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Comparative Outcomes of Giant Retinal Tear Repair: Choroidectomy with Laser vs. Laser Alone.

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Abstract

Background: Giant Retinal Tear (GRT)-associated retinal detachment is a vision-threatening condition requiring precise surgical intervention. While LASER photocoagulation is a standard treatment, the role of choroidectomy in improving anatomical and functional outcomes remains debated. To compare the surgical outcomes and visual improvement in patients with Giant Retinal Tear (GRT) treated with Choroidectomy and LASER versus LASER alone.

Methodology: A retrospective cohort study was conducted in the Department of Ophthalmology, Lahore General Hospital, over a 12-month period. Twenty patients were enrolled and randomly assigned into two equal groups. One group underwent GRT repair with choroidectomy and LASER, while the other received LASER alone. Postoperative follow-up was conducted for six months.

Results: Both surgical approaches achieved high retinal reattachment rates 90% in the choroidectomy with LASER group and 80% in the LASER-only group indicating a marginally better outcome for choroidectomy in complex cases. Visual recovery was also higher in the choroidectomy group (70%) compared to the LASER-only group (60%). However, preoperative macular status and postoperative management appeared to have a greater influence on visual improvement than the inclusion of choroidectomy.

Conclusion: This study found no significant difference between choroidectomy with LASER and LASER alone in treating giant retinal tears (GRT). Retinal reattachment rates were 90% vs. 80%, and visual improvement was 70% vs. 60%, but the differences were not statistically significant.

Keywords

Giant Retinal Tear, Choroidectomy, Proliferative Vitreoretinopathy.

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Introduction

Giant retinal tears (GRTs) are full-thickness retinal breaks extending circumferentially to 90 degrees or more, often leading to progressive retinal detachment requiring urgent surgical intervention to prevent vision loss[1]. GRTs predominantly affect younger individuals, with a higher prevalence among males, likely due to increased trauma and myopia in this group[2-5]. The underlying pathophysiology includes vitreoretinal traction, peripheral retinal weakening, and posterior hyaloid membrane detachment, all of which increase the risk of detachment[6].

Surgical management of GRTs has evolved with advancements in vitreoretinal techniques, improving anatomical reattachment rates and functional outcomes. However, GRT repair remains challenging due to its complexity and the risk of complications such as proliferative vitreoretinopathy (PVR)[2]. The standard approach is pars plana vitrectomy (PPV), often combined with scleral buckling, internal tamponade, and in selected cases, choroidectomy[4,6].

Choroidectomy involves partial or complete removal of the choroid to address severe traction, hemorrhage, or subretinal fibrosis, facilitating retinal reattachment. While it may improve surgical outcomes in complex cases, it carries risks such as intraoperative bleeding, choroidal circulation disruption, and potential damage to the retinal pigment epithelium, which may impact visual recovery[3,5]. Research on choroidectomy's benefits in GRT repair is inconclusive, with some studies reporting improved anatomical success and reduced recurrence, while others highlight risks such as chronic hypotony and suboptimal visual recovery[2,5,7].

This study compares the outcomes of GRT repair with and without choroidectomy, focusing on anatomical success, functional visual outcomes, and complications. While choroidectomy may enhance reattachment in severe cases, surgical approaches without it may reduce intraoperative risks and yield comparable anatomical success, particularly in cases without extensive subretinal pathology.

Methodology

Study Design

This study was a retrospective cohort study conducted to assess the surgical outcomes of giant retinal tear (GRT) management with and without choroidectomy. The study spanned a period of twelve months, from March 1, 2023, to March 1, 2024.

Ethics

Ethical approval for this study was obtained from the Institutional Review Board (IRB) of Lahore General Hospital, ensuring compliance with ethical guidelines and patient confidentiality protocols. Informed consent was obtained from all patients prior to data collection, and the study adhered to the principles outlined in the Declaration of Helsinki.

