Surgical Techniques for the Management of Parotid Salivary Duct Strictures

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KEYWORDS

• Sialendoscopy • Ductal scar • Salivary stricture • Salivary endoscopy

KEY POINTS

- Parotid ductal scar management and success depends on the site of ductal scar, extent, the underlying salivary gland status, and patient expectations.
- Endoscopic management is usually possible for short stenosis or focal strictures; however, multiple strategies may be required for management of parotid ductal scar.
- Treatment should be offered starting from least invasive to most invasive options; parotidectomy for patients with inflammatory gland disease, often associated with parotid ductal scars, is associated with a higher rate of facial nerve paresis or palsy.

Ductal scar or stenosis is the second most common indication for salivary endoscopy.[1] Stenosis tends to occur more commonly in women and usually in the parotid ductal system.[1] This may be because of the tendency for autoimmune phenomenon being greater in women; often leading to inflammatory salivary gland disease, the end result of which is stenosis or scar. Also, ductal scar may be more pronounced in the parotid ductal system because of the smaller diameter of the parotid duct as compared with the submandibular duct or possibly the presence of the masseteric bend, a natural kink of the ductal system. The management of parotid ductal disease requires a different approach because it has to take into consideration some major concerns while managing the parotid duct that do not factor while managing the submandibular duct; such as a perforation of the parotid duct has more significant implications because saliva could leak into a closed buccal space rather than open into the floor mouth. Facial nerve palsy poses a significant risk to parotid procedures that are limited in submandibular procedures. However, before we proceed, it is important to highlight some important facts and considerations about parotid duct anatomy.

Anatomy

The parotid is the largest salivary gland and lies within the parotid space. The parotid gland sits anterior to the external auditory ear canal and over the mandibular ramus. The tail of the gland extends toward the mastoid process and lies partially over the sternocleidomastoid muscle. The parotid duct, also known as the Stenson duct, runs parallel to the zygomatic arch, approximately 1.5 cm inferior to the arch. It courses superficial to the masseter muscle and then pierces the buccinator muscle as it opens into the oral cavity, its papilla, near the second maxillary molar. Average length of the duct is 4 to 6 cm with an average diameter of 2.0 to 2.5 mm.[2] The papilla is the narrowest portion of the duct and is relatively easy to cannulate when compared with the submandibular duct. However, the masseteric bend, a natural curve of the parotid duct around the anterior border of the masseter, can provide a challenge to navigate during endoscopic procedures.

The Stenson duct is in close proximity to the buccal branches of the facial nerve that lie lateral to the plane of the duct as we examine the papilla transorally. This relation is relevant for both transoral and external approaches to the parotid duct. The anterior border of the masseter muscle is a line that divides the parotid ductal system into an anterior zone (papilla to anterior border of the masseter) that can be surgically accessed via a transoral approach and a posterior zone (anterior border to the hilum of the gland) that is best accessed surgically via a combined external approach. Intraglandular disease clearly would need an external approach to manage pathology.

Stenosis type and classification

Ductal scar can be characterized as either "stricture" or "stenosis." Strictures tend to be short segments of ductal scar that extend across the lumen of the duct, a more focal pathology. Stenosis tends to be lengthwise narrowing of the duct without as much loss of the ductal lumen, a more diffuse pathology.

There are many classifications by which ductal scar may be described (Table 1).

As mentioned earlier, stenosis of the salivary ducts is the second leading cause of gland obstruction,[3] with 75% of

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Table 1 Clinical characteristics and classification of ductal scar/stenosis

Factor	Description	
Tissue color	Pink-salmon/Thin vessels Pale/Avascular Erythematous/Red/Dilated vessels	
Tissue consistency	Pliable Stiff	
Scar location	Ostium Main duct (distal) Main duct (proximal) Hilum Intraglandular duct (primary branches) Intraglandular duct (secondary branches) Intraglandular duct (tertiary branches)	
Scar distance from ostium	Centimeters	
Scar type	Stricture Stenosis	
Scar grade	I (0%—50% stenosis; 1.3-mm scope) II (50%—70% stenosis; 1.1-mm scope) III (70%—99% stenosis; 0.8-mm scope) IV (100%)	
Scar extent	S0 S1 S2 S3 S4	No stenosis One or more diaphragmatic stenoses Single stenosis, main duct Multiple stenosis, or complete main duct Diffuse (main duct and intraglandular)
Scar inflammation	Type I Type II Type III	Inflammatory (acute) Web stenosis; segmental dilations (chronic) Fibrotic, long segment stenosis

