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REVIEW ARTICLE

Endoscopic Management of Pediatric Nasolacrimal Anomalies

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ABSTRACT

The nasolacrimal drainage system begins development in the third fetal months from a cord of epithelium found between the maxillary and frontal nasal recesses. Canalization of this cord along its entire length leads to its communication with the inferior nasal meatus by the sixth fetal month. Failure of canalization is the most common cause of nasolacrimal drainage obstruction use of endoscopes in children is evolving, may it be endoscopic DCR or other congenital problems. In spite of the smaller anatomic dimensions posing a technical challenge, the endonasal endoscopic approach to nasolacrimal obstruction in children not only avoids a scar, it preserves the function of the lacrimal pump also.

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INTRODUCTION

The nasolacrimal drainage system begins development in the third fetal months from a cord of epithelium found between the maxillary and frontal nasal recesees.[1] Canalization of this cord along its entire length leads to its communication with the inferior nasal meatus by the sixth fetal month. If this canalization fails to occur, it most commonly leaves a membranous barrier between the nasolacrimal duct and the nasal cavity at the level of valve of Hasner, which is the most common cause of nasolacrimal drainage obstruction in infants.

A congenital dacryocystocele occur when there is both an imperforate nasolacrimal duct distally and a valve like obstruction at the junction of the common canaliculus and lacrimal sac proximally.[2] Accumulation of fluid leads to distention of the nasolacrimal duct system. The proximal obstruction is attributed to distention of the sac compressing the canalicular system, causing a function trap door type block. Chronic distention of the nasolacrimal system in the setting of patient obstruction also may adversely affect lacrimal pump function, further compressing tear drainage.

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CLINICAL FEATURES

Congenital dacryocystocele have a significant demonstrable female preponderance.[3-6] There seem to be a genetic predilection as whites are generally more commonly affected than other racial groups.[3-5] Congenital dacryocystoceles may either unilateral or bilateral.

Congenital dacryocystoceles typically present at birth or become apparent with in the few weeks of life as tear production increases. Epiphora is the most common manifestation. A cystic mass with bluish coloration may be noted at the medial canthus. Manual compression of this mass fails to result in the reflux of tears through the lacrimal puncta. These infants are at increased risk for developing secondary infection. Infact, acute dacryocystitis, periorbital cellulites or orbital cellulites in neonates should raise the suspicion of presence of this anomaly.

It can also present as an ipsilateral nasal cyst or in some cases the expansion of cyst occurs only in the nasal cavity and the child presents with nasal congestion only. Respiratory distress would be commonly associated with congenital dacryocystocele with nasal extension because infants are obligate nasal breathers,[7-9] and bilateral ones can cause life-threatening airway obstruction.

On examination after a proper decongestion of nose, endoscopy will reveal a cystic mass arising from the undersurface of inferior turbinate, which will be soft and compressible when palpated with a nasal probe or suction, or sometimes just redundant mucosa without an obvious mass is visualized.

A large intranasal dacryocystocele obstructing the nasal cavity leads to be differentiated from other cystic tissue masses, like nasal descurd, nasal glioma most significantly encephaloceles or meningoencephaloceles.

The characteristic radiological findings of a congenital dacryocystocele with nasal extension include the trial of

medial canthal cystic mass, a detailed ipsilateral nasolacrimal duct and an intranasal cystic mass all in continuity on CT scan. Although not routinely indicated, MRI offers additional soft tissue delineation of these is a doubt of a contiguous intracranial communication.

MANAGEMENT

Management of congenital dacryocystoceles largely depends upon its division into uncomplicated and complicated categories based on clinical presentation. Surgical intervention is indicated if:

a. Dacryocystocele is associated with acute or chronic dacryocystitis.
b. External medial canthal cyst is large and causing corneal astigmatism with risk of amblyopia.
c. An intranasal cyst causes respiratory distress.

Uncomplicated Categories

There is evidence to suggest that spontaneous dacryocystocele resolution may occur.[3] Initial treatment may be conservation. Warm compresses and lacrimal massage are advocated to enhance nasolacrimal drainage. Topical antibiotics can be used to prevent secondary conjunctivitis. Lacrimal probing is proposed if spontaneous resolution does not occur.

Complicated Categories

A joint otorhinolaryngologic and ophthalmologic approach to the treatment is advocated. Marsupialization with endoscopic excision of the medial cyst wall is preferred over simple cyst puncture with compression. Laser mucosal vaporization is an alternate approach but adds unnecessary time and cost without improved effectiveness. Concomitant nasolacrimal probing and irrigation are necessary to ascertain nasolacrimal system potency.[10] This therapeutic approach also provides tissue for confirmatory histopathological examination.[5]

PEDIATRIC ENDONASAL ENDOSCOPIC DCR

Nasolacrimal duct (NLD) obstruction is a common disorder, clinically manifested by the presence of tearing and or infection. Although, it is not a serious condition, the symptoms like epiphora or repeated infections are quite annoying and cosmetically distressing. Nasolacrimal duct stenosis is a common etiology for epiphora and matting of eyelashes in infants and young children. Uncomplicated congenital nasolacrimal obstruction occurs in up to 6% of all infants and has a spontaneous remission rate of 85 to 96% by the age of 1 year.[11,12] Nasolacrimal massage with or without probing and dilatation helps to receive most of the obstructions. The success rate of probing decreases with increasing age of the child. The success rate at age 12 months or less is 92% whereas success rate at age 18 months or older is only 50%, so it is generally avoided after 12 months of age.[13]

