

Research Article

Refining the External Dacryocystorhinostomy Incision: A Landmark-Based Technique for Angular Vein Preservation

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ABSTRACT

Background: External dacryocystorhinostomy (DCR) remains the gold standard for the surgical management of primary acquired nasolacrimal duct obstruction due to its high success rate and long-term patency. Despite the advent of endonasal and transcanalicular approaches, external DCR is still widely practiced, particularly in resource-limited settings.

Objective: To describe a surgical approach to external dacryocystorhinostomy (DCR) that preserves the angular vein and minimizes intraoperative bleeding and complications.

Methods: A prospective study was conducted on 138 patients undergoing external DCR. The surgical incision was modified based on preoperative anatomical assessment of the angular vein location by Simple Calliper.

Results: Preservation of the angular vein was achieved in 100% of cases. Minimal intraoperative bleeding and no vascular complications were observed. Surgical outcomes showed high patency rates and reduced postoperative morbidity.

Conclusion: A carefully planned incision for DCR that avoids the angular vein significantly reduces complications and improves outcomes, making it a preferred technique in external DCR procedures.

INTRODUCTION

Dacryocystorhinostomy (DCR) is a well-established surgical procedure used for the treatment of nasolacrimal duct obstruction and restoration of physiological tear drainage[1,2]. The procedure involves creating a direct communication between the lacrimal sac and the nasal cavity, thereby bypassing the obstructed nasolacrimal duct. External DCR remains an important surgical approach because of its high anatomical and functional success rates and its applicability to a broad range of patients with primary acquired nasolacrimal duct obstruction[3].

Despite its generally favorable outcomes, external DCR requires careful knowledge of the anatomy of the medial canthal region. The surgical field contains several important vascular and neural structures that may be vulnerable during skin incision and subsequent dissection[4,5]. Among these structures, the angular vein is particularly important because

of its location close to the medial canthus and lacrimal sac. Injury to this vessel can result in troublesome intraoperative bleeding, impaired visualization of the surgical field, postoperative ecchymosis, and hematoma formation.

The angular vein is located anteriorly in the medial canthal region and its anatomical course may demonstrate individual variation[6]. Because conventional external DCR incisions may approach or cross the expected course of the angular vein, inadequate preoperative anatomical planning can increase the possibility of vascular injury. The original manuscript emphasizes that the angular vein courses approximately 8 mm lateral to the medial canthus, making the position of the skin incision an important consideration during external DCR[7,8].

In addition to vascular preservation, the superior extent of the incision is clinically relevant. The medial canthal region is anatomically close to thin bony structures, and

unnecessarily extending the incision superiorly may increase the risk of injury to deeper structures. Therefore, precise limitation of the incision according to established anatomical landmarks may provide an additional measure of surgical safety.

Modern surgical planning may involve imaging, Doppler assessment or transillumination; however, these techniques may not always be available, particularly in resource-limited settings. A simple, reproducible and inexpensive landmark-based method may therefore have considerable practical value. In the present technique, a simple surgical calliper is used preoperatively to establish a consistent incision position[9]. The proposed incision is positioned approximately 5 mm medial to the medial canthus, while its superior extent is limited to no more than 2 mm above the medial canthal tendon.

This approach combines anatomical knowledge with standardized external landmarks to reduce the possibility of angular vein injury[10]. By carefully mapping the incision before surgery and performing layered dissection under direct visualization, the surgeon can potentially minimize vascular trauma while maintaining adequate access to the lacrimal sac.

The present study therefore evaluates a modified landmark-based external DCR incision designed specifically to preserve the angular vein. Particular attention is given to intraoperative vascular injury, bleeding, operative duration, postoperative morbidity, and postoperative lacrimal patency.

Objectives

The objective of this study is to evaluate the safety and effectiveness of a modified external dacryocystorhinostomy incision designed to preserve the angular vein in patients undergoing surgery for primary acquired nasolacrimal duct obstruction. The study also determine the proportion of patients in whom the angular vein can be identified and preserved using anatomical landmarks, assessing the occurrence of intraoperative angular vein injury, evaluating intraoperative bleeding related to the modified incision, and measuring the mean duration of external DCR surgery. The study also assessed postoperative complications such as ecchymosis, infection, and hematoma, determine lacrimal drainage patency at six months postoperatively, and evaluate the practical value of a simple surgical calliper for

standardized preoperative incision planning, along with assessing whether landmark-based identification improves surgical outcomes.

