

## Application of Botulinum Toxin Type A in the Management of Ranula

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| Received: 16.03.2019 | Accepted: 17.03.2019 | Published: 25.03.2019

DOI: [10.36348/sjm.2019.v04i03.005](https://doi.org/10.36348/sjm.2019.v04i03.005)

### Abstract

Ranula presents clinically as a painless mucus pseudocyst in the floor of the mouth. They typically grow slowly and may be reported as a cycle of rupture and recurrence. Simple ranulas are mucus walled off above the mylohyoid muscle. Complex or plunging ranulas develop when the mucus extravasation extends through or around the mylohyoid muscle and deeper into the neck. Various treatment modalities have been advocated based on the size and location of the ranula. Deep plunging ranulas can be managed by surgical enucleation of the ranula along with the associated salivary gland or marsupialization whereas simple superficial ranulas can be managed by surgical enucleation or less invasive procedures. Ever since the first therapeutic use by Scott for strabismus till today, the spectrum of therapeutic applications of botulinum toxin has widened. Botulinum toxin offers a transient, reversible, relatively safe treatment option to many conditions of interest in the maxillofacial region. It can be used effectively as well as efficiently as a minimally invasive alternative to conditions which are refractory to routine medical management or require extensive surgical intervention. We present a case of a simple ranula in the floor of the mouth treated by Botulinum toxin efficiently in a non-invasive manner.

**Keywords:** Ranula, Botulinum toxin, salivary glands.

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### INTRODUCTION

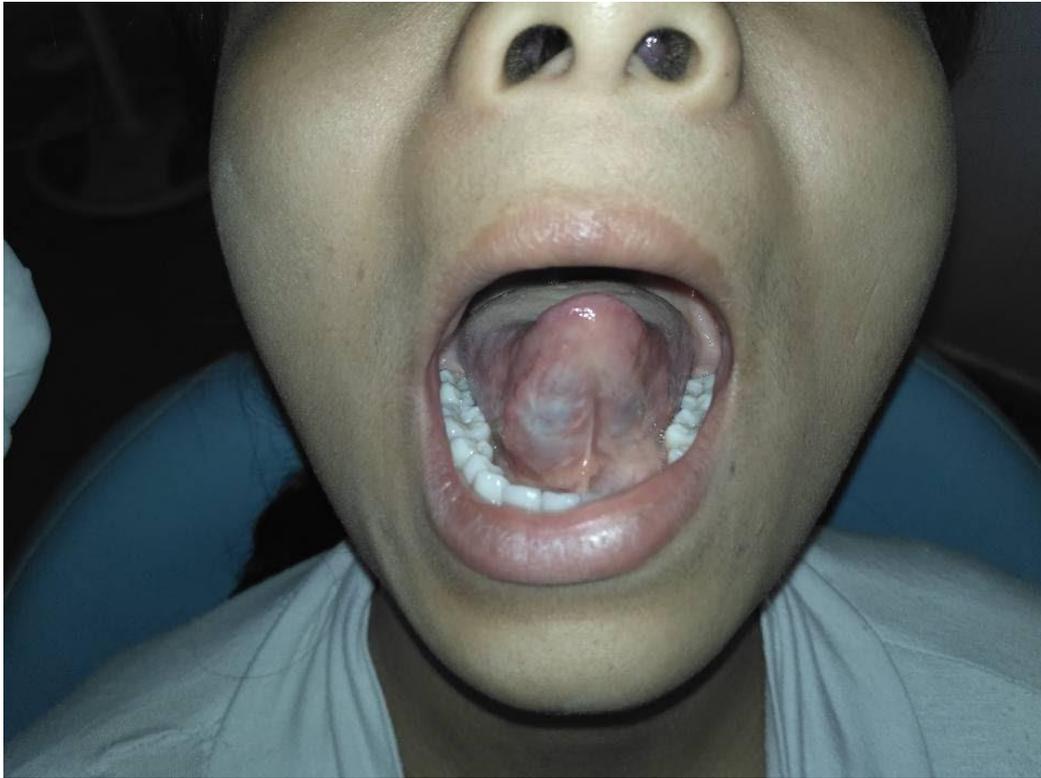
Ranula is a form of mucocele which specifically occurs in the floor of the mouth in association with the ducts of the submaxillary or sublingual gland [1]. The formation of ranula is thought to be due to the excretory duct rupture followed by extravasation and accumulation of saliva into the surrounding tissue [1]. The accumulation of mucous in the surrounding connective tissue forms a pseudocyst that lacks an epithelial lining [1]. Simple ranulas remain confined to the sublingual space, whereas diving ranulas extend beyond it [2]. The conventional treatment is surgical enucleation [2]. Considering the fact that there is a possibility of causing injury to the lingual nerve and the submandibular duct during surgical intervention, injection of botulinum toxin offers a non-invasive and effective mode to manage these clinical scenarios. This paper is intended to analyze the clinical outcome & efficiency of intra-cystic botulinum toxin injection for superficial ranula in the floor of the mouth.

