Proximal Lacrimal Obstruction – A Review

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Abstract

While less common than distal lacrimal obstruction, proximal obstruction causes many cases of epiphora. This article examines the aetiology of proximal lacrimal obstruction and considers current management strategies with reference to recent literature. The Lester Jones tube is the favoured method of dealing with most cases of severe proximal obstruction; other methods have been tried with less success.

Keywords

Proximal lacrimal obstruction, epiphora, canalicular blockage, Lester Jones tube

Disclosure: The authors have no conflicts of interest to declare.
Received: 31 March 2009 **Accepted:** 14 April 2009 *DOI: 10.17925/EOR.2009.03.01.81*
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Obstruction of the lacrimal apparatus commonly causes sufferers to present with symptoms of epiphora, for which they are commonly referred to ophthalmology departments. In those units where collaboration with otorhinolaryngology occurs, the distal site of obstruction is usually dealt with. However, in this article we aim to update the reader on the causes and current management strategies for proximal lacrimal obstruction, which may account for approximately only one in three cases of epiphora.[1] Lacrimal obstruction is usually classified into proximal, distal and functional causes (see *Figure 1*).

Proximal obstruction can be defined as punctal stenosis or absence, and single canalicular or common canalicular (lateral or medial); common medial canalicular blockage may be regarded as a distal blockage as it is usually caused by a membrane within the lacrimal sac closing off the internal opening of the common canaliculus (see *Figures 2–5*). Distal obstruction can be divided into sac and duct; the third category is functional obstruction (see *Figures 2–5*).

Causes of Proximal Lacrimal Obstruction

The proximal lacrimal apparatus includes the canaliculi and their puncta with the caruncle separating the puncta. Disease processes that affect the canaliculi include infective causes, particularly viral infections, cicatrising disorders (including pemphigoid and Stevens-Johnson syndrome), drug-induced stenosis, burns, facial trauma, iatrogenic injury (including radiotherapy) and neoplasms. Congenital causes can also be attributed to proximal obstruction, including dacrocystocoeles. Percentages quoted here are based on the figures derived from 310 patients attending Moorfields Eye Hospital over a 25-year period.[2]

Congenital Causes (10%)

Absence or imperfection of lacrimal puncta and/or canaliculi can occur, and in one report was found to be inherited in an autosomal dominant fashion.[3] Where absence of the punctum and papilla (congenital punctal agenesis) occurs, it is likely that more distal parts of the lacrimal apparatus are obliterated.

Ciactrical Conjunctival Disorders (~2%)

The pathological manifestation in ocular pemphigoid and Stevens-Johnson syndrome is subepithelial fibrosis of the conjunctiva, which in turn causes the canaliculi and/or puncta to become obstructed.[4] However, not all patients affected by this fibrotic change will complain of epiphora owing to the fact that the lacrimal glands may also be involved and, hence, decreased secretion of the glands will result. The inherent problem in managing these patients is the tendency for further fibrosis to occur around any indwelling devices inserted.

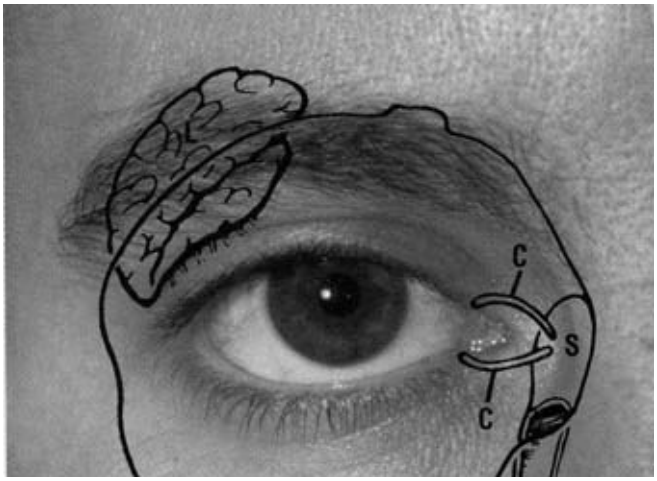
Drug-induced Canalicular Stenosis (2%)

The main suspects for causing canalicular stenosis include glaucoma drugs such as phospholine iodide and penicillin (Stevens-Johnson syndrome),[5] but fibrosis can occur with chemotherapeutic agents such as fluorouracil[6] (commonly given for gastrointestinal tumours and breast cancer).

