DIAGNOSTIC VALUE OF COMBINING EXAMINATION METHODS IN CHRONIC DACRYOCYSTITIS

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Abstract. *The problem's relevance lies in the fact that chronic obstruction of the nasolacrimal duct continues to be one of the most frequently encountered conditions at the border of ophthalmology and otorhinolaryngology, manifesting as constant tearing and periorbital suppuration that markedly worsens patients' daily life. Combining modern endoscopic instruments, radiopaque preparations, and multislice computed tomography before surgery allows the fine topographic relationships between structures to be visualised with precision. The purpose of this work was to assess the combined diagnostic value of these three approaches in patients with chronic dacryocystitis. Regarding material and methods, 80 patients and 20 conditionally healthy individuals were observed between 2024 and 2026; they underwent rhinoscopy, rigid-optic endonasal endoscopy, a modified dye test based on methylene blue, dacryocystography with a self-developed polymer contrast agent, and volumetric (3D) MSCT. According to the findings obtained, in every subject examined (100%) the indicator substance failed to reach the nasal cavity during the half-hour observation period, indicating complete duct occlusion. The viscosity of the proprietary contrast medium proved roughly 20–25 times higher than that of standard preparations (6 units) — reaching 100 to 150 units — which allowed even the thinnest canaliculi to be clearly visualised. Tomographic measurements clarified the position of the sac: in nearly three-quarters of cases (78%) it lay between the lacrimal bone and the frontal process, in 18% behind the frontal process, and in the remaining five percent behind the lacrimal bone itself. MSCT was performed in sixty percent of patients, and the resulting measurements matched exactly what was later observed on the operating table. In conclusion, combining these three methods provides a reliable means of locating the obstruction precisely, thoroughly planning the surgical scope in advance, and timely detecting concomitant nasal changes.*

Keywords: *dacryocystitis, endoscopy, dacryocystography, computed tomography, dye test, lacrimal pathways.*

Introduction.

According to World Health Organization data, dacryocystitis can occur at any age, but because of the narrowness of the nasolacrimal duct in women and the continuous exposure to cosmetic products, the condition is six to eight times more common in women than in men, particularly between the ages of thirty and sixty. When the normal secretion and outflow of tear fluid is disrupted, the quality of the tear film gradually deteriorates and is partially or completely lost. Dacryocystitis and narrowing of the nasolacrimal duct significantly reduce quality of life by causing blurred vision and forcing the patient to rub the eye constantly; the spread of purulent discharge onto the conjunctiva can lead to even more serious complications - chronic conjunctivitis, corneal ulceration, lacrimal sac abscess, and even orbital cellulitis or meningitis.

Chronic dacryocystitis develops on the basis of primary or secondary narrowing of the nasolacrimal duct, in which stagnation of tear fluid in the lacrimal sac creates favorable conditions for the proliferation of pathogenic microflora and the gradual replacement of the normal mucosal epithelium with fibrous tissue. As the disease progresses, the walls of the sac lose their elasticity, the lumen of the duct narrows further, and a vicious circle is formed in which each episode of inflammation worsens the anatomical prerequisites for the next one. From a broader clinical standpoint, this condition lies squarely at the intersection of ophthalmology and otorhinolaryngology,

since the nasal cavity, its lateral wall, and the surrounding paranasal structures form the anatomical corridor through which any surgical or diagnostic access to the lacrimal sac must pass.

Over the past decade, endoscopic dacryocystorhinostomy (DCR) has become firmly established as the treatment of choice for chronic dacryocystitis and nasolacrimal duct obstruction, gradually displacing the classical external approach in most specialized centers. Multiple recent series and reviews report success rates for the endonasal endoscopic technique that are comparable to, or in some settings exceed, those of the external route, while avoiding a visible facial scar and shortening recovery time [4, 5, 13]. At the same time, the growing body of literature reveals persistent methodological heterogeneity: surgeons continue to debate the optimal timing of surgery in acute suppurative dacryocystitis, the value of preserving mucosal flaps, the routine use of silicone stents, and the necessity of perioperative systemic antibiotics [6, 8, 9, 15, 17, 19]. Some authors advocate very early or even immediate endoscopic intervention once the acute inflammatory phase has been controlled, arguing that this shortens the overall treatment course and reduces the risk of recurrence, whereas others favor a more conservative, staged approach in which surgery is deferred until the acute episode has fully resolved [11, 15, 17]. Comparative work on single- versus double-flap techniques, on the use of adjunctive antifibrotic or anti-inflammatory agents such as triamcinolone, and on modifications of the classical ostium (for example, via the middle uncinate process) further illustrates how actively the surgical technique itself is still evolving [6, 10, 20].

