Frown Incision: A Means To Minimize Astigmatism

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Abstract : Introduction: Modern day cataract surgery is aimed at giving optimal catarefractive outcome . This study was inspired by a chance finding of high astigmatic reading on performing retinoscopy three weeks after surgery in a female who underwent manual small incision cataract surgery. Aim of study: To study effect of scleral tunnel incision at different locations on pre-existing astigmatism ,and to calculate surgically induced astigmatism there from . Design: The scleral tunnel incision is known to undergo changes upto six weeks after cataract surgery .If pre operative value and post operative values at the end of six weeks are known ,SIA can be calculated. All patients operated free of cost for cataract are implanted an all PMMA non foldable 6.0mm intraocular lens hence we chose a six mm frown incision. From our study we aim to give cut off values of native astigmatism to chose incision site in order to provide least residual astigmatism, since this group of patients being non affording cannot undergo any additional surgical procedure to get astigmatism corrected . The higher order post cataract surgery residual error degrades quality of image ,hence accentuation of native error by SICS is non justifiable . Rather,our aim should be to regress existing error by 50% -75%. Method: In 150 eyes undergoing cataract surgery in the department of Ophthalmology, Aurobindo Institute Of Medical Sciences under eye camp, the preoperative keratometric values in vertical and horizontal axis were noted .At the end of six weeks after cataract surgery performed by 6mm incision at superior, superotemporal and absolute temporal locations , keratometry readings were noted again along the principle meridia .SIA was calculated from these two readings. At the end of six weeks keratometry and retinoscopy weres done. Result: From the study it was concluded that location of incision in the eye has a bearing on existing astigmatic error . A regression (or accentuation) in the existing error is dependent on the incision site and the magnitude of pre-existant error. With superior and absolute temporal scleral tunnel incision , SIA average was 0.77 Dioptres while with BENT(between nine and twelve) clock hours it was lesser (0.68 Dioptres) Except in thirteen eyes who accepted cylindrical lens in oblique meridia, all others accepted glasses in primary meridia. Conclusion: For upto 1 D astigmatism, ATR or WTR, placement of incision on steeper axis should be the choice. For WTR, of any degree, a superior location should be the choice. For ATR amounting to 1.25D, a superotemporal incision offers best results. For higher ATR absolute temporal location should be the choice if regression in astigmatism is desired. [Luban Khan NJIRM 2013; 4(5) : 90-93]

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Introduction: All surgeons operating cataracts in developing countries have changed over to sutureless technique .However, more attention is needed to employ methods for minimizing post operative residual error which has to be prescribed in the form of glasses. Though all Ophthalmic surgeons by virtue of their surgical skill , are equipped with the prerequisite of offering the best refractive outcome to the patient , they are unable to do so in cent percent cases , possibly because in high volume cataract surgery there is less scope for attention to patients on individual basis . We need to change our aim while operating cataract. It should target restoration of visual function without accentuating the pre-existant refractive error and as far as possible , correcting it by optimal incision site .There is scope for giving best visual outcome to the patient neither with need of any additional calculations , instrumentation, nor surgical procedure. All that is needed is proper selection of site to operate cataract. Without doubt, it requires added expertise to handle ocular tissues not universally at the twelve O" clock position, but at other locations in the eye.

Much has been done in this context[1,2,3,4], however, no study has drawn demarcating lines or cut off values in amplitude of pre-existing astigmatism to chose incision location,since even with fixed position and size of incision, varying results are obtained .Our study aims at giving generalized values of pre-existing astigmatism to help in selecting site of incision .

Advantages which SICS offers to Ophthalmic surgeons in developing countries are numerous, namely , a low learning curve ,low cost efficacy and no dependency on machine , very high wound stability even without sutures , quick rehabilitation and astigmatic decay resistance. However , there is only one aspect about this method which needs attention and that is site of incision . Eggars showed in his study that 0.5 to 0.75 D WTR as optimal while Huber[5] in their study showed myopic astigmatism as the planned target. Trinidade F ,Oliviera A ,Frasson M also held myopic astigmatism as optimal outcome[6] .

Other options to minimize astigmatism:

1. Astigmatic keratotomy along with cataract surgery (Maloney).
2. LRI with guarded diamond blade set at 600 micron depth along steeper meridian.
3. Clear corneal phaco/manual SICS with opposite clear corneal incisional tunnel (for over 2 D astigmatism).
4. Phaco by curved incision outside the limbus combined with additional 7or 8 or9 mm long incision tailored for pre existing astigmatism (Kershner)
5. Incorporate the astigmatic correction in intraocular lens implant itself (toric IOL)
6. Upto 4 D astigmatism can be dealt with by scleral recession (Lindstrom).