Infective Causes (30%)

The most common infective agent implicated in obstruction of the proximal apparatus is the herpes simplex virus (HSV);[7] however, it is possible that in many cases where antivirals have been used this is an iatrogenic effect of the drug rather than of the virus itself.[8] However, in cases of herpetic keratitis, HSV has been found by testing for viral DNA in the tears passing through the lacrimal system.[9] Herpes zoster is also associated with canalicular obstruction, as is the vaccination for chicken pox.[10] Chlamydial infections have also been associated with canalicular obstruction in endemic areas.[11]

Figure 1: The Lacrimal System



Thermal and Traumatic Injuries and Radiotherapy-induced Injury (34%)

Radiotherapy treatment can induce stenosis of any part of the lacrimal system and is seen particularly with dosing to basal cell carcinomas in the inner canthal area and for sino-nasal tumours. Surgical removal of such skin lesions may also give rise to injury of the nasolacrimal apparatus.[12] Other thermal injuries to the face will have similar effects. Traumatic injury to the proximal nasolacrimal apparatus is more common in men.[2]

Canalicular Neoplasms (2%)

These are rare occurrences but may include papillomas and basal cell carcinomas.[13] The causes cited above can cause lateral common canalicular obstructions in the same manner as they affect the individual canaliculi.

Other Miscellaneous Causes

Other causes of canalicular obstruction or malfunction include failed lacrimal surgery (10%), facial nerve palsy (2%), maxillary sinusitis (0.3%), lid abscess (0.3%) and sarcoidosis (nasal) (0.3%).[2] Idiopathic cases appear to occur not infrequently (9%), and while there are theories that this is due to chronic wiping in some patients, in women post-menopausally or that there may even be a history of prior conjunctivitis,[14] there are many cases in this category where there is no identifiable underlying pathology predisposing towards stenosis of the proximal lacrimal apparatus.

Investigation of Lacrimal Obstruction

Examination – Inspection of the Lid

The lid should be carefully inspected to look for signs of punctal involvement. Ptosis may obstruct the punctum or change the dynamics between the two puncta. Any sign of weakness in opening and closing the eyelid should be noted, as well as any laxity. Holding the eyebrow against the bone and asking the patient to look down can help to demonstrate floppy lid syndrome. The position of the puncta should also be noted. If sclera show is evident on examining the relationship of the lower lid to the inferior limbus, a lacrimal pump problem may be present.

Jones Dye Tests

In a Jones I test, dye is instilled in a patient's eye and a cotton bud is placed in the inferior meatus. If dye is present after five minutes, this indicates a patent system. Absence of dye indicates the anatomical obstruction between the punctum and valve of Hasner. A Jones II dye test is performed after a negative Jones I test. The lacrimal system is flushed by syringing and washing of excess fluorescein from the conjunctival sac. The test is positive if dye is detected on the cotton bud, which suggests functional obstruction of the nasolacrimal duct. A negative Jones II test indicates punctal or canalicular stenosis, whereas regurgitation indicates complete nasolacrimal duct obstruction or complete common canaliculus block. If no saline appears in the nose, there is a source of complete obstruction somewhere in the lacrimal drainage system.

Lacrimal Probing

Lacrimal irrigation and probing of the canaliculi are two investigations that may be part diagnostic and part therapeutic, for example by dislodging a stone. Probing may be used in an attempt to palpate or localise the site of obstruction. With probing, the length of canalicular patency distal to the punctum can be measured, and from that the length of the canalicular blockage can be estimated.

Dacryocystography

This radiological technique enables visualisation of the anatomical details of the lacrimal drainage system using contrast material injected into one or both canaliculi. It helps to determine the surgical plan and remains the most common and definitive test for assessing the nasolacrimal system. Digital subtraction techniques are now usually employed as this reduces the radiation dose to the lens of the eye.[14]

Dacryoscintigraphy

Nuclear lacrimal scanning is a simple non-invasive test where a 10µl drop of technetium-99 pertechnetate is placed onto the marginal tear strip with the patient situated on a head rest opposite a gamma camera. It is useful for assessing functional lacrimal duct obstruction and it is for this purpose that it has most merit as an investigation. While scintigraphy does not provide as detailed anatomical imaging as contrast double-contrast gastrography (DCG), the two may be used as complementary investigations.[15]

If sclera show is evident on examining the relationship of the lower lid to the inferior limbus, a lacrimal pump problem may be present.

