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Imaging Technique and Histopathology A Diagnostic Dilemma: A Plunging Ranula, Sialadenitis with Mucous Retention Phenomenon

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Abstract

Ranula is a mucus extravasation pseudocyst arising from the sublingual salivary gland, usually secondary to trauma or obstruction of the glandular ducts.[1] The term "ranula" originates from the Latin word *rana* (frog), describing the resemblance of the bluish translucent swelling to the underbelly of a frog.[2] Ranulas are broadly classified into oral ranulas, which remain confined to the floor of the mouth, and plunging ranulas, which extend beyond the oral cavity into the cervical fascial spaces through or around a defect in the mylohyoid muscle.[3]

Plunging ranula is an uncommon lesion accounting for a small proportion of salivary gland pathologies and typically presents as a painless fluctuant swelling in the submandibular or upper cervical region.[4] Owing to its clinical presentation and anatomical location, it may be mistaken for a variety of cystic lesions of the neck, including dermoid cysts, epidermoid cysts, branchial cleft cysts, cystic hygromas, thyroglossal duct cysts, and salivary gland disorders.[5] Consequently, accurate diagnosis often requires a combination of clinical examination, radiological investigations, cytological evaluation, and histopathological assessment.[6]

Imaging modalities such as ultrasonography, computed tomography (CT), and magnetic resonance imaging (MRI) are useful in determining the origin, extent, and anatomical relationships of plunging ranulas.[7] Characteristic findings include a cystic lesion extending from the floor of the mouth into the submandibular space, often demonstrating the "tail sign," which is considered highly suggestive of a plunging ranula.[8] Fine-needle aspiration cytology may reveal mucin-rich aspirates and inflammatory cells; however, cytological and radiological findings alone may occasionally be insufficient to distinguish plunging ranulas from primary salivary gland pathologies.[9]

Histopathological examination remains the gold standard for establishing a definitive diagnosis and excluding other cystic lesions or inflammatory salivary gland diseases. [10] The present case describes a patient

presenting with a cystic swelling of the right submandibular region in whom clinical, cytological, and radiological findings were strongly suggestive of a plunging ranula. However, definitive histopathological examination revealed sialadenitis with mucous retention phenomenon, creating a clinicoradiological–histopathological discordance. This report highlights the diagnostic challenges encountered in the evaluation of cervical cystic swellings and emphasizes the importance of correlating imaging findings with histopathological examination before establishing a final diagnosis.

Keywords: Computed Tomography, Diagnosis, Epidermoid Cysts, Ranula

Chief complaint

A 32-year-old male presented to the Department of Oral and Maxillofacial Surgery with a painless swelling of the right lower jaw region of one month's duration.

History

The patient had been asymptomatic until approximately one month before presentation, when he noticed a swelling in the right lower posterior region of the face. The swelling was sudden in onset, increased gradually over a short period, and thereafter remained static. There was no associated pain, fever, or discharge, no difficulty in swallowing or breathing, and no variation with meals. He first attended a local general surgeon, where ultrasonography and computed tomography were performed, and was referred to the present tertiary centre, where fine-needle aspiration cytology (FNAC) and a preoperative laboratory profile were obtained before definitive management. His medical, drug, allergic, and family histories were unremarkable, and he reported with no tobacco, areca-nut, or alcohol habit.

Clinical features

On general examination the patient was conscious, cooperative, and oriented, afebrile, and haemodynamically stable (blood pressure 120/70 mmHg, pulse 72 beats per minute), and was graded as American Society of Anesthesiologists (ASA) physical status I. There is no lymphadenopathy. Extraoral examination revealed gross facial asymmetry of the lower right face owing to a swelling that extended superiorly to approximately 3 cm below the angle of the mouth, inferiorly to approximately 4 cm below the inferior border of the mandible, and anteroposteriorly from the angle of the mandible to the submental region across the midline. The overlying skin was normal in colour and texture, with no ulceration or sinus. On palpation the swelling was soft, non-tender, and pinchable from the overlying skin, with no local rise in temperature. The temporomandibular joints moved synchronously without deviation or restriction. Intraoral examination showed subtle fullness of the floor of the mouth on the right, maintained occlusion, adequate mouth opening, and poor oral hygiene, with dental caries in relation to the mandibular right and left first molars (Figure 1).

