ORIGINAL RESEARCH

Advantageous Hyaluronic Acid in Endoscopic Dacryocystorhinostomy

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Abstract

Background: Endoscopic dacryocystorhinostomy (Endo-DCR) is a standard care for chronic dacryocystitis; however, wound adhesion and granulation affect its optimal outcome. Surgical technique modification, stents, and chemicals are used to achieve better results. Hyaluronic acid has beneficial effects on mucosa which encouraged us to perform a study to find its role in Endo-DCR.

Materials and methods: The study had a hyaluronic acid case group and a control group consisting of thirteen subjects each. Standard Endo-DCR was performed in all while the case group had hyaluronic acid application around the ostium.

Results: The hyaluronic acid group showed a statistically significant difference in ostium patency as compared to the control group. Granulation and adhesions formation were significantly lower in the case group.

Conclusion: Hyaluronic acid increased the surgical success rate of Endo-DCR in this study. Further research in a large sample size randomized control study with a longer follow-up period is warranted.

Keywords: Chronic dacryocystitis, Endonasal dacryocystorhinostomy, Hyaluronic acid, Success rate.

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Introduction

Dacryocystorhinostomy (DCR) consisting of external and endonasal methods is the existing standard procedure for managing nasolacrimal duct obstruction beyond the lacrimal sac.

Although external dacryocystorhinostomy (Ex-DCR) is considered to be a gold standard treatment for the nasolacrimal duct obstruction, endoscopic dacryocystorhinostomy (Endo-DCR) is favored by patients and surgeons as this technique avoids external facial scar and medial palpebral ligament or angular facial vessels injury.[1] However, Endo-DCR has some limitations in terms of stoma stenosis or closure leading to surgical failure. To overcome this, some surgical modifications in terms of the use of lacrimal stents and fibrosis-inhibiting drugs (mitomycin-C) have been advocated; however, they also carry the risk of outcome failure. Hyaluronic acid has the ability to retain moisture and decrease fibrosis. It is used in cosmetic and ophthalmic practice as skin lotion/cream and intradermal/intralesional injections. Hyaluronic acid has been found to be helpful in the preservation of mucosal physiology and lower adhesion rates in postoperative care following sinus surgery.[2–6] Hence, this study was performed to determine the effectiveness of hyaluronic acid application in Endo-DCR.

Materials and Methods

This study was conducted on adult patients of chronic dacryocystitis after institutional ethical approval. All subjects gave informed consent for enrolment in this study. Subjects with facial trauma, previous nasal or ophthalmic surgery, nasal or ophthalmic anatomical variations, requiring revision surgery, and systemic diseases were excluded from the study.

Twenty-six subjects were allocated equally to the case and control groups using computer-generated random numbers. The subjects were blinded to the group allocation. The case group had a mean age of 43.69 ± 13.55 years and received sodium hyaluronic acid application at the operative site while control subjects with a mean age of 45.62 ± 9.18 years underwent standard Endo-DCR and did not receive any drug at the operative site.

The subjects underwent nasal Endo-DCR as per standard operative technique under local or general anesthesia. All cases were performed by well-trained and experienced endoscopic surgeons. The standard Endo-DCR surgical procedure was followed. The lacrimal sac is opened and widened by complete removal of its medial wall. The patency was confirmed by the free flow of Betadine-diluted normal saline through the nasolacrimal duct. One milliliter of hyaluronic acid was applied to the stoma with Gelfoam snugly inserted into the sac. The control group did not receive drug therapy in the stoma site. Nose packed with merocel which was removed after 18–24 hours. Nasal douching using normal saline was done in all subjects. All subjects were prescribed nasal saline spray and eye drops containing antibiotics and dexamethasone. All subjects were evaluated at 1, 4, 8, and 12 weeks after the surgery for relief of symptoms, lacrimal sac patency, and nasal endoscopic examination and cleaning. The interventional outcome was

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assessed on patency of the lacrimal system, endoscopic observation on stoma size and granulation, and the patient's perspective on the outcome.

Results

The subjects were subjected to nasal douching, cleaning, and endoscopic examination on every follow-up visit.

Subjects of both groups were evaluated for symptomatic relief for epiphora in each follow-up visit. All subjects belonging to both groups had improvement in symptoms on the first follow-up at 1 week; however, this satisfaction started decreasing on subsequent visits. In comparison to the control group, the case group had symptomatic improvement. This variable showed a highly significant difference (p <0.05).

The lacrimal sac was patent in all subjects of both groups at the first follow-up 1 week after surgery. However, the number of subjects started decreasing in subsequent visits to the control group which lead to a significant difference (p <0.05) (Table 1).

The endoscopic examination found patent stoma without any granuloma formation in all subjects of both groups in the first visit 1 week after surgery. Following visits at 4, 8, and 12 weeks after surgery found statistically significant (p <0.05) differences in granuloma, stoma size, and adhesions in the case group as compared to the control group (Table 2).