Alongside the surgical debate, a parallel and equally active line of research concerns the role of preoperative and intraoperative diagnostic methods in defining the exact site, length, and cause of the obstruction. Endoscopy alone, however skillfully performed, provides only a two-dimensional view of the visible mucosal surface and cannot reliably show the course of the duct once it disappears into bone, nor can it demonstrate the precise relationship between the lacrimal sac and the surrounding paranasal sinus anatomy. Functional tests, such as the dye disappearance test and its endoscopically monitored modifications, remain valuable for confirming that an obstruction is functionally significant, but by themselves they say little about its exact anatomical location [7]. It is for this reason that radiographic and cross-sectional imaging techniques - conventional dacryocystography, computed tomography dacryocystography (CT-DCG), and, more recently, multislice and cone-beam CT protocols combined with contrast instillation - have attracted growing clinical and research interest as a means of visualizing the lacrimal drainage system as a three-dimensional structure embedded within the surrounding nasal and paranasal framework. Recent multicenter and single-center series applying these combined approaches have shown that fusing functional, radiological, and endoscopic data substantially improves the surgeon's ability to plan the extent of bony removal, to anticipate anatomical variants, and to identify concomitant nasal pathology - such as septal deviation, sinonasal polyposis, or vasomotor rhinitis - that might otherwise be missed and that can compromise surgical outcomes if left unaddressed [1, 2, 3, 14, 16].

Despite this progress, most published studies to date have examined endoscopy, dacryocystography, and computed tomography as separate, competing modalities rather than as complementary components of a single diagnostic algorithm, and comparatively few have attempted to quantify, within one patient cohort, how much additional information each method contributes once the others have already been applied. Moreover, the specific behavior of radiopaque contrast agents of varying viscosity within the lacrimal pathways, and the practical implications of this for image quality and canalicular visualization, remain incompletely characterized in the available literature. This gap is particularly relevant for surgeons practicing outside the small number of high-volume referral centers that generated most of the existing evidence, since local anatomical variation, differences in available equipment, and differences in the typical stage at which patients present may all affect which diagnostic strategy is most efficient in a given clinical setting.

It is precisely this combination of a still-evolving surgical landscape and an incompletely standardized preoperative diagnostic pathway that makes the present line of investigation relevant

today. Despite the continuous advancement of diagnostic technologies in this field - including computed tomography and endoscopes of various flexibility - the incidence of dacryocystitis in clinical practice is not decreasing, and clinicians continue to encounter cases in which the site and cause of obstruction are only fully clarified during surgery itself, after the operative plan has already been fixed. This is precisely what motivates researchers, both foreign and local, to pursue further study in this direction, since the data obtained through modern examination methods make it possible to view the nasal cavity and its adjoining structures as a single, interconnected system rather than as isolated anatomical compartments.

In this connection, the present article set the following aim: to determine how effective endoscopic, radiological, and computed-tomographic methods are - both individually and, above all, in combination - in the comprehensive preoperative assessment of the lacrimal pathways and nasal structures in patients with chronic dacryocystitis, and to establish a practical, reproducible diagnostic sequence that can be applied in everyday clinical practice.

Materials and methods.

The observation covered 80 patients treated between 2024 and 2026 at the Republican Specialized Scientific and Practical Medical Center of Otorhinolaryngology and Head and Neck Diseases, along with 20 conditionally healthy individuals included for comparison. The majority were aged 18 to 59 years and were predominantly female (60% of the total number).

The inclusion criteria for the study were as follows: age of at least 18 years, a history of tearing persisting for no less than three months, a confirmed diagnosis of chronic dacryocystitis, and complete obstruction of the lower portion of the duct with no patency found on irrigation. Conversely, individuals were excluded from the study if they had severe somatic pathology, a tumor identified in the nasal cavity or lacrimal pathways, or if the duct proved patent during irrigation.

For each subject, complaints and history were carefully collected, the degree of tearing was assessed using the Munk scale, functional status was studied by means of acoustic rhinometry and anterior active rhinomanometry, anterior rhinoscopy and endonasal endoscopy were performed using rigid 0°, 30°, and 70° optical instruments from Storz and Eleps, and 3D MSCT of the paranasal sinuses was obtained. To determine duct patency, irrigation with physiological saline was carried out, together with a modified dye test using a diluted (0.5%) solution of methylene blue under endoscopic control, and the lacrimal-nasal (Jones) test; the outcome was observed every half minute over a total period of thirty minutes.

