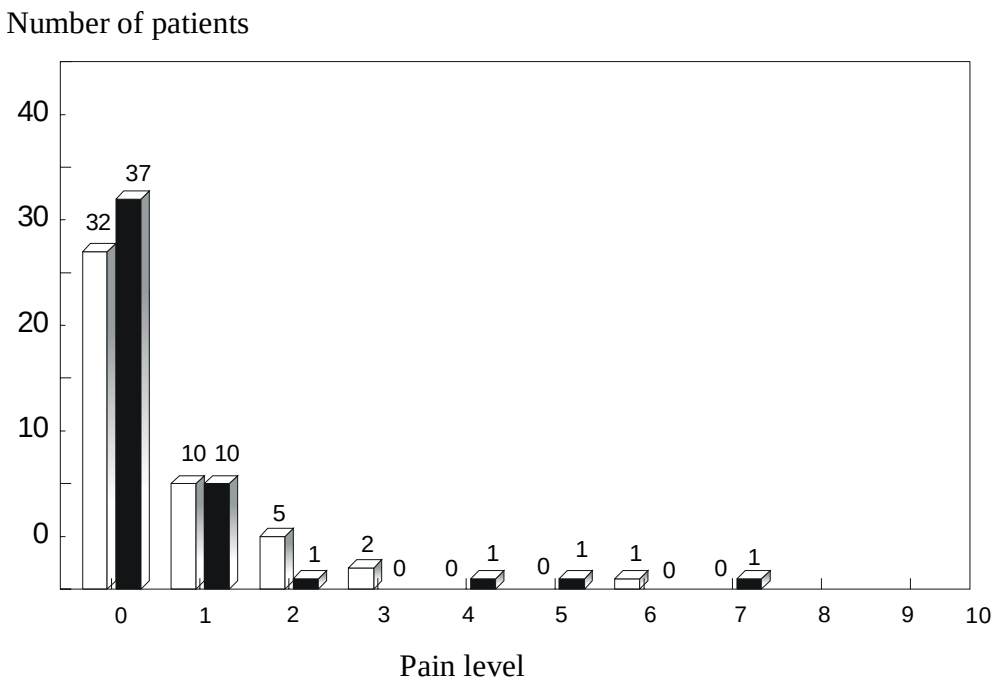

Fig. 3 Pain scores recorded for postoperative period. (White bars = prechop group; dark bars = phaco group).Pain scale: 0 = none; 1 = slight discomfort; 2 = slight; 3 = light; 4 = light to moderate; 5 = moderate; 6 = moderate to severe; 7 = severe; 8 = very severe; 9 = excruciating; 10 = unbearable

