Section: Ophthalmology

Original Research Article

STUDY OF ROLE OF PRE -OPERATIVE PARACENTESIS AND PROTEIN CONCENTRATION IN AQUEOUS HUMOR IN PHACOLYTIC GLAUCOMA

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ABSTRACT

Background: Cataracts if left untreated become hypermature wherein the lens cortex liquefies and leaks through the micropores of lens capsule and blocks the trabecular meshwork resulting in an acute rise in intraocular pressure (IOP) causing Phacolytic Glaucoma. It commonly occurs in elderly patients with a history of gradual vision loss and less than ideal access to health facilities.

Materials and Methods: Patients presenting with gradual progressive loss of vision, acute onset of eye pain, redness, visual acuity less than or equal to 3/60, IOP of ≥ 21 mm Hg, hypermature cataract, macroscopically intact anterior capsule and flare of 2+ were included in the study. Vision assessment was done using Snellen's chart. Slit lamp examination was done and IOP measured using Goldmann's applanation tonometry. Patients were admitted and tablet acetazolamide 250 mg was started. Subsequently paracentesis was done and 0.1-0.2 ml of aqueous was aspirated using a 26 gauge specially designed cannula which was then sent for analysis of protein content. Applanation IOP was recorded two hours after paracentesis.

Results: A total of seventeen patients were recruited and IOP recorded 2hours post paracentesis was below 20 mmHg in all except two patients who showed a recurrent rise in IOP >30 mmHg. They were managed with tablet acetazolamide alone. All patients underwent small incision cataract surgery once the eye was quiet. Hyphema was seen in 3 patients but no cases of endophthalmitis or anterior synechiae at the paracentesis site was seen.

Conclusion: Paracentesis was found to be a safe, viable option in reducing the IOP rapidly in the small series of our phacolytic glaucoma patients. It not only helps in reducing the IOP and thus the need for multiple anti-glaucoma medications prior to surgery but also ensures a favourable visual outcome in the post-operative period by limiting optic nerve damage due to raised IOP.

Keywords: Cataract, Phacolytic glaucoma, Intra ocular Pressure, paracentesis.

INTRODUCTION

Cataracts if left untreated become hypermature. Here the lens cortex becomes white and liquefies. In some patients the liquefied cortex leaks through the micropores of an intact lens capsule into the anterior chamber. The leaked lens protein is thought to block the trabecular meshwork resulting in an acute rise in intraocular pressure (IOP) causing Phacolytic Glaucoma.[1-3] The raised pressure is associated with eye pain and conjunctival congestion due to ocular inflammation.[4,5] Phacolytic glaucoma commonly occurs in elderly patients with a history of reduced vision in the eye ranging from months to years and less than ideal access to health facilities.[6] With increasing affluence though the incidence is likely to come down in the developing world, it is unlikely to go away completely even in developed societies because of the existence of geriatric populations in care homes.[7]

Patients with phacolytic glaucoma can have an IOP of over 40 mmHg and such levels of acute rise in IOP

can potentially damage the optic nerve quickly especially in older people. To reduce IOP rapidly and protect the optic nerve, anti-glaucoma measures including intra-venous mannitol and oral glycerol is used before the patient is taken up for cataract surgery. Use of mannitol in older patients is not without its risks and oral glycerol can increase blood sugars in diabetics. When systemic and topical medications fail, paracentesis has been suggested as an additional measure to control IOP.[8]

Paracentesis has been tried as an effective adjuvant measure to reduce IOP in patients with acute angle closure glaucoma resulting in corneal clearing and thus enabling laser peripheral iridotomy in hazy edematous corneas.[9] Use of paracentesis in a patient with phacolytic glaucoma has been described both as a diagnostic and management tool.[10] Paracentesis has the potential to cause endophthalmitis, sudden hypotony and related complications like anterior chamber bleed and haemorrhage due to sudden reduction in IOP.[11,12] If the available ophthalmology services allows easy access to operation theatre facility then paracentesis performed under aseptic and controlled conditions enables patient comfort by rapid reduction of IOP without the need for IV medications that take longer time to act in comparison and are associated with dangerous side effects .Also paracentesis by normalising the IOP allows time for pre-operative control of intraocular inflammation which in turn improves surgical outcomes and faster post-operative recovery.