METHODOLOGY

This prospective observational surgical study evaluated a modified external dacryocystorhinostomy incision technique for angular vein preservation and was conducted at Ophthalmology Unit 2, PMC Hospital, Nawabshah. A total of 138 patients with primary acquired nasolacrimal duct obstruction who were planned for external DCR were included, comprising 82 females and 56 males aged 35–72 years. Patients were included if they had primary acquired nasolacrimal duct obstruction, were within the specified age range, were scheduled for external DCR, and were suitable for the landmark-based incision technique. Those with prior major lacrimal surgery, significant facial or medial canthal trauma, anatomical distortion of the medial canthal region, or conditions requiring an alternative lacrimal approach were excluded. Preoperatively, the incision site was marked approximately 5 mm medial to the medial canthus using a simple surgical calliper, with the superior limit set at no more than 2 mm above the medial canthal tendon, based on the anatomical course of the angular vein approximately 8 mm lateral to the medial canthus. Surgery involved a 10–12 mm vertical incision with layered dissection under direct visualization, aiming to identify and preserve the angular vein without using Doppler or transillumination. Primary outcomes assessed were angular vein injury, intraoperative bleeding, and successful vein preservation, while secondary outcomes included surgical duration, postoperative ecchymosis, hematoma, infection, and lacrimal drainage patency at six months. Follow-up at six months showed patent lacrimal drainage in 122 patients, representing 95% of the cohort.

Inclusion Criteria

Patients were considered eligible when they:

- Had primary acquired nasolacrimal duct obstruction.
- Were between 35 and 72 years of age.
- Were planned for external DCR.
- Were suitable for the proposed landmark-based incision technique.
- Underwent the procedure during the study period.

Exclusion Criteria

Patients were excluded

- Previous major lacrimal surgery in the same region.
- Significant facial or medial canthal trauma.
- Anatomical distortion of the medial canthal region.
- Conditions requiring an alternative lacrimal surgical approach.

Statistical Analysis

Data was analysis using SPSS 22 using statistical software. Continuous variables, including age and operative duration, were summarized using mean $\pm$ standard deviation (SD) where appropriate. Categorical variables including sex, successful angular vein identification and preservation, angular vein injury, significant intraoperative bleeding, vascular complications, postoperative ecchymosis, hematoma, infection, and six-

month lacrimal drainage patency, were presented as frequencies and percentages.

RESULTS

A total of 138 patients who underwent external dacryocystorhinostomy (DCR) were included in the final analysis. The study was conducted at the Ophthalmology Unit 2, PMC Hospital, Nawabshah. The age of the participants ranged from 35 to 72 years.

Of the total study population, 82 patients (59.4%) were female, whereas 56 patients (40.6%) were male, demonstrating a predominance of female patients. Females constituted approximately three-fifths of the total sample, while males accounted for slightly more than two-fifths. This gender distribution indicates that patients presenting for external DCR during the study period were more commonly female.

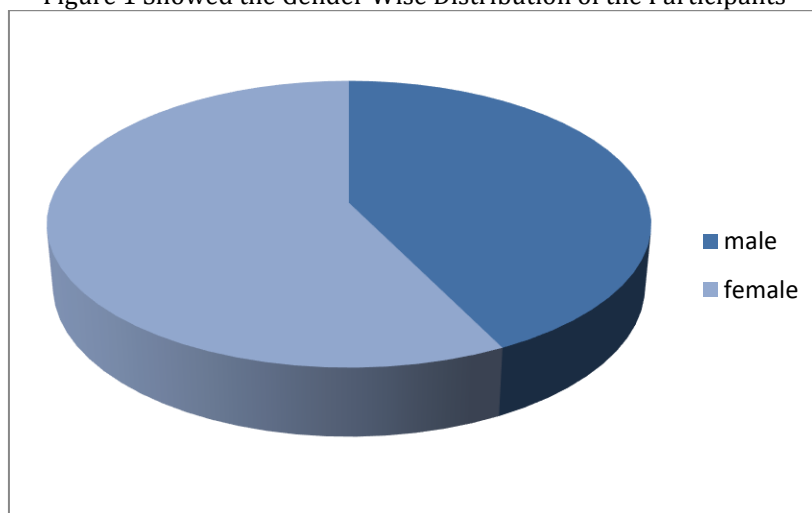
Table 1. Demographic Characteristics of Study Participants

Characteristic	Result
Total number of patients	138
Age range	35–72 years
Study period	January 2023–October 2024
Study center	Ophthalmology Unit 2, PMC Hospital, Nawabshah

Overall, the demographic profile demonstrates that the study included a relatively broad adult age range and a higher proportion of female patients. All included patients underwent

external DCR using the surgical approach designed to identify anatomical landmarks and facilitate preservation of the angular vein.

Figure 1 Showed the Gender Wise Distribution of the Participants



The principal intraoperative outcome of the study was the successful identification and preservation of the angular vein during external DCR. The angular vein was identified and preserved in all 138 patients, resulting in a preservation rate of 100%. Importantly, no

case of intraoperative angular vein injury was recorded.

