Comparison of Phacnit Rollable IOL with Acrylic Foldable IOL

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Abstract

Background : Phacnit or ultra micro incision phacoemulsification cataract surgery involves phacoemulsification through a 0.9 millimetre sleeveless phaco tip and irrigating chopper followed by implantation of a rollable intraocular lens. The procedure leads to negligible astigmatism and faster visual recovery as compared to phacoemulsification with a foldable intraocular lens. **Methods :** This prospective study analysed 80 cases of sub millimetre phacnit surgery with implantation of rollable intraocular lenses (IOL) in 40 cases and acrylic foldable IOL in the remaining 40 cases. Evaluation of efficacy and adaptability of procedure, equipment settings, operative constraints, postoperative complications, keratometric and topographic evaluation of induced astigmatism with visual outcome and patient's rehabilitation were studied.

Results : The intraoperative complications were surge/ chamber collapse in 16 (20%), iris chaffing in one and corneal burns in two cases. All cases had an induced astigmatism of less than or equal to ± 0.25 D in four to six weeks after rollable IOL and ± 0.5 D to ± 0.75 D after acrylic IOL implantation. All patients had best-corrected visual acuity of 6/6 by third post operative day.

Conclusion : Phacnit with rollable IOL is a perfect blend of surgical skill, application of technology and ultra thin IOL.

MJAFI 2007; 63 : 19-22

Key Words : Phacnit; Ultra micro phaco; Submillimetre incision; Rollable IOL implantation

Introduction

The term 'Phacnit' means phacoemulsification (phaco) with a needle (N) opening via an incision (I) and with the phaco tip (T). Phacnit through 0.9 mm incision was popularised by Dr Amar Agarwal of Agarwal Eye Hospital, Chennai (India) [1]. The submillimetric incision and bimanual phacoemulsification was the greatest modification of the concept of sleeveless phacoemulsification by other workers like Hara and Hara [2]. Until recently micro incision phaco was restricted to the incision size of 1.4-1.5 millimetre [3-7].

Initial modifications had inherent restriction of incision size of more than 1.9 millimetre (mm) since the infusion sleeve takes up a lot of space and the procedure was essentially coaxial [2]. In the new technique the infusion sleeve was removed from the phaco tip and the modified micro tip of 0.9 mm diameter was passed inside the eye through an incision of 0.9 mm. The left hand had an irrigating chopper made up of bent needle of 19 or 20 gauge passing fluid inside the eye [1,8]. The standard technique of phacoemulsification of lens nucleus followed by aspiration was done. The incision was

extended and foldable acrylic lens was implanted through a 3.2 mm incision. However no lens was available at that time which could be implanted through a sub 1.5 mm incision till the recent introduction of rollable IOL [1,4].

Phacnit surgery with foldable acrylic lens implantation was started in 2003 at our centre in armed forces and rollable lens was implanted through sub 1.3 mm incision in 2004. Recently with the modification of the irrigating chopper up to 23 gauge (less than 0.8 mm) and 0.9 mm keratome, phacnit through 0.9 mm incision and implanted rollable lens through 1.2 mm incision has been performed. We evaluated the efficacy and adaptability of phacnit technique in terms of structural, anatomical and visual functional recovery with the pattern of visual rehabilitation.

Material and Methods

This prospective study enrolled 80 cases in the age group of 45-65 years, with presenile or senile cataract. Evaluation of hardness of the nucleus was based on slit lamp examination. The power of intraocular lens was calculated by SRK-II formula. Patients with glaucoma, iridocyclitis or any systemic disease were excluded from the study. The type of IOL

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implanted was randomly selected with emphasis on evaluation of efficacy and adaptability of the procedure, equipment settings, operative constraints, postoperative complications, keratometric and topographic evaluation of induced astigmatism, visual outcome and patient's rehabilitation.

