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Case Report

Surgical management of a large plunging ranula: A case report and review of diagnostic challenges

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ABSTRACT

Introduction: Ranulas are mucous cysts that arise from the sublingual gland due to ductal obstruction or trauma. Plunging ranulas, a rare variant, extend into the neck and often present diagnostic challenges. Definitive surgical management is necessary to prevent recurrence and ensure successful outcomes.
Case presentation: A 20-year-old female presented with a slowly enlarging, painless mass in the floor of her mouth extending into the submandibular region and anterior neck. The mass had progressively increased in size over five years, affecting her appearance and mastication. MRI confirmed a large plunging ranula. The patient underwent complete surgical excision of the cyst and the sublingual gland under general anesthesia. She recovered well, with no immediate postoperative complications. Follow-up at 12 months showed no recurrence, and the patient reported full resolution of symptoms.
Conclusion: This case highlights the importance of early recognition and accurate diagnosis of plunging ranulas to guide appropriate surgical intervention. Complete excision of the sublingual gland remains the treatment of choice for preventing recurrence. In line with similar cases in the literature, this approach resulted in a successful outcome with no evidence of recurrence during follow-up. The findings underscore the clinical significance of individualized treatment strategies based on the extent of anatomical involvement.

1. Introduction

Ranulas are mucous cysts resulting from the extravasation or retention of saliva in the sublingual gland due to ductal obstruction or trauma. They are typically characterized by a bluish, fluctuant swelling on the floor of the mouth, often displacing nearby oral structures. These lesions are broadly classified into two types: *simple ranulas*, which remain localized to the floor of the mouth, and *plunging ranulas*, a more uncommon variant that extends beyond the mylohyoid muscle into the neck, sometimes manifesting as cervical swelling. The latter poses significant diagnostic and surgical challenges due to its involvement in multiple anatomical compartments, and its presentation can easily mimic other cervical pathologies such as abscesses or cysts [1,2].

Globally, plunging ranulas represent a rare clinical entity, with a small percentage of oral cavity cysts presenting in this manner [1–5]. While the condition has been reported across various geographic populations, its incidence appears to be higher in specific ethnic groups, such as Polynesians and Maori, suggesting a potential genetic predisposition [3,4]. However, in non-endemic populations, the rarity of plunging ranulas complicates the diagnostic process, leading to potential mismanagement if not correctly identified early. Despite the clear surgical indications, particularly with lesions extending into the neck, there remains a lack of consensus on the most effective long-term treatment modalities to prevent recurrence.

This case report focuses on the presentation of a large plunging ranula in a 20-year-old female patient, underscoring the challenges of diagnosis and management. While marsupialization and other conservative treatments have been employed in certain cases, complete surgical excision of the sublingual gland remains the gold standard for definitive treatment, especially in cases of large or recurring lesions [5–7]. This report highlights the rarity of the condition, explores the diagnostic challenges, and emphasizes the importance of early and accurate diagnosis to prevent recurrence and complications. Furthermore, this case adds to the limited literature on plunging ranulas in non-endemic populations and reinforces the need for individualized treatment strategies.

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2. Case presentation

A 20-year-old female presented to the Maxillofacial Surgery department at Stomatology Hospital, Kabul, Afghanistan, in November 2022 with concerns about a slowly enlarging, painless intraoral mass that had progressively extended to the neck. The patient first noticed the mass five years earlier, but only recently became concerned due to its increased size, which was affecting her appearance and mastication. Notably, she experienced no associated symptoms such as pain or tenderness, and beyond its physical impact, the mass had caused minimal discomfort.

2.1. Initial clinical examination

On examination, a large, fluctuant mass was evident in the floor of the mouth, significant enough to cause lateral deviation of the tongue. The mass extended into the submandibular region and the anterior neck. The overlying skin remained normal in color and texture, with no signs of infection or inflammation. Palpation of the mass revealed no tenderness, and the patient had no history of trauma or recent illness.

Given this presentation, initial differential diagnoses included sublingual and submandibular abscesses. However, the absence of associated inflammatory symptoms, such as pain, redness, or systemic signs, led to further diagnostic evaluations.

2.2. Diagnostic imaging

Magnetic resonance imaging (MRI) of the neck with contrast was conducted, revealing a well-defined, large cystic mass in the left sublingual region (Fig. 4). The lesion extended from the left floor of the mouth into the left side of the neck, measuring approximately 10 cm in cranio-caudal length, 8 cm in transverse diameter, and 5 cm in anterior-posterior diameter. The mass caused mild compression of the anterior trachea and oropharynx but did not result in significant displacement of these structures. These imaging findings were consistent with a plunging ranula diagnosis (Figs. 1 and 2).

2.3. Surgical intervention

After discussing the benign nature of the lesion with the patient, surgical excision was determined to be the optimal treatment approach. The procedure was performed under general anesthesia, with complete resection of both the ranula and the affected sublingual gland (Fig. 5). The surgery was uneventful, and no intraoperative or immediate postoperative complications were noted (Fig. 3).