Setting

The study was conducted at the Department of Ophthalmology, Lahore General Hospital, a tertiary care hospital with a high patient influx and advanced ophthalmic surgical facilities.

Participants

a. Inclusion Criteria:

- Patients diagnosed with GRT of any etiology.
- Age >18 years.
- No contraindications to surgical intervention.

b. Exclusion Criteria:

- Patients with advanced glaucoma or other coexisting retinal pathologies.
- Patients lost to follow-up.
- Patients with significant systemic comorbidities precluding surgery.

Variables

The key variables assessed in this study included demographic details (age, gender), clinical factors (etiology of GRT, extent and duration of retinal detachment, presence and grading of proliferative vitreoretinopathy (PVR) membranes, history of previous ocular surgery), surgical outcomes (retinal reattachment rate, visual recovery rate), and follow-up parameters (visual acuity, intraocular pressure (IOP), and findings on dilated fundus examination).

Data Sources/Measurement

Data were collected using a pre-designed proforma documenting demographic details, medical history, clinical examination findings, and surgical outcomes. Surgical success was defined in terms of retinal reattachment rates, while visual recovery was measured as improvement in visual acuity using Snellen's Chart. Follow-up assessments included:

- **Postoperative Day 1:** Initial evaluation of visual acuity, IOP, and fundus examination.
- **Day 7:** Follow-up examination to assess early postoperative complications.
- **Monthly follow-ups for six months:** Continuous monitoring of visual acuity, IOP, and anatomical success.

Bias

Selection bias was minimized by employing a standardized patient selection process. Performance bias was reduced by ensuring that all surgeries were performed by experienced retinal surgeons following the same procedural protocol. Detection bias was controlled by standardizing outcome assessment criteria.

Study Size

The study included a total of 20 patients, divided into two equal groups of 10 patients each. Although the sample size was relatively small, it provided preliminary data on the comparative effectiveness of GRT management with and without choroidectomy.

Statistical Methods

Statistical analysis was performed using SPSS software version 22.0. Chi-square tests or Fisher's exact tests were used compare variables between the two groups. A p-value of <0.05 was considered statistically significant.

Results

Participants

A total of 20 patients diagnosed with giant retinal tear (GRT) were enrolled in the study. The cohort comprised 14 males (70%) and 6 females (30%), with a mean age of 48 years. Patients were randomly allocated into two equal groups: Group A (n=10) underwent choroidectomy with LASER, while Group B (n=10) was managed with LASER alone.

Descriptive Data

Baseline characteristics, including demographic details, etiology of GRT, extent of retinal detachment, and grading of proliferative vitreoretinopathy (PVR), were comparable between the two groups. None of the patients had significant systemic comorbidities that could have influenced surgical outcomes. The mean duration of retinal detachment prior to surgery was similar in both groups.

Outcome Data

a. Anatomical Closure

The primary outcome assessed was the anatomical success of retinal reattachment. In Group A, 9 out of 10 patients (90%) achieved successful reattachment after the initial procedure, whereas in Group B, 8 out of 10 patients (80%) had effective retinal reattachment. These results suggest a slightly higher anatomical success rate in the choroidectomy with LASER group, aligning with previous research that supports the role of choroidectomy in improving reattachment in cases of severe subretinal disease.

b. Visual Improvement

Functional outcomes were assessed in terms of improvement in visual acuity. In Group A, 7 out of 10 patients (70%) exhibited an improvement of at least two lines on the Snellen chart, whereas in Group B, 6 out of 10 patients (60%) demonstrated comparable improvement.

Both groups showed that factors such as the absence of preoperative complications (e.g., PVR) and macular involvement played a crucial role in determining functional recovery.

Table 1: Baseline Characteristics.

Variable		Group A	Group B
Age (years); Mean±SD		48 ± 7.0	47 ± 6.0
Gender; N(%)	Male	7(70)	7(70)
	Female	3(30)	3(30)
Extent of Retinal Detachment		85%	84%
PVR Grade; Mean±SD		2.5 ± 0.5	2.6 ± 0.6

Table 2: Postoperative Outcomes.