Dacryocystography was performed in the occipitofrontal projection using a contrast agent developed by the authors - based on urografin or omnipaque thickened with hydroxypropyl methylcellulose or polyvinyl alcohol; the relative viscosity of the preparation was measured using an Ostwald viscometer. Computed tomography was carried out on a Siemens Somatom CRX (third-generation) unit at 125 kV and 500 mAs, with 2-millimeter slice sections, using a contrast agent with an iodine content of 8 mg/mL, in axial and coronal projections. The statistical significance of differences between groups was assessed using the chi-square test ($p<0.05$ was considered significant).

Results and discussion.

The results of the modified dye test showed that in all subjects examined (that is, one hundred percent), the indicator was not detected at all in the nasal cavity within the designated thirty-minute period - meaning the duct was in a state of complete occlusion. Because the test was monitored via endoscope, its results were considerably more reliable than those obtained with conventional methods.

The polymer preparation used during dacryocystography stood out for its adhesive properties: owing to its consistency, which is close to that of tear fluid, even the thinnest canaliculi were clearly visualized. The relative viscosity of this preparation ranged from 100 to 150 units, whereas this figure is only about six units for standard water-soluble agents. Notably, no allergic or other adverse reaction was recorded in any patient.

Computed tomography was performed in 38 patients (60% of the total number) in axial and coronal sections, with the ducts pre-contrasted. As for the topographic location of the sac, in 78% of cases it was found between the lacrimal bone and the frontal process, in 18% behind the frontal process alone, and in the remaining five percent behind the lacrimal bone itself. The average cross-sectional area of the sac was 6.1±0.9 mm², and the average distance from its base to the middle nasal concha was 3.4±0.7 mm. The width of the common nasal meatus in the osteomeatal region was 3.1±0.4 mm in the first group and 2.8±0.6 mm in the second group.

Furthermore, MSCT revealed that among patients with impaired duct function, 10% had polypoid changes in the maxillary sinus and ethmoid cells, 14% had a deviated septum, and 11% had vasomotor rhinitis. On the operated side, the tomographic measurement indicators fully matched the picture observed during surgery, which attests to the high predictive capacity of the method.

Histological examination of 47 specimens obtained during surgery revealed the presence of stratified epithelium, lymphoplasmacytic cell infiltration, and seromucous glands in the mucosa of the lacrimal sac and duct - this finding once again objectively confirmed the clinical and instrumental diagnostic conclusions.

Discussion. The data gathered during the study indicate that relying on a single method does not provide a complete picture of the obstruction - while the dye test reveals the functional aspect, dacryocystography and computed tomography provide precise dimensional, topographic evidence. In particular, the use of the highly viscous proprietary contrast agent made it possible to obtain a considerably clearer image than with standard preparations, which is of particular value in visualizing narrowed structures. The high degree of agreement between the MSCT data and the actual picture observed during surgery (fully identical in 60% of cases) provides grounds for recommending this method as a mandatory preoperative stage.

Conclusion.

1. The modified dye test, using a methylene blue solution as the indicator and carried out under endonasal endoscopic control, allows the patency of the lacrimal pathways to be assessed with high accuracy.

2. The water-soluble, polymer-based radiopaque agent (with a relative viscosity of 100-150 units) clearly contrasts the ducts owing to its consistency, which is close to that of tear fluid.

3. Computed tomography performed together with the polymer contrast agent containing 8 mg/mL of iodine is an effective method for determining the condition of the sac, the location of the obstruction, and the most suitable surgical approach.

4. The combined use of endoscopic, dacryocystographic, and computed-tomographic methods enables timely detection of concomitant nasal pathology (found in 32% of subjects) and correct determination of the surgical scope.

REFERENCES

1. Aftab R. et al. Success of Endoscopic Dacryocystorhinostomy Using Flap Technique. Pakistan Journal of Health Sciences. 2026:105-110.

2. Agarwal A., Bothra N. Endoscopic Dacryocystorhinostomy in Management of Lacrimal Drainage System Obstructions. Current Otorhinolaryngology Reports. 2026;14(1):6.

3. Akbari M. et al. Comparison of Results of Primary Endoscopic Dacryocystorhinostomy With and Without Silicon Stent Placement: A Randomized Clinical Trial. Indian Journal of Otolaryngology and Head & Neck Surgery. 2025;77(5):2097-2103.