A self-sealing semi temporal (11 or 1 o'clock in Right or Left eye respectively) clear corneal incision of 0.9 mm was made with the help of a specially designed 0.9 mm corneal keratome. The anterior chamber was reformed with viscoelastic substance, continuous curvilinear capsulorhexis of 5.5-6 mm was made. Hydro-dissection and hydro delineation was carried out. The side port was made using a specially designed side port knife. Irrigating chopper with 21/22 gauge bore, connected to irrigation port of phacomachine was introduced through the side port and fluid was passed continuously to maintain anterior chamber through out the procedure. 0.9 mm micro flow phaco tip having half cut sleeve was introduced and phacoemulsification carried out. Bimanual irrigation and aspiration was carried out using high vacuum settings of 450–500 mm of Hg. This was followed by introduction of acrylic foldable lens implantation in 40 cases and ultra thin rollable lens implantation in the remaining

40. Subconjunctival injection of dexamethasone 4mg and gentamicin 20mg was given. Eye pad was given and removed after 3-5 hours of the surgery.

Results

Out of 80 patients, 43 were male and 37 female. Effective phacotime was 15-150 seconds. Phaco-power ranged from 5-40% (average 10-20%). Effective irrigation and aspiration time was 30-150 seconds and vacuum was 100-150 mm Hg during fragment emulsification and 450 mm Hg during cortical clean up. The intraoperative constraints were fluctuation in stability of anterior chamber in 16 (20%), corneal burns in two (2.5%), iris chaffing in one and posterior capsular rent in one case (Table 1). Corneal striate lasted for two to three days in 18 (22.5%) and macular oedema seen in three (3.75%) disappeared in three weeks (Table 2).

Post operative visual recovery to 6/6 was seen in 65 (81.25%) and 6/12 or better in 15 (18.75%) cases within 4-5 days. Postoperative astigmatism ranged from $\pm 0.5D$ to $\pm 0.75D$ with rollable IOL as compared to $\pm 0.75D$ to $\pm 1.50D$ with acrylic foldable IOL implants (Tables 3,4). However with rollable IOL it regressed within one to two weeks as compared to four to six weeks with acrylic IOL (Tables 4,5).

Table 1

Phaconit: Intra operative complications.

Complications	No of Cases					Total number of cases (%)
	Grade I 8 (10%)	Grade II 24 (30%)	Grade III 32 (40%)	Grade IV 12 (15%)	Grade V 4 (5%)	
Surge/ Chamber collapse	1	4	4	5	2	16 (20)
Iris chaffing	Nil	Nil	Nil	Nil	1	1 (1.25)
Corneal burn(mild)	Nil	Nil	Nil	1	1	2 (2.5)
Inadvertent posterior capsule rent (< 2mm)	Nil	Nil	Nil	Nil	1	1 (1.25)

Table 2

Phaconit : Post operative complications

Complications	No of Cases					Total number of cases (%)
	Grade I 8 (10%)	Grade II 24 (30%)	Grade III 32 (40%)	Grade IV 12 (15%)	Grade V 4 (5%)	
Moderate corneal striate (disappear within 3 days)	1	6	4	5	2	18 (22.5)
Uveitis (mild to moderate)	Nil	Nil	4	1	1	6 (7.5)
Secondary Glaucoma (after 2 weeks)	Nil	Nil	1	1	1	3 (3.75)
Macular Oedema	Nil	Nil	1	1	1	3 (3.75)

Table 3

Phaconit: Pattern of induced astigmatism (based on type of IOL implants)

Type of IOL implant	Pattern of induced astigmatism					
	Day One	Day Four	One week	Two weeks	Four weeks	Six weeks
Rollable IOL implantation (through sub 1.3mm incision)	± 0.5 to $0.75 D$	± 0.12 to $0.75 D$	Nil to $\pm 0.5 D$	Nil to $\pm 0.25 D$	Nil to $\pm 0.25 D$	Nil to $\pm 0.25 D$
Acrylic hydrophilic foldable IOL implantation (through 3.2mm incision)	± 0.75 to $1.50 D$	± 0.5 to $1.25 D$	± 0.5 to $1.25 D$	± 0.50 to $1.00 D$	± 0.50 to $0.75 D$	± 0.50 to $0.75 D$

Table 4**Phaenit: Pattern of uncorrected visual acuity (based on type of IOL implants)**

Type of IOL implant	No of cases											
	Day One		Day Four		One Week		Two Weeks		Four Weeks		SixWeek	
	R	A	R	A	R	A	R	A	R	A	R	A
(R) & Acrylic (3.2mm)(A)	(1.3mm) (3.2mm)											
> 6/5	Nil	Nil	Nil	Nil	Nil	Nil	2	Nil	3	Nil	3	Nil
6/6	10	3	12	3	14	3	18	5	18	5	18	7
6/9	22	19	23	21	23	21	19	22	18	25	18	25
6/12	5	14	5	14	3	14	1	13	1	9	1	7
6/18	3	4	Nil	2	Nil	2	Nil	2	Nil	1	Nil	1
6/24	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