Adapted from Gillespie MB. Salivary duct scar. In: Gillespie MB, Walvekar RR, Schaitkin B, et al, editors. Gland-preserving salivary surgery: a problem-based approach. Cham (Switzerland): Springer; 2018. p. 72; with permission.

strictures occurring in the parotid.[4] These can be associated with salivary stones, although only approximately 15% of the time.[1] Stenson duct stenosis is often affected with stenosis at the middle third (39.6%) and proximal third (27.8%).[4]

Causes of stenosis include chronic sialadenitis, autoimmune disease (Sjögren syndrome), radioactive iodine—induced sialadenitis, salivary stones, idiopathic causes, and post radiation changes.[1] Congenital or traumatic abnormal ductal anatomy can also cause stenosis. Congenital causes include abnormal ductal folds, ductal reflux, or ductal kinks due to enlarged or hypertrophic masseter muscle.[2,5] Trauma etiology can include external trauma (eg, facial lacerations, compression from tumors/neoplasms), internal trauma (dental radiograph films damaging ductal anatomy), or iatrogenic trauma (eg, facelift surgery).

The classification of stenosis helps in documentation and prognostication to some extent. For example, a focal mid-ductal stenosis or a papillary stenosis is more likely to be treatable than diffuse or multiple stenosis affecting the entire duct. However, the most important differentiation that directs the need for treatment and also level of invasiveness is the presence or absence of symptoms.

Patient selection

Documenting patient symptoms and classifying patients into symptomatic or asymptomatic is the first step of the evaluation and management. It is important also to document the nature of symptoms and the effect that they have on the patient's day-to-day quality of life and medical status.

Because parotid stenosis is associated with systemic or inflammatory salivary gland disease, such as Sjögren disease, radioactive iodine—induced sialadenitis, or even juvenile recurrent parotitis, the symptoms can be either systemic symptoms that are associated with the global disease process and/or salivary gland—specific symptoms. It is important for the purpose of patient counseling and to keep in sync with treatment expectations that it is made clear to patients that salivary gland—specific symptoms are likely to benefit from sialendoscopy, whereas the systemic symptoms may or may not improve.

Common salivary gland—specific symptoms include painful or painless swelling of the salivary gland most often in relation to meals and associated gland infection with purulent discharge. Stenosis often leads to sialadenitis though a stasis of salivary flow. This leads to ascending infection throughout the duct.[6]

Systemic symptoms and signs that may be associated with salivary gland symptoms, such as dry mouth, chronic salivary gland pain not associated with glandular swelling, tenderness on palpation of the salivary glands, and chronic gland swelling with asymmetry, may not resolve even after successful endoscopy and management of ductal stenosis. Ultimately, it must be remembered also that chronic inflammation ensues placing the gland at risk of the formation of stenotic segments.[6] Consequently, chronic gland symptoms may be worth evaluating with endoscopy even if obstructive symptoms are not obviously evident.

Diagnostic studies

In most North American centers, computed tomography (CT) scan with and without contrast is the first diagnostic imaging of choice. Typical CT findings would be presence of dilated ductal system secondary to an obstructive stenosis. In general, the stenosis, per se, is difficult to visualize on imaging. The location and extent of the stenosis is usually inferential. The only tool that can conclusively demonstrate stenosis is an endoscopic examination. Ultrasound imaging is becoming more and more popular to evaluate salivary gland pathology in North America; it is gold standard for most European centers.[3] Ultrasound provides detail and definition while providing the ability to provide real-time dynamic imaging that can be augmented with a sialagogue challenge. Ultrasound can be used for diagnosis and also during interventional sialendoscopy to help locate stenosis/stones and guide placement of balloon dilators for dilation under ultrasound guidance. Ultrasound can provide an overview of the ductal system, revealing areas of dilation that appear as a hypoechoic band on the masseter muscle (Fig. 1) (see Henry T. Hoffman's article, "Ultrasound-Guided Salivary Gland Techniques and Interpretations," in this issue).[7,8]

Other tools that can be helpful include MRI sialography. MRI sialography is an expensive diagnostic tool, but in some cases, for example, where diagnostic endoscopy shows a complete or