

Ranula: A Review of Literature

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ABSTRACT

Purpose: To review the literature regarding ranula.

Materials and Methods: An electronic search was performed for various publications about ranula, published in a specific time frame of January 1945 to October 2013.

Results: 150 Articles were obtained by electronic search. Publications were evaluated regarding appropriateness of content for preparing this review.

Conclusion: Based on the review of literature it can be concluded that ranula are extravasation cysts. Newer conservative methods are promising and can be used initially for treatment of ranula in selected cases. However, surgical excision of ranula along with involved sublingual salivary gland is treatment of choice with least recurrence rate.

Keywords: Ranula, Sublingual Gland, OK-432

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Introduction

Ranulas are cystic lesions which results from rupture or damage of ducts of the sublingual glands leading to mucus extravasation or dilatation of the gland's duct. Extravasation cysts are more common as compared to retention cysts. Ranula mostly arises from sublingual glands and involvement of the submandibular gland is rare. Ranula often protrudes into the floor of the mouth, having only an oral component. Ranulas can be of three types based on the clinical presentation. "Sublingual ranulas" are most common and presents with intraoral sublingual swelling. The ranulas that are located cervically beyond mylohyoid are termed "plunging ranulas", and those having an oral and cervical component are called "sublingual plunging ranula"[1]. The basic aim of this article is to present the review of literature regarding ranula.

Materials and Methods

An electronic search was performed for various publications about ranula, published in a specific time frame of January 1945 to October 2013. The following key words and Boolean operators were used: Ranula; sublingual plunging ranula; sublingual ranula; plunging ranula; mucocoeles; retention phenomenon; retention cyst; extravasation cyst; mucus extravasation phenomenon; extravasation phenomenon.

Results

150 Articles were obtained by electronic search. Publications were evaluated regarding appropriateness of content for preparing this review.

Discussion

By definition ranula is defined as a mucus filled cavity in relation to sublingual gland present in the floor of mouth. The name "ranula" has been derived from the Latin word "rana" which means "frog". Ranula resembles a frog's translucent underbelly or air sacs. Ranulas are characterized by large (>2 cm) cystic cavities and appear as a tense fluctuant dome-shaped vesicles, sometimes with a bluish hue. In the floor of the mouth these are typically present unilaterally. A clinical variant "plunging ranula" occur when the fluid pressure of the mucus dissect through the mylohyoid muscle to reach the submandibular gland[2-4].

The prevalence of ranula is about 0.2 cases per 1000 persons and accounts for 6% of all oral sialocysts. Only 1% to 10% of the ranulas are true retention cysts. Ranula usually occurs in children and young adults. The peak frequency of ranula occurs in the second decade of life[5].

There are two schools of thought regarding the development of ranulas. One theory states that ranulas develop as a result of mucus extravasation, whereas the second theory is in favor of mucus retention, both as a result of rupture or damage of a duct of sublingual gland[6]. However, current consensus and opinion supports mucus extravasation as the developmental factor because ranulas are mostly devoid of lining epithelium[7].

Certain ethnic groups like Maori and Pacific Island Polynesians, have greater tendency to develop ranulas. The greater prevalence of ranula in these specific population groups is suggestive of probable congenital origin of ranula[8, 9].

A Study of 83 cases of ranula in Zimbabwe revealed high prevalence of ranula in HIV positive subjects, suggesting HIV salivary gland disease could be an etiologic factor[10].

Plunging and sublingual-plunging ranulas cause swelling in the neck by one of the following four mechanisms. Firstly, sublingual gland may project through the mylohyoid muscle, or alternatively an ectopic salivary gland may present on the cervical side of the mylohyoid. This mechanism can explain the develop-

ment of plunging ranulas without intraoral components.

Moss and Hendrick reported the presence of ectopic salivary gland below the mylohyoid muscle [11].

