Resolution of Dacryostenosis After Osteopathic Manipulative Treatment

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Dacryostenosis is an obstruction of the nasolacrimal duct and is the most common cause of epiphora and ocular discharge in newborns. Whereas most cases resolve spontaneously, invasive treatment may become necessary if symptoms persist past age 6 to 12 months. In the present case, a 9-month-old boy with persistent dacryostenosis was scheduled for lacrimal duct probing after first-line treatments failed. After a single session of osteopathic manipulative treatment, the patient's epiphora and other symptoms resolved, and he no longer needed surgical probing. A review of the literature highlights key pathophysiologic processes, management options, and musculoskeletal aspects of dacryostenosis. Physicians should consider osteopathic manipulative treatment in the management of dacryostenosis.

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Dacryostenosis, an obstruction of the nasolacrimal duct (NLD),[1] is found in up to 20% of newborns[2] and is the most common cause of epiphora and ocular discharge in this patient population. Dacryostenosis results from either incomplete canalization of the nasolacrimal epithelial cord in utero or from misaligned cranial bones that have shifted due to forces in utero, during childbirth, or during the postpartum period.[3,4]

The criterion standard of care for patients with dacryostenosis is nasolacrimal massage, a noninvasive technique in which a nonspecific pressure is applied over the lacrimal sac to force tears into the NLD. The primary role of the NLD is to drain tears from the eye. Although 96% of dacryostenosis cases resolve spontaneously by age 12 months, the likelihood of spontaneous resolution decreases with age.[5] If symptoms persist for infants aged 6 to 12 months, nasolacrimal probing with the use of anesthesia may be required.[6] If dacryostenosis is left untreated, patients are at risk for complications such as infection and anisometropia.[1,5]

We report the case of an infant boy whose persistent dacryostenosis resolved after osteopathic manipulative treatment (OMT). To our knowledge, the current report is the first to discuss OMT for dacryostenosis.

Report of Case

A 9-month-old boy was brought to the health care clinic by his mother, who reported increased tearing and crusting around the boy's right eye upon waking. The patient had a history of dacryostenosis and recurrent dacryocystitis since birth, as diagnosed by his pediatrician and ophthalmologist. The mother had been performing nasolacrimal massage on the patient twice per day as symptoms occurred since the patient's birth. At the time of the visit, the patient was on day 5 of polymyxin B sulfate-trimethoprim ophthalmic solution (10,000 U-1 mg/mL) and bacitracin ophthalmic ointment (500 U/g). The mother reported that the antibiotics would alleviate the patient's symptoms temporarily, but that his symptoms would reappear within a few weeks after stopping antibiotics. Because of the recurrent symptoms, the patient was scheduled for nasolacrimal probing.

The patient had no notable medical or family history. He was born at 38 weeks gestation to a primigravid mother by cesarean delivery for failure to progress. He had no known drug or seasonal allergies. His ophthalmologist reported no additional vision or ocular problems. No pets were in the patient's home and neither parent smoked cigarettes or used drugs.

Physical examination revealed that vital signs were within reference range. The patient was meeting all developmental milestones appropriately. Examination of the head was notable for increased tearing of the right eye without pus or blood. The right orbit appeared smaller compared with the left orbit because of increased edema of the soft tissue surrounding the eye (*Figure 1A*). The remainder of the physical examination findings were unremarkable.

Osteopathic structural examination findings included internal rotation somatic dysfunction of the right nasal bone, right frontal bone, and right maxillary bone; bilateral condylar compression; right scalene spasm; spinal levels C2 through C3 flexed, rotated, and sidebent right; spinal level C5 extended, rotated, and sidebent left; right first rib inhalation dysfunction; and spinal level T1 flexed, rotated, and sidebent right. The patient was treated with OMT techniques including nasion spread, cranial bone lifts such as frontal lift and maxillary lift, balanced ligamentous tension of the cervical and upper thoracic regions, bilateral condylar decompression, and myofascial release of the cervical spine and thoracic inlet.

Immediately after treatment, edema around the patient's right eye decreased. During 3 follow-up telephone calls, the patient's mother reported the following: At 1 week after treatment, epiphora and ocular discharge had decreased. At 3 weeks after treatment, epiphora had resolved, ocular discharge was present, and the edema around the right eye had decreased (*Figure 1B*). At 6 months after treatment, no symptoms were present. Surgical nasolacrimal probing or nasolacrimal massage were no longer required, and the patient had not needed antibiotics since receiving OMT.