Time point	Outcome	Group A	Group B	p-value
Day 1	Retinal Reattachment	90%	80%	0.45
	Visual Acuity (Mean LogMAR); Mean ± SD	0.5 ± 0.2	0.6 ± 0.3	0.35
	IOP (mmHg); Mean ± SD	18 ±4.0	19±3.0	0.68
Day 7	Postoperative Complications	20%	30%	0.56
Month 1-6	Final Retinal Reattachment	90%	85%	0.72
	Visual Improvement (≥2 Snellen lines)	70%	60%	0.42

Values are given as n(%).
*p<0.05 is considered statistically significant

Table 3: Comparison of Retinal Reattachment Success between Surgical Groups.

Group	Success (Retinal Reattachment)	Failure (No Reattachment)	P-Value
Group A	9	1	0.50
Group B	8	2	0.60

Values are given as frequency (n).
*p<0.05 is considered statistically significant

Table 4: Comparison of Visual Acuity Improvement between Surgical Groups.

Group	Success (Improvement)	Failure (No Improvement)	P-Value
Group A	7	3	0.62
Group B	6	4	0.40

Values are given as frequency (n).
*p<0.05 is considered statistically significant

Discussion

When the neurosensory retina separates from the underlying retinal pigment epithelium, it can lead to a serious eye disorder known as rhegmatogenous retinal detachment (RRD)[1]. This separation is typically brought on by a tear or hole in the retina, which causes fluid to build up between the retina and the surrounding tissues and pull away[8]. In recent years, the prevalence of RRD has risen from 1 in 10,000 to 13 in 10,000, with 1.3 times as many males as girls being affected by it[3].

Untreated or poorly managed cases lead to permanent visual loss and blindness[4]. Proliferative vitreoretinopathy (PVR), severe and complex retinal detachment, and poor visual outcomes could result from delayed treatment[5].

Age, myopia, previous eye surgery or trauma, and family history are risk factors for RRD[6]. Systemic and genetic disorders like marfan syndrome and stickler syndrome also contribute to development of RRD and GRT[7]

Surgery can be used to treat RRD, but the effectiveness of the procedure depends on the severity of the condition and how quickly it is identified and treated[8].

RRDs associated with giant retinal tears (GRTs) are a subtype of retinal detachment that is defined by full-thickness retinal tears that are at least 90° or 25% of the circumferential extent. RRD instances make up around 1.5% of GRT cases, while 72% of all GRT cases are in males[9]. Prior research has either focused on the variations in the clinical outcomes of GRT-related RRDs or categorized RRDs according to functional outcomes[10].

The high incidence of PVR, which raises the danger of redetachment, and the frequent rolling of the posterior edge of the retinal flap make managing GRT-related RRDs extremely difficult[11,12].

A number of techniques, including scleral buckling, fluid-air exchange, combined scleral buckling and vitrectomy, primary pars plana vitrectomy (PPV) involving gas or silicone oil tamponade, and pneumatic retinopexy, are used to treat GRT-related RRDs, depending on the size, location, extent, and severity of both the GRT and RRD. However, GRT-related RRDs present a significant barrier to treatment results due to the high risks of intraoperative and postoperative complications as well as technical issues[13].

The creation of postoperative PVR and epiretinal membrane are two postoperative complications of retinal detachment repair that may compromise the final visual outcome even with high primary anatomical success (PAS) and final anatomical success (FAS) rates[14].

Retinal detachment (RD) remains a significant cause of visual impairment worldwide, with giant retinal tears (GRTs) posing unique surgical challenges[15]. Various surgical approaches, including vitrectomy and choroidectomy, have been explored to enhance anatomical and functional outcomes[16]. This study compares the outcomes of patients treated with and without choroidectomy, specifically evaluating retinal reattachment rates and improvements in visual acuity following GRT repair.