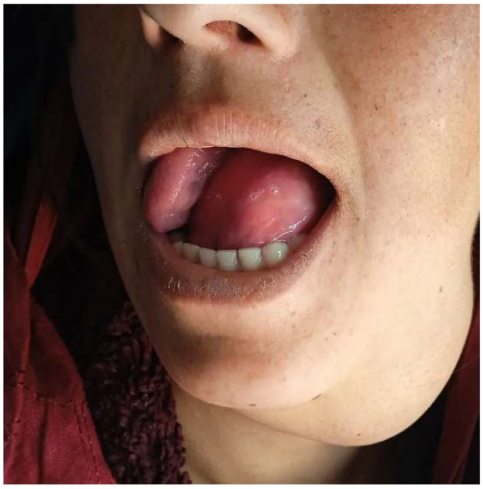

Fig. 1. Intraoral presentation of a 20-year-old female with a plunging ranula. The image shows a large, fluctuant swelling under the tongue, displacing the tongue to the side. The swelling extends from the sublingual region, indicative of a ranula, which also extends into the submandibular and anterior neck regions.

Fig. 2. Preoperative Intraoral Examination: A clinical image showing the intraoral view of the 20-year-old female patient with a large, fluctuant mass in the floor of the mouth, causing lateral deviation of the tongue.

Fig. 3. Excised specimen of the plunging ranula from a 20-year-old female. The well-defined, cystic mass was surgically removed from the sublingual and submandibular regions, measuring approximately 10 cm in length.

2.4. Postoperative follow-up and long-term outcomes

The patient recovered well and was discharged within 24 h of the procedure, with clear postoperative instructions. Her first follow-up, conducted two weeks' post-surgery, revealed no signs of infection or recurrence, and the patient reported significant improvement in her symptoms, particularly the resolution of the mass and its effect on her mastication.

Subsequent follow-up (Table 1) assessments at 3, 6, and 12 months' post-surgery showed continued positive outcomes. No clinical evidence of recurrence was observed, and the patient expressed satisfaction with the cosmetic and functional results. Long-term follow-up at the 12-month mark confirmed stable outcomes, with no residual swelling or reformation of the ranula.

Fig. 4. MRI scan of a 20-year-old female with a plunging ranula. The image reveals a large, well-defined cystic mass extending from the left sublingual region into the neck, causing mild displacement of the trachea and oropharynx.

Fig. 5. Intraoperative Surgical Excision: Surgeons performing the resection of the plunging ranula under general anesthesia. The image shows the incision and surgical exposure of the cystic mass in the neck and the floor of the mouth, with ongoing removal of the affected sublingual gland.

3. Discussion

Ranula, a retention extravasation cyst arising from the sublingual salivary gland, presents in two forms: the more common oral ranula and the less frequent plunging ranula, which extends beyond the mylohyoid muscle into the neck [6]. Plunging ranulas are challenging because they often present as neck masses, leading to potential misdiagnosis due to their deep anatomical location and the involvement of multiple compartments.

In this case, the patient presented with both intraoral and cervical swelling, a typical manifestation of plunging ranula, which is often associated with oral ranulas [6]. However, plunging ranulas can occasionally arise without any intraoral component, making diagnosis more difficult [7]. The extravasation of saliva from the sublingual gland, likely due to trauma or ductal obstruction, remains the leading theory behind the pathogenesis of plunging ranulas [7,9].

Table 1
Patient's clinical progression timeline.

Timeline	Event	Outcome
November 2022	Initial presentation at Maxillofacial Surgery	Large, painless mass extending to neck identified
December 2022	MRI evaluation	Confirmed plunging ranula diagnosis
December 2022	Surgical excision of ranula and sublingual gland	Surgery successful, no complications
2 weeks post-op	First follow-up	No recurrence, symptoms resolved
3 months post-op	Follow-up	No recurrence, patient fully recovered
6 months post-op	Follow-up	Stable results, no recurrence
12 months post-op	Final follow-up	No recurrence, long-term outcome successful

3.1. Comparison with literature

This case is consistent with the typical presentation of plunging ranulas described in the literature. The majority of cases involve extension into the neck via a dehiscence or hiatus in the mylohyoid muscle [5]. The size of the cyst in this patient, measuring 10 cm in cranio-caudal length, is similar to cases reported in large studies of plunging ranulas [9]. A case series review by Morton et al. found a predominance of plunging ranulas in Polynesian and Maori populations, and suggested a potential genetic predisposition [7,8]. While our patient does not fit into these ethnic groups, the review emphasizes the wide geographic distribution and the genetic hypothesis, which may not be applicable to all regions [10].

