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Original Article

Comparative Efficacy of Posterior Subtenon Kenacort Compared to Standard Surgical Treatment for Macular Hole Closure

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ABSTRACT

Background: Macular holes cause significant vision loss, particularly in older adults. Although standard surgical treatment (SDT) has been successful, there is increasing interest in less invasive treatments that might offer better outcomes, especially in terms of best-corrected visual acuity (BCVA) and macular hole closure.

Objective: This study aimed to determine the effectiveness of posterior subtenon Kenacort (SBT) in closing macular holes and to compare its efficacy with standard surgical treatment (SDT). Additionally, the study examined the impact of macular hole classification on treatment outcomes in both groups.

Methods: An interventional study was conducted at Al-Shifa Trust Eye Hospital in Rawalpindi, involving 60 subjects aged 45 to 65 years with idiopathic macular holes. Participants were selected using non-probability sampling. Group A (30 eyes) received two SBT injections three months apart, while Group B (30 eyes) underwent SDT, which included pars plana vitrectomy with internal limiting membrane (ILM) peeling and gas tamponade. OCT imaging and logarithm of the minimum angle of resolution (LogMAR) measurements were obtained for all subjects before treatment, with follow-up assessments conducted six months post-treatment. Data analysis was performed using SPSS version 25.0, with quantitative variables expressed as mean ± SD and inferential statistics explored using ANOVA and paired sample t-tests. A p-value ≤ 0.05 was considered statistically significant.

Results: Both treatment groups had thirty patients each with similar average macular hole sizes (SBT: 436 ± 126 µm, SDT: 439 ± 127 µm). In the SBT group, average BCVA improved from 1.48 to 0.846, while in the SDT group, it changed from 1.44 to 1.25. Macular hole classification significantly affected post-treatment BCVA scores in both groups ($p < 0.001$). The SBT group showed significantly greater BCVA improvement compared to the SDT group.

Conclusion: Posterior subtenon Kenacort effectively closed macular holes and improved BCVA more than standard surgical treatment. Macular hole classification influenced post-treatment BCVA scores in both treatment groups, highlighting its importance in predicting treatment outcomes.

Keywords: Macular Hole, Kenacort A, Triamcinolone Acetonide, Vitrectomy, Visual Acuity, Posterior Subtenon Injection, Internal Limiting Membrane Peeling.

INTRODUCTION

Idiopathic macular hole (IMH) is a condition that significantly threatens vision and quality of life, with prevalence rates ranging from 0.16% to 0.4% (1). Optical coherence tomography (OCT) has become indispensable for diagnosing and managing IMH, distinguishing it from conditions like lamellar holes, which present with an irregular foveal contour and a defect in the inner fovea, and pseudoholes, characterized by an irregular foveal contour with steep edges but without true retinal tissue absence, often linked to an epiretinal membrane (2). Spontaneous closure of full-thickness macular holes is rare, occurring in only 4% to 6% of cases (3). Kelly and Wendel first introduced vitreous surgery for idiopathic macular holes in 1991, revolutionizing the treatment landscape (4, 5). The subsequent addition of internal limiting membrane (ILM) peeling by Eckardt et al. in 1997 further enhanced closure rates for idiopathic macular

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holes (6). Currently, the combination of pars plana vitrectomy with ILM peeling and intraocular tamponade is the standard surgical procedure, achieving closure rates of 85% to 100% in a single operation (7). However, factors influencing the healing process and functional restoration of the neuroretina post-surgery vary (8, 9).

The size of the macular hole, particularly the minimum diameter between the hole edges and its longest diameter, has been identified as a significant predictor of surgical outcomes (10). Visual results post-vitrectomy are generally favorable, with better preoperative visual acuity correlating with better postoperative outcomes. Nevertheless, even eyes with poorer preoperative visual acuity often exhibit the most significant improvements following surgery (11). Despite the high success rates, recurrence of macular holes can occur after initial successful closure. Classification schemes for macular holes, such as those by Gass and the International Vitreomacular Traction Study (IVTS) Group, aid in the clinical understanding and management of this condition (12). Patients with macular holes often have an irregular vitreoretinal interface, increasing the risk of retinal tears or detachment during vitrectomy (13). Complex cases involving simultaneous rhegmatogenous retinal and choroidal detachments are marked by significant hypotony and impaired vision (14).

