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Isolated Distal Stenson's Duct Avulsion Without Facial Nerve Injury Effectively Managed by Intraoral Duct Diversion: A Case Report

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ABSTRACT

Stensen's duct (Parotid duct) injuries are uncommon but clinically significant because of the risk of complications such as sialocele formation, salivary fistula, ductal stenosis, and chronic salivary dysfunction. Early diagnosis and timely intervention are essential to restore physiological salivary drainage and achieve optimal outcomes.

We report the case of a 54-year-old male who sustained a penetrating injury to the right cheek region caused by a bus door piston, resulting in a deep and blind lacerated wound with avulsion of distal end of stensen's duct, without any associated facial nerve injury. The diagnosis was established clinically by directly identifying the avulsed distal ductal end and confirming salivary flow through the ductal orifice upon palpation of the parotid gland.

In such rare cases of duct avulsion injuries, where primary cannulation or microsurgical repair are not ideal, a simple manoeuvre is required to restore both anatomical continuity and functional salivary flow. Management involved intraoral diversion of the proximal segment and its anastomosis to the adjacent oral mucosa, closer to its pre-existing position opposite to the maxillary second molar, thereby reestablishing a functional intraoral ductal opening and restoring physiological salivary drainage. Intraoral duct diversion provides a technically straightforward, chairside approach that can be performed during the initial management of the injury itself, thereby reducing the likelihood of subsequent complications requiring secondary intervention.

This patient was reviewed at subsequent intervals for up to three months to assess ductal patency and wound healing. The procedure successfully restored the structural anatomy and functional salivary drainage, with established ductal patency and satisfactory gland function throughout the follow-up period, demonstrating the effectiveness of this technique.

This case highlights intraoral duct diversion as a simple, reliable, and effective surgical option for the management of stensen's duct avulsion injuries, underscoring the novelty of this technique.

Keywords: Salivary duct trauma, Duct avulsion, Stensen's duct diversion, Duct patency, Sialocele, Penetrating parotid injury, Case report

INTRODUCTION

Maxillofacial trauma can compromise skin, muscle, bone, and salivary gland structures, leading to functional and aesthetic morbidity. Among salivary gland injuries, stensen's duct injuries are relatively uncommon but clinically important due to their potential complications.

The stensen's duct is particularly vulnerable in cheek injuries due to its superficial course across the masseter muscle. Trauma in this region may also involve adjacent structures such as the facial nerve and transverse facial vessels. Common causes include penetrating injuries from sharp objects and road traffic accident.

If unrecognized, stensen's duct injuries may result in sialocele, salivary fistula, or ductal stenosis. Early identification during initial wound assessment is therefore critical. Although, these injuries are frequently overlooked, posing diagnostic and therapeutic challenges due to the duct's anatomical course and its proximity to the facial nerve.

Van Sickels and Alexander classified stensen's duct injuries based on their anatomical relationship to the masseter muscle into three types. Type A injuries occur proximal to the posterior border of the masseter, Type B injuries involve the duct overlying the masseter, and Type C injuries occur distal to the masseter near its intraoral opening, near the buccinator muscle and the intraoral opening opposite the maxillary second molar, often presenting as distal ductal avulsions or intraoral disruptions. This classification aids in planning and guiding surgical approach, as proximal injuries may require glandular exploration, while distal injuries can often be managed with intraoral ductal repair or diversion techniques **(1)**.

This report presents a case of Type C distal duct avulsion successfully managed by intraoral duct diversion and mucosal anastomosis. This simple technique has proved to restore the anatomical and functional outcomes when a microsurgical repair is inaccessible.

CASE REPORT

A 54-year-old male presented to the emergency department 2 hours after sustaining a penetrating injury to the right cheek caused by a bus door piston. He complained of pain and bleeding from a laceration over the right cheek (Figure 1).

Figure 1: Traumatic lacerated wound with extruded distal end of stensen's duct. Drooling blood- tinged saliva can be visualized.

There was no history of loss of consciousness, vomiting, ear bleeding, or any other associated injuries. The patient had no significant medical history or known

drug or food allergies. Clinical examination revealed mild facial asymmetry with diffuse swelling over the right preauricular region. No bony tenderness or discontinuity of the facial skeleton was detected on palpation, and no functional deficits were evident. Facial nerve function was intact, and no foreign body was identified.

