

Evaluation of Foamed Lauromacrogol Sclerotherapy as a Possible Primary Treatment for Ranula: A Case Report

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Abstract

Ranula are mucous cysts of salivary gland origin. The traditional treatment is surgery to resect the ranula but it has disadvantages such as postoperative pain, perioperative risks, and surgical side effects. Our team firstly reported the case of a 21-year-old man with an extraoral ranula who was successfully treated with foamed lauromacrogol sclerotherapy. The extraoral ranula disappeared during the one-year follow-up, and no adverse events were noted. This therapy can potentially become a primary treatment for extraoral ranula.

Keywords: Ranula • Foamed lauromacrogol sclerotherapy • Treatment

Introduction

Ranula are mucous cysts of salivary gland origin caused by obstruction, ruptured ducts, and leakage of saliva, and these cysts mainly occur in the sublingual area [1,2]. The diagnosis is primarily based on the clinical findings; they always have a soft consistency, are bluish in colour, and appear as a transparent cystic swelling with a history of bursting and collapsing, which may occur repeatedly [3]. The traditional treatment is surgery to resect the ranula but it has disadvantages such as postoperative pain, perioperative risks, and surgical side effects. In addition, surgical treatment does not consider quality of life or postoperative symptoms after ranula resection.

Foam sclerotherapy could be considered a possibly safe and effective treatment for ranulas. Traditional treatment of ranulas was surgery, however, this surgical treatment requires general anesthesia and results in some complications, including injury of lingual nerve and vessel. Recent studies have explored sclerotherapy for treating mucocele. The patients showed a perfect response and they did not experience any serious side effects. No serious adverse events were noted [4]. Lauromacrogol (polyoxyethylene lauryl ether) is a foam sclerotherapy with a local anaesthetic effect, that can act on vascular endothelial cells and cyst wall epithelial cells, interfere with the surface active molecules of the cell membrane, destroy the structural stability of the cell membrane, decrease its surface tension and induce fibrosis [5]. However, the application of foamed lauromacrogol sclerotherapy has not previously been reported for ranula treatment. Our team firstly reported the case of a 21-year-old man with an extraoral ranula who was successfully treated with foamed lauromacrogol sclerotherapy. At the same time, we have summarized the literature on the use of foamed lauromacrogol sclerotherapy for treating extraoral ranulas.

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Case Presentation

A 21-year-old man presented to the Stomatology Center of the First Affiliated Hospital of Shihezi University, complaining of a soft, painless mass under the right side of the tongue for a month. Six months ago, the patient experienced similar swelling in the same area, which gradually decreased and disappeared without any treatment. There was no other paraesthesia, medical history or family history. The swelling was located in the extra-oral (submandibular) area, where the skin temperature and skin tone were normal. The 50 mm mass was non-tender, soft to the touch, and non-compressible (Figures 1A-1E). Secondary changes, such as ulceration, fistula formation, infection, or secretions, were not observed. No swollen or abnormal lymph nodes were present. Computed Tomography (CT, GE-VCT) showed no evidence of sialic acid obstruction of the submandibular gland ducts, and the appearance of the mass indicated it was a cystic lesion (Figures 2A-2F). When

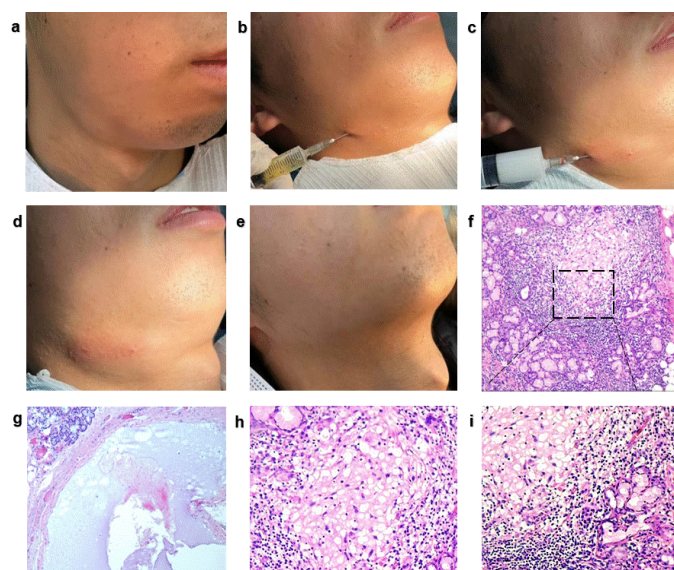


Figure 1. Extra-oral presentation and pathological examination during treatment. **A)** The swelling was soft, non-tender, and non-compressible in the right submandibular space; **B)** Puncture revealed it contained a yellow viscous or egg white-like fluid; **C)** Foamed lauromacrogol sclerotherapy injection; **D)** Slight localized redness and swelling of the lesion area after injection, no tenderness; **E)** The ranula disappeared from the sublingual region after one year; **F)** Dilated sublingual gland ducts filled with mucus (hematoxylin and eosin; X20); **G)** and **H)** A large infiltration of lymphocytes around the ranula tissue (hematoxylin and eosin; X20) and **I)** Foamy macrophages and mucin-filled macrophages (hematoxylin and eosin; X20).