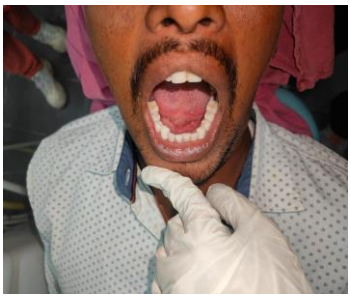


Figure 1:

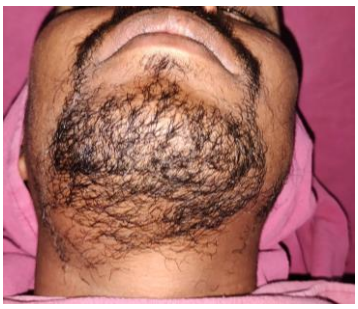


Figure 2:

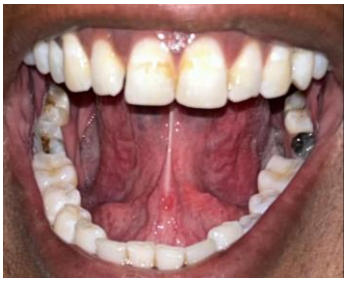
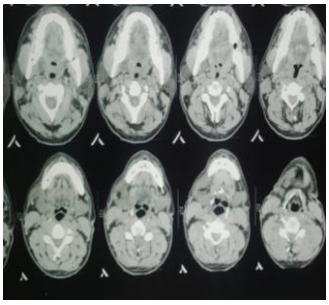


Figure 3:

Radiographic and other investigation findings

Preoperative haematological and biochemical investigations are summarised in Table 1; bleeding time, clotting time, and serology were within normal limits. Mildly elevated fasting and postprandial glucose with a glycated haemoglobin (HbA1c) of 7.2% indicated previously undiagnosed dysglycaemia, which was relevant to perioperative care. FNAC of the swelling yielded mucoid material containing inflammatory cells. Ultrasonography (USG) demonstrated a thin-walled, well-defined cystic lesion in the floor of the mouth extending into the cervical soft tissues below the mylohyoid muscle, and the submandibular gland was reported as sonographically normal. Contrast-enhanced computed tomography (CECT) demonstrated a well-defined, non-enhancing, fluid-attenuation cystic lesion arising from the right floor of the mouth and extending into the right submandibular space, interpreted as a plunging ranula; an incidental small hypodense nodule in the left lobe of the thyroid was considered likely benign, and there was no pharyngeal or laryngeal abnormality.



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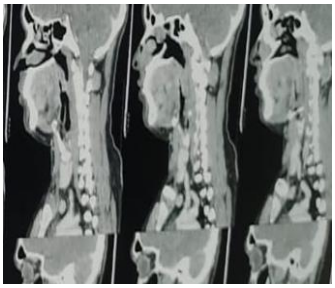


Figure 5:

Table 1:

Test Name	Result	Range
Fasting Blood Sugar	102 mg/dl	60 - 100 mg/dl
Haemoglobin	14.2	13-16
PPB5	264 mg/dl	<140 mg/dl
HbA1c	7.2%	Non-diabetic: 6% Glycemic Control: 6 - 7% Fail Control: 7 - 8% Poor Control: >8%
Urea	10.00 mg/dl	10 - 40 mg/dl
Creatinine	0.80 mg/dl	0.60 - 1.5 mg/dl

Uric Acid	2.00 mg/dl	2.6 - 6.0 mg/dl
Calcium	9.7 mg/dl	8.6 - 10.2 mg/dl
Phosphorus	3.5 mg/dl	2.5 - 4.5 mg/dl
Sodium	141 mmol/L	136 - 145 mmol/L
Potassium	4.2 mmol/L	3.5 - 5.1 mmol/L
Chloride	97 mmol/L	98 - 107 mmol/L

Diagnosis

On the basis of a soft, painless, cystic submandibular swelling with subtle floor-of-mouth fullness, supported by mucoid cytology and by cross-sectional imaging showing a cystic lesion arising from the floor of the mouth and extending into the submandibular space, a preoperative diagnosis of a right plunging ranula was made, and surgical planning proceeded on that basis.

Treatment plan and procedure

The preoperative investigations localised a cystic lesion to the right floor of mouth and submandibular space. In keeping with the established principle that durable management is achieved by excising the lesion together with the involved source gland, and given the cervical extent of the swelling, excision of the cystic lesion and the ipsilateral submandibular gland through a transcervical (Risdon) approach was planned and performed under general anaesthesia.