The laceration was linear, vertically oriented, and measured approximately 3 × 4 × 1 cm, extending inferiorly from a point approximately 4 cm lateral to the right nasolabial fold. The wound margins appeared clean; however, the deeper tissues were irregular, resulting in a blind wound. A white, glistening duct-like structure was observed protruding from the wound, with its proximal end remaining attached within the laceration. As the injury crossed the tragus–oral commissure line, a Stensen's duct injury was suspected (Figure 2).

Figure 2: Lacerated wound crossing the tragus-commissure of lip line suggesting higher chance of injury to stensen's duct.

The preauricular swelling was fluctuant and non-tender. Compression of the parotid gland expressed blood-tinged, low-viscosity fluid through the protruding ductal segment, confirming the structure as a patent Stensen's duct. The swelling subsided following gland compression, indicating salivary decompression through the injured duct. The protruding segment corresponded to the distal portion of the duct, which normally opens opposite the maxillary second molar.

Although injuries to stensen's duct are frequently associated with facial nerve damage, facial nerve function remained intact on both the initial and subsequent examinations.

Intraoral examination revealed a mild hematoma of the right buccal mucosa adjacent to the maxillary first molar. The right ductal papilla appeared constricted compared with the contralateral side, confirming distal ductal avulsion. The patient was counselled regarding the planned procedure, and informed written consent was obtained.

Cannulation of the distal ductal segment using a 22-gauge cannula was attempted but was unsuccessful because the avulsed ductal end was friable with ragged margins. The distal ductal segment was therefore gently grasped with a fine mosquito forceps and traced through the laceration, traversing the buccinator muscle toward the buccal mucosa. The duct was redirected mesial to its preexisting intraoral opening, and the tip of the forceps was palpated intraorally. A controlled 0.5 cm mucosal incision was made with a No. 11 blade (Figure 3), through which the duct was delivered into the oral cavity to establish salivary drainage. The duct was secured to the buccal mucosa using 4-0 polyglactin sutures, achieving a mucosal anastomosis (Figure 4).

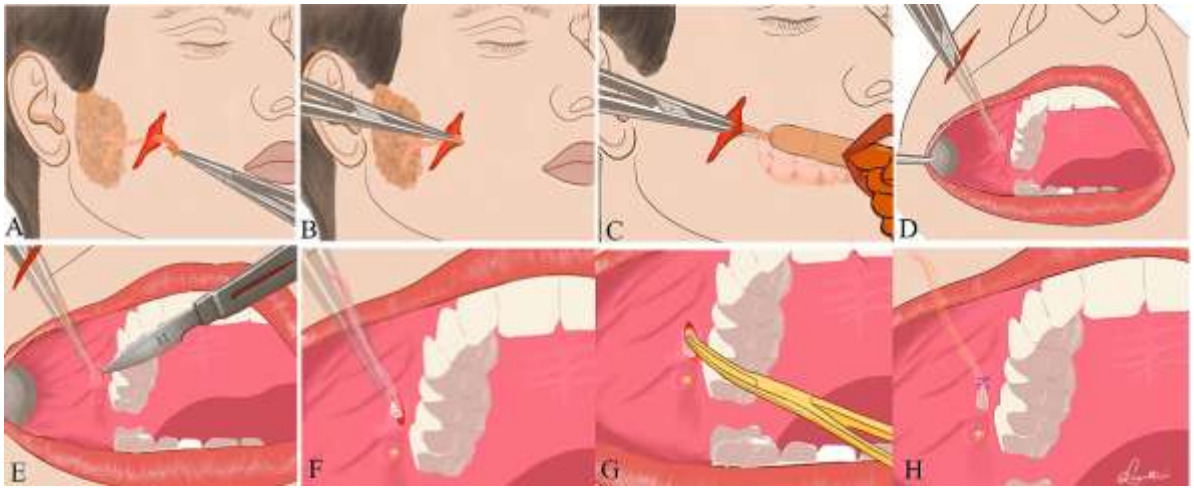

Figure 3: Illustration of maneuver and procedure performed.
A: The distal end of the extruded duct was gently held with a fine mosquito forceps.
B: Distal end traced back through the laceration toward the buccal mucosa.
C: The tip of the forceps was palpated intraorally.
D: Duct redirected mesial to the expected intraoral opening of Stensen's duct.
E: Controlled mucosal incision of 0.5 cm was created using a No. 11 surgical blade.
F: The duct was then diverted intraorally to establish salivary drainage.
G: Ductal end held with mosquito forceps.
H: Ductal epithelium sutured to the oral mucosa using 4-0 Vicryl to create new intraoral opening.

Figure 4: Intraorally diverted distal ductal opening through an incision.

