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"A small nick under the tongue" – a case report of iatrogenic soft tissue trauma and subsequent submandibular sialocele

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Abstract

Dentists frequently use sharp instruments and high-speed rotary handpieces which carry an inherent risk for iatrogenic trauma in routine procedures. While most iatrogenic injuries are minor, trauma to the floor of the mouth poses a greater concern due to the proximity of vital structures. This report highlights a case of penetrating bur injury to the floor of the mouth during routine dental treatment, resulting in a submandibular sialocele with progressive complications.

A 31-year-old male presented with submandibular swelling, dysphagia, and fluid tracking into the neck following the injury. Initial management included antibiotics, steroids, and close monitoring, but worsening symptoms required surgical exploration and drainage. Definitive management involved botulinum toxin injection into the submandibular gland, successfully resolving the swelling and symptoms.

This case highlights the potential for acute swelling and airway concern following minor iatrogenic dental trauma. It is important for practitioners to exercise caution during treatment and remain vigilant for complications.

Introduction

Iatrogenic trauma to oral tissues, referring to injuries caused by a practitioner's actions during treatment, is a significant concern in dentistry, particularly given the potentially hazardous nature of many sharp instruments, appliances and strong chemicals used in clinical practice. Such injuries can vary from minor gingival lesions to more severe complications affecting blood vessels, nerves, salivary glands and underlying alveolar bone. These injuries may result in sloughing of the epithelium, erosion, ulcer formation, erythema, bleeding, and inflammation (Ozcelik *et al.*, 2005). Some reports describe iatrogenic oral injuries that have caused severe complications, thus requiring more complex management (Dhanda *et al.*, 2008; Hoehn *et al.*, 2019).

Although data on the incidence of iatrogenic dental injuries is limited, there is growing research on injury claims and case studies resulting from such events. A recent Danish study analysed over 5,000 dental treatment-related injury claims over a five-year period and found that 2.25% of approved compensation cases involved damage to anatomical structures other than teeth or nerves (Ferlias *et al.*, 2024). The Accident Compensation Corporation (ACC) is New Zealand's national compensation scheme, offering no-fault coverage for individuals who have suffered injuries, including those from medical and dental treatments (ACC, 2023). ACC's injury claim data is also a key resource for analysing treatment-related harm in New Zealand. An official information request to ACC in 2024 revealed that from 1 July 2014 to 30 June 2024, 7,382 dental injury claims received for dental injuries, of which 4,806 received acceptance (Table 1; ACC, 2024).

The type and severity of injury varies depending on the site and mechanism. Commonly reported iatrogenic injuries include improper use of rotary or hand instruments, retraction agents, and caustic endodontic treatments, as well as damage caused by orthodontic appliances (Ozcelik *et al.*, 2005). This case report highlights a rare but critical instance of iatrogenic dental injury, where a patient experienced slippage of a bur into the floor of the mouth during routine dental work, resulting in complications that required hospital admission and surgical management. Although such cases are infrequently documented, they emphasise the necessity for dental practitioners to have a comprehensive understanding of the oral soft tissue anatomy to prevent and effectively manage such injuries to minimise potential complications. This report seeks to raise awareness of these possible injuries and provide insight into potential ramifications that may significantly impact the patient's quality of life.

Case

A 31-year-old man presented to the Emergency Department one hour after routine dental treatment on his mandibular left first molar, reporting progressive jaw swelling, excessive drooling, and difficulty swallowing. An ACC treatment injury claim was initiated on his arrival to hospital. His heart rate, temperature, blood pressure, and respiratory rate were within normal limits and was referred to the on-call Oral and Maxillofacial service (OMS) for urgent review.

