

Complications Associated With Surgical Management of Ranulas

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Purpose: We present the intraoperative and postoperative complications associated with 606 procedures for ranulas in a series of 571 patients.

Patients and Methods: Clinical records of 606 procedures in 571 patients with ranulas operated on in the Hospital of Stomatology, Wuhan University, China between 1962 and 2002 were retrospectively reviewed. The methods of surgery and intraoperative and postoperative complications were documented and analyzed.

Results: The most common complications were recurrence of the lesion (5.78%) and sensory deficit of the tongue (4.89%), followed by damage of Wharton's duct (1.82%). Postoperative hematoma, infection, or dehiscence of the wound were seldom seen. Temporary numbness of the tongue resolved within 2 to 7 months postoperatively. Recurrences were often seen after marsupialization and excision of the ranula, with few recurrences after excision of the ranula and sublingual gland or excision of the sublingual gland alone.

Conclusion: Complications associated with ranula surgery are minor and self-limiting. Transoral excision of the sublingual gland has the least possibility of ranula recurrence.

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Ranulas have been managed by marsupialization, excision of the lesion, excision of the sublingual gland, or combined excision of both the ranula and the sublingual gland.¹⁻⁵ Treatments that do not include removal of the involved sublingual gland, such as incision and drainage, excision of the ranula, and marsupialization, have high recurrence rates.^{4,6,7} There is no question that excision of the offending sublingual gland will cure all ranulas. However, some surgeons still prefer to initially treat ranulas by marsupialization, perhaps because of the potential surgical complications when removing the sublingual gland, most notably injury to the lingual nerve, injury to Wharton's duct with the possibility of stenosis leading to obstructive sialadenitis, and ductal laceration causing salivary leakage. We retrospectively ana-

lyzed 606 procedures in 571 patients with ranulas who underwent several different surgeries between June of 1962 and December of 2002 to determine the results of surgery and the types and rate of complications.

Materials and Methods

Five hundred seventy-one patients with ranulas had 606 procedures. All patients were treated surgically in the Department of Oral and Maxillofacial Surgery at the Hospital of Stomatology, Wuhan University, China.

Treatments used were excision of the lesion only, marsupialization, excision of the sublingual gland, or sublingual gland removal combined with ranula excision. Surgery was performed under local or general anesthesia. Tissues obtained at surgery were routinely sectioned and stained for microscopic examination. All patients were followed-up postoperatively. The intraoperative and postoperative complications were documented. The chi-square test was used to assess the statistical significance of each variable (SPSS, Version 11.0 for Windows [SPSS Inc, Chicago, IL]).

Results

Five hundred seventy-one patients had 606 operations, in which there were 9 marsupializations, 28 excisions of the ranula, 356 excisions of the sublin-

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Table 1. COMPLICATIONS ASSOCIATED WITH PROCEDURES FOR TREATMENT OF RANULA

Complications	No. of Cases	Percentage
Damage of Wharton duct	11	14.67
Bleeding or hematoma	5	6.67
Dehiscence of wound	6	8.00
Postoperative infection	5	6.67
Numbness of tongue	22	29.33
Recurrence	26	34.66
Total	75	100.00

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gual gland, and 213 excisions of both the sublingual gland and ranula. Evaluation of damage of Wharton's duct, postoperative bleeding or hematoma, dehiscence of wound, and infection were based on records of 606 procedures for treatment of ranulas. Loss of tongue sensation and recurrence of the lesion were evaluated by clinical examination or contact with the patient by mail or telephone. These data were obtained from 415 patients who were followed-up for more than 6 months. These 415 patients had undergone 450 procedures. The most common reports of complication by the patient were numbness of the tongue and recurrence of the lesion. Table 1 provides a complete list of all complications.

In 606 procedures, Wharton's duct was noted to be severed or damaged in 11 cases and relocated. One patient complained of recurrent swelling in the submandibular area on the operated side during eating 3 months after transplantation of the Wharton's duct. The chronic submandibular sialadenitis was demonstrated by sialography and the gland was then removed. Postoperative hematoma and partial dehiscence of the wound occurred in 5 and 6 cases, respectively. One postoperative bleed required reentering the operative room and it was found that the bleeding was from the branch of the sublingual artery, which was ligated. Five patients had postoperative infection after excision of a plunging ranula with the

sublingual gland. Excision was performed via both the extraoral and intraoral approaches in 4 cases, and excision of the sublingual gland was completed via the intraoral approach in 1 case. Infection resolved after drainage and intravenous antibiotic therapy. Numbness of the tongue, usually on the ventral surface, occurred in 22 cases, and resolved within 2 to 7 months.

Table 2 shows the connection between complications and procedures. The majority of complications were related to excision of the sublingual gland or excision of the gland and ranula. However, the recurrent rates after marsupialization and excision of ranula were significantly higher than that after excision of the ranula and/or sublingual gland removal ($P < .001$).

Discussion

Ranulas are treated by various surgical methods. Marsupialization has a high recurrence rate, but is still used perhaps because of fear of potential surgical injury to adjacent structures when removing the sublingual gland or because of preservation of the function of the gland.

