Comparison of the safety and efficacy of different methods of posterior subtenon Triamcinolone injection

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INTRODUCTION

Cystoid macular edema (CME) is a frequent cause of reduced central vision. It is a nonspecific pathologic response to a variety of ocular conditions and diseases, including many retinal vascular and chorioretinal diseases. Essentially, any condition inducing intraocular inflammation, retinal vascular occlusion, or retinal traction may be associated with CME.

Periocular corticosteroids, either given in a sub-tenon's or retrobulbar fashion, may be useful in patients with cystoid macular edema, some forms of intermediate and posterior uveitis[1]. Steroids given locally by the periocular route are a better method of drug delivery in cases of intermediate uveitis or cystoid macular edema as there is close placement of drug near the macula (the site of action)[2]. At the same time, systemic side effects of drug are minimized.

The advantages of periocular steroids are: no systemic side effects, high local concentration at the site of action, long duration of action, determined by the solubility of the steroid and the location of the injection. They are also effective against inflammatory disorders of the posterior segment[4]. Resolution of CME and/or intraocular inflammation occurs with visual preservation or improvement.

Various risks and complications which may be associated are -dangerous and prolonged elevation of intraocular pressure because of their long duration of action. Common side effects include redness, irritation, sub-conjunctival hemorrhage and mild to moderate intraocular pressure elevation.

AIMS AND OBJECTIVES

To compare the efficacy of posterior subtenon's triamcinolone injection given by two different methods- Smith and Nozik technique and Cannula method in patients of Cystoid Macular Edema, Intermediate uveitis, Vitritis and Pars planitis in terms of the improvement in visual acuity and changes in Ocular Coherence Tomography findings

To compare the side effects in terms of subjective pain at the time of injection and the rise in Intra ocular pressure by these two methods

MATERIAL AND METHODS

Study Design: A prospective randomized interventional study

Inclusion Criteria: CME secondary to intermediate uveitis, vitritis or pars planitis of noninfectious etiology and due to other etiology (e.g., post-surgical, diabetic) with a best corrected visual acuity less than/equal to 6/9 and adequate media clarity to enable documentation using OCT

Exclusion Criteria: Patients with history, clinical features, and investigations suggestive of infectious etiology

Any associated macular pathology (e.g., subretinal scarring/epiretinal membrane/macular hole)

Intraocular pressure (IOP) at baseline > 21 mmHg

Patients who had received a posterior subtenon injection in the preceding 3 months

Opaque media.

Patient Selection: A total of 30 consecutive patients with cystoid macular edema, who satisfied the inclusion criteria, were randomly allocated to 2 different groups, each containing 15 eyes of 15 patients. In group 1, PST injection was given by cannula method[3] and in Group 2, by the Smith and Nozik method[2]. Written informed consent was obtained and patients were selected after assessment of: History, Visual acuity (Snellen's chart), Aplanation tonometry, Slit lamp and Fundus examination. Optical coherence tomography was also performed. Posterior Subtenon's Injection was given by one of the two techniques

(1) The Smith and Nozik method, and

(2) The cannula method

The methods of PST injection of triamcinolone acetonide 0.5 mL (20 mg) employed in this study are as follows:

Group 1: Cannula Method

- Conjunctiva is anesthetized with proparacaine drops.
- Wire speculum is placed and patient is asked to look at inferonasal side with the help of his thumb as fixation target.
- Conjunctiva along with tenon is lifted about 10 mm away from the limbus using a blunt serrated forceps at the site of intended entry in the superotemporal quadrant.
- At this point, entry is made into the episcleral space using the stillete of a 24-gauge intravenous cannula made of polytetrafluoroethylene.
- The stillete (with bevel up) and cannula are advanced together for about 3 mm within the episcleral space under direct visualization.
- The cannula is further advanced simultaneously with withdrawal of stillete with rotatory movement of fingers.
- When the cannula has advanced about 12–14 mm posteriorly in subtenon space, the stillete is completely withdrawn and a syringe loaded with triamcinolone is attached to the cannula and 0.5 mL (20 mg) triamcinolone is injected.
- The cannula is slowly withdrawn and a cotton swab stick is applied to the site of injection for few seconds.
- Antibiotic drops are then instilled into the eye.