Jack Singer named an incision 7 mm in length curved towards the cornea, with its maximum convexity placed 1.5 mm. from it as a FROWN incision. It offers dual advantage: Stability and stigmatic decay resistance.

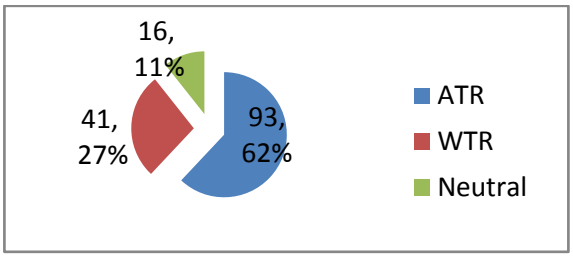
Aims & objectives:

1. To study surgically induced astigmatism at different incision locations.
2. To correlate site of incision placement with accentuation/regression[7] of pre-existing ATR or WTR.
3. To have a feedback about our choice of surgical incision placement , so as to give optimal incision in forthcoming manual SICS especially while training postgraduates and other surgeons .

The overall aim of undertaking this study was to give the patient benefit of least astigmatic correction ,since with higher magnitude of this type of residual error, the image comprises of diffusion circles instead of point focus on retina. This leads to a compromised quality of image.

Material & Methods: 150 patients between age group 41 to 86 were operated under peri bulbar anesthesia. Calculation of intraocular lens implant power was done by the SRK regression formula, for which all patients underwent. A scan biometry and keratometry. These preoperative keratometric values were noted in the two principle meridia .From the pre-existing values at the corneal plane, the type of astigmatism(WTR ,ATR) was ascertained . Astigmatically neutral subjects (eight in number) were also included in the series. All surgeries were performed by a single surgeon who placed the incision at superior location. As the technique was familiar, Incision site was chosen based on with or against the rule astigmatic error. All the cases underwent small incision cataract surgery by the posterior limbal 6.0 mm " frown " incision placed at superior , superotemporal and absolute temporal location . For placement of incision an axis marked transparent ring and callipers were used. Keratometric values were noted at the end of one week, third week and six weeks from the day of surgery. From final and preoperative keratometric readings, surgically induced astigmatism was calculated. Angle of error was calculated using value of surgically induced astigmatism (SIA) and intended (aimed) astigmatism using the formula Angle of error= SIA – aimed intended astigmatism

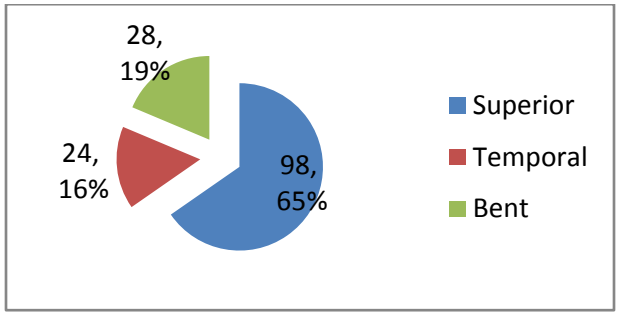
Pre-Operative Status



A 6 mm frown shaped sclera tunnel incision was made at superior, supero- temporal or absolute temporal location using No 11 Bard Parker knife upto superficial one third thickness ,dissection was continued upto clear cornea using crescent knife. All incisions were sutureless . In the BENT incision, fornix based conjunctival flap was made from nine clock hours position to twelve clock hours position

.A transparent ring with axis marked on it was used for placing the incision Also, callipers were used for measuring and centering the wound.Lateral limits of incision were marked by gentle pressure using callipers set at 6.0mm.

Scleral Tunnel Location – An overview



Follow-up: Keratometric readings were taken on 7th day, 21st day and at the end of 6 weeks post operatively. Surgically induced astigmatism was calculated therefrom. Using SIA calculator-1.0, individual values were calculated at the end of six weeks from pre and post operative keratometric readings . Mean SIA was calculated for the three locations of tunnel. All values were entered on extra large sheet on computer . Angle of error was calculated for every incision given on individual basis . Acceptance of optical aid was correlated with surgically induced astigmatism

Concept Of Angle Of Correction:

Angle of Separation: between the two vectors is the angle of error and the correction of surgical axis direction required is from the induced towards the aimed.