A horizontal cervical incision of approximately 4 cm was placed within a skin crease approximately 2 cm below the inferior border of the mandible to protect the marginal mandibular branch of the facial nerve. Skin, subcutaneous tissue, and platysma were incised and subplatysmal flaps were raised; the cystic lesion came into view immediately after division of the platysma. The marginal mandibular nerve was identified and retracted superiorly. The facial vein was ligated and divided, and the facial artery was double-ligated and divided to allow mobilisation of the gland. The deep cervical fascia was incised to expose the submandibular gland capsule, and the gland was mobilised by blunt and sharp dissection. During posterior dissection the lingual nerve was identified looping over the submandibular (Wharton) duct and was preserved, the duct was traced anteriorly, ligated, and divided, and the hypoglossal nerve, lying deep and inferior to the duct, was identified and protected. The submandibular gland was delivered together with the cystic lesion, and the bed was irrigated. Haemostasis was secured and the wound was closed primarily in layers, with the deep fascia and platysma approximated using polyglactin sutures and the skin closed with subcuticular and interrupted sutures. No drain was placed, and a pressure dressing was applied. The excised specimen comprised the right submandibular gland and the cystic lesion.

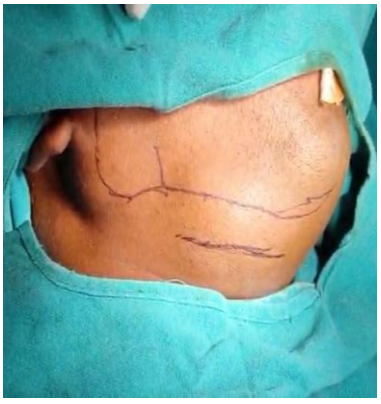
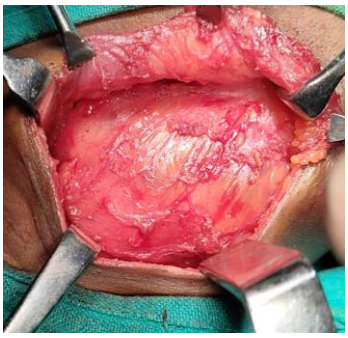


Figure 6:



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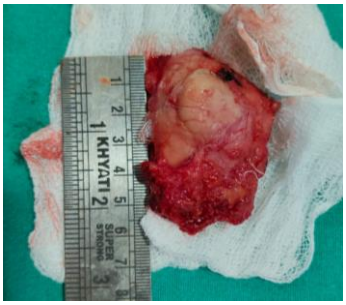

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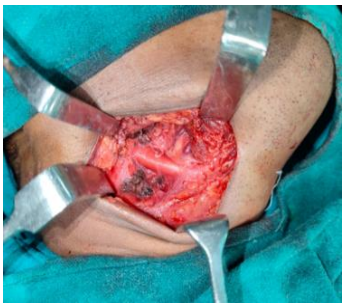

Figure 9:

Post operative care

The postoperative course was uneventful. The patient received antibiotics, analgesics, and vitamin B12 supplementation, and the pressure dressing was used in the early postoperative period. Facial nerve function, tongue movement, and the wound were monitored, with no salivary leak, haematoma, infection, or clinically detectable nerve deficit. Histopathological examination of the excised submandibular gland revealed sialadenitis with a mucous retention phenomenon, a finding discordant with the preoperative radiological impression of a plunging ranula and with the sonographic report of a normal gland. Because the involved source gland was excised together with the lesion, the prognosis is favourable and the expected risk of recurrence is low; the patient was advised regular follow-up.