Group 2: Smith and Nozik Method

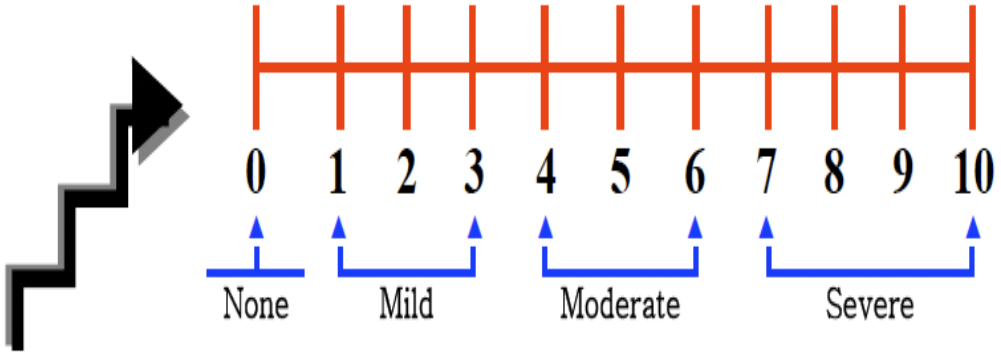
- Conjunctiva is anesthetized with proparacaine drops and a wire speculum is placed.
- Patient is asked to look inferonasally
- Conjunctiva is lifted with help of blunt serrated forceps
- Syringe filled with 0.5mL(20 mg) of triamcinolone and fitted with 26-gauge needle is advanced with bevel facing toward the globe, supero/temporally along the curve of the globe. Intermittent sidewise sweeping movement is done to confirm the separation of needle from sclera.
- The needle is advanced till the hub touches the conjunctiva.
- Plunger is slightly withdrawn to rule out injecting steroids within a vessel. 0.5 mL of triamcinolone is injected and needle is withdrawn.
- Antibiotic drops are then instilled into the eye.

FOLLOW UP

Snellen's visual acuity, slit-lamp examination, fundus evaluation and aplanation tonometry: were recorded at day 0, 1st week, 6th week and 12th week. OCT was conducted at day 0, 6th week and 12th week.

PAIN SCORING

Pain experienced while receiving the injection was also rated by the patient immediately after receiving the Injection.



RESULTS

Average Snellen's Visual acuity (Decimal equivalent)

Visual acuity	Group 1 (Cannula)	Group 2 (Smith and Nozik)
Baseline	0.26	0.19
Week 1	0.33	0.21
Week 6	0.39	0.27
Week 12	0.47	0.30

The average difference in final visual acuity (week 12) from the baseline in both the groups was analyzed after applying Paired t test (two tailed t test) and taking P value as <.05 as statistically significant.
It showed that there is a statistically significant improvement in BCVA after posterior subtenon's injection of triamcinolone acetonide by both, the canula method and Smith and Nozik technique.
The average change in visual acuity (difference between BCVA at week 12 and at baseline) attained in the two groups was also compared statistically.
It showed that the final change in best corrected visual acuity was higher in Group 1 (Cannula method) than in Group 2 (Smith and Nozik technique) and this difference was found to be statistically significant.

Mean Central Macular thickness on OCT

Central Macular Thickness (CMT) (mean value in microns)	Group 1	Group 2
Baseline	399.3	419.1
Week 6	318.9	361.2
Week 12	282.7	336.6

The average difference in final Central macular thickness (week 12) from the baseline in both the groups was analyzed after applying Paired t test (two tailed t test) and taking P value as <.05 as statistically significant.
It showed that there is a statistically significant decrease in CMT after posterior subtenon's injection of triamcinolone acetonide by both, the canula method and Smith and Nozik technique.
The average change in CMT (difference between CMT at week 12 and at baseline) attained in the two groups was also compared statistically, which showed that the final change in CMT was higher in Group 1 (Cannula method) than in Group 2 (Smith and Nozik technique) and this difference was found to be statistically significant.