punctured, it produced a yellow viscous or egg white-like fluid. The swelling was diagnosed as a ranula. Ultrasonography suggested abnormal echogenicity with well-defined borders in the right submandibular region. CT showed a 50 mm ovoid cystic structure in the right submandibular region extending into the hyoid muscle.

The patient was afraid of surgical treatment and could not pay for hospitalization, therefore he refused to surgically remove ranula and signed the 'informed consent form for foamed lauromacrogol sclerotherapy (Supplementary material)'. The mucosa around the ranula was sterilized with 2% iodophor solution. A local anaesthetic gel (benzocaine 20%) was applied to the surface of the swelling and allowed to act for 5 minutes. Then, we used a disposable syringe (5 ml) to extract as much of the fluid form within the ranula as possible. Applying the Tessari method, foamed lauromacrogol sclerotherapy (Tianyu, Shannxi, H20080445) was prepared by using 220 ml disposable syringes +1 three-way valve according to the ratio of liquid to gas 1:4 (2 ml 1% foamed lauromacrogol sclerotherapy: 8 ml air). Foamed lauromacrogol sclerotherapy was injected from the edge of the ranula, and the ranula cavity was filled with the foamed lauromacrogol sclerotherapy. The injection was stopped when the local bulge of the lesion became obvious. After the injection, the patient was observed for 30 minutes. No adverse events occurred. The patient was discharged from the outpatient clinic after explaining the precautions in detail. The patient was told to attend a follow-up visit if there was any suggestion of recurrence.

The ranula fluid was sent for pathological analysis. Pathological examination showed a large infiltration of lymphocytes around the ranula tissue (Figures 1F-1I). The surrounding fibrous and fatty tissue was hyperplastic, and the blood vessels were dilated and congested. The patient's clinical history and preoperative imaging findings indicated that the protrusion was diagnosed as a ranula (extraoral) in the right submandibular region, which was consistent with the intraoperative findings and pathology. This patient was followed up by phone and underwent an examination 1 week, 15 days and 30 days after the injection to ensure there was no sign of ranula recurrence or submucosal scar nodules. We collected full follow-up data, including any local reactions and complications. No recurrence has been reported since foamed lauromacrogol sclerotherapy from 2021/07/25 to 2023/01/15 (Figure 1).

Results and Discussion

Treatment of ranulas is divided into two categories surgical treatment and nonsurgical treatment. Previous studies have shown that surgical treatment has the advantage of a relatively low recurrence rate [6-10]. However, surgery may damage the lingual nerve or the submandibular duct. At the same time, complications such as postoperative infection, recurrence, and psychological trauma may occur. Foamed lauromacrogol, as one of the nonsurgical treatments, has been focused in treatment of ranulas. The present case represents the only case encountered in our department, and this treatment may carry less bleeding and physical trauma.

Although small sample limits the conclusions, some important findings could be highlighted that sclerotherapy injection, such as OK-432 and lauromacrogol injection, was effective in treating a thyroid abscess and ranulas [4-11]. The mechanism of sclerotherapy injection was that the epithelial cells of the cyst wall were rapidly dehydrated, and the cyst disappeared due to aseptic inflammation. However, foamed sclerotherapy could improve the therapeutic effect of sclerosing agent. And other mechanism of foamed sclerotherapy could be to accelerate vascular endothelial cell injury, fibroblast proliferation, and venous fibrosis. Foamed lauromacrogol sclerotherapy has presented good efficacy and safety in oral and maxillofacial angiomas and vascular malformations. We tried foamed lauromacrogol sclerotherapy in this case, and compared the various treatments for sublingual cysts and summarized them in the Table 1. We concluded that i) foamed lauromacrogol sclerotherapy with the Tessari method was a better treatment for 'simple' sublingual cysts; ii) the inflammatory reaction was well tolerated and minimally invasive; and iii) repeatability and less side effects.