4. Amarnath S. B., Gouthami Sushma S., Visweswara Rao Guthi. Restoring the Flow: Observational Outcomes of Endoscopic Endonasal Dacryocystorhinostomy in a Tertiary Care Institution. Cureus. 2025;17(9):e92730.

5. Babu A. R., Sandhya D., Amulya T. M. et al. Endoscopic Dacryocystorhinostomy: A Comprehensive Review of Surgical Techniques and Clinical Outcomes. Indian Journal of Otolaryngology and Head & Neck Surgery. 2024;76:4575-4579.

6. Bani-Ata M., Aleshawi A., Ahmad M., Saleh O., Ashour R., Khalil H., Alomari S., Alhowary A. A. A. Endoscopic dacryocystorhinostomy: a comparison of double-flap and single-flap techniques. Annals of Medicine and Surgery (London). 2020;54:1-5.

7. Boal N., Chiou C., Sadlak N. Antibiotic utilization in endoscopic dacryocystorhinostomy: a multi-institutional study and review of the literature. Orbit. 2024;43(2):183-189.

8. Dutta M., Ghatak S., Bandyopadhyay S. Should Silicone Lacrimal Stenting be a Better Choice for Primary Endoscopic Powered Dacryocystorhinostomy? Indian Journal of Otolaryngology and Head & Neck Surgery. 2023;75(2):496-502.

9. Homer N., Watson A., Nakra T. Post-operative endonasal debridement may improve outcomes of endoscopic dacryocystorhinostomy. Ear, Nose & Throat Journal. 2023 (published online).

10. Kaptı H., Korkmaz H. Evaluation of the efficacy of postoperative triamcinolone in endoscopic dacryocystorhinostomy using lacrimal symptom questionnaire. International Ophthalmology. 2022;42:2573-2580.

11. Lilja M., Leivo T., Uusitalo M. Acute versus late endoscopic dacryocystorhinostomy in treatment of acute dacryocystitis: a prospective randomised trial with an 18-month follow-up. Acta Ophthalmologica. 2024;102:441-447.

12. Liu S., Zhang H., Zhang Y-R., Chen L-J., Yu X-Y. The efficacy of endoscopic dacryocystorhinostomy in the treatment of dacryocystitis: A systematic review and meta-analysis. Medicine. 2024;103(11):e37312.

13. Locatello L. G., Redolfi De Zan E., Caiazza N., Tarantini A., Lanzetta P., Miani C. A critical update on endoscopic dacryocystorhinostomy. Acta Otorhinolaryngologica Italica. 2024;44(6):351-360.

14. Mao B-X., Wang Y-H., Liu Z-K., An N-Y., Jin H-L., Wang M-L., Wu W-C., Yu B. Endoscopic dacryocystorhinostomy in acute dacryocystitis: a multicenter study in China. International Journal of Ophthalmology. 2024;17(9):1689-1695.

15. Pakdel F., Soleimani M., Kasaei A. Shifting to very early endoscopic DCR in acute suppurative dacryocystitis. Eye. 2020;34:1648-1653.

16. Rikhtehgar M. H., Rikhtehgar M. J., Hassanpour K., Aletaha M., Veisi A. Clinical outcomes of endoscopic dacryocystorhinostomy without preserving mucosal flaps in combination with silicone stent and steroid-soaked gelfoam. Journal Français d'Ophtalmologie. 2024;47(2):104013.

17. Sung J., Kim J., Hwang J. et al. Optimal timing for primary early endoscopic dacryocystorhinostomy in acute dacryocystitis. Journal of Clinical Medicine. 2021;10(10):2161.

18. Vinciguerra A., Nonis A., Resti A. et al. Impact of post-surgical therapies on endoscopic and external dacryocystorhinostomy: systematic review and meta-analysis. American Journal of Rhinology & Allergy. 2020;34(6):846-856.

19. Wladis E., Khan H., Chen V. Are systemic antibiotics required during and after dacryocystitis-related dacryocystorhinostomy? Orbit. 2020;39(6):413-414.

20. Yang J., Cao Z., Gu Z. Modified endoscopic dacryocystorhinostomy using the middle uncinate process approach. Journal of Craniofacial Surgery. 2020;31(5):1464-1466.

21. Yu B., Tu Y., Zhou G. Management of chronic dacryocystitis cases after failed external dacryocystorhinostomy using endoscopic technique with a novel lacrimal ostium stent. International Journal of Ophthalmology. 2022;15(3):413-419.

22. Outcome of endoscopic dacryocystorhinostomy in elderly versus younger adults: a comparative analysis. Canadian Journal of Ophthalmology. 2026 (published online ahead of print).