### CASE REPORT

A young female in her second decade of life reported to our unit complaining of swelling in the right side of floor of the mouth and ventral surface of the tongue since 8 months. The swelling started as a small one and gradually increased to the present size. There were no other associated symptoms. On examination, the ventral surface of the tongue on the right side revealed a small swelling which is bluish white in colour and measured around 3 x 2 cm as shown in Fig-1. The size of the swelling increased upon compression of the right sublingual gland. The overlying skin was free from the swelling and was non-tender. There was no associated lymphadenopathy. Based on the history and the clinical presentation the swelling was provisionally diagnosed as Ranula. Ultrasound was done, which revealed a thin walled homogenous unilocular cystic lesion in the sublingual space. Finally a diagnosis of ranula was made. Patient was advised to undergo conventional surgical intervention. However, the patient was not willing for surgical intervention. Hence, considering the location and the size of the swelling a non-invasive mode of treatment in the form of botulinum toxin A was considered instead of the

conventional surgical intervention. Patient consents were taken and the patient was prepared for intralesional injection of botulinum toxin. Following needle aspiration of 1 ml of clear viscous fluid from the lesion, 50 units of botulinum toxin A was injected into the cyst as well as into the sublingual gland as shown in Fig-2. The cyst instantaneously decreased in size but

recollected to the original size the next day. However, the cyst markedly attenuated 2 days following injection and ceased to recollect. There was no evidence of lingual nerve injury resulting in tongue paresthesia. There was no evidence of recurrence at 6 months follow up post therapy as shown in Fig-3.



**Fig-1: Preoperative view of the lesion**



**Fig-2: Injection of botulinum toxin into the lesion**



**Fig-3: Postoperative view of the lesion**

## DISCUSSION

Botulinum is a natural protein and lethal neurotoxin. It is one of the most potent biological substances used in bioterrorism [3]. It is the first toxin used for therapeutic purposes. There are seven different toxin serotypes, namely, A, B, C, D, E, F and G, which differ in their potency, duration of action, and cellular target sites [4]. Commercially available variants are Botulinum toxin A and Botulinum toxin B. Botulinum toxin A is the most commonly used toxin in medicine and dentistry.<sup>5</sup> The usual recommended therapeutic dose is about 80-100 U. Cosmetic dosages are less than the therapeutic dose.<sup>5</sup> It is injected either via intramuscular, intradermal, intraglandular or into the affected area depending on the condition to be treated. It diffuses up to 10 mm into the adjoining areas [5]. A ranula can be classified into two clinical variants. An oral ranula located in the floor of the mouth presenting as a dome-shaped bluish discolouration. It is typically painless and does not change in size in response to chewing, eating or swallowing. A plunging ranula located near the upper airway extending into the floor of the mouth. From the submandibular space, it can extend into the submental region, the contralateral side of the neck, the nasopharyngeal area and up to the skull base, the retropharyngeal and into the upper mediastinum [6-8]. A congenital ranula may develop as a result of failure in the development of the salivary duct. An acquired aetiology is usually related to trauma to the sublingual gland or the duct and scar formation following this may cause obstruction [6]. Various methods of investigations of a ranula were advocated in the literature ranging from clinical observation alone to FNA and imaging.

Imaging modalities include ultrasound, CT scan and MRI [9, 10]. MRI is the imaging of choice to delineate the extent of lesion and its association with the normal structures. FNA usually revealed high protein and amylase concentrations [6]. Treatment of ranula may be in the form of surgical or non-surgical. Excision of the sublingual gland with or without the cyst is the treatment of choice in view of the least risk of recurrence ranging from 0% to 1% [11]. Marsupialization was associated with high recurrence rate, approximately 60% to 90% while marsupialization and packing of the cyst reduced the recurrent rate from 10% to 12% [12]. Considering this fact, the authors used a non-invasive and effective means in the form of botulinum toxin for the management of superficial ranula. Botulinum toxin blocks acetylcholine release at parasympathetic nerve terminals [5]. The clinical effects appear between 1 and 3 days after administration of botulinum toxin, and the maximum effects occur after 1-2 weeks, which then stabilizes to a moderate level until complete recovery of the nerve in approximately 3 months [14]. Botulinum toxin does not inhibit the production of acetylcholine, and therefore, motor function is recovered by subsequent motor axon outgrowth [14]. In clinical conditions like management of ranula, botulinum toxin acts by chemical denervation of the secretomotor parasympathetic nerve endings responsible for salivation [15]. Fuster *et al.*, injected botulinum toxin into parotid and submandibular gland with doses varying from 10 to 100 units, which resulted in reduction in saliva production which lasted for 6 months [16]. It has also been used successfully in patients with post-traumatic and iatrogenic salivary sialoceles and acute

postparotidectomy salivary fistula [17, 18]. Botox is useful in cases of drooling or salivary fistulas after oropharyngeal cancer surgery where temporary stopping of glandular secretory action is needed to promote healing [19]. There are no absolute contraindications for botulinum toxin use. However, relative contraindications include pregnancy, lactation, neuromuscular diseases, motor neuron disease, drug interactions and injection into infectious sites. Local side effects are mild and include Pain, edema, headache, erythema, ecchymosis, blepharoptosis, and perioral muscular palsy.<sup>5</sup> Systemic side effects are nausea, fatigue, headache, facial pain, flu-like symptoms, anxiety, itching, and transient weakness [5].

## CONCLUSION

Successful management of a ranula in the floor of mouth includes identification of the extent of the ranula and removal of the sublingual gland that is the underlying cause. Extent of treatment will depend on the size and location of the ranula. Clinical application of botulinum toxin in the maxillofacial region is progressively increasing. Treatment with botulinum toxin can be considered when the ranula is superficial particularly in scenarios where the patient is not willing for surgical interventions. Treatment with botulinum toxin has shown to have a low risk of side effects and is comparably cost effective, and relatively safe making it a viable treatment choice.

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