DISCUSSION
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Glaucoma accounts for 2% of blindness in India, out of which half are due to open angle glaucoma. Till date trabeculectomy is considered as a gold standard in glaucoma surgery but it has complications due to anterior chamber entry and, due to conjunctival filtering bleb such as hypotony & flat anterior chamber, uveitis & hyphema, leaking of filtering bleb, dellen, cataract and endophthalmitis. To eliminate these complications we used a non penetrating filtering surgery known as viscocanalostomy for treatment of open angle glaucoma in a series of 20 patients. Viscocanalostomy is a new procedure, first proposed by Robert Stegman in 1991. The technique is non penetrating & independent from external filtration. The lack of direct entry in to anterior chamber leads to less risk of infection, cataract, hypotony and flat anterior chamber. The absence of external filtration avoids bleb formation and related discomforts. It also reduces the risk of late infections, and most importantly, the success of the procedure is independent of Conjunctival or Episcleral scarring.

The rationale for the technique is based on the evidence, that the site of greatest aqueous outflow resistance in open angle glaucoma is the trabecular meshwork. Viscocanalostomy is aimed at creating a bypass, through which the aqueous can reach Schlemm’s canal directly and then leave the eye through the normal physiological pathway, without passing through the trabecular meshwork. This is done by making a chamber in sclera known as
sub scleral lake, and an intact window is created in Descemet’s membrane, just anterior to trabecular meshwork, through which aqueous diffuses from the anterior chamber in to the sub scleral lake and then leaves, by directly entering the Schlemm’s canal.

Also we at the Department of Ophthalmology, Maharani Laxmi Bai Medical College, Jhansi, modified viscocanalostomy by combining it with trabeculectomy in which sub scleral lake was made, without the formation of the conjunctival filtering bleb as a treatment for patients of primary open angle glaucoma and termed it SUB SCLERAL LAKE TRABECULECTOMY. We performed this procedure on a series of 40 patients. Here we tried to minimise the complications due to anterior chamber entry as shallow or flat anterior chamber, hypotony, choroidal detachment, and hypotony maculopathy. This procedure was independent of filtering conjunctival bleb hence complication due to the bleb such as blebitis, leaking of filtering bleb, dellen, and non functional bleb were eliminated.

In both the above procedures aqueous from the sub scleral lake leaves the eye via ostia to the Schlemm’s canal, without a need for internal filtration. The aqueous also leaves the lake through the thin scleral layer in to the suprachoroidal space. Here no filtration of aqueous occurs through the conjunctiva and no conjunctival bleb is formed.
This study consisted of a series of 60 patients of open angle glaucoma, out of which 20 patients underwent viscocanalostomy and 40 underwent sub scleral lake. The patients were randomly selected for either of the procedure. These cases were thoroughly studied in pre operative, operative and post operative period to access the result of viscocanalostomy and sub scleral lake trabeculectomy. The findings of the study are being analysed and discussed below.

**SEX:** As shown in table – 1 most of our patients were female i.e. 75%. This is in contrast to other studies which has higher prevalence of males Khan HA, Milton RC (1980); Leske MC (1994); Ekstrom C (1996). This may be probably due to regional variation.

**AGE:** As shown in table – 2 the age of the patients with open angle glaucoma varied from 41 to 80 years. The maximum numbers of the patients were of the age group of 51 – 60. This shows open angle glaucoma is basically a problem of geriatric people. This is similar to prevalence of open angle glaucoma found in other studies Hollows FC, Graham PA (1966); Leibowitz HM (1980); Klein BE (1992).

**SOCIO ECONOMIC STATUS:** Table – 3 shows that most of our patients were from lower socio economic status and rural background. This may be due to the fact that most people attending our O.P.D. are from rural background and of lower socio economic status.
VISUAL ACUITY AND CATARACT FORMATION: Table – 4 shows that most of the patients of viscocanalostomy and sub scleral lake trabeculectomy group had best corrected visual acuity between 6/60 – 1/60. Table – 10 shows that Post operative visual acuity after 6 months after viscocanalostomy was between 6/60 – 1/60 in most of the patients; but after sub scleral lake trabeculectomy was finger counting in most of the patients.

Table – 11 shows a comparison of pre operative and post operative visual acuity after 6 months of viscocanalostomy and sub scleral lake trabeculectomy. It shows that there was no significant decrease of vision after 6 months of viscocanalostomy, some diminution of vision was due to normal aging phenomenon or due to accidental A.C. entry. There was significant decrease of vision after 6 months of Sub Scleral Lake Trabeculectomy. This diminution of vision was due to A.C. entry or due to normal aging phenomenon.

Table – 7 shows that most of the patient undergoing viscocanalostomy and sub scleral lake trabeculectomy had incipient and intumescent cataract post operatively. Table – 12 and 13 shows post operatively after 6 months there was almost no change in type cataract in viscocanalostomy group; but in patients who under went sub scleral lake trabeculectomy, there was a significant change in type of cataract and most of the cases had advanced to a higher stage.