Visscher et al. have the opinion that mucus secretion from these ectopic glands may drain saliva directly into neck mass [3]. Secondly, a hiatus or dehiscence in the mylohyoid muscle may occur. Several anatomical studies showed the presence of an opening in the mylohyoid muscle through which submental artery, lymph vessels, and branches of the sublingual artery and vein passes. This defect is observed along the lateral aspect of the anterior two-third of the muscle. Mucus from sublingual gland may pass through this defect and reach the submandibular space [11-13].

Projection of the sublingual gland through the hiatus between anterior and posterior part of the mylohyoid muscle were reported in 45% of the cadaver specimens and it clearly shows involvement of this herniation in cervical extensions of the ranulas [13]. Thirdly, approximately 45% of plunging ranulas occur iatrogenically as a result of surgery to remove oral ranulas. It has been reported that plunging ranulas may develop secondarily after surgical procedures such as implant placement, removal of sialolith and duct transposition [14-16].

Additionally, Bridger et al. after reviewing plunging ranulas, found that 44% of them developed iatrogenically after single or multiple attempts at eliminating oral ranulas by either marsupialization or simple drainage. They stated that surface fibrosis after repeated failed procedures could be responsible for diversion of the saliva inferiorly leading to plunging ranula [17].

Therefore, Crysedale et al. recommended that all oral ranulas greater than 1 cm should be treated by removal of lesion along with offending sublingual gland [18]. Whereas, other authors have proposed this treatment modality irrespective of the size of the ranula [19].

Lastly, a duct from the sublingual gland may join the submandibular gland or its duct, allowing the ranula to form in continuity with the submandibular gland. Therefore, ranula may reach the neck from behind the mylohyoid muscle. [3] Patton postulated that an aberrant duct from the deep lobe of the sublingual gland may open into the submandibular duct. This abnormal communication may cause stasis of salivary flow in the duct leading to extravasation of the saliva into the neck in the submandibular region [20].

The diagnosis of ranula is of clinical importance as some benign and malignant lesions may have similar clinical presentation. The differential diagnosis include various inflammatory and neoplastic lesions of the sublingual and submandibular glands, of the lymph nodes, granulomatous, adipose tissue diseases, cystic hygroma, branchial or thyroglossal duct cysts,

Laryngocele, dermoid and epidermoid cysts [13].

There are no specific diagnostic tests for ranulas. Differential diagnosis should be based on the history of the lesion. In majority of the cases ranula present as a cystic fluctuant lesion which increases in size gradually over a period of time. Salivary amylase and protein content of the fluid in ranula is higher as compared to serum. This further suggests that ranula originate from sublingual gland which produces saliva with higher protein concentration as compared to submandibular gland [21].

Ultrasonographic examination of sublingual salivary gland is usually inconclusive due to its location. On computed tomography, the simple ranula present as a rough ovoid-shaped cystic lesion with a homogenous central attenuation of 10 to 20 HU. The wall of the ranula is either very thin or not seen at all. The sublingual ranula is positioned above the mylohyoid muscle and lateral to genioglossus muscle. It can extend anteriorly behind the symphysis of the mandible, above the genioglossus and geniohyoid muscles. In case of plunging ranula there is infiltration of the lesion into the adjacent tissue planes, extending dorsally and inferiorly to the submandibular region. Although a plunging or sublingual-plunging ranula may extend into the submandibular triangle and displace the submandibular gland, it does not lead to any intrinsic changes within the gland [22].

Magnetic resonance imaging (MRI) is the most sensitive method to examination the sublingual glands. On MRI, the ranula's characteristic appearance is dominated by its high water content. Therefore, it has low T1-weighted intermediate proton density and high T2-weighted signal intensity. This appearance, especially in case of plunging ranula, may be similar to that of a lateral thyroglossal duct cyst, a lymphangioma and an inflamed lymph node. However, the signal intensity may vary if the protein concentration of the ranula's cystic content is high. In such instances the MRI differential diagnosis should includes pathologies like lipomas, dermoid and epidermoid cysts [23].