External Dacryocystorhinostomy (DCR) for the treatment of nasolacrimal duct obstruction was first described by Addeo Toti in 1904.[14] Caldwell described the first endonasal operative approach to the lacrimal system in 1893.[15] It was modified by West[16] in 1910 and advocated by Mosher[17] in 1921. Despite all this, endonasal approach could not gain popularity because of limited transnasal visualization. With the advent of rigid nasal endoscopes and fiberoptic light carrier systems, surgical access through the nasal cavity has been greatly enhanced because of better illumination and magnification. In 1989, McDonough and Meiring[18] described the endoscopic nasal DCR. Many modifications and different techniques in the procedure have been described by different authors to establish that endoscopic DCR could be safely performed in adults with less morbidity and comparable success rates to those with traditional external approach. Review of literature reveals paucity of data on the role of endoscopic DCR in children.[19-23]

For a successful operative result of endonasal endoscopic DCR, the understanding of the nasolacrimal system is very important. The lacrimal drainage system begins at the superior and inferior puncta. These lacrimal puncta lead into the vertical and then into the horizontal segments of the superior and inferior canaliculi, which join medially to form the common canaliculus. As it passes through the posterolateral surface of the sac, the valve of Rosenmuller guards it. The lacrimal sac passes inferiorly into the nasolacrimal duct which traverses a bony canal for approximately 1.5 to 2.0 cm along the medial maxillary wall until it opens into the inferior meatus through the valve of Hasner. This is the most common site for the nasolacrimal duct blockage.[24] Obstruction of the nasolacrimal system can occur proximally at the puncta or the valve of Rosenmuller or distally at the valve of Hasner or there can be combination of obstruction at both sites. Children with obstruction at both the sites lead stasis of secretions and a formation of a mucocele or a pyocele presenting as a medial canthal mass.

Congenital nasolacrimal obstruction is unlikely to resolve spontaneously regardless of the age of the child.[11] In older children prognosis following nasolacrimal intubation is also poor, may be because of inflammation induced canalicular obstruction.[25] So, an early surgical intervention in the form of endonasal endoscopic DCR is advocated in the children.

Surgical Technique

Hypotensive general anesthesia is typically necessary in all children. The child is positioned supine with nose

and affected eye in the operative field. The nasal cavity and middle meatus is packed with nasal wicks having 4% lignocaine with adrenaline (1:50,0000), for adequate decongestion to achieve a bloodless field. Zero degree and 30° with 2.7 and 4 mm diameter nasal endoscopes can be used for surgery. The lateral wall of nose and around the attachment of the middle turbinate along with the area of lacrimal fossa externally is infiltrated with 1% lignocaine with 1:1 lac adrenaline. A Rosen's knife is then used to elevate a 2 × 1.5 cm strip of the mucosa anterior to the anterior attachment of the middle turbinate to expose the lacrimal bone. The lacrimal bone can removed to expose the lacrimal sac. The most important step is the identification of the medial wall of the sac. The position of the lacrimal sac is confirmed by pressing the sac area externally, which causes bulging of the lacrimal sac into the nasal cavity. A Kerrison rounger or sometimes a sheathed drill (if the bone thickness is more) is used to fashion a 1.0 to 1.5 cm bony window exposing the entire medial wall of the lacrimal sac. Lasers such as holmium: YAG laser can be used for this purpose.[19] The bony defect is smoothened. A sickle knife, an angled keratome or a myringotomy knife can used to incise the lacrimal sac. The medial wall of the sac is then removed by Blakesley forceps making as wide opening as possible.

Patency of the stoma is checked by sac syringing and confirming the free flow of irrigating fluid by the endoscope. Only adequate amount of nasal mucosa is removed so as to expose the sac, so that there is no granulations tissue formation.

Postoperative Care and Follow-up

Immediate postoperatively, patients can be asked to put antibiotic steroid eye drops and nasal decongestant drops. Though discomforting to children but regular saline nasal irrigation is advised. Endoscopy and sac syringing can be done after 1 month to check the patency of the stoma and to remove any crusts or granulations if present. After 1 month patients can be called for follow-up every month for 3 months then at 6 months and possibly at 1 year and more. A failed procedure is to be reviewed and assessed for its cause and revision surgery. Any underlying cause for the failure is treated first and then the revision surgery performed. An uncinectomy can be considered at the time of revision surgery.

RESULTS

Success rate following the performance of external DCR in children is reported to be in the range of 83 to 96%.[25-27] The primary surgical failure rate in children of 10% reported is similar to that reported in adults.[28] The success rate of endoscopic DCR without the use of any stents and probing during the procedure in a study carried out by Gupta et al was 94.4%, which is comparable to other studies of both the external and endoscopic techniques with or without stents.[29] The purpose of nasolacrimal stenting is to maintain DCR ostium patency but there is evidence that it may rather increase the chances of failure by inciting granulomatous inflammation at the nasolacrimal fistula site.[30] The success rate of 94.4% in the series by Gupta and Bansal[29] also emphasis the facts that probing and stenting of the lacrimal system at the time of the primary surgery does not improve the surgical results rather may cause more failures. Moreover, this study used relief of patients' symptoms as a subjective method and endoscopic visualization of the lacrimal sac ostium as an objective method for labeling a successful outcome.

CONCLUSION

In summary, the use of endoscopes in children is evolving, may it be endoscopic DCR or other congenital problems. In spite of the smaller anatomic dimensions posing a technical challenge, the endonasal endoscopic approach to nasolacrimal obstruction in children offer several advantages such as:

- Acute stage of the disease is not a contraindication.
- It prevents an external scar.
- It preserves the functional pump mechanism of tearing by maintaining the integrity of the orbicularis oculi muscle and medial palpebral ligaments.
- Endoscopic DCR can be followed up easily through the nasal cavity and any problem can be dealt at the initial stage.

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