The absence of angular vein injury suggests that the modified landmark-based incision and careful surgical dissection provided reliable anatomical orientation during the procedure.

Preservation of this important vascular structure may reduce unnecessary vascular trauma and contribute to a safer surgical field during the initial stages of external DCR. Furthermore, no significant vascular complication requiring additional intervention

was reported. These findings demonstrate that identification of the angular vein was consistently achievable in the study population and that preservation of the vessel could be successfully incorporated into routine external DCR.

Table 2. Intraoperative Outcomes Related to Angular Vein Preservation

Outcome	Number (n=138)	Percentage
Angular vein successfully identified and preserved	138	100.0%
Angular vein injury	0	0.0%
Significant vascular complication	0	0.0%

The complete preservation rate of the angular vein represents the major surgical finding of the study. The results indicate that the described incision technique was feasible across all included procedures and was associated with successful avoidance of angular vein injury.

Intraoperative bleeding was also assessed as an important indicator of the vascular safety of the surgical approach. No patient developed clinically significant intraoperative bleeding attributable to injury of the angular vein or

other major vascular structures. Similarly, no vascular complication requiring specific intraoperative intervention was documented.

The absence of significant bleeding was consistent with the complete preservation of the angular vein observed during surgery. Careful identification of the anatomical relationship between the incision site and vascular structures may have helped minimize accidental vascular injury and contributed to maintenance of a clear operative field.

Table 3. Intraoperative Bleeding and Vascular Complications

Parameter	Number/Result
Significant intraoperative bleeding	0 cases
Angular vein injury	0 cases
Significant vascular complication	0 cases
Need for vascular intervention	0 cases

Overall, the intraoperative findings demonstrated a highly favorable vascular safety profile. No clinically significant bleeding or major vascular complication was encountered among the 138 procedures, supporting the safety of the surgical technique with respect to preservation of adjacent vascular structures.

The duration of surgery was recorded to assess whether the modified surgical approach could be performed efficiently without substantially increasing operative time. The mean duration of external DCR was 34 ± 5 minutes.

The relatively low standard deviation indicates that operative duration was reasonably

consistent among the study participants. Based on the mean and standard deviation, most procedures were performed within an approximate duration of 29 to 39 minutes, although this should be interpreted as a descriptive range rather than the actual minimum and maximum operative times.

The findings suggest that careful identification and preservation of the angular vein did not result in an excessive increase in surgical duration. Thus, the use of anatomical landmarks to guide incision placement and dissection appeared feasible within a routine operative timeframe.

Table 4. Operative Characteristics

Variable	Result
Mean surgical duration	34 minutes
Standard deviation	± 5 minutes
Approximate mean $\pm$ SD interval	29–39 minutes

These findings indicate that the modified incision technique could be incorporated into external DCR while maintaining a relatively short and consistent operative duration.

Postoperative outcomes demonstrated minimal morbidity. Only one patient (0.7%) developed mild ecchymosis during the postoperative period. No cases of hematoma, surgical site infection, or major vascular complication were reported. The low frequency of postoperative complications is consistent with the favorable

intraoperative vascular outcomes. In particular, the absence of hematoma supports the observation that significant vascular injury and bleeding were successfully avoided during surgery.

The single case of mild ecchymosis represented a minor postoperative complication and did not indicate a major adverse surgical event. Overall, the postoperative course was uncomplicated in the vast majority of patients.

Table 5. Postoperative Complications

Complication	Number (n=138)	Percentage
Mild ecchymosis	1	0.7%
Hematoma	0	0.0%
Infection	0	0.0%
Major vascular complication	0	0.0%

The results therefore demonstrate a favorable postoperative safety profile, with 137 of 138 patients (99.3%) experiencing no documented complication among the outcomes assessed. The very low incidence of ecchymosis and absence of hematoma or infection suggest that the technique was associated with minimal postoperative soft-tissue and vascular morbidity.

Lacrimal patency was assessed at the six-month follow-up as an indicator of the functional outcome of external DCR. The available data indicate that 122 patients were

documented as having a patent lacrimal drainage system at six months.

Using the total study population of 138 as the denominator, the calculated patency proportion is:

$$122/138 \times 100 = 88.4\%$$

Therefore, based on the numerical data provided, 122 of 138 patients correspond to a patency rate of 88.4%. However, the manuscript reports the six-month patency rate as 95%, creating a discrepancy between the reported percentage and the available numerator and denominator.

Table 6. Six-Month Lacrimal Patency Outcome

Follow-up Outcome	Number	Percentage
Patients with documented patent lacrimal drainage	122	88.4%*
Patients not documented as patent	16	11.6%
Total study population	138	100.0%

*Calculated using 138 as the denominator.