We conducted this study to look at the role of paracentesis as a primary procedure to reduce IOP in cases of phacolytic Glaucoma followed by cataract surgery being performed electively after the IOP was normal and eye was quiet. We also looked at the protein concentration in the fluid aspirated from the anterior chamber and its correlation if any to the level of IOP.

MATERIALS AND METHODS

This was a prospective, interventional, study (IRB no 8164 dated 09/01/2013) done in a tertiary eye care centre. All consecutive cases fulfilling the inclusion and exclusion criteria presenting to the Ophthalmology department over a 12month period were included in the study after obtaining Informed consent. The study was done in accordance with the tenants of the Declaration of Helsinki.

Patients presenting with a history of slow progressive loss of vision, acute onset of mono-ocular eye pain and redness, having the clinical features of visual acuity less than or equal to 3/60, IOP of ≥ 21 mm Hg, hypermature cataract, macroscopically intact anterior capsule and flare of 2+ or more in the absence of keratic precipitates were included in the study.

Patients with a history of trauma, pre-existing glaucoma, previous use of long term (more than two weeks) topical medications-steroids, uveitis, previous ocular surgeries, patients on anti-glaucoma medications prior to enrolment were excluded from the study.

After consent a detailed history of symptoms and its duration was taken. Vision assessment was done using Snellen's chart. Slit lamp examination was done and IOP measured using Goldmann's applanation tonometry. Gonioscopy and fundus examination of the fellow eye was done.

Patients were admitted and tablet acetazolamide 250 mg once every 6 hours was started. Within 24 hours of starting the treatment, under peri-bulbar block and strict aseptic conditions similar to any intraocular surgery, paracentesis was done at the temporal or nasal limbus with a micro vitreo-retinal (MVR) blade taking care to avoid limbal blood vessels. About 0.1-0.2 ml of aqueous was aspirated using a 26 gauge specially designed cannula mounted on a tuberculin syringe (Fig :1). This cannula had a 3 mm bend to enable aspiration of aqueous without traumatising the intra- ocular structures when the anterior chamber (AC) becomes shallow. The aspirated material was sent for biochemical and cytology studies. Sterile pad was applied to protect the eye for two hours. Two hours after the procedure topical medications were started as part of the study protocol and included :1) Steroids - Prednisolone acetate (1 %) eyedrops: 1 drop once every hour, 2) Chloramphenicol eyedrops (0.5%) :1 drop once every 6 hours and 3) Cyclopentolate (1%) eyedrops :1 drop twice a day was started. Applanation IOP was recorded two hours after paracentesis and tablet acetazolamide-250 mg was continued if IOP remained above 22mm Hg after paracentesis. Cataract surgery was done as an elective procedure when the eye quietened and IOP was below 21 mm of Hg.

Figure 1: CUSTOM MADE 26 g cannula mounted on Tuberculin syringe.

To enable statistical calculations Snellen visual acuity has been converted to LogMAR equivalent using the conversion table.

Protein concentration of the aqueous was measured by pyrogallol technique.13 The Protein measurement was performed in Roche Modular P 800 auto analyser. The sample is centrifuged at 4500 RPM and supernatant was used for the assay. The active ingredient in the Pyrogallol red reagent is pyrogallol red-molybdate complex. The complex binds with basic amino groups in protein causing shift in absorbance which is measured at 600 nm. The

absorbance of this complex is directly proportional to the protein concentration in the sample.

Data were presented as mean, standard deviation (SD), median, IQR, minimum and maximum. Analysis of relationship between variables was done using Pearson's correlation. All data analyses were performed with STATA for Windows (version 13.0, StataCorp, College Station, TX, USA). P value less than 0.05 was taken as statistically significant.

RESULTS

A total of seventeen of the eighteen cases who presented during the study period consented for the study and were recruited. 9 (53%) were males. Age of the patients ranged from 50 to 85 with a mean age of 69.25 years. The demographic profile, symptom duration, time before cataract surgery could be undertaken and final visual acuity is given in Table 1.