Anterior chamber entry in trabeculectomy leads to cataract formation and hence decreases in visual acuity in 20 to 40% of the patients Lamping K.,
Bellows AR, Hutchinson BT (1986). The results of viscocanalostomy shows that this non penetrating filtering surgery do not cause cataract formation and hence insignificant decrease in visual acuity if intra ocular tension is also controlled in this group. But the results of sub scleral lake trabeculectomy shows that there was a significant change in type of cataract and most of the cases had advanced to a higher stage; these results are similar to trabeculectomy where there is rapid advancement to higher stage cataract.

**INTRA OPERATIVE COMPLICATIONS:** Table – 8 shows intra operative complications.

In Viscocanalostomy intra operatively Hyphema occurred in 6 (30%) cases. Carassa RG (2002) reported it in 11% of cases. Anterior chamber entry occurred in 2 (10%) cases. One (5%) case had iris injury. Three (15%) cases had button holing of superficial scleral flap. Schlemm’s canal was not located in 2 (10%) of cases. The cases which had accidental anterior chamber entry i.e. 2 and those in which Schlemm’s canal was not located i.e. 2, were converted into normal Trabeculectomy i.e. 4 cases. The higher rate of complications in viscocanalostomy in this study as compared to other studies Carassa RG (2002), Stegmann R (1999) can be attributed to learning curve.

In sub scleral lake trabeculectomy intra operatively Hyphema occurred in 10 (25%) cases. 4 (10%) case had iris injury. Three (7.5%) cases had button
holing of superficial scleral flap. Schlemm’s canal was not located in 4 (10%) of cases. These complications can also be attributed to learning curve.

**POST OPERATIVE COMPLICATIONS:** Table — 9 shows intra operative complications.

In viscocanalostomy hyphema was seen in 1 case 2nd post operative day and it was absorbed in 10 days. Iritis was noted in 4 cases (20%) and it resolved in 7 days of frequent installation of combination of Ofloxacin .3% and Dexamethasone .1%, and Tropicamide 1% eye drops once a day. Bleb formation occurred in 3 cases (15%), this was probably due to loose suturing of Scleral flap. Shallow A.C. was not seen in any of the cases.

In sub scleral lake trabeculectomy hyphema was seen in 2 case 2nd post operative day and it was absorbed in 10 days. Iritis was noted in 10 cases (25%) and it resolved in 7 days of frequent installation of combination of Ofloxacin .3% and Dexamethasone .1%, and Tropicamide 1% eye drops once a day. Bleb formation occurred in 5 cases (12.5%), this was probably due to loose suturing of Scleral flap. Keratitis was present in 6 cases i.e. 15%. It cleared within 2 weeks. Shallow A.C. was not seen in any of the cases.

The above results show that that there were very less post operative complications in viscocanalostomy. There was no case of flat or shallow anterior chamber. The complications in sub scleral lake trabeculectomy were
similar to trabeculectomy but there was no case of shallow or flat anterior chamber which is a most dreaded complication in trabeculectomy. As eye did not land in hypotony at any stage, so there were no complications of choroidal detachment and hypotony maculopathy. These procedures were independent of filtering conjunctival bleb hence complication due to the bleb such as blebitis, leaking of filtering bleb, dellen, and non functional bleb were not seen.

**INTRA OCULAR PRESSURE:** Table – 5 shows pre operative intra ocular pressure. Mean pre operative intraocular pressure in viscocanalostomy group was 30.4 mm Hg and in sub scleral lake trabeculectomy group was 30.5 mm Hg.

Table – 6 shows that 75% of patients were taking per operative glaucoma therapy in both the groups.

Table – 14 shows post operative intraocular pressure. The mean intra ocular pressure after 12 months in viscocanalostomy group was 16.9 mm Hg. Only 5 patients had intra ocular pressure between 22 – 30 mm Hg. Those eyes which had intraocular pressure more than 21 mm Hg were brought under control by administering .5% timolol maleate eye drops twice daily. This shows that 75% of eyes operated for viscocanalostomy had intra ocular pressure between 7 – 21 mm of Hg without any medication. Carassa RG (2002) showed 86.2% success; Stegmann R, Pienaar A, Miller D (1999) showed 82.7% success without medication. Our lower success rate as
compared to others may be due to a learning curve associated with any new technique.

The mean intraocular pressure after 12 months in sub scleral lake trabeculectomy group was 14 mm Hg. Only 4 patients had intraocular pressure between 22 – 30 mm Hg. Those eyes which had intraocular pressure more than 21 mm Hg were brought under control by administering .5% timolol maleate eye drops twice daily. This shows that 90% of eyes operated for sub scleral lake trabeculectomy had intra ocular pressure between 7 – 21 mm of Hg without any medication.

Lower mean intra ocular pressure was obtained in sub scleral lake trabeculectomy group than viscocanalostomy group as well as the success rate was also higher in sub scleral lake trabeculectomy group. This can be due to the fact that we are also removing 1.5 mm anteroposterior by 4 mm wide trabeculectomy block just anterior to scleral spur and also doing iridectomy through it in sub scleral lake trabeculectomy.

In open angle glaucoma pressure levels of 21 mm Hg or lower is achieved in about 80% to 90% of eyes after trabeculectomy Lamping KA (1986); Spaeth GL (1980); Shields MB (1980). The results of viscocanalostomy and sub scleral lake trabeculectomy are comparable to standard trabeculectomy.