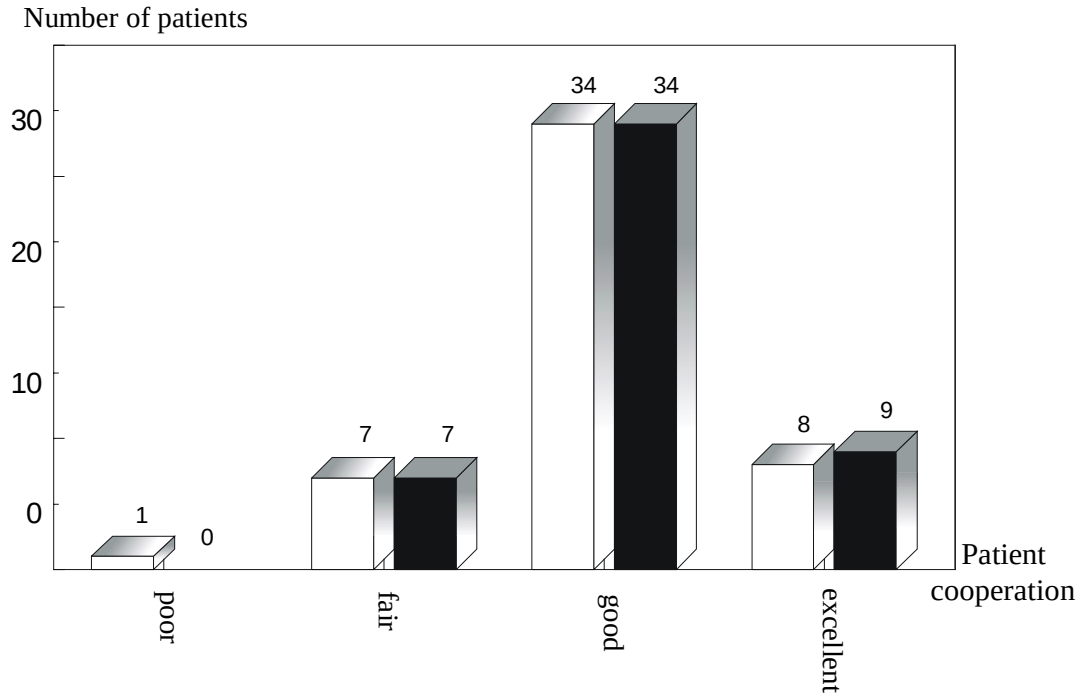

Fig. 4 Patient cooperation. (White bars = prechop group ;dark bars = phaco group)

ninety-four percent in the phaco group reported no pain or slight discomfort 2 hours postoperatively. One patient in the prechop group and three patients in the phaco group reported more than level 3 pain. The mean pain score was 0.64 $\pm$ 1.14 in the prechop group and 0.48 $\pm$ 1.25 in the phaco group (p = .221).

Patient cooperation is shown in Fig. 4. Eighty-four percent in the prechop group and eighty-six percent in the phaco group evaluated as having good or excellent cooperation. One eye in the prechop group was evaluated as having poor cooperation. The mean cooperation score was 2.98 + -0.62 in the prechop group and 3.14 $\pm$ 0.78 in the phaco group (p = .446). Surgery time averaged 13.3 minutes (range 9.5-17.3 minutes) in the prechop group and 12.5 minutes (range 10.0-18.0 minutes) in the phaco group.

Surgical complications are shown in Table1. No severe complications were observed in either group. The incidence of lid squeezing, inadvertent eye movement, hyphema and iris prolapse were similar among the groups. Neither capsule rupture nor vitreous loss occurred in any eye, in either group. Intraocular lens implantation was successful in all eyes. At the first postoperative day, corneal edema occurred in 2 eyes (4%) in the prechop group and one eye (2%) in the phaco group (p = 1.00).

Table 1. Complications during cataract surgery in the two treatment groups: prechop manual phacofragmentation (prechop, n = 50) and phacoemulsification (phaco, n = 50)

Complications	Prechop (n = 50)	Phaco (n = 50)	p-value
Lid squeezing	3	2	1.00
Inadvertent eye movement	2	2	1.00
Hyphema	2	0	0.495
Iris prolapse	4	1	0.362
Rupture PC	0	0	-
Corneal edema	2	1	1.00

Discussion

The number of ophthalmologists performing phacoemulsification cataract surgery is rapidly increasing. In addition, topical anesthesia with less invasive techniques is gaining in popularity. The main advantages of topical anesthesia are immediate visual recovery and the lack of serious needle-tip complications[5-13]. Prechop manual phacofragmentation (Prechop MPF) is the manual small incision cataract surgery.The nucleus is divided into two pieces and removed through the corneal incision using simple instruments, without the need for a phaco machine. Visual acuity and complications were similar after prechop MPF and phacoemulsification[3]. This technique was performed mostly under retrobulbar block. There was no report of this technique with topical anesthesia.

In this prospective randomized comparative study, the authors compared the pain level and possible complications with prechop manual phacofragmentation and phacoemulsification during cataract surgery with topical anesthesia. Both types of cataract surgery provided satisfactory operative conditions. Operating time was approximately equal in both groups. Visual analog pain scores were not significantly different between the prechop group and the phaco group during the administration of the topical anesthetic (p = .077). This is expected since the preoperative delivery of the topical drops was identical for each group.

For the prechop MPF technique, the step of nuclear delivery and nuclear removal during the surgery was the most painful part of cataract procedure. No pain or slight pain during the cataract surgery was reported by 66% in the prechop group and 82% in the phaco group. Six patients in the prechop group and two patients in the phaco group reported more than level 3 pain. The mean pain score was 1.64 in the prechop group and 0.92 in the phaco group, both higher than the respective preoperative(during the administration of the anesthetic) and postoperative pain scores. The difference in the mean pain scores between groups was statistically significant (p = .001). The level 1 or level 2 pain score was only slight discomfort and the patients did not suffer from pain. Although the degree of patient discomfort was significantly higher during the Prechop MPF surgery, the difference was small. The step of surgery that caused more pain was possibly due to nuclear removal through corneal incision, pressure on the sclera with the Sinskey hook caused more pain.