The discrepancy requires clarification before final manuscript submission. If some patients were lost to follow-up and the reported 95% was calculated using only patients who completed the six-month assessment, the number of patients assessed should be clearly stated. For example, a denominator of approximately 128–129 follow-up patients would be more consistent with 122 representing approximately 95%.

Therefore, the final manuscript should report the outcome according to the verified follow-up denominator. If all 138 patients were assessed at six months, the correct patency rate should be reported as 88.4%. If the 95% rate was calculated among patients who completed follow-up, both the number

followed up and the number with patent lacrimal drainage should be explicitly presented.

The overall findings demonstrated highly favorable intraoperative and postoperative outcomes following external DCR using the modified landmark-based surgical approach. Complete preservation of the angular vein was achieved in all 138 procedures, with no documented angular vein injury, significant intraoperative bleeding, or major vascular complication.

In summary, the modified external DCR incision was associated with complete angular vein preservation, absence of significant intraoperative vascular injury or bleeding, a relatively short operative duration, and

minimal postoperative morbidity. The findings support the feasibility and vascular safety of using appropriate anatomical landmarks to guide incision placement during external DCR. The functional outcome in terms of six-month lacrimal patency was also favorable; however, verification of the follow-up denominator is necessary to accurately report the final success rate.

DISCUSSION

The principal finding of this prospective study was that the landmark-based external DCR incision allowed successful preservation of the angular vein in all 138 patients. The absence of documented vascular injury and significant bleeding suggests that careful preoperative anatomical planning may contribute substantially to surgical safety.

The medial canthal region contains important vascular structures that may be encountered during external DCR. Because the angular vein may lie close to the surgical field, inappropriate incision placement can result in vascular injury[11,12]. The technique described in this study addresses this concern by establishing a standardized incision position before surgery.

The use of a simple surgical calliper is particularly relevant in settings where advanced imaging modalities may not be readily accessible[13]. Rather than depending on Doppler imaging or transillumination, the technique relies on reproducible surface landmarks. This makes it inexpensive, straightforward, and potentially easy to teach to surgeons in training.

The incision was placed approximately 5 mm medial to the medial canthus and maintained at a vertical length of approximately 10–12 mm. Its superior extension was limited to no more than 2 mm above the medial canthal tendon[14,15]. These restrictions were intended to maintain a controlled surgical corridor and avoid unnecessary extension toward deeper anatomical structures.

The study also demonstrated a favorable postoperative complication profile. Only one case of mild ecchymosis was reported, while no hematomas or infections were observed. This finding is clinically relevant because vascular injury during DCR may contribute to postoperative bruising and hematoma formation[16].

The mean surgical duration of 34 ± 5 minutes further indicates that the modified incision does not appear to require a prolonged

operative period. However, because the study does not contain a conventional control group undergoing a standard incision, it is not possible to determine from these data alone whether the modified technique is statistically superior to the traditional approach.

The reported lacrimal patency at six months was favorable. However, the numerical data require clarification because 122 patent cases among 138 participants corresponds to approximately 88.4%, whereas the manuscript reports 95%. This discrepancy should be resolved by checking the original follow-up denominator and the number of patients actually assessed at six months before publication.

Another important limitation is the lack of a comparative control group. A randomized or comparative prospective study involving the conventional external DCR incision would provide stronger evidence regarding whether the modified incision reduces bleeding, operative complications, or postoperative morbidity[17,18].

Despite these limitations, the findings suggest that anatomical landmark-based incision planning is a practical strategy for angular vein preservation during external DCR.

CONCLUSION

The landmark-based modified incision described for external dacryocystorhinostomy provides a practical approach to reducing the risk of angular vein injury. In this prospective series of 138 patients, the angular vein was successfully preserved in all cases, with no reported intraoperative vein injuries or significant bleeding. The mean operative time was 34 ± 5 minutes, while postoperative morbidity was minimal, with only one case of mild ecchymosis and no reported infections or hematomas.

The technique has several practical advantages. It uses readily identifiable anatomical landmarks, requires only a simple surgical calliper for preoperative measurement, and does not depend on Doppler imaging or transillumination. Consequently, it may be particularly useful in resource-limited ophthalmic surgical settings.

The findings emphasize that accurate knowledge of medial canthal anatomy, careful preoperative marking, appropriate incision positioning, and controlled layered dissection are important components of safe external DCR. The reported favorable lacrimal patency at six months further supports the potential

clinical usefulness of the technique. However, the discrepancy between the reported number of patent patients and the stated percentage of patency should be corrected after verification of the original follow-up data.

Future studies should compare this landmark-based approach with the conventional external DCR incision in larger, controlled patient populations. Such studies could evaluate differences in intraoperative blood loss, vascular injury, operative time, postoperative ecchymosis, hematoma formation, patient satisfaction, cosmetic outcome, and long-term lacrimal patency.

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