Takimoto suggested a simple radiographic technique for pre-operative diagnosis of plunging ranula. This technique involves administration of a contrast medium in the sublingual space. [24] Sialographic examination of the patient with a sialocyst presents smooth displacement of the glandular ducts around the mass. Sialographic examination failed to demonstrate direct communication of the lesion with the ductal system of the gland [25].

Histopathological examination of the ranula consists of a central cystic space containing mucin and a pseudocyst wall which is composed of loose, vascularized connective tissues. There is predominance of histiocytes within the pseudocyst wall, but over a period of time, these become less prominent. An important feature in histologic diagnosis is the absence of epithelial tissues in the wall of ranula [26]. A biopsy of the cystic wall is recommended not only for histopathologic diagnosis, but also to rule out the presence of squamous cell carcinoma arising from the cyst wall

and papillary cystadenocarcinoma of the sublingual gland, which may present as ranula [25].

Many treatment modalities have been applied in the past for the management of ranulas. These include excision of the ranula only, marsupialization with or without cauterization of the lesion lining, excision of the oral part of the ranula along with involved sublingual gland or rarely submandibular gland, incision and drainage of the lesion via intraoral approach, excision of the lesion via extraoral approach, combined with excision of sublingual gland in certain cases. Even with the above mentioned treatment modalities, many patients presented with recurrence and sometimes may have larger lesions as compared to initial one. Excision of ranula along with involved sublingual gland is the most accepted method with low recurrence rate [27].

In 1995, Morton and Bartley stated that ranula can be treated by placing silk suture in the dome of the cyst [28]. Later on Delbem et al. utilized the micromarsupialization technique for the treatment of ranula. This technique involve topical anesthesia of the lesion for 3 minutes and use of a single 4-0 black silk suture passed through the internal part of the lesion along its widest diameter. The suture was removed after 7 days [29].

Sandrini et al. performed modified micro-marsupialization for treatment of ranula. The modification include an increased number of sutures, decreased distance between the entrance and exit of the needle followed by maintenance of sutures for longer duration approximately 30 days. The basic idea of micromarsupialization is to establish drainage of saliva and formation of new permanent epithelized tract along the path of sutures. They stated that the simplicity of execution, low invasiveness of the procedure, and the fact that no special care is required during recovery make this technique a good treatment option especially in pediatric patients [30].

Baurmash advocated that radical surgery should be reserved only for plunging ranula and recurrent cases [31]. Baurmash recommended against the sublingual gland removal as the primary treatment modality of ranulas. He advocated marsupialization followed by positive pressure gauze packing as the primary treatment modality. The marsupialization procedure leads to evacuation of the mucus only. The positive pressure gauze packing into the cavity not only seal the initial leak, but also evoke a inflammatory response sufficient enough to initiate fibrosis to permanently seal the leak, leading to acinar atrophy and healing. With this addition to the un-roofing technique for treatment of the deep ranula, the recurrence rate was reduced to 10% to 12% [32].

Pandit and Park advocated radical management of all ranulas by excision of ranula along with sublingual gland to prevent recurrence. Pandit and Park suggested that submandibular duct dissection with relocation appears to enhance exposure to the floor of the mouth [33]. Bridger et [17] and Catone et al [19] recommended sublingual gland excision as the primary treatment

modality irrespective of the size of ranula,. However, Crysdale et al. suggested that lesions larger than 1 cm should be treated with gland removal [18].

Baurmash recommended that this method of treatment should be reconsidered. The term ranula is loosely applied to any cyst like swelling in the floor of the mouth. Some of these lesions are unrelated to the body of sublingual gland. These lesions are mucoceles arising from the mucus secreting incisal glands in the anterior floor of the mouth, retention cysts at Wharton's duct orifice and retention cyst involving the openings of ducts of Rivinus. These lesions must be differentiated from the ranula which arises from the depth of sublingual gland. These superficial lesions are 0.5 to 1.5 cm in size as compared to ranula arising from the gland with size of >1.5 to 3.0 cm. In support of his recommendations Baurmash presented a clinical case of a superficial dissecting ranula that crosses the midline and clinically appear bilaterally. Typically ranulas are unilateral lesions, and without conservative surgical intervention one cannot determine the offending gland and depth of lesion [34].