Table 1: Patient profile with IOP and visual outcome

Num	Age (years)	Gender	Duration of symptoms (days)	Time of cataract surgery after presentation (days)	Presenting IOP (mmHg)	Post-paracentesis IOP (mmHg)	Post-op Vision Snellen (LogMAR)
1	68	F	10	5	34	16	6/12 (0.3)
2	56	M	3	4	62	20	6/6 (0.0)
3	73	M	4	3	30	12	6/9 (0.2)
4	63	M	4	4	50	26	6/9 (0.2)
5	65	M	3	6	52	14	6/6 (0.0)
6	72	M	10	2	38	14	6/18 (0.5)
7	60	F	4	3	52	0	6/12 (0.3)
8	70	M	3	3	22	21	6/18 (0.5)
9	78	F	6	3	44	16	6/18 (0.5)
10	80	M	7	2	54	4	6/9 (0.2)
11	85	F	7	6	40	20	6/12 (0.3)
12	62	F	4	4	32	18	6/12 (0.3)
13	74	M	2	6	50	16	6/24 (0.6)
14	60	F	10	9	39	32	HM (3.0)
15	65	M	7	5	38	6	6/9 (0.2)
16	73	F	1	2	42	22	6/24 (0.6)
17	71	F	3	4	42	14	6/9 (0.2)

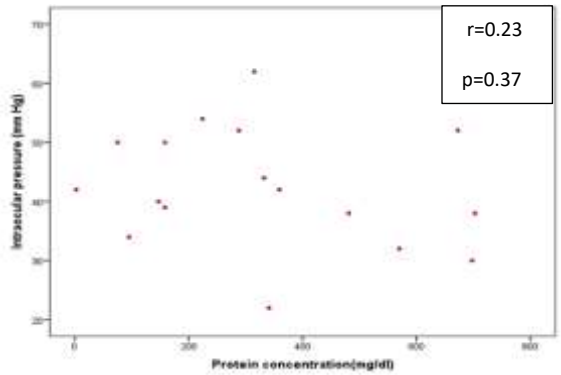

Figure 2: Correlation between presenting IOP and Protein concentration

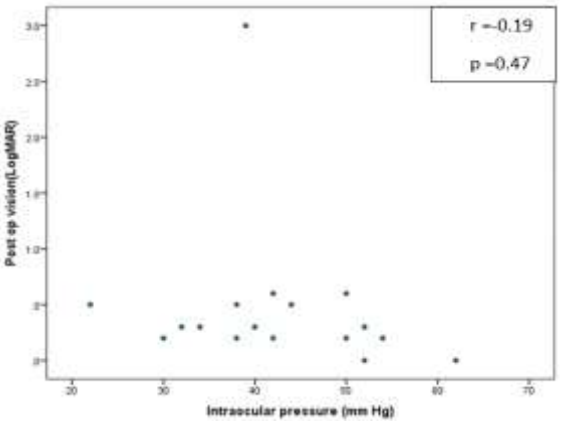

Figure 3: Correlation between Post-op vision and presenting IOP

The presenting vision ranged from perception of light to 3/60, with hand movements vison in five patients, 3/60 in one patient and only perception of light in the remaining. The presenting intra-ocular pressure varied from 22mmHg to 62mmHg. Relative afferent pupillary defect (RAPD) was present in 14 (82.35%) of the 17 patients and phacodonesis was noted in 9(50%) of the patients. After the paracentesis the 2hour intra-ocular pressure came down below 20 mmHg in all except two patients. Of the patients in whom IOP was initially controlled, two showed a recurrent rise in IOP above 30 mmHg the next day and two patients had IOP between 20 to 30 mmHg. They were managed with tablet acetazolamide alone. All patients underwent manual small incision cataract surgery (MSICS) after the eye was quiet.

Three patients underwent cataract surgery with intraocular lens (IOL) implantation one day after paracentesis. Nine patients were suitable for the cataract surgery with IOL implantation with controlled IOP and inflammation within three days and four patients in five days after paracentesis. One patient had surgery nine days after presentation because of a functional block of the lacrimal outflow and had to have a dacryocystorhinostomy.