Angle of correction is simply the angle between aimed & achieved astigmatism.

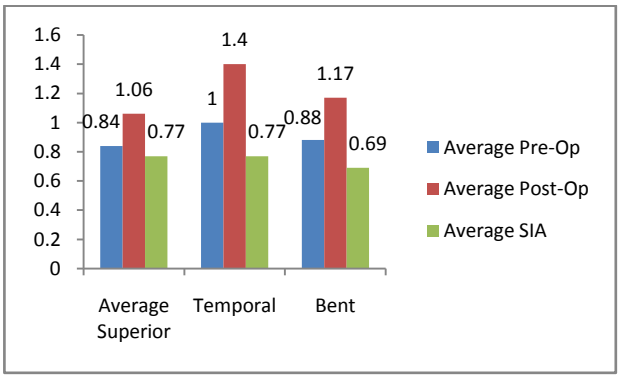
Example: Preoperative "K" V-45.50 H-44.50
1 D @ 90 degree
Postop "K" V-48.50 H-46.75
1.75 @ 90 degree

Intended angle of astigmatism is @ 180 degree.
SIA is 0.75 @ 90 degree.

Angle of error = SIA – intended angle.
Angle of error = 0.75 @ 90 – 180, = 0.75 @-90

From this example it is observed that angle of error is in negative notation which means that the incision needed a clockwise shift amounting to 90 degree.

Amplitude of pre & post op. astigmatism at different locations



Results: In the superior tunnel group we had WTR and ATR. The WTR ranged from 0.25 D to 2.0 D, while ATR ranged from 0.25to 3.5 D. In the WTR group the mean astigmatism reduced from 0.68 to 0.38. In ATR group mean value of 0.91 increased to 1.29 D.

In all, 24 cases were dealt with by temporal scleral tunnel inclusive of ATR and WTR. SIA was identical as for superior tunnel 0.77being the average. With the BENT incision in my series SIA was 0.68 as against 0.77 with other two locations.

Only 8 patients accepted optical correction at oblique axis (50 to 60 degree in right eye, 120 to 130 degree in left eye).Remaining 142 eyes accepted optical correction at primary meridians.

Discussion: For superior tunnels, the values of WTR patients having reduction in SIA proves that if SICS incision is centered on steep meridian, by inducing an ATR change it will correct the native error. Conversely, at the same superior position the tunnel centerred on the flatter meridian in ATR group accentuated the native error from 0.91 to 1.29

The result with superior tunnel are comparable with studies done by Singer & Martin[1,2]. Jaeffe & Clay man studied 22 cases & found SIA to be 0.71 at 4 weeks with temporal location of tunnel. A 6.0mm incision placed at the posterior limbus in

the steep is estimated to reduce 2-3 dioptres of cylinder[8].

Kawano[9] noted that 6.0mm corneoscleralincision placed obliquely between nine and twelve o clock was associated with significantly less induced astigmatism and faster stabilization than incision placed superiorly , effectively reducing oblique astigmatism(kawano).

Conclusion: In our opinion an error like 0.75D and 1D WTR should not be dealt with by supero temporal tunnel , since it accentuates the error.For upto1.0D astigmatism WTR or ATR, best result is achieved with incision on steeper axis . WTR astigmatics universally require superior tunnel centered at twelve clock hours. For ATR amounting to 1.25D, optimal result is achieved with superotemporal incision but for complete regression in ATR amounting to 1.5D, 1.75D absolute temporal incision should be chosen. However, there is a limit to regression in ATR at absolute temporal location also. If astigmatism amounts to 2.0 D or more, absolute temporal incision alone will not be able to bring about a regression. It has to be reinforced with opposite clear corneal incisional tunnel or scleral recession using 9-0 nylon suture to keep posterior lip of sclera in recessed position.

To conclude, application of knowledge of these values has helped tremendously to prevent untoward residual error while dealing with fellow eyes with over two dioptres astigmatic error and preventing non compatible axes in the two eyes.

During secondary implantation in the surgically handled eye having higher error, we can employ necessary adjustments in placing the incision thereby reducing the error. The authors achieved an optimal 0.7426 D mean myopic astigmatism in a series of 33 cases of aphakia who underwent secondary implantation. Our aimed target of giving ATR myopic astigmatism in pseudophakia isoptimal for that eye as it gives better unaided distance vision than the WTRand astigmatically neutral counterparts. Moreover, the ATR myopic astigmatics have increased depth of focus for near since when distant object moves closer to the eye, the myopic focus shifts posteriorly on the retina.

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