Galloway et al. described a safer surgical approach to ranula by elevation of a mucoperiosteal flap from the lingual surface of the mandibular alveolar process [35]. Kaneko recommended that during treatment of ranula, the sublingual gland should be removed through intraoral approach rather than from cervical approach because of the accessibility to the sublingual gland, lack of scar formation on the skin and lack of danger of injury to marginal mandibular nerve [36]. Patel et al. in their retrospective study also concluded that definitive treatment yielding lowest recurrence and complication rates was transoral excision of the ipsilateral sublingual gland with ranula evacuation [37].

Zhao et al. recommended insertion of a large lacrimal probe or indwelling catheter into the Wharton's duct to facilitate identification of this structure during surgical exposure and removal of the sublingual gland [38].

Takimoto et al. recommended meticulous dissection of the ranula in continuity with the sublingual gland of origin. After evacuation of the mucus, fibrin glue was injected into the cystic space. This prevents the collapse of wall of lesion during surgery and facilitates the surgical procedure by clearly outlining the involved area and sharply delineating its thin wall [39]. In the treatment of ranula Choi and Oh used hydrodissection technique, which involves the injection of saline and lidocaine with 1:100000 of epinephrine under pressure into the dissection planes. The reported advantages include less bleeding, fewer incidents of neural & soft tissue damage and lower recurrence rate [40].

The reported recurrence rates after various treatment modalities are: incision and drainage (70% to 100%), marsupialization (36.4% to 80%), excision of ranula only (18.7% to 85%), and excision of ranula along with sublingual salivary gland (0% to 3.8%) [18, 27, 38, 41-42].

Beside surgical management, CO₂ laser, Er,Cr :YSG laser has been used to vaporize ranulas. Vaporization of ranula by various types of laser is also widely practiced. The minimal lateral tissue damage seen with laser minimizes the risk. In addition, the bloodless nature of surgery in the vascular area adds to increased safety by allowing more visibility of the surgical field [43]. Lai JB et al. recommended use of CO₂ laser for treatment of sublingual ranula. In addition to vaporization of ranula, lasers can also be used to vaporize the base of the lesion, destroying cells layer by layer and sealing the underlying minor salivary glands. The added advantages with the CO₂ laser are less pain, swelling and scarring for the patient [44].

Intra cystic injection of sclerotherapy agents like OK-432 (a lyophilized mixture of low virulence group A streptococcus pyogenes with penicillin G potassium) has been reported to be highly effective in the management of intraoral ranulas [45]. A clinical study evaluating the efficacy of OK-432 sclerotherapy of plunging ranula in 21 patients stated that it is a safe and potentially curative procedure that may be used as a primary treatment for plunging ranula before considering surgery. The only contraindication to use of OK-432 is in patients having allergy or hypersensitivity to penicillins. The complication includes fever, mild pain at the injection site and odynophagia [46].

A recent study found orally administered Nickel Gluconate-Mercurius Heel-Potentised Swine Organ Preparations D10/D30/D200, a hemotoxicological agent to be an effective treatment modality for ranulas [47].

A case series involving 3 patients, reported successful treatment of ranula with administration of Botulinum Toxin Type A into the cystic swelling [48]. The drug acts by chemical denervation of the secretomotor parasympathetic nerve endings responsible for salivation. This medication has been used for a variety of problems for the past 2 decades, and its safety as well as tolerability is well documented [49].

Conclusion

Based on the review of literature it can be concluded that ranula are extravasation cysts. Newer conservative methods are promising and can be used initially for treatment of ranula in selected cases. However, surgical excision of ranula along with involved sublingual salivary gland is treatment of choice with least recurrence rate.

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