Computed Tomography Scan

This may be indicated if trauma or neoplasms are suspected, or in certain cases where dacryocystorhinostomy (DCR) is performed.

Current Management Strategies

Punctal

Incomplete punctal stenosis and membrane occlusion can be treated with simple dilating, but should probably not be repeated

too frequently.[14] If the punctum is absent, a cut-down can be performed, but often Jones tube placement is required. Secondary causes of punctal obstruction such as ptosis should be treated in themselves to correct the problem. It should be noted that absence of puncta, e.g. congenital punctal agenesis, is often associated with complete blockage of the canaliculi.

Canalicular Blockage at Proximal End

The therapeutic approach to patients with proximal lacrimal obstruction involves the canaliculodacryocystorhinostomy (CDCR) with retrograde canaliculostomy, whereby the probe is passed backwards through the common canaliculus at the time of DCR. This technique can only be carried out through an external DCR approach and not the endonasal DCR approach. The success rate for this procedure has been reported to be 73% as judged by an improvement in epiphora, with just under half of the failed cases requiring placement of a Jones tube (see below).[16] One problem with this technique is maintaining patency at the canaliculostomy site; however, performing this procedure does not preclude other options such as Jones tube placement.

Mid-canalicular Blockage

Previously, resection of the stenotic segment with end-to-end re-anastomosis followed by stenting with a silicon tube was proposed as the most efficacious approach. Again, this requires an external DCR approach and is technically difficult; therefore, with a success rate of 64% it has not gained popularity among lacrimal surgeons.[17] Not only is this procedure technically difficult,[18] but also there is concern that the suturing materials may induce foreign-body reactions and affect the patency of the canaliculus. The authors have reported their experience of treating mid-canalicular blockage using the endoscopic DCR approach and putting a silicon stent through the stenotic segment of the canaliculus, with a success rate of 54% at six months.[1]

As a general rule, the more lateral the obstruction in the canaliculus, the lower the chances are of successfully correcting the stenosis at the primary site or by using DCR and stenting. For these cases, bypassing of the canaliculi using a Lester Jones tube may be necessary.[2] In the biggest series of Jones tube placements published to date, Rose and Welham found a 91% rate of satisfaction among patients for relief of epiphora;[2] however, accurate placement of this tube is the key to a successful outcome. If the lateral opening of the tube is positioned too posteriorly, it can cause corneal irritations and abrasions. If the flange of the Jones tube is positioned too anteriorly, it may cause ectropion.

The other main factor in the management of the Jones tube is regular flushing as biofilms will gradually form inside the tube and eventually cause blockage. Replacement of the Jones tube has been cited by Rose and Welham to be required in 44% of cases occurring at an average time of 17 months post-operatively.[2] Loss of the Jones tube has been cited as the main cause of failure;[19] as such, Dailey and Tower have detailed the use of a frosted tube in order to improve its stability.[20] The use of a Medpor-coated tube (linear high-density polyethylene) has also recently been shown to have prevented tube extrusion over a 2.5-year follow-up period in a small series of 26 cases.[21] Placement of the tube is contraindicated in patients who are unlikely or unable to undertake the necessary aftercare, such as children and the learning-disabled.[19]