Immediate ductal patency was confirmed by observing salivary flow from the newly created intraoral opening. The extraoral wound was subsequently irrigated, debrided, and closed in layers using 4-0 polyglactin sutures (Figure 5). The procedure was performed as a day-care surgery under local anesthesia. A pressure dressing was applied, and the patient was discharged on the same day with antibiotics, analgesics, corticosteroids, and a proton pump inhibitor. Interestingly, no sialagogue medications were prescribed. Instead, salivary flow was stimulated non-pharmacologically by encouraging the patient to incorporate lemon juice into the diet.

The patient was reviewed every two weeks during the first postoperative month and monthly thereafter for a period of 6 months to assess ductal patency and identify any complications (Figure 6).

Figure 5: Extraoral layer-wise closure with 4-0 Vicryl

Figure 6: Extraoral & Intraoral 2-week follow-up photographs. Can visualize the new patent duct opening in the buccal mucosa.

Despite the anticipated risk of ductal obstruction secondary to mucosal overgrowth, adequate salivary flow was maintained during all follow-up visits. Patency was evaluated objectively by observing salivary flow from the diverted intraoral ductal opening following extraoral compression of the parotid gland and subjectively by the absence of xerostomia. The postoperative course was uneventful, with no evidence of sialocele formation, salivary fistula, ductal stenosis, or other complications. The patient remained satisfied with the functional and clinical outcome throughout the follow up period.

DISCUSSION

Morel et al. recognized as early as 1963 that facial lacerations extending across the tragus–oral commissure line carry a high risk of stensen's duct injury(2). Despite the rarity of traumatic Type C Stensen's duct avulsion injuries, evidence guiding their management remains limited.

In severe facial trauma, accurate identification of the ductal orifice may itself represent a significant intraoperative challenge, delaying definitive treatment. Consequently, various methods have been described to facilitate localization of the ductal orifice and aid surgical management in complex maxillofacial injuries.

Methods to aid in locating the duct are:

1. Inspection & probing: Cannulation of duct with angio-catheter(20-22gauge) via intraoral orifice with lacrimal probe or small catheter in clean wounds **(1)**.

2. Compressing parotid gland to look for flow of saliva from avulsed ductal orifice or irregular unclean wounds **(3)**.
3. Retrograde injection of 1-2 mL diluted methylene blue **(3)**.
4. Radiographic method: Sialography **(4,5)**, Helical CT scans to evaluate parotid parenchyma **(6,7)**

In the present case, the diagnosis of distal Stensen's duct avulsion was established by the presence of an extruded ductal segment, expression of saliva on compression of the parotid gland, and an associated intraoral buccal hematoma.

In a prospective study of 19 patients, Lewis and Knottenbelt demonstrated that facial lacerations crossing the tragus-oral commissure line with parotid duct injury could often be managed successfully by simple wound closure without ductal repair. Although a few patients developed transient sialocele or salivary fistula, all resolved with conservative treatment, leading the authors to recommend non-operative management unless persistent complications develop **(4)**. However, this approach was not applicable in the present case because the obvious distal ductal avulsion required an immediate surgical intervention.

Lewkowicz et al. proposed a systematic approach for the diagnosis and management of parotid duct injuries based on primary duct cannulation followed by dye injection to delineate the injured segment **(8)**.

A technique reverbing to ours was described by Vishal et al. in the secondary management of a salivary fistula resulting from an initially undiagnosed penetrating injury. The fistulous tract was mobilized, transposed intraorally through a buccal mucosal incision, and sutured to the oral mucosa **(9)**.

Mardani and Arabion described successful repair of a traumatic parotid duct injury using a size 6 feeding tube as an intraductal stent **(10)**. Although their case shared a similar mechanism of injury, it involved complete ductal transection rather than distal ductal avulsion. In our patient, attempted cannulation was unsuccessful because the avulsed distal ductal segment was friable and unable to support stent placement. Several materials have been reported as intraductal stents for parotid duct repair, including epidural catheters, urethral catheters, double-J catheters, catgut sutures, and Vitallium wire **(11–14)**. In contrast, the present technique provides an immediate and practical alternative when stenting is not feasible or unavailable, while avoiding the use of foreign materials that may increase the risk of infection.

Sialoendoscopy-assisted microsurgical repair of transected Zone B Stensen's duct has been shown to provide a minimally invasive approach with excellent functional outcomes in appropriately equipped centers **(15)**. Likewise, Venkatachalam et al. described reconstruction using a buccal pedicled flap with a polypropylene trans-anastomotic stent under magnification for a patient with extensive facial soft-tissue loss, minimal residual duct, and associated facial nerve injury **(16)**. Unlike their case, our patient had no significant tissue loss or facial nerve involvement, allowing immediate ductal diversion under local anesthesia without the need for complex repair.