In addition to surgical approaches, intravitreal injections have been explored as a treatment option for macular holes, particularly those associated with inflammation (14). Closure rates vary with the size of the macular hole: approximately 85.7% for small holes (<250µm), 80% for medium holes, and 33.3% for large holes (15). Posterior subtenon injection of triamcinolone acetonide, traditionally used for posterior uveitis, diabetic macular edema, and cystoid macular edema secondary to retinal vein occlusions, offers a potential non-surgical treatment modality for idiopathic macular holes (16). Recent case studies and literature reviews suggest that posterior subtenon Kenacort (SBT) may effectively close idiopathic macular holes and improve visual acuity (17). This study aims to assess the efficacy of posterior subtenon Kenacort in closing idiopathic macular holes and compare its outcomes with the standard surgical treatment (SDT). Additionally, it seeks to explore the influence of macular hole size on visual acuity improvement following both treatments. By investigating these aspects, the study aims to identify a potential non-surgical alternative for managing idiopathic macular holes and provide insights into the role of macular hole classification in predicting treatment outcomes (18).

MATERIAL AND METHODS

A quasi-experimental study was conducted at Al-Shifa Trust Eye Hospital in Rawalpindi from November 2023 to April 2024 to compare the efficacy of posterior subtenon Kenacort (SBT) and standard surgical treatment (SDT) for the closure of idiopathic macular holes. The sample size was determined using G*Power, employing a non-probability sampling technique. Sixty eyes of sixty subjects, aged 45 to 65 years with idiopathic macular holes of various sizes, were included in the study. The study received institutional review board approval from the IRB committee at the Pakistan Institute of Ophthalmology, Al-Shifa Trust Eye Hospital, and adhered to the principles of the Declaration of Helsinki. Fully informed written consent was obtained from all participants (19). Patients with a history of ocular trauma, high myopia, optical media opacity, glaucoma or other optic nerve diseases, and other retinopathies were excluded. Additionally, patients with macular holes caused by high myopia or ocular trauma were not included. Subjects were divided into two groups: Group A consisted of 30 eyes that underwent posterior subtenon Kenacort treatment, while Group B comprised 30 eyes that underwent standard surgical treatment, including pars plana vitrectomy with ILM peeling and gas tamponade (20).

In Group A, the posterior subtenon Kenacort injections were administered twice, three months apart. Patients were positioned lying down, and after applying topical anesthesia with 0.4% oxybuprocaine, a 1 ml dose of 40 mg/ml triamcinolone acetonide (Kenacort, Bristol-Myers Squibb, Sermoneta, Italy) was injected in the inferotemporal quadrant using a 27-gauge needle attached to a 2.5-ml syringe. The needle was inserted with the bevel towards the eye, penetrating the conjunctiva and Tenon's capsule, and the corticosteroid was injected slowly. Ointment was prescribed post-injection. In Group B, standard surgical treatment involved pars plana vitrectomy with ILM peeling and gas tamponade (18).

Baseline OCT imaging and LogMAR visual acuity measurements were obtained for all subjects prior to treatment. Follow-up assessments, including OCT and BCVA through LogMAR, were conducted six months post-treatment. Quantitative variables were expressed as mean ± standard deviation, and qualitative variables were presented as frequency and percentages. Inferential statistics were explored using ANOVA and paired sample t-tests. The Statistical Package for Social Sciences (SPSS) version 25.0 was utilized for data analysis. A p-value of ≤ 0.05 was considered statistically significant.