Table 5**Phaenit with rollable IOL: Best corrected/uncorrected visual acuity after 2 months**

Visual Acuity	Rollable IOL (40 cases)		Acrylic Foldable IOL (40 cases)	
	Uncorrected	Corrected	Uncorrected	Corrected
6/5 or better	3 (7.5%)	6 (15%)	Nil	Nil
6/6	18 (45%)	32 (80%)	7 (9.50%)	36 (90%)
6/9	18 (45%)	2 (5%)	25 (62.5%)	4 (10%)
6/12 or better	1 (2.5%)	Nil	7 (17.5%)	Nil
6/18	Nil	Nil	1 (2.5%)	Nil
6/18 - 6/24	Nil	Nil	Nil	Nil
Less than 6/36	Nil	Nil	Nil	Nil
Total cases	40	40	40	40

Discussion

Phaenit has revolutionized phacoemulsification surgery and has broken the barrier of sub 1mm incision [1,3,4,5, 8]. We have modified microsurgical instruments like the irrigating chopper and keratome to perform phaenit surgery through 0.9 mm incision and implant specially designed rollable IOL (thinopt X Rollable lens)

Fig. 1 : Phaenit instrumentation **Fig. 2 : a) Rollable IOL, b) Injector system for rollable IOL**

through a 1.2-1.3 mm incision. Bimanual phacoaspiration and phacofragmentation achieved minimal phaco-power ranging from 5-30% (average 10-15%) as compared to standard phacoemulsification (30-50% phaco power) effective irrigation and aspiration time of 30-150 seconds, vacuum setting of 100-150mm Hg during fragment emulsification and 450 mmHg during cortical clean up similar to other studies [4-8]. The energy requirement and fluids can be monitored effectively with the help of advanced phacosystems[10] using burst mode technology, however we used basic Venturi system. We had higher incidence of chamber instability and other intraoperative complications like minimal corneal burn (2.5% cases) as compared to other studies [3,7-10]. In our view, this increased incidence was not due to smaller bore irrigating chopper and micro flow 0.9 mm phacotip but the initial learning curve, as intraoperative complications decreased in subsequent cases. Bimanual microphaco gives the advantage of two hands to remove cortex easily and reduce the surgical time [1,8]. If lens material gets caught in the angle, one can automatically use fluid stream to wash it out rather than use another

Fig. 3 :

Table 6

Phaconit: Incidence of early posterior capsular opacification within 9 - 12 months (based on grade of nucleus and type of IOL implants)

Type of IOL	Number of cases (Posterior Capsular Opacification)					Total number of cases
	Grade I 8 (10%)	Grade II 24 (30%)	Grade III 32 (40%)	Grade IV 12 (15%)	Grade V 4 (5%)	
Rollable IOL implantation (through sub 1.3mm incision) (40 cases)	Nil	Nil	Nil	1	Nil	1 (2.5%)
Acrylic hydrophilic foldable IOL implantation (through 3.2mm incision) (40 cases)	Nil	Nil	1	1	1	3 (7.5%)
Total 80 cases	—	—	—	—	—	4(5%) (% of 80 cases)

instrument [1,8]. A smaller incision leaks less postoperatively and is less likely to cause infection [1,6,11].

The incidence of posterior capsule opacification (PCO) was less than 2.5% following rollable IOL implantation as compared to 7.5% in cases of acrylic IOL implantation (Table 6).

In view of the advantages of phaconit procedure, we propose that army officers other than those in field formation can be upgraded to SHAPE-1 after seven days of cataract surgery and those in field formation after a period of three months. The junior commissioned officers and other ranks can be upgraded after two weeks of cataract surgery while those in high altitude or counter insurgency operations can be upgraded after three months. In Air Force, the personnel other than pilot involved in flying duties can be upgraded after two weeks of cataract surgery and pilots after three months. The ground duty personnel both officers and airmen can be upgraded after seven days of cataract surgery. In Navy, officers and sailors can be upgraded after seven days of cataract surgery while personnel on submarine duty may be upgraded after three months of cataract surgery.

Conflicts of Interest

None identified

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