Discussion

Dacryocystorhinostomy (DCR) is commonly used to treat nasolacrimal duct obstruction. Although external DCR is the most common method, Endo-DCR is also becoming widely accepted.[7]

For the last two decades, Endo-DCR is on the rise with various technique modifications like laser surgery,[8] mucosal flap,[9,10] silicon tube stent, and mitomycin-C application[11–13] so as to achieve absolute success. However, all these modifications have varied success rates as compared to standard external DCR.[11–13] In this quest, we did a study to find the advantages of hyaluronic acid in the Endo-DCR.

Hyaluronic acid is a glycosaminoglycan formed by glucuronic acid and N-acetylglucosamine. It is a major component of the extracellular matrix and is found abundantly in the synovial fluid, connective tissue, vitreous humor, and umbilical cord. It has anti-inflammatory property and preserves mucociliary functions.

Hyaluronic acid ointment/cream is commonly used in Switzerland for nasal surgery. It provides excellent mucosal healing after surgery.[2] The beneficial effects of hyaluronic acid on nasal mucosa encouraged us to find the effect of this drug in Endo-DCR. The present study found a 100% success rate with hyaluronic acid in comparison to standard Endo-DCR which showed 61.53 and 69.23% success rates in syringing and symptomatic after 12 weeks of surgery. Wu et al.[14] studied the effects of hyaluronic acid coverage on wound healing and ostial patency in Endo-DCR and found that the success rate of ostial patency reached 94.6% in the hyaluronic acid group compared to 80% in the control group and concluded that hyaluronic acid group enhances the success rate of Endo-DCR by promoting mucosal epithelial healing and preventing excessive scarring.

We did not find any granulation or adhesion in the case group while more than 50% of subjects in the control group had granuloma and adhesions at 12 weeks. Khorshidi et al.[15] did an animal experimental study to find the effectiveness of sodium hyaluronic, sesame oil in preventing postoperative adhesion formation. They found that adhesions were 48% less than in other groups leading to the conclusion that hyaluronic acid prevents postoperative adhesion. Fong et al.[3] reviewed 13 studies involving 501 patients who had hyaluronic acid application in endoscopic sinus surgery. They found a low incidence of adhesions after surgery with insignificant side effects. They concluded hyaluronic acid application could bring better outcome result in endoscopic sinus surgery.

Park et al.[4] studied the effectiveness of sodium hyaluronate application in Endo-DCR and found significant anatomical and functional success in comparison to the control group. The granuloma formation was also found to be significantly less in hyaluronate subjects. The synechia formation was also less in this group but it did not show significance as compared to the control group. Macchi et al.[5] did a randomized control trial in 46 cases undergoing endoscopic sinus surgery. They found that nasal mucosa and ciliary motility functions were significantly better

Table 1: Nasolacrimal patency and symptomatic improvement during follow-ups

	Case		*Control*	
Follow-up period (week)	*Syringing*	*Symptomatic relief*	*Syringing*	*Symptomatic relief*
1	13 (100%)	13 (100%)	13 (100%)	13 (100%)
4	13 (100%)	13 (100%)	11 (84.61%)	11 (84.61%)
8	13 (100%)	13 (100%)	9 (69.23%)	9 (69.23%)
12	13 (100%)	13 (100%)	9 (69.23%)	8 (61.53%)

Table 2: Local tissue response during follow-ups

	Case				*Control*			
	Granuloma grade				*Granuloma grade*			
Follow-up period (week)	*I*	*II*	*III*	*Adhesions*	*I*	*II*	*III*	*Adhesions*
1	—	—	—	—	—	—	—	—
4*	—	—	—	—	1	6	—	2
8*	3	—	—	—	7	3	—	1
12*	—	—	—	—	4	2	—	2

*p <0.05

with hyaluronic acid in comparison to the control group who received saline. Similar results were found by Mozzanica et al.[6] in a multicentric, prospective, randomized, double-blind, parallel group study on 56 endoscopic sinus surgery patients.

Small sample size and shorter follow-up were the main limitations of the present study; however, hyaluronic acid was found safe that improves the surgical outcome of Endo-DCR which is still progressing to match the external DCR, the gold standard technique.

Summary

- Endo-DCR has become favorable over external DCR due to cosmetic concerns.
- Various modifications have been incorporated for the absolute success of Endo-DCR.
- This case–control study used hyaluronic acid in Endo-DCR as it decreases adhesion and granulations.
- This study found 100% ostium patency in cases who received hyaluronic acid.
- Further large sample randomized control study is warranted to prove that hyaluronic acid can help Endo-DCR to achieve surgical outcomes similar to external DCR.

Ethical Standards

The authors assert that all procedures contributing to this work comply with the ethical standards of the national and institutional guidelines on research in humans by use of hyaluronic acid in Endo-DCR and with the Helsinki Declaration of 1975, as revised in 2008.

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