The study ensured rigorous data collection and assessment protocols. Macular hole sizes were measured using OCT, and visual acuity was assessed using the LogMAR chart. Data collection was performed by trained ophthalmic technicians, ensuring consistency and accuracy. Ethical considerations were strictly followed, with all procedures adhering to the ethical standards set by the Declaration

of Helsinki. Participants were fully informed about the study's purpose, procedures, potential risks, and benefits, and their confidentiality was maintained throughout the study.

This study provided a comprehensive comparison of the efficacy of posterior subtenon Kenacort and standard surgical treatment for idiopathic macular hole closure. By employing robust data collection, ethical standards, and rigorous statistical analysis, the study aimed to offer valuable insights into potential non-surgical alternatives for managing idiopathic macular holes and the role of macular hole classification in predicting treatment outcomes.

RESULTS

The study included 60 subjects aged 45 to 65 years with idiopathic macular holes, equally divided into two groups: Group A (SBT treatment) and Group B (SDT treatment). Both groups exhibited similar baseline characteristics, including macular hole size and best-corrected visual acuity (BCVA). The descriptive statistics for age, macular hole size, and BCVA are presented in Table 1.

Table 1: Descriptive Statistics of Age, Macular Hole Size, and BCVA

Variable	SBT Group (n=30)	SDT Group (n=30)
Age (years)		
Mean ± SD	54.5 ± 67.3	57.2 ± 5.77
Median	54.0	57.0
Range	43 – 65	48 – 66
Macular Hole Size (µm)		
Mean ± SD	436 ± 126	439 ± 127
Median	473	470
Range	220 – 610	210 – 610
BCVA (LogMAR)		
Pre-treatment Mean ± SD	1.48 ± 0.883	1.44 ± 0.880
Post-treatment Mean ± SD	0.846 ± 1.12	1.25 ± 0.981
Pre-treatment Median	1.00	1.00
Post-treatment Median	0.180	1.00
Range	0.5 – 3.0	0.5 – 3.0

Gender and Resolution Distribution

The gender distribution and resolution outcomes for both treatment groups are detailed in Table 2.

Table 2: Gender and Resolution Distribution in SBT and SDT Groups

Group	Gender	Count	Percentage (%)
SBT Group	Male	15	50.0
	Female	15	50.0
Resolution	Closed	20	66.7
	Not Closed	10	33.3
SDT Group	Male	15	50.0
	Female	15	50.0
Resolution	Closed	20	66.7
	Not Closed	10	33.3

The analysis showed a significant effect of macular hole classification on post-treatment BCVA scores for both treatment groups, as shown in Table 3.

Table 3: Effect of Macular Hole Classification on Post-Treatment BCVA

Variable	Sum of Squares	df	Mean Square	F	p	η^2
BCVA Post-SBT						
MH Classification	14.6	2	7.289	9.11	<.001	0.403
Residuals	21.6	27	0.800			

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Variable	Sum of Squares	df	Mean Square	F	p	η^2
BCVA Post-SDT						
MH Classification	16.7	2	8.332	20.0	<.001	0.597
Residuals	11.3	27	0.417			

The comparison of treatment outcomes based on macular hole size for both SBT and SDT groups is presented in Table 4.

Table 4: Effect of Macular Hole Size on Treatment Outcomes: SBT vs. SDT

MH Size Classification	Comparison	Mean Difference	SE	df	t	p
SBT Group	Medium - Large	-1.3842	0.369	27	-3.755	0.002
	Medium - Small	0.0711	0.537	27	0.132	0.990
	Large - Small	1.4553	0.497	27	2.928	0.018
SDT Group	Medium - Large	-1.388	0.260	27	-5.328	<0.001
	Medium - Small	0.325	0.382	27	0.850	0.676
	Large - Small	1.712	0.361	27	4.742	<0.001

The comparison of mean improvement in BCVA between the SBT and SDT groups is shown in Table 5.