Discussion

Physiologic and Pathologic Process

The NLD originates at the nasolacrimal fossa in the medial wall of the orbit. The nasolacrimal fossa comprises the lacrimal bone posteriorly and the frontal process of the maxilla anteriorly. Canalization begins during the third month in utero and starts superiorly at the punctum and ends distally at the Hasner valve, which covers the opening to the inferior meatus of the nasal cavity (*Figure 2*).[3] When tears enter the puncta, a combination of orbicularis oculi muscle contraction, fascial traction, and negative pressure creates a pumping action to force tears farther into the NLD.[7]

The most common cause of dacryostenosis is an unopened membrane at the Hasner valve (*Figure 2*).[7] Other causes include interosseous narrowing from dysfunctions of the adjacent frontal, maxilla, and ethmoid bones. Intraosseous compression may also occur within the lacrimal bone, because the bones of an infant are soft and easily molded by surrounding stressors.[4]

Figure 1.
Eyes of a 9-month-old boy with dacryostenosis before (A) and 3 weeks after (B) osteopathic manipulative treatment. In image A, the right orbit appears smaller than the left orbit because of increased edema of the soft tissue surrounding the eye. In image B, a complete resolution of epiphora and ocular discharge and a decrease in the edema around the right eye can be observed.

Diagnosis and Complications

Diagnosis of dacryostenosis is usually clinical, marked by the presence of ocular symptoms such as discharge and epiphora. If dacryostenosis is suspected but no symptoms are present at the time of evaluation, physicians may deposit fluorescein-stained saline on the lens to evaluate drainage through the NLD. Other causes of these symptoms that must be considered in the differential diagnosis include conjunctivitis, blepharitis, and trauma. Complications of persistent dacryostenosis include anisometropia, dacryocystitis, and orbital cellulitis.[6]

Management

First-line treatment for patients with dacryostenosis is nasolacrimal massage, which is performed by applying pressure to the tissues over the NLD and massaging from the lacrimal sac toward the distal NLD. The pressure assists in forcing tears into the NLD by enhancing the mechanism of capillary action that draws tears into the lacrimal sac.[6,7] It may also help to rupture the unopened Hasner valve.[6] If symptoms persist after the patient is aged 6 to 12 months, NLD probing may be necessary. If probing fails, balloon dilation or temporary silicone stents may be used. In rare cases, permanent measures are available, such as the construction of a window between the lacrimal sac and nasal cavity.[2]

Osteopathic Approach and Considerations

To understand the role of OMT in alleviating stenosis, one must be familiar with the anatomy of the NLD and its surrounding bones, muscles, and fasciae. Structurally, the osseous canal through which the NLD traverses can narrow if the frontal process of the maxilla is driven posteriorly or if the lacrimal bone is driven anteriorly.[4] One objective of a cranial bone lift is to manage dysfunctions of the associated bones in relation to their sutural or dural connections.[8] In cases of dacryostenosis, cranial bone lifts can be used to manage the stresses placed on the lacrimal bone by the surrounding maxillary, frontal, and ethmoid bones. The canal may become more patent and drain more easily if the bony articulations are decompressed.

Orbital muscles also play a role in dacryostenosis.[7] The orbicularis oculi muscle originates at the lacrimal bone and inserts into the zygomatic bone. A small portion, known as the Horner muscle, runs posteriorly to the lacrimal sac and posterior lacrimal crest (*Figure 2*). The Horner muscle is responsible for proper NLD function and contracts to pump tears through the canal. Another portion of the orbicularis oculi muscle surrounds the ampulla and tightens to prevent retrograde movement of tears.[7] In our case, cranial bone lifts at the bony origins and insertions of the orbicularis oculi muscle addressed muscular restrictions with the goals of improving muscle function and increasing the efficacy of the pumping mechanism of tear drainage.