After the surgery, both groups were very comfortable. The mean postoperative pain scores were 0.64 and 0.48 for groups 1and 2, respectively (p = .221). Eighty-four percent in the prechop group and 94% in the phaco group reported no pain or slight discomfort after surgery.

The patient cooperation in the present study showed no significant difference between groups (p = .446). Eighty-four percent in the prechop group and eighty-six percent in the phaco group evaluated as having good or excellent cooperation. This "patient cooperation" describes the patient's ability to follow directions from the surgeon (i.e. look to the right, look directly at the light). Patient cooperation is critical to successful topical cataract surgery and it can cause surgical complications.The posterior capsule rupture may occur during the nuclear division using 23G disposable needle or MVR blade in the prechop group. It could be argued that good patient cooperation is so essential that this result alone justifies the use of topical anesthesia in prechop manual phacofragmentation.

Although in the present study iris prolapse was noted in 4 eyes in the prechop group and 1 eye in the phaco group, there was no statistically significant difference (p = .362). The other complications (i.e. lid squeezing, inadvertent eye movement, hyphema, corneal edema) were similar in both groups. Neither capsule rupture nor vitreous loss occurred in any eye in either group. In incidences of surgical complication, this result alone justifies the use of topical anesthesia in prechop manual phacofragmentation. Results indicated that prechop manual phacofragmentation with topical anesthesia is as safe as those in phacoemulsification.

In conclusion, topical anesthesia in both prechop manual phacofragmentation and phacoemulsification provide good surgical conditions for the surgeon and comfortable operative circumstances for the patient. However, patient assessments of pain in Prechop MPF had slightly more intraoperative pain than those in the phacoemulsification. The authors believe that less bothersome tissue manipulation and better surgical skill will decrease the patient pain during cataract surgery using topical anesthesia in prechop manual phacofragmentation.

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การศึกษาเปรียบเทียบระดับความปวดจากการผ่าตัดต้อกระจกแบบแผลเล็กโดยการหยอดยาชาระหว่าง prechop manual phacofragmentation และ phacoemulsification

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วัตถุประสงค์: *เพื่อศึกษาเปรียบเทียบระดับความปวดจากการผ่าตัดต้อกระจกแบบแผลเล็กโดยการหยอดยาชาระหว่าง prechop manual phacofragmentation และ phacoemulsification*

วิธีการศึกษา: *การศึกษาไปข้างหน้าเปรียบเทียบแบบสุ่ม*

วัสดุและวิธีการ: *ผู้วิจัยทำการศึกษาในผู้ป่วย 100 รายที่มารับการผ่าตัดต้อกระจก โดยผู้ป่วยได้รับการผ่าตัดด้วยวิธี prechop manual phacofragmentation จำนวน 50 ราย และได้รับการผ่าตัดด้วยวิธี phacoemulsification จำนวน 50 ราย ผู้ป่วยทุกรายได้รับการผ่าตัดด้วยการหยอดยาชา และได้รับการประเมินระดับความปวดในขณะหยอดยาชา, ขณะผ่าตัดและหลังผ่าตัด ส่วนแพทย์ผู้ผ่าตัด จะประเมินความร่วมมือในการผ่าตัดและประเมินภาวะแทรกซ้อนจากการผ่าตัด*

ผลการศึกษา: *คะแนนความปวดเท่ากับ 1.64 $\pm$ 1.48 (SD) ในกลุ่มแรก และเท่ากับ 0.92 $\pm$ 1.34 (SD) ในกลุ่มที่สอง ซึ่งมีความแตกต่างกันอย่างมีนัยสำคัญทางสถิติ ($p = .001$) แต่ไม่มีความแตกต่างกันของคะแนนความปวดในขณะหยอดยาชา ($p = .077$) และหลังผ่าตัด ($p = .221$) และไม่มีความแตกต่างของความร่วมมือในการผ่าตัดของผู้ป่วย ($p = .446$) และภาวะแทรกซ้อนจากการผ่าตัด*

สรุป: *ผู้ป่วยที่ได้รับการผ่าตัดต้อกระจกโดยวิธี prechop manual phacofragmentation มีระดับความปวดมากกว่ากลุ่มที่ได้รับการผ่าตัดโดยวิธี phacoemulsification เล็กน้อยแต่ไม่พบความแตกต่างของความร่วมมือในการผ่าตัดของผู้ป่วยและภาวะแทรกซ้อนจากการผ่าตัด*