When conventional marsupialization is undertaken, the wound margins tend to be in contact with each other because of the narrow space and the movement of the tongue and the floor of the mouth. As a result, the lesion tends to reform.³ The failure rate of marsupialization, as reported in the literature, has been anywhere from 61% to 89%,² with clinical evidence of recurrence appearing between 6 weeks to 12 months.⁸ In addition, Bridger et al,⁹ in reviewing cervical or plunging ranula, found that 44% were iatrogenic, occurring after single or multiple attempts at eliminating oral ranulas via marsupialization or simple drainage. They suggested that repeated failed procedures could lead to surface fibrosis and divert the salivary leakage inferiorly, and then a plunging ranula might result. Therefore, Crysedale et al² recommended that

Table 2. COMPLICATION RATES ASSOCIATED WITH PROCEDURES FOR TREATMENT OF RANULA

Complications	Procedures*				Total
	M	ER	ESLG	ESLGR	
Damage of Wharton duct	0 (0/9)	0 (0/28)	1.40 (5/356)	2.82 (6/213)	1.82 (11/606)
Bleeding or hematoma	0 (0/9)	0 (0/28)	0.28 (1/356)	1.88 (4/213)	0.83 (5/606)
Dehiscence of wound	0 (0/9)	0 (0/28)	0.84 (3/356)	1.41 (3/213)	0.99 (6/606)
Postoperative infection	0 (0/9)	0 (0/28)	0.28 (1/356)	1.88 (4/213)	0.83 (5/606)
Numbness of tongue	0 (0/9)	3.85 (1/26)	2.10 (6/286)	11.63 (15/129)	4.89 (22/450)
Recurrence	66.67 (6/9)	57.69 (15/26)	1.05 (3/286)	1.55 (2/129)	5.78 (26/450)

Abbreviations: M, marsupialization; ER, excision of ranula; ESLG, excision of sublingual gland; ESLGR, excision of sublingual gland and ranula.

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an oral ranula larger than 1 cm should be treated by removal of the offending sublingual gland; other authors have proposed that this treatment be used regardless of the size of the lesion.^{1,9} We found that recurrence rate was 66.67% after marsupialization. Therefore, in our department, this procedure has only been used as an initial treatment if the lesion is superficial and the patient has a poor general condition.

Baurmash⁵ modified marsupialization by identifying the full depth of the pseudocystic cavity after the unroofing procedure and firmly packing this cavity with gauze rather than merely leaving it open. The packing is left in place for 7 to 10 days, allowing it to naturally exfoliate. Baurmash performed this marsupialization for 12 cases, with only 1 failure requiring subsequent sublingual gland removal. Therefore, he recommended that oral ranulas be treated initially by marsupialization with packing and, if recurrence occurs, the offending sublingual gland should then be excised.

Takimoto et al¹⁰ believed that the essential treatment of a ranula was meticulous dissection of the thin wall of the cyst in continuity with the sublingual gland of origin. They used a technique of fibrin glue injection into the cystic space of the ranula after it had been evacuated by aspiration. The fibrin glue within the cystic cavity prevents collapse of the wall of the cyst during surgery and facilitates and simplifies the surgical procedure by clearly outlining the involved area and by sharply delineating its thin wall. Yoshimura et al³ compared the results for 35 procedures in 27 cases of oral and plunging ranulas. Four patients had excision of the ranula only, 22 had marsupialization, and 9 had removal of the sublingual gland combined with the excision of the ranula. These treatments showed a 25.0%, 36.4%, and 0% recurrence rate, respectively. They recommended the removal of the sublingual gland combined with excision of the ranula, especially in cases of large oral and plunging ranulas. Pandit and Park¹¹ suggested that submandibular duct dissection with relocation appears to enhance exposure to the floor of the mouth. They therefore suggest that the pseudocyst and entire sublingual gland should be removed when pediatric oral cavity ranulas are surgically treated.

Excision of the sublingual gland or ranula may carry the potential risk of severe hemorrhage from the lingual and sublingual vasculature, lingual nerve damage, and duct severance. Anatomically, the submandibular duct, as it traverses in anterior and superior direction from the gland to its orifice, is in immediate contact with the medial surface of the sublingual gland.¹² As such, the submandibular duct may be damaged during ranula surgery or more likely during removal of the sublingual gland.

To avoid severing the Wharton duct, we advise that a large lacrimal probe or indwelling catheter be inserted into the duct to facilitate identification of this structure during surgical exposure and removal of the sublingual gland. Another structure to be concerned with when considering excision of the sublingual gland and ranula is the lingual nerve, which is in close relation to the posterior part of the gland before it crosses beneath the submandibular duct to enter the substance of the tongue.^{12,13} Our findings show that numbness of the tongue resulting from lingual nerve damage was more common after excision of both the sublingual gland and ranula than after excision of the gland alone. Fortunately, this postoperative numbness of the tongue is transient and is usually resolved within 6 months postoperatively. In addition, postoperative infection or dehiscence of wound and hematoma occurred in only a few cases. Potential risks were similar, but their incidence appears to be considerably less than that seen with excision of both the sublingual gland and ranula. The greater likelihood of these postoperative complications is due to more extensive dissection during excision of the gland combined with the ranula. Our retrospective analysis showed that the recurrence rate was low and not significant between excision of the sublingual gland combined with ranula and after excision of the gland alone. Thus, the logical treatment of the ranula is