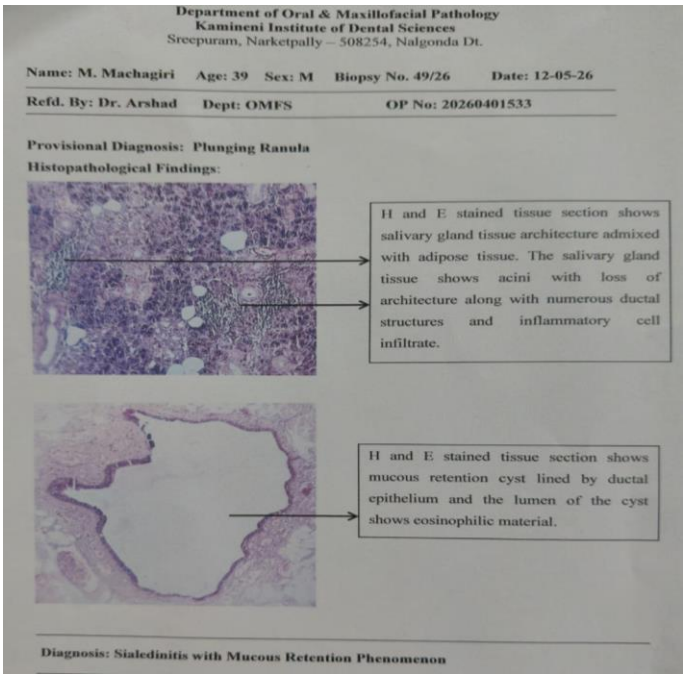

Figure 10:

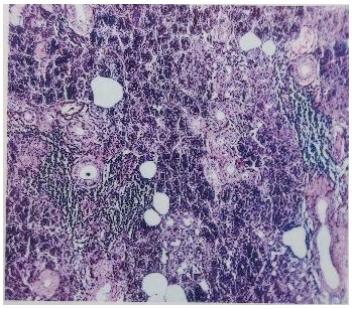

Figure 11:

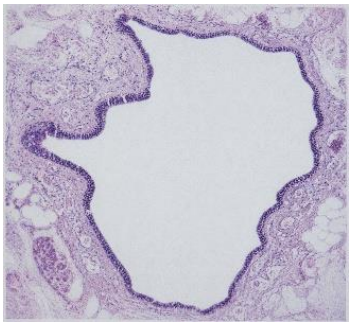

Figure 12:

Discussion

The present case represented a diagnostic challenge because the clinical, cytological, and radiological findings were highly suggestive of a plunging ranula. The patient presented with a painless cystic swelling in the

submandibular region associated with subtle fullness of the floor of the mouth. Fine-needle aspiration cytology yielded mucoid material containing inflammatory cells, while ultrasonography and contrast-enhanced computed tomography demonstrated a well-defined cystic lesion extending from the floor of the mouth into the submandibular space. These findings are commonly described in plunging ranulas and have been reported as characteristic features aiding preoperative diagnosis. Consequently, a provisional diagnosis of plunging ranula was considered reasonable and formed the basis of the initial surgical plan.[11,12,13]

A notable finding in the present case was the discrepancy between the preoperative diagnosis and the final histopathological diagnosis. Ranulas are generally regarded as mucous extravasation pseudocysts resulting from disruption of the salivary gland duct, most commonly involving the sublingual gland. Extravasated mucus accumulates within the surrounding connective tissue and elicits a granulation tissue response. Histologically, ranulas characteristically lack a true epithelial lining. In contrast, a mucous retention phenomenon develops secondary to ductal obstruction, resulting in retention of secretions within a dilated ductal structure. Such lesions are commonly associated with chronic inflammatory changes, ductal dilatation, and varying degrees of glandular damage. Therefore, although both lesions involve accumulation of saliva, their underlying pathogenesis is fundamentally different.[15,16,17,18]

Despite their distinct pathological mechanisms, mucous extravasation and mucous retention lesions may exhibit considerable overlap in clinical presentation and imaging characteristics. Both may present as painless cystic swellings and yield mucin-rich aspirates on cytological examination. Similarly, radiological investigations frequently demonstrate well-circumscribed fluid-filled lesions involving the floor of the mouth or adjacent cervical spaces. Imaging modalities such as ultrasonography and computed tomography are valuable in determining lesion extent and anatomical relationships; however, they primarily depict morphological features and cannot reliably differentiate between mucus extravasation and mucus retention phenomena. Consequently, lesions associated with chronic salivary gland inflammation and ductal obstruction may occasionally mimic plunging ranulas, resulting in clinicoradiological–histopathological discordance similar to that observed in the present case. [11,12,13]