Since functional recovery is often contingent on anatomical success, the primary goal of GRT-related RD procedures remains retinal reattachment. In our study, patients who underwent choroidectomy exhibited a slightly higher retinal reattachment rate (90%) compared to those who did not (80%). These findings align with previous studies that highlight the effectiveness of choroidectomy in addressing subretinal pathology, particularly in the presence of proliferative vitreoretinopathy (PVR). Choroidectomy may facilitate subretinal fluid evacuation, thereby improving anatomical outcomes[1,3]. The degree of retinal tear and intraoperative complications also contribute to variations in surgical success. Published literature reports primary anatomical success rates for GRT repair ranging from 68% to 96%, depending on the surgical technique employed[17].

The slightly higher reattachment rate in the choroidectomy group suggests potential benefits, particularly in cases of severe disease[18]. However, the 80% success rate in the non-choroidectomy group indicates that standard GRT repair techniques remain effective in cases with minimal PVR or lower subretinal tension. While structural success is critical, the ultimate objective of RD surgery is functional recovery, particularly visual acuity. In our study, 70% of patients in the choroidectomy group demonstrated an improvement of at least two Snellen lines, compared to 60% in the non-choroidectomy group. These results align with existing research, which emphasizes that postoperative visual outcomes are heavily influenced by macular involvement, preoperative visual acuity, and the severity of PVR[19,20].

The improved visual outcomes in the choroidectomy group may be attributed to more effective subretinal fluid clearance and a lower incidence of postoperative complications such as recurrent PVR[21]. Studies indicate that approximately 59% of patients experience visual improvement following successful RD repair, though underlying macular degeneration can limit recovery[22]. The notable functional recovery observed in the non-choroidectomy group underscores the effectiveness of current vitrectomy techniques, even in the absence of additional surgical adjuncts such as choroidectomy.

Several factors influence the outcomes of GRT-related RD procedures, regardless of the surgical technique used. Macular status plays a crucial role, as macula-on detachments generally have better prognoses than macula-off detachments[23]. Research suggests that preoperative macular integrity significantly enhances visual recovery, particularly in cases of severe peripheral retinal tears. Additionally, PVR remains one of the leading causes of surgical failure in RD repairs involving GRTs[24]. By facilitating the removal of fibrotic membranes and improving retinal apposition, choroidectomy may mitigate the effects of PVR, contributing to higher reattachment rates in this group.

Advancements in surgical techniques, including the use of silicone oil tamponades and perfluorocarbon liquids, have significantly improved outcomes in both groups. Previous research highlights the critical role of surgical expertise in optimizing results, as experienced surgeons tend to achieve higher success rates and lower complication rates[25].

Despite the overall success of both techniques, potential challenges must be managed effectively to maximize outcomes. Postoperative complications such as recurrent RD and PVR, as well as intraoperative risks like iatrogenic retinal breaks, can influence surgical success. While choroidectomy may be beneficial in select cases, it also carries risks, including intraoperative bleeding and chronic inflammation.

Study Limitations

This study has several limitations. The small sample size and retrospective, single-center study design limit the generalizability of our findings. Additionally, since all surgeries were performed by a single surgeon, there is a possibility of bias due to personal surgical preferences. Future studies should incorporate larger, multicenter cohorts and include multiple surgeons to minimize variability and enhance the robustness of findings.

Conclusion

This study found no significant difference between choroidectomy with LASER and LASER alone in treating giant retinal tears (GRT). Retinal reattachment rates were 90% vs. 80%, and visual improvement was 70% vs. 60%, but the differences were not statistically significant. Both techniques appear equally effective, suggesting that factors like preoperative PVR severity and macular involvement may influence outcomes more than the choice of procedure. Further research with larger samples is needed to confirm these findings.

Conflicts of Interest

The author(s) have no conflicts of interest.

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