Absolute value of mean IOP

Mean IOP at	Group 1	Group 2
Baseline	14.27	14.93
Week 1	14.73	14.98
Week 6	14.93	15.37
Week 12	14.53	15.07

The average rise in intra-ocular pressure from the baseline in both the groups was analyzed after applying Paired t test (two tailed t test) and taking P value as <.05 as statistically significant.
It revealed that a statistically significant rise in IOP does not occur after posterior subtenon's injection of triamcinolone acetonide by either of these methods.
The difference between rise in IOP at week 6, from the baseline, attained in the two groups was also compared statistically.
The rise in IOP at week 6 was not found to be statistically different between Group 1 (Canula method) and Group 2 (Smith and Nozik technique).

Average Pain Score

Pain Score	Group 1 (Cannula method)	Group 2 (Smith and Nozik technique)
Baseline	2.53	4.20

The average pain score in group 2 was significantly higher than in group 1.

DISCUSSION

Venkatesh P. et al in sudy on 'Posterior subtenon injection of corticosteroids using polytetrafluoroethylene (PTFE) intravenous cannula' concluded that injection of corticosteroids into the posterior subtenon space using an intravenous cannula made of polytetrafluoroethylene (PFTE) that allows safer delivery of the drug into the posterior subtenon space[3]. In our study, the pain score was lower in cannula group, hence supporting this study.
Venkatesh P. et al[4] in a study on 'the comparison of the efficacy and safety of different methods of posterior subtenon injection' concluded that the different methods of posterior subtenon injections are equally efficacious in terms of improving visual acuity. However the cannula method achieves the greatest quantitative reduction in macular thickness. In our study also the quantitative reduction was greatest in cannula group consistent with this study. However, cannula method was also found to be most efficacious in terms of improving visual acuity, unlike this study.
E.Y. Yoon et al[5] in study on 'Effect of Posterior Subtenon's Injection of Kenalog on Central Macular Thickness Measured by Optical Coherence Tomography and Visual Acuity' demonstrated that the mean central macular thickness decreased after posterior subtenon's injection for CME. However, there was no statistically significant difference in pre and post–injection Visual Acuity. Additionally, there was no correlation between the change in mean central macular thickness and change in VA. In our study however both the visual acuity and mean central macular thickness decreased after the posterior subtenon's injection, unlike this study.

Basel T. Ba'arah et al[6] in a study on 'Posterior subtenon injection of triamcinolone acetonide for cystoid diabetic macular edema' noted that at one week after injection, all injected eyes showed significant visual acuity improvement from baseline measurements ($p<0.001$) and 88% of them showed clinical serous macular edema regression. The most significant improvement in logarithm of the minimum angle of resolution visual acuity was noted at month two post injection. They concluded that Posterior subtenon triamcinolone acetonide injection of 40mg triamcinolone acetonide through a supero/temporal approach appears to be safe and effective for short-term management of diabetic cystoid macular edema. The findings of our study also supported this since significant improvement in visual acuity and macular edema regression was seen after the posterior subtenon triamcinolone injection.

CONCLUSION

In our study, most injections were given for diabetic cystoid macular edema (56.67%), followed by cystoid macular edema due to vitritis or pars planitis (23.33%) and then other causes like post surgical and following vascular occlusions (20%).

The significant improvement in best corrected visual acuity and the decrease in central macular thickness on OCT, in the Cannula method group compared to Smith and Nozik method group can be attributed to a more posterior drug delivery, nearer to the macula, using the PTFE canula compared to the ½ inch, 26 G needle used in Smith and Nozik technique.

The pain score was significantly lower in the cannula method group as compared to the Smith and Nozik method group, which can be attributed to the polytetrafluoroethylene cannula being softer and more malleable than the rigid 26 G needle.

The method of administering the posterior subtenon's triamcinolone injection did not have an effect on the rise in IOP.

Also, the incidence of serious complications like globe rupture, though not noted in our study can occur more with Smith and Nozik technique. This is related to a sharp-tipped needle being used for the injection and also because the needle is advanced up to the hub without any visualization of its tip. PST injection by the cannula method is given with help of a 24-gauge cannula. While the injection is given the stillete is withdrawn after inserting the cannula for an initial 3 mm. This makes the procedure safer and the risk of globe perforation during injection is practically absent. Hence our study suggests that the cannula method is a more efficacious alternative to the more widely used Smith and Nozik method and may be safer, as a sharp needle is avoided after the initial entry done under visualization.

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