The patient's medical history was unremarkable; he denied any regular medications and had no known drug allergies. Clinical examination revealed a soft, non-erythematous, painless swelling in the left submandibular region without extension across the midline (Figure 1). The patient had no difficulty opening their mouth, but his speech was muffled and unclear. Intra-orally, a noticeable sublingual swelling elevated the tongue and the floor of the mouth, which was soft and non-haemorrhagic (Figure 2). A minor laceration measuring approximately 2 mm in length was observed between the lingual gingiva and floor of the

Figure 1 (left). Initial presentation to ED showed a left-sided slight submandibular swelling.
Figure 2 (right). The left-sided sublingual swelling and an associated tongue deviation to the right-hand side were evident at the initial presentation to the ED.

mouth mucosa, immediately lingual to a dental restoration on the left mandibular first molar. A small amount of blood escaped from the laceration on firm extraoral palpation of the submandibular soft tissues.

The dental practitioner who treated the patient was contacted, and the clinician reported an inadvertent minor penetrating bur injury to the floor of the mouth. This occurred while performing restorative treatment to the lower left first molar. The patient had not reacted to the soft tissue trauma, possibly due to the local anaesthesia used for the clinical procedure. The laceration seemed small and superficial and had been deemed not to require a formal repair. The dentist disclosed the injury to the patient and described it as "a small nick under the tongue".

Figure 3. An extra-oral photo taken in ED on review of the patient, showing significant left submandibular swelling extending towards the submental area with noted drooling.

The OMS team first considered the possibility of a developing submandibular and sublingual haematoma secondary to the iatrogenic dental bur injury, although the clinical presentation was not entirely consistent. Preliminary blood tests were conducted, and analgesics were administered alongside a 1g bolus of intravenous tranexamic acid to address the suspected haematoma. Over the day, the patient was monitored and re-examined for complaints of increased pain and swelling crossing the midline with tenderness extending to the right submandibular area (Figure 3). His mouth opening reduced to 10mm, while swallowing, controlling saliva, and speaking became more difficult. The patient became progressively agitated and concerned.

An urgent CT scan with contrast was requested to investigate the swelling and airway patency. Imaging confirmed the presence of soft tissue swelling. There was evidence of fluid tracking from the lower left floor of the mouth into the left submandibular space (Figure 4), with a small amount of fluid and associated left platysma thickening extending to the level of the laryngeal prominence. There was no definable fluid collection. The upper airway was patent, with no deviation away from the midline. There was no extravasation of contrast to suggest ongoing haemorrhage.

The patient was admitted under OMS and was charted eight hourly intravenous 1.2g amoxicillin-clavulanic acid together with three doses of 8mg dexamethasone every

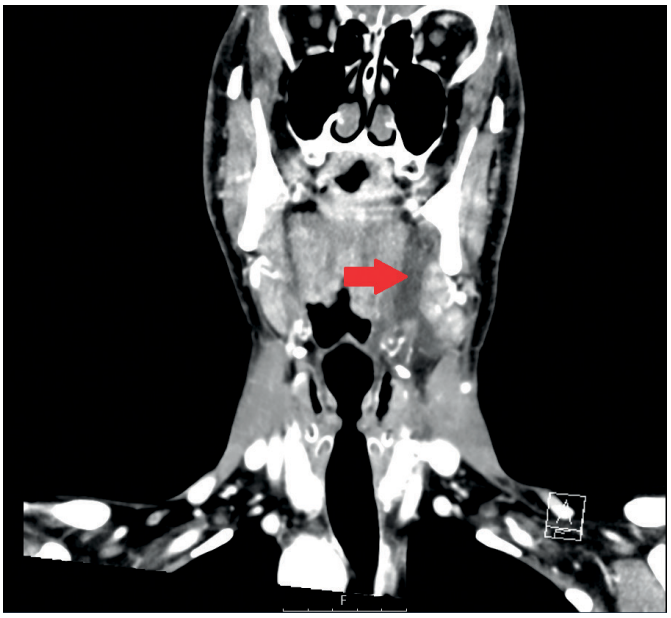

Figure 4. A coronal slice taken from the urgent CT requested after the development of the submandibular swelling. Diffuse fluid buildup can be seen in the left submandibular space, displacing the submandibular gland laterally.

8 hours. The patient's condition improved significantly overnight, with reduced swelling and clearer speech, prompting for discharge on oral antibiotics.