Osteopathic manipulative treatment may have a role in normalizing autonomic tone of the orbit. Somatic dysfunctions along the pathways of cranial nerves and

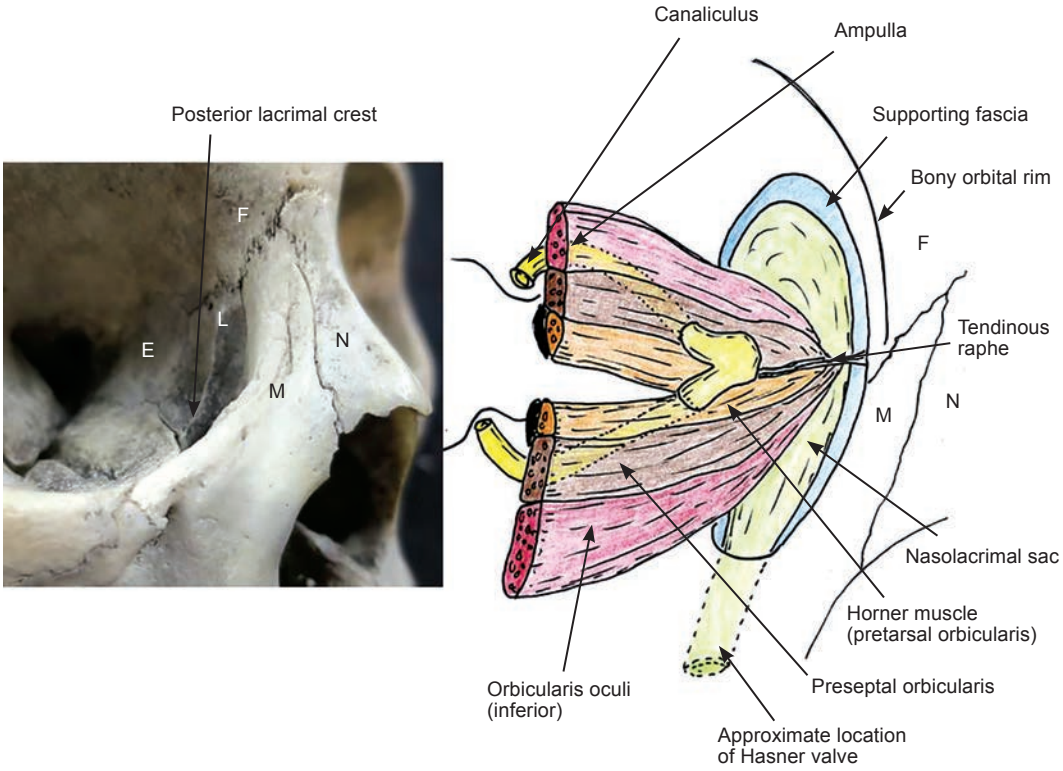

Figure 2.
Anatomy of the lacrimal duct in the eye. A small portion of the orbicularis oculi muscle, known as the Horner muscle, runs posteriorly to the lacrimal sac and posterior lacrimal crest.
Abbreviations: F, frontal bone; N, nasal bone; M, maxilla bone; E, etnmoid bone; L, lacrimal bone.
Illustration by Nikos Solounias, PhD.

their ganglia can cause symptoms of dacryostenosis, which may be alleviated as the strain patterns are managed.[9] The orbicularis oculi muscle is innervated by the temporal and zygomatic branches of the facial nerve (cranial nerve VII), which course through the facial canal and exit at the stylomastoid foramen. The ophthalmic branch (cranial nerve VI) of the trigeminal nerve provides the afferent innervation to the lacrimal gland. The efferent parasympathetic nerves originate in the brainstem, travel through the pterygoid canal, and ultimately synapse at the pterygopalatine ganglion. Postganglionic fibers exit the skull through the inferior orbital fissure.[7] The innervations of the orbicularis oculi muscle and lacrimal gland take a rather tortuous course through the cranium. Cranial bone lifts and myofascial techniques to restricted areas may improve autonomic balance, and direct inhibition of the pterygopalatine ganglion may affect lacrimation.[10]

Addressing the myofascial strains that create bony restrictions may augment lymph drainage by activating lymphatic stretch reflexes and normalizing sympathetic effects on the contractile elements of lymphatic vessels.[11] Even indirect techniques, such as cranial bone lifts, alter the pressure on smaller lymphatic vessels.[10] In our case,

the management of cervical and thoracic somatic dysfunctions potentially addressed restrictions that were preventing proper lymphatic drainage from the head and neck, which may have facilitated the subsequent decrease in periorbital edema. Orbital lymphatic vessels first drain into the preauricular, parotid, and submandibular nodes and then drain into the right thoracic duct. By understanding the anatomy of the venous and lymphatic systems surrounding the NLD, physicians can better orient their application of OMT.

Conclusion

As demonstrated in the present case, OMT may decrease the need for antibiotics and invasive procedures in patients with persistent dacryostenosis. Additional research is needed to support these findings and to evaluate the role of OMT as a potential conservative first-line treatment for these patients.

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