Autologous venous grafts have also been described for replacement of severely damaged ductal segments **(17–19)**. However, these procedures require microsurgical end-to-end anastomosis, are technically demanding, and are generally reserved for extensive ductal defects or delayed reconstruction performed under general anesthesia. Distal ductal avulsion, conversely, does not routinely require reconstruction unless there is extensive tissue loss, severe crushing of the ductal end, or failure of ductal diversion.

Primary repair of Stensen's duct may occasionally be deferred in patients with extensive maxillofacial trauma, severe soft-tissue loss, associated facial nerve injury, or when the injury is initially overlooked. In such circumstances, life-saving measures and wound stabilization understandably take precedence over ductal repair. Hosseinzadeh

et al. reported a missed traumatic parotid duct injury associated with an extraoral facial laceration that subsequently presented as a sialocele and ultimately required parotidectomy **(20)**. Untreated ductal injuries may progress to sialocele formation or cutaneous salivary fistula, which can be confirmed by elevated amylase levels in aspirated fluid or by sialography. Delayed presentation is further complicated by fibrosis and scar formation, making secondary reconstruction more technically challenging.

Management of sialocele initially consists of conservative measures, including repeated aspiration, pressure dressing, and anti-sialagogues **(21)**. Persistent cases may require primary duct repair, proximal duct ligation, reconstruction or, rarely, parotidectomy or radiotherapy, while adjunctive therapies such as tympanic neurectomy and botulinum toxin A have been used to reduce salivary secretion **(22–25)** (Table 1).

Table 1: Treatment methods: When, Where, how?

Treatment Method	Indications	Key Steps	Important Considerations
Primary Microsurgical Repair (Duct Anastomosis) **(3)**	•Recent injury •Clean, sharp lacerations (commonly site B) •Minimal or no tissue loss	• Identify distal and proximal duct ends • Mobilize both ends to allow tension-free approximation • Insert a stent through the duct • Perform end-to-end repair using fine sutures (8-0 or 9-0 nylon) • Secure stent to buccal mucosa and maintain for 10–14 days	• Preferred treatment when feasible • Protect nearby buccal branches of the facial nerve and transverse facial artery • Stenting reduces risk of postoperative stenosis
Duct Diversion (Creation of New Intraoral Opening)	•Distal duct injuries •Tissue avulsion where direct repair is not possible but proximal duct remains intact.	• Deliver proximal duct through buccinator muscle into oral cavity • Suture ductal epithelium to oral mucosa to form a new opening	• Stent usually not required • Suitable when primary anastomosis cannot be achieved
Duct Ligation with Functional Suppression **(1)**	• Severe tissue loss •Extensive avulsion with non-repairable duct.	• Ligate proximal duct • Apply pressure dressing over gland • Administer anti-sialagogue medications	• Leads to gradual gland atrophy • Initial swelling and discomfort may occur
Reconstruction using 1.Vein grafts **(17–19)** 2. Sialodochoplasty **(26)**	• Severe tissue loss with need of complete repair or reconstruction of duct • Complex segment loss • Delayed reconstruction	•Great saphenous vein, Cephalic vein, External jugular vein tributaries, Forearm vein, Basilic veins are used for autologous vein grafts •A trapezoidal buccal pedicled flap was tabularized to recreate the internal lining of duct and flip flopped over the masseter. Cheatle maneuver performed for achieving perfect anastomosis.	•Preferred in complex soft tissue defects •Asepsis and careful tissue handling for maintaining graft viability is important.

A distinctive feature of this case was the absence of facial nerve injury, despite the close anatomical relationship between the facial nerve and the parotid gland. This emphasizes the importance of thorough clinical evaluation.