3.2. Challenges and learning points

The primary challenge in this case was the accurate diagnosis. Initial consideration included a sublingual or submandibular abscess due to the swelling in both intraoral and neck regions. However, the absence of associated inflammatory signs, along with detailed imaging using MRI, helped to confirm the diagnosis of a plunging ranula [11,14]. Studies have highlighted the diagnostic difficulties that can arise from the variable presentation of these lesions. For instance, Jain et al. reported that plunging ranulas were frequently misdiagnosed as abscesses, simple cysts, or other neck pathologies [13].

The learning point from this case is the importance of thorough clinical and radiological assessment. Misdiagnosis could lead to inappropriate treatment, unnecessary surgical risks, and frustration for both the patient and the surgeon [10,15].

3.3. Clinical implications and future directions

This case contributes to the growing body of literature on plunging ranulas, reinforcing the recommendation for definitive treatment via surgical excision of the sublingual gland. Based on current literature, transoral excision of the sublingual gland, combined with complete cyst evacuation, yields the lowest recurrence rates and is considered the gold standard for treatment [8,12]. The patient's positive postoperative outcome, with no signs of recurrence up to one year following surgery, further supports this approach.

However, it is important to note that variations in surgical techniques can result in different outcomes. In cases where conservative approaches are employed, such as marsupialization, higher rates of recurrence have been reported [8,9]. Therefore, individualized

treatment strategies based on the size and extent of the lesion are critical in determining the best course of action.

3.4. Limitations and recurrence prevention

One limitation of this case is the relatively short duration of follow-up (12 months), which may not capture potential late recurrences. Although the surgical outcome has been favorable thus far, long-term follow-up over multiple years is essential in fully assessing the effectiveness of the procedure. Recurrence rates, even after sublingual gland excision, have been documented, albeit at lower rates than with other treatment modalities [11,16].

Future research should focus on long-term outcomes of plunging ranula excision across diverse populations, as well as the efficacy of various surgical approaches in reducing recurrence. Additionally, investigating genetic or environmental factors that may predispose certain individuals or populations to the development of plunging ranulas could provide valuable insights for both diagnosis and prevention. Lastly, innovations in minimally invasive surgical techniques should be explored to improve patient recovery times and reduce recurrence rates.

4. Conclusion

This case highlights the characteristic presentation and successful surgical management of a large plunging ranula in a young adult patient. Plunging ranulas, though rare, present unique diagnostic challenges due to their deep anatomical involvement and their potential to be misdiagnosed as other neck pathologies. Early and accurate diagnosis, facilitated by advanced imaging techniques such as MRI, is essential to avoid mismanagement and ensure timely surgical intervention.

The definitive treatment in this case—complete surgical excision of the cyst along with the sublingual gland—proved to be highly effective, with no recurrence observed during the 12-month follow-up period. This outcome underscores the importance of individualized treatment strategies, with sublingual gland excision remaining the gold standard for preventing recurrence in plunging ranula cases.

Key Lessons and Future Applications:

- Accurate and early diagnosis through comprehensive clinical and radiological assessments is critical to distinguishing plunging ranulas from other neck masses.
- Surgical excision of the sublingual gland, combined with cyst removal, provides the best outcomes and should be prioritized to minimize the risk of recurrence.
- Long-term follow-up is essential to monitor for potential recurrence and ensure sustained treatment success.

This case reinforces the need for clinicians to maintain a high index of suspicion for plunging ranulas in patients presenting with both intraoral and neck swellings. Future cases can benefit from these insights by adopting early diagnostic measures and adhering to surgical best practices to ensure optimal patient outcomes.

Clinical message

Plunging ranulas, though rare, should be considered in the differential diagnosis of neck swellings, particularly when accompanied by intraoral masses. Accurate diagnosis, facilitated by imaging techniques such as MRI, is essential to distinguish ranulas from other neck pathologies. Surgical excision of the sublingual gland, along with cyst removal, remains the most effective treatment to prevent recurrence. Early recognition and definitive management can significantly improve patient outcomes, minimizing the risk of complications and the need for repeat interventions.

Ethical considerations

This case was conducted at the Stomatology National Hospital of Afghanistan under the supervision of professors from the oral and maxillofacial surgery department. All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation and with the Helsinki Declaration. Informed written consent was obtained from the patient for participation in the study, including the use of all personal information and images for research purposes.

Data availability statement

Access to the data is available upon request, subject to approval by the research committee and corresponding author this study (Dr. Hedayatullah Ehsan). Interested parties may obtain access by submitting a polite request to the designated contact person. We are committed to facilitating access to the data while ensuring compliance with ethical and privacy considerations.

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Declaration of competing interest

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CRediT authorship contribution statement

Abdul Karim Sharif: Writing – original draft, Resources, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Hedayatullah Ehsan:** Writing – review & editing, Writing – original draft, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Abdul Wahab Abri:** Writing – original draft, Validation, Methodology, Investigation, Formal analysis. **Sayed Wahabuddin Mirzad:** Writing – review & editing, Resources, Project administration, Methodology, Data curation, Conceptualization. **Khujasta Amin:** Methodology, Investigation, Formal analysis, Data curation, Conceptualization.

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