Hyphema was seen in 3 (17.64 %) cases as an intraoperative complication during paracentesis procedure. There were no cases of endophthalmitis or anterior synechiae at the paracentesis site. Exudative strand was seen at paracentesis port in two cases which resolved with topical steroids -Prednisolone

acetate (1%) eyedrops. Complications of cataract surgery included posterior capsular rent in one case. In two cases anterior chamber IOL was implanted primarily because the capsular bag was unstable. There was no failure of peribulbar block and all patients were comfortable during the cataract surgery.

The anterior chamber aspirate from these patients showed protein concentration ranging from 75 mg/dl to 1.9g/dl with a mean of 442.17mg/dl. Figure 2 shows the correlation between IOP and Protein concentration in the aspirate. There was only a weak negative (r=0.23) statistically insignificant (p=0.37) correlation between the two. Figure 3 shows the correlation between presenting IOP and final vision of these patients. Here again there is only a weak negative (r=0.19) statistically insignificant (p=0.47) correlation between the two.

After cataract surgery the IOP was below 20mmHg in 15 cases. One patient required tablet Acetazolamide 250mg twice daily for a week and the other required Timolol eyedrops (0.5%) for 3 days before the IOP came down to normal. No patient needed long term IOP reducing drops. Post-operative vision was 6/18 or better in 14(82.35%) out of 17 patients and one patient had vision of only hand movements due to glaucomatous optic neuropathy.

DISCUSSION

Phacolytic glaucoma though rare is seen in most countries. This is now seen more in patients who have had intraocular lens implant is one eye and the other eye is ignored for social and economic reasons.[14] Rather than doing cataract surgery in the acutely inflamed eye, it is safer to wait for the IOP to be normal and the eye quiet. In an inflamed eye the anaesthesia does not take well and the chances of bleeding are higher. There was relative afferent pupillary defect in 14 (82.35%) out of 17 patients. Such a high incidence of RAPD has not been reported before. This suggests optic nerve dysfunction due to the high pressure making it imperative to reduce the IOP quickly.

Paracentesis alone, done in the acute setting not only reduces the intraocular pressure quickly but also quietens the eye with removal of the phacolytic material. This avoids the use of potentially dangerous medications like mannitol in these older patients which take time to administer and get a response. We evaluated the use of paracentesis in our series and found it effective in reducing the IOP quickly and being able to do the definitive surgery within a week without any complications due to an inflamed eye.

The protein concentration in aqueous humor as expected was also high in our series of patients ranging from 75 mg/dl to 1.9 g/dl. Since protein clogging the trabecular meshwork is thought to raise the IOP in phacolytic glaucoma we looked at correlations between the protein concentration and presenting IOP but could not find any.[15]

Fifty percent (50%) of our cases had phacodonesis which was higher compared to other studies. This could be due to the lack of support for the iris by the decompressed thinner natural lens with a heavy mobile nucleus.

The post-operative vision improved in all patients except in one case where the patient presented only after 10 days after the onset of symptoms and cataract surgery was deferred by nine days as she had to undergo emergency dacryocystorhinostomy. The poor visual outcome in this patient was due to glaucomatous optic neuropathy.[16,17] Similar visual outcomes have been reported following MSICS with trypan blue by Rengaraj V et al,[18] Less optimal visual outcome were also noted following MSICS in phacolytic glaucoma in a study by Akbani et al.[19]

The sample size in this study is small and to get larger numbers will become more difficult with improving access to health care. Though our study did not have any endophthalmitis, statistically there is a possibility that the endophthalmitis rates could be as high as 20%. Characterization of the type and concentrations of proteins rather than just total protein may have given a better indication as to what characteristics of these proteins if any, has the highest influence on IOP. In view of the low numbers of patients a meta-analysis may give more insights into phacolytic glaucoma.

CONCLUSION

Paracentesis was found to be a safe, viable option in reducing the IOP rapidly in the small series of our phacolytic glaucoma patients. It not only reduces the need for multiple anti-glaucoma medications prior to surgery but also ensures a favourable visual outcome in the post-operative period by limiting optic nerve damage due to raised IOP and allowing earlier surgical intervention.It also enables sample for further research and analysis of aqueous humor.

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