However, the day following discharge, he returned to the ED with increased extra-oral swelling and pain in the sublingual and submandibular areas. Upon examination, the extra-oral swelling had become indurated and warm. The swelling on the floor of his mouth had resolved, and although his mouth opening had improved since his initial visit, he complained of worsening dysphagia. An urgent ultrasound scan of the left submandibular region showed that the left submandibular gland was normal in size but had ill-defined margins and approximately 10mm of hypoechoic material surrounding the gland. The fluid differentials reported were saliva, haematoma, or phlegmonous material. Again, there was no evident, drainable fluid collection.

The patient was readmitted under the OMS service and was taken to the operating room on the fourth day following his initial presentation for exploration under anaesthesia (EUA) of the left submandibular swelling. The left submandibular space was accessed via a skin incision made 2cm below the lower border of the mandible. Clear fluid and phlegmon were found in the submandibular space and flushed out with normal saline. A Penrose drain was inserted and secured to the neck skin. There was no evident damage to the left submandibular gland. A communication between the floor of the mouth and the sublingual space was identified. The laceration in the floor of the mouth wound was not explored due to the presence of oedematous mucosa to avoid the potential risk of causing further trauma. Instead, an effort was made to close the laceration, but this was difficult due to the tight attachment of the mucosa to the mandibular alveolus. In the following days postoperatively, the patient's observations were stable, his swelling decreased, mouth opening returned to normal, and speech improved. A fluid similar in consistency and colour to saliva initially drained from the Penrose drains and later from the skin wound after drain removal.

The patient was discharged three days post-surgery and was prescribed anticholinergic medication (hyoscine hydrobromide postauricular patches) to reduce salivary output. Despite some effectiveness in reducing the symptoms, the high cost of $60 per patch, coupled with side effects such as blurred vision and nausea, led to discontinuation. Over the next three weeks, the patient frequented both the ED and the OMS outpatient review clinics. The patient's primary issue during these visits was the persistent fluid leakage from the extraoral wound, prompting a referral to radiology for a fluoroscopic sialogram of the left submandibular gland.

Two weeks post-surgery, a left submandibular gland sialography was unsuccessfully attempted due to difficult cannulation of the duct, possibly from scar tissue formation from the initial injury. Due to the lack of a formal diagnosis, hindered by the non-availability of amylase testing, inconclusive imaging results, and unsuccessful sialography, the management had to be guided by the patient's continued symptoms. The saliva-like fluid was observed both during and after the surgical exploration, with continued leakage from the neck wound which narrowed treatment toward the submandibular gland. Ultrasound-guided botulinum toxin was administered by the interventional radiography team into the left submandibular gland. Twenty units of botulinum toxin was injected into four separate sites within the gland. Consequently, the patient experienced a significant improvement in symptoms, with swelling and leakage of saliva resolving one week later. An ultrasound examination performed at the OMS outpatient review one-month post-intervention, showed no glandular enlargement or fluid collection. Clinically, clear and unobstructed saliva was able to be expressed from the left submandibular gland. After three months the patient had no concerns.

Discussion

Despite rigorous training and safety protocols, the use of high-speed, sharp instruments on awake patients inherently carries a risk of dental treatment injuries. The ACC dataset from 2024 lacks a specific category for floor-of-mouth injuries, instead grouping them into broader classifications such as 'Abrasion – Other' (26 claims), 'Tissue injury/damage' (29 claims), 'Laceration/tear' (203 claims), and 'Other' (592 claims), collectively accounting for less than 17.7% of accepted claims (Table 1) (ACC, 2024). These figures highlight the potential for harm during routine procedures, as demonstrated in our case. However, the absence of specific categories and inconsistent documentation within the profession likely obscure the true incidence, leaving many cases unreported or inadequately measured.

The literature on iatrogenic dental trauma is limited, especially regarding injuries involving the floor of the mouth.