We further reviewed the relevant literature to explore the initial mechanism

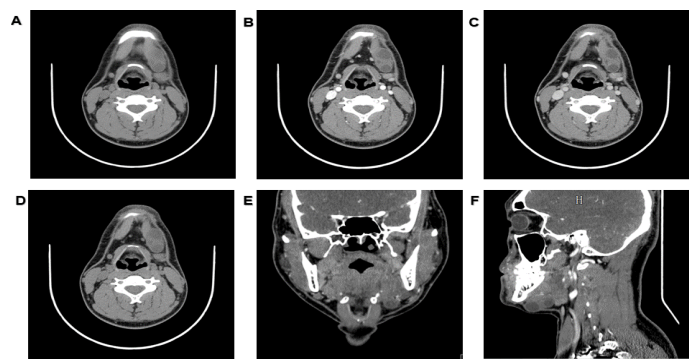


Figure 2. Computed tomography shows the ranula lesion extending from the right submandibular space through the plane of the mylohyoid. This mass was approximately 50 mm in diameters. **A)** Routine scan; **B)** Arterial phase; **C)** Venous phase; **D)** Delayed phase; **E)** Coronal position (arterial phase) and **F)** Sagittal position (arterial phase).

Table 1. Comparison of the present case with previously published case reports.

Reference	Publication, Country	Patient, Age	Patient, Gender	Patient, Race	Medical, History	Treatment	Outcome
Kono M, et al. [8]	Japan	Mean 29-30 yr	18 females and 5 males	Japanese	No	OK-432 injection	The overall efficacy rate was 91.3%
Chen A [3]	China	Mean 16 yr	23 females and 14 males	Chinese	No	Promethazine hydrochloride injection	The overall efficacy rate was 91.9%
Shakib K [6]	India	27-year-old	Male	Indian	No	Surgically remove ranulas	Cure
Present case	China	21-year-old	Male	Chinese	No	Foamed lauromacrogol sclerotherapy	Cure

of foamed lauromacrogol sclerotherapy. As a surfactant-type cleaning hardener, foamed lauromacrogol sclerotherapy has surface active molecules that interfere with cell membranes, destroying their structural stability, and inducing aseptic inflammation and fibrosis [12]. And foamed sclerotherapy could improve the therapeutic effect of sclerosing agent. The mechanism of foamed sclerotherapy could be to accelerate vascular endothelial cell injury, fibroblast proliferation, and venous fibrosis. All these mechanism of foamed lauromacrogol sclerotherapy could play a role of damage to vascular endothelial cells in treatment of vascular diseases. Furthermore, foamed sclerotherapy injection has been repeatable, which could allow for a more stable and safer aspiration procedure for the treatment of cystic masses [13].

At the same time, we innovatively applied the Tessari method to foamed lauromacrogol sclerotherapy (the hardener-to-air ratio was 1:4), because foamed lauromacrogol sclerotherapy could replace the lymph in the malformation lumen, maintain the initial concentration of lauromacrogol sclerotherapy and maximize the role of sclerotherapy. Foamed lauromacrogol sclerotherapy using the Tessari method would be homogenous and stable, and have unique adhesion and compactness, which could function for a longer time [11]. At the same time, foamed lauromacrogol sclerotherapy with the Tessari method increased the surface area of the hardener in contact with the wall of the cyst, and the foam was distributed at the gas-liquid interface to enhance the stability of the foam. All of these could play a more effective role in the injury of vascular endothelial cells.

Overall, foamed lauromacrogol sclerotherapy with the Tessari method was conditional effective. In addition, this simple ranula was isolated, and the cyst fluid was easily drained, and the foamed lauromacrogol sclerotherapy could achieve full contact with the cyst wall. Therefore, we concluded that foamed lauromacrogol sclerotherapy was an effective, minimally invasive treatment for extraoral ranulas.

Conclusion

Our team reported that foamed lauromacrogol sclerotherapy was minimally invasive and might be performed under topical anesthesia. The procedure was fast and caused little tissue damage or inflammation. This therapy can potentially become a primary treatment for extraoral ranula. This case was a limited study, but we believed that lauromacrogol sclerotherapy could be

recommended as primary treatment for ranulas. Furthermore, its mechanism needs deeply study.

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Availability of Data and Materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Authors' Contributions

CG and FY contributed to first co-author. XZ and CG were engaged in clinical treatment and writing; FY was participated in imaging diagnostics and clinical treatment; ES and YL were participated in follow-up patient.

Ethics Approval and Consent to Participate

The ethical approval and documentation for a case report was approved by the Ethical Committee of First Affiliated Hospital of Shihezi University School of Medicine (Shihezi, China; approval no. KJ2023-118-01).

Patient Consent for Publication

The patient provided written informed consent for the publication of this study.

Conflict of Interest

The authors declare that they have no competing interests.

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