The distinction between these entities is clinically important because their management differs. Current evidence suggests that successful treatment of plunging ranula requires elimination of the source of mucus extravasation, most commonly through excision of the involved sublingual gland, with or without removal of the associated cystic component. This approach has been associated with lower recurrence rates compared with simple aspiration, marsupialization, or cyst excision alone. In contrast, management of chronic sialadenitis with mucous retention phenomenon depends on the severity of gland involvement and may range from conservative measures such as hydration, sialogogues, gland massage, and antibiotic therapy to surgical excision in cases of persistent symptoms, recurrent swelling, extensive glandular destruction, or diagnostic uncertainty. [16,17,18]

Although histopathological examination ultimately demonstrated sialadenitis with mucous retention phenomenon, the surgical management undertaken in the present case was considered appropriate. The lesion exhibited clinical and radiological characteristics

consistent with a plunging ranula and produced a clinically significant cervical swelling requiring definitive treatment. Furthermore, preoperative investigations could not reliably exclude alternative salivary gland pathologies. Surgical excision of the lesion together with the ipsilateral submandibular gland therefore served both diagnostic and therapeutic purposes. Histopathological evaluation established the definitive diagnosis, while complete removal of the diseased gland eliminated the source of the pathological process and is expected to reduce the likelihood of recurrence. The favourable postoperative course and absence of complications further support the adequacy of the treatment provided.

This case highlights the importance of correlating clinical, radiological, surgical, and histopathological findings in the evaluation of cystic lesions of the submandibular region. While modern imaging techniques play a critical role in preoperative assessment, they may not always distinguish between lesions with similar morphological characteristics but different pathological origins. Histopathological examination remains the definitive diagnostic modality and may reveal unexpected findings that alter the final diagnosis. Awareness of the overlap between plunging ranula and salivary gland disorders such as sialadenitis with mucous retention phenomenon is essential for accurate diagnosis, appropriate treatment planning, and prevention of recurrence.

The histopathological findings in the present case provided the key evidence for differentiating the lesion from a true plunging ranula. Microscopic examination demonstrated loss of normal salivary gland architecture, numerous ductal structures, chronic inflammatory cell infiltration, and a mucous retention cyst lined by ductal epithelium. These findings are characteristic of chronic sialadenitis associated with ductal obstruction and mucus retention. Importantly, the presence of an epithelial lining favours a retention phenomenon rather than an extravasation phenomenon. In contrast, ranulas are classically regarded as pseudocysts that lack a true epithelial lining and instead consist of mucus pools surrounded by granulation tissue and inflammatory cells. The identification of ductal epithelium within the cyst wall therefore constituted the principal histopathological feature that excluded a true plunging ranula and established the final diagnosis of sialadenitis with mucous retention phenomenon. [14], [17]

The observed loss of acinar architecture and prominent inflammatory cell infiltrate further support a chronic inflammatory process involving the salivary gland. Chronic ductal obstruction may result in salivary stasis, progressive glandular injury, inflammatory infiltration, ductal dilatation, and formation of retention cysts. As the cyst enlarges, the resulting lesion may mimic other cystic pathologies of the floor of the mouth and submandibular region both clinically and radiologically. This mechanism may explain the striking resemblance to a plunging ranula observed in the present case despite the fundamentally different histopathological diagnosis. [16],[17]

The present case highlights the limitations of relying exclusively on clinical examination, cytology, and imaging when evaluating cystic lesions of the submandibular region. Although ultrasonography, computed tomography, and fine-needle aspiration cytology strongly supported a diagnosis of plunging ranula, histopathological examination demonstrated an alternative pathology. This clinicoradiological–histopathological discordance emphasizes the importance of maintaining a broad differential diagnosis when assessing cervical cystic swellings. Furthermore, it reinforces the role of histopathological evaluation as the

definitive diagnostic modality capable of distinguishing between lesions with similar clinical and radiographic appearances but fundamentally different pathological origins. Awareness of this diagnostic overlap may facilitate appropriate treatment planning and prevent diagnostic errors in future cases.[11–19]

Conclusion

The present case demonstrates the diagnostic challenges associated with cystic lesions of the submandibular region. Despite clinical, cytological, and radiological findings strongly suggestive of a plunging ranula, definitive histopathological examination revealed sialadenitis with mucous retention phenomenon. The presence of a ductal epithelial lining and chronic inflammatory changes were critical in establishing the final diagnosis and differentiating the lesion from a true mucous extravasation pseudocyst. This case underscores the importance of correlating clinical, radiological, surgical, and histopathological findings to achieve an accurate diagnosis and highlights histopathology as the gold standard for evaluating cystic salivary gland lesions.

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