Table 1. Accepted primary injuries for dental treatment injury (ACC) claims decided between 1 July 2014 and 30 June 2024 (ACC, 2024)

Primary Injury	Accepted Claims	Percentage of Total (%)
Tooth - Chipped/Damaged	709	14.8
Nerve Damage	537	11.2
Foreign Body	341	7.1
Oroantral Fistula	311	6.5
Perforation - Root Canal	258	5.4
Temporomandibular Joint (TMJ) Dysfunction	247	5.1
Allergic Reaction	238	5.0
Strain/Sprain – Other	225	4.7
Laceration/tear	**203**	**4.2**
Infection	173	3.6
Tooth - removed/dislodged	165	3.4
Strain/Sprain - Neck	107	2.2
Wound Infection	84	1.8
Abscess	78	1.6
Fracture - Facial	75	1.6
Anaphylactic Reaction	69	1.4
Perforation - Other	68	1.4
Sinus Damage/Injury	55	1.1
Burn - Other	53	1.1
Haematoma - Bruising	51	1.1
Dislocation	47	1.0
Equipment - Retained	39	0.8
Tissue injury / damage	**29**	**0.6**
Abrasion - Other	**26**	**0.5**
Surgical Emphysema	26	0.5
Other	**592**	**12.3**
Total	**4806**	**100**

Ozcelik *et al.* (2005) reported 13 cases of iatrogenic dental injuries caused by chemical, physical, and thermal mechanisms. Bur-related injuries, in particular, can result in significant morbidity. Dhanda *et al.* (2008) detailed a rare case where a bur injury led to an avulsed and thrombosed vein in the floor of the mouth. Similarly, Hoehn *et al.* (2017) reported a penetrating bur injury to the floor of the mouth, resulting in pain and swelling. This was later diagnosed as a sialocele and was successfully managed with surgical intervention. Other reports highlighted various forms of iatrogenic trauma, including nerve damage (Hillerup, 2007), injuries following orthodontic treatment (Barreto and Feitosa, 2016), and salivary duct injuries in cancer patients (Kulyapina *et al.*, 2014).

The presented case is significant for the acute onset of submandibular swelling and floor-of-mouth elevation immediately following dental treatment—a rare but severe complication of what is likely a common and underreported injury. While minor trauma to the floor of the mouth is occasionally encountered in dental practice, the rapid progression to swelling and airway compromise observed in this patient is rarely documented. The present case emphasises the need for awareness, accurate documentation, and prompt management of acute complications for dental injury. It should be noted that the use of dental dams may help prevent injuries of this nature. Dental dam isolation during restorative and endodontic procedures not only improves infection control but also plays a critical role in patient safety by acting as a barrier against accidental inhalation or ingestion of instruments, debris, or chemical agents (Patel and Hamer, 2021). In circumstances where high-speed rotary instruments are used near delicate soft tissue structures, the added protection of a dental dam may reduce the likelihood of penetrating trauma.

A submandibular sialocele secondary to ductal trauma or stricture from a penetrating bur injury is a plausible explanation for our patient's acute swelling (Mandel, 2024). Most documented cases of salivary gland duct injury involve the parotid gland (Kulyapina *et al.*, 2014; Henry *et al.*, 2015; Bowers and Schaitkin, 2021). This likely arises from the parotid gland's more exposed anatomical position compared to the submandibular gland, which is protected by the mandible laterally and superiorly (Lazaridou *et al.*, 2012). A review of the literature reveals that where submandibular sialoceles are described, they can appear from days to months after the initial iatrogenic injury (Capaccio *et al.*, 2007; Hoehn *et al.*, 2019; Bhatia *et al.*, 2024).