Table 5: Comparison of BCVA Improvement Post-Treatment: SBT vs. SDT

Variable	Statistic	df	p	Mean Difference	SE Difference
BCVA Post-SBT vs. SDT	-2.49	29	0.009	-0.401	0.161

In summary, both treatment groups had an equal distribution of male and female patients, with similar average macular hole sizes. The SBT group demonstrated a significant improvement in BCVA compared to the SDT group. The macular hole classification significantly affected post-treatment BCVA scores in both groups, indicating its importance in predicting treatment outcomes. These results suggest that posterior subtenon Kenacort is an effective non-surgical treatment for closing idiopathic macular holes and improving visual acuity.

DISCUSSION

The discussion of this study centers on the comparative efficacy of posterior subtenon Kenacort (SBT) and standard surgical treatment (SDT) for the closure of idiopathic macular holes and the subsequent improvement in best-corrected visual acuity (BCVA). This investigation confirmed that SBT not only effectively closed idiopathic macular holes but also resulted in greater improvement in BCVA compared to SDT. These findings align with previous studies that have explored alternative, less invasive treatments for macular holes.

Kelly and Wendel's pioneering work on vitreous surgery laid the foundation for surgical intervention in idiopathic macular holes, demonstrating significant visual improvement post-surgery (5). The addition of internal limiting membrane (ILM) peeling, as introduced by Eckardt et al., further enhanced closure rates, solidifying pars plana vitrectomy as the standard surgical approach (6). Despite high closure rates ranging from 85% to 100% after a single operation, this study's results indicated that SBT could offer comparable closure rates with significant visual acuity improvement, presenting a viable non-surgical alternative.

The improvement in BCVA observed in the SBT group underscores the potential of corticosteroid injections in managing macular holes. This is consistent with the findings of Ebrahimi et al., who reported successful closure of inflammatory macular holes with subtenon triamcinolone injections, resulting in substantial visual improvement (14). Similarly, Bonnell et al. demonstrated the efficacy of topical steroids in closing full-thickness macular holes, further supporting the therapeutic potential of corticosteroid applications in such cases (19).

A notable strength of this study was the rigorous methodology, including the use of OCT imaging and LogMAR visual acuity measurements for precise assessment of treatment outcomes. The inclusion of a homogeneous sample, strictly adhering to inclusion and exclusion criteria, ensured the reliability of the findings. Furthermore, the dual administration of SBT injections, spaced three months apart, provided a comprehensive evaluation of the sustained efficacy of this treatment modality.

However, the study was not without limitations. The relatively small sample size of 60 subjects, divided equally between the two treatment groups, may limit the generalizability of the results. Future studies with larger sample sizes are warranted to confirm these findings and further elucidate the comparative benefits of SBT over SDT. Additionally, the follow-up period of six months, while sufficient to observe initial outcomes, may not capture long-term effects and potential recurrences. Extended follow-up studies would be beneficial in assessing the durability of treatment effects.

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Another limitation was the inability to completely control for variables such as retinal detachment and diabetic macular edema, which affected the closure rates in some cases. Addressing these variables in future research could provide a clearer understanding of the factors influencing treatment success. Moreover, the study did not include a direct assessment of patient-reported outcomes, such as quality of life and visual function, which are critical for comprehensive evaluation of treatment efficacy.

The findings from this study have important clinical implications. The significant improvement in BCVA with SBT suggests that it can be considered a viable non-surgical alternative for patients with idiopathic macular holes, particularly those who may be at higher risk for surgical complications or prefer less invasive treatments. The impact of macular hole classification on treatment outcomes, as demonstrated by the significant differences in BCVA based on hole size, highlights the necessity for personalized treatment approaches tailored to individual patient characteristics.

CONCLUSION

In conclusion, this study provided compelling evidence supporting the efficacy of posterior subtenon Kenacort in closing idiopathic macular holes and improving visual acuity, presenting it as a potential alternative to standard surgical treatment. The results advocate for further research with larger sample sizes and longer follow-up periods to validate these findings and explore the long-term benefits and safety of SBT. The incorporation of patient-reported outcomes in future studies would also enhance the understanding of the overall impact of these treatments on patient quality of life.

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