Figure 2: Lateral Common Canalicular Obstruction

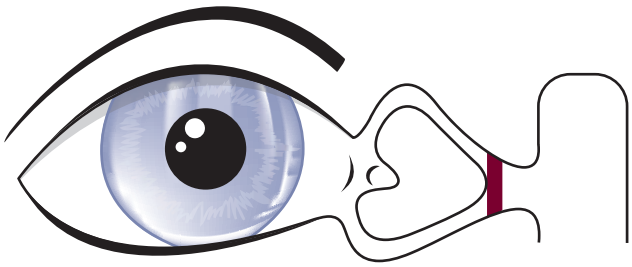


Figure 3: Inferior Canalicular Obstruction

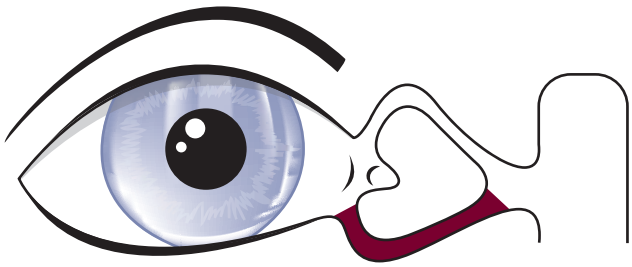


Figure 4: Obstruction of Both Canaliculi – <8mm Left

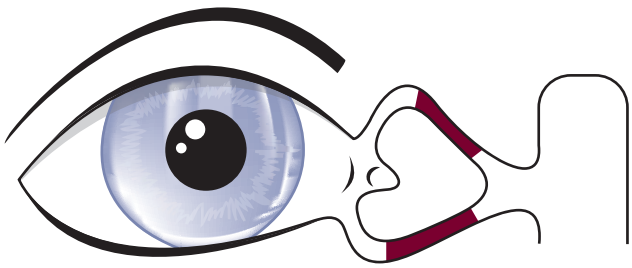
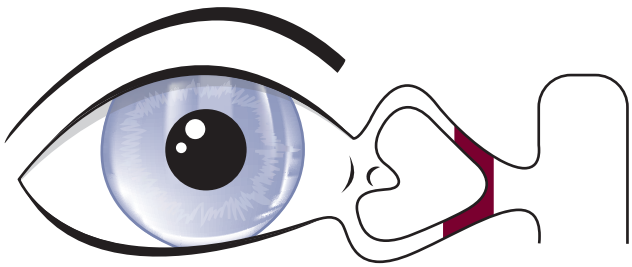


Figure 5: Obstruction of Both Canaliculi – >8mm Left



Currently, the Jones tube is the gold standard for managing lacrimal obstruction, but the technique has recently been challenged by Schwarcz et al. in Los Angeles who demonstrated a success rate of 92% for modified conjunctivo-DCR as opposed to the conventional CDCR method where the caruncle is removed.[22] A modification to the Jones tube has recently been considered that accommodates intranasal anomalies such as a paradoxical middle turbinate.[23] Other alternatives include a bypass without an osteal window,[24] transcanalicular yttrium–aluminium–garnet (YAG) laser[25,26] and balloon dilatation.[27–34]

A more recent alternative is the Ipswich lacrimal flap technique.[35] This involves performing an endoscopic DCR and then converting it into a

conjunctivo-DCR by creating a fistula from the area of the caruncle into the nasal cavity using a sharp trocar. The fistula is then stretched and a superiorly based septal flap is pulled through to the conjunctival surface. This technique has been utilised in cases where severe proximal lacrimal obstruction has not resolved with previous Jones tube placement. This proposed alternative treatment is relatively new, and long-term follow-up is necessary to determine whether it works. It remains to be seen whether any of these alternatives can truly replace the Jones tube as the most preferred surgical treatment for severe proximal lacrimal obstruction.

Conclusion

Proximal lacrimal obstruction provides a common source of patients with epiphora and new treatment modalities are being pioneered. However, the Jones tube has been utilised for over 25 years, and will remain the main modality of treatment for canalicular blockage in the short term at least. ■

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Editor's Recommendation

Endoscopic Dacryocystorhinostomy and Conjunctivodacryocystorhinostomy

Woog JJ, Sindwani R, *Otolaryngol Clin North Am*, 2006;39:1001–17.

Intranasal approaches to the correction of lacrimal outflow obstruction initially were described more than 100 years ago, but they have gained renewed popularity with the recent development of the field of endoscopic sinus surgery. Endoscopic dacryocystorhinostomy (EDCR) surgery may be considered in many patients who have lacrimal outflow obstruction. It may be particularly advantageous in patients who have concomitant sinonasal disease, patients with a history of radiation therapy, paediatric patients and revision procedures. Advantages of the endoscopic technique include excellent visualisation, the ability to evaluate the location and size of the rhinostomy site thoroughly and the avoidance of a facial scar. Recent studies suggest that the success rates of EDCR are comparable to those achieved through traditional external dacryocystorhinostomy. ■