Ranula can present clinically as swellings either in the floor of the mouth (sublingual type) or extending into the neck (plunging type) (Bowers and Schaitkin, 2021). This occurs when mucous extravasates from the sublingual gland, triggering an inflammatory response that leads to pseudocyst formation (Bowers and Schaitkin, 2021). Diagnosis of ranula relies on features such as a thicker, egg-white-like mucous aspirate and well-defined swelling margins on CT and ultrasound imaging (Chen *et al.*, 2015). Our diagnosis of the salivary gland source for the sialocele was established based on typical findings of serous fluid specific to the submandibular gland, distinct from the mucous contents usually observed in ranulae (Chen *et al.*, 2015). Despite the lack of biochemical assessment to confirm amylase content, it was clinically evident that no mucous was present in the aspirate. Imaging also did not indicate well-defined swelling borders characteristic of ranula pseudocyst formation.

We hypothesise that due to a penetrating bur injury, an anatomically-varied more superficial salivary duct was severed, leading to a sialocele formation. Chen *et al.* (2015) reported similar injuries where the submandibular salivary duct was severed during total sublingual gland removal for recurrent ranula. They noted that residual swelling in such cases is not indicative of ranula recurrence but rather results from saliva traveling through the submandibular duct and pooling at the site of the severed duct. It is plausible that leakage from the injured duct could accumulate in surrounding tissues, elevating the floor of the mouth and causing acute extraoral swelling. Not dissimilar to the clinical presentation of a plunging ranula, submandibular swelling could be attributed to the extravasation of saliva through a hiatus in the mylohyoid muscle (Yang *et al.*, 2016).

Management of submandibular sialocele is not well documented, though treatment strategies for parotid sialocele offer some guidance. Sialoendoscopy, in conjunction with imaging and aspirate testing, is another valuable diagnostic tool for identifying injuries to the salivary gland and/or duct (Henry *et al.*, 2015). However, as observed in our case, and by Bhatia *et al.* (2022), this method may face limitations post-trauma due to altered anatomy and duct contracture, rendering the duct inaccessible for sialoendoscopy. Conservative options include restoring oral flow through duct repair or suppressing salivary production using duct ligation, anticholinergic medications, or botulinum toxin injections (Henry *et al.*, 2015). Anticholinergic drugs such as propantheline-bromide can reduce salivary output to facilitate the healing phase, though they are known to produce unwanted side effects (Bowers and Schaitkin, 2021). Botulinum toxin type A injections, which inhibit acetylcholine release in presynaptic neurons, offer a minimally invasive option to decrease salivary flow (Maharaj *et al.*, 2020). This technique has been widely documented in treating sialorrhea and parotid sialoceles, though there is low level (level 4) evidence for its use in submandibular sialoceles (OCEBM Levels of Evidence Working Group, 2011; Costan *et al.*, 2019; Maharaj *et al.*, 2020). In 2007, Cappacio *et al.* claimed to be the first to successfully treat an iatrogenic submandibular sialocele with botulinum toxin while also pointing out the rarity of the presentation. It was evident through follow-up with our patient that botulinum toxin injections successfully resolved the swelling, sparing the need for more invasive interventions. While this approach holds promise, optimal dosing protocols for submandibular gland trauma are still unclear (Costan *et al.*, 2019; Bowers and Schaitkin, 2021). If conservative measures fail, surgical removal of the gland may be considered as a last resort (Lazaridou *et al.*, 2012; Callahan *et al.*, 2022). Ultimately, the goal is to restore patients to their pre-injury state and maintain salivary function without compromising quality of life.

Conclusion

This case highlights the importance of dental practitioners exercising extreme care during all treatment procedures to avoid accidental iatrogenic injury to surrounding tissues. Minor iatrogenic injuries to the floor of the mouth should not be underestimated since they carry the potential for swelling and airway obstruction, which can manifest immediately or within a few hours. While literature relating to iatrogenic injuries of the salivary glands remains scarce, management can be guided by principles established for managing parotid sialoceles and a tailored approach to the patient's specific needs.

Author contributions

Conception or design of the work – HF
Data collection – HF, AF
Drafting the article – HF, AF
Critical revision of the article – HDS, DT
Final approval of the version to be published – all authors

Declaration of patient consent

Informed consent from the patient to use their clinical photographs, imaging, and health records in a published article was obtained in writing.

Conflict of interest

The authors declare no conflicts of interest.

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