Management of stensen's duct injuries depends on the site and extent of injury. While primary end-to-end anastomosis with stenting is ideal, it may not always be feasible, in cases of distal duct avulsion associated with friable tissues and limited

access to microsurgical equipment. In this scenario, intraoral diversion of the duct provides an effective alternative by creating a new drainage pathway into the oral cavity. A potential limitation of this technique is the absence of an intraductal stent, which may theoretically increase the risk of tissue overgrowth and secondary ductal obstruction during healing. However, this complication was not encountered in the present case, likely owing to meticulous tissue handling and precise mucosal suturing. Notably, Stevenson et al. described that stenting is not essential for this diversion technique, as transposition of the proximal duct creates a functional intraoral orifice, allowing the procedure to be performed under local anesthesia as a simple chairside intervention **(2)**. Although few other literature recommends intraductal stenting to prevent ductal collapse or obstruction, careful tissue handling with appropriate postoperative care and patient's compliance with oral hygiene instructions, also attributed to healthy reconstructed ductal orifice in this case **(3,12)**. Constant salivary flow may also have helped maintaining the opening patent, by preventing the healing tissues from epithelizing over it and obstructing the duct.

The technique employed in this case encompass identification of the duct, intraoral retrieval, creation of a controlled mucosal opening, and suturing which proved to be simple, reliable and feasible to perform in a minor surgical office setting. Timely identification, precise surgical technique, and careful postoperative monitoring are essential to ensure ductal patency and prevent complications such as stenosis and fistula formation. The favorable outcome in this patient underscores the importance of prompt intervention.

Although several treatment strategies have been described for the secondary complications of traumatic parotid duct injuries, the optimal primary management of Type C Stensen's duct avulsion remains poorly defined and warrants further investigation through larger case series.

The present case demonstrates that immediate intraoral ductal diversion can serve as a simple, reliable, and effective treatment option when primary stenting or microsurgical reconstruction is impractical or not feasible.

An algorithm for management of lacerations around the parotid region is demonstrated in Figure 7.

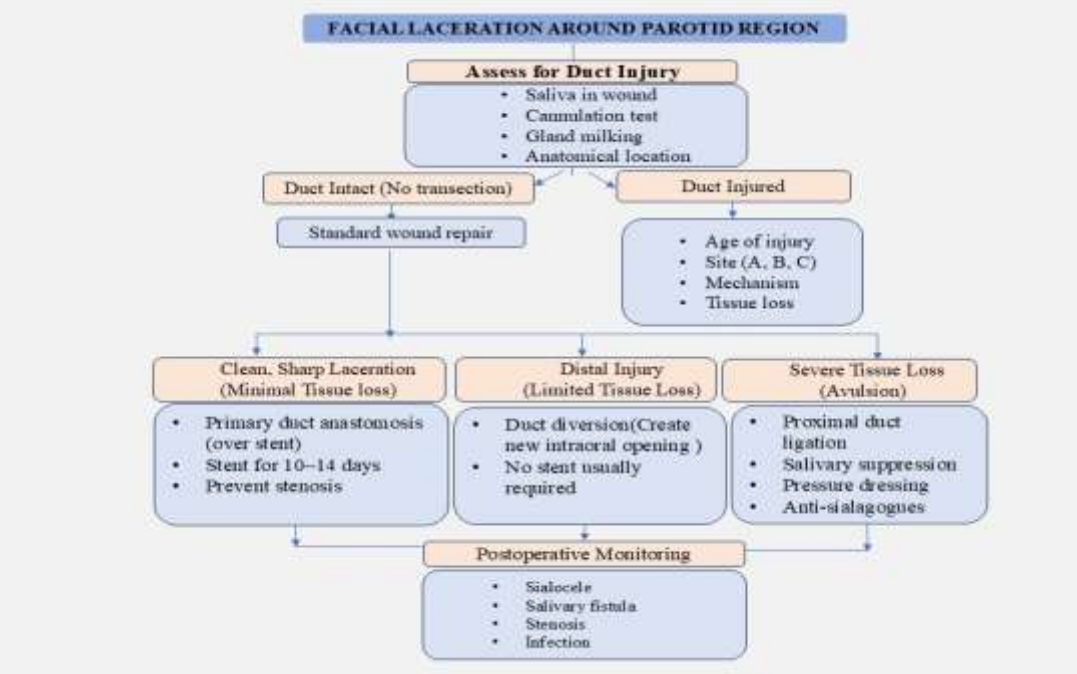

Figure 7: Treatment algorithm for wound around parotid region. How to assess and what to do?

CONCLUSION

Distal stensen's duct avulsion injuries, although uncommon, require a high index of suspicion during primary wound repair. When microsurgical reconstruction is not feasible, intraoral duct diversion with mucosal anastomosis offers a simple and effective chairside alternative for managing distal duct injuries. A thorough understanding of duct anatomy and its surrounding structures is essential for accurate diagnosis and appropriate treatment. Precise surgical technique and consistent postoperative monitoring can help preserve structural and functional integrity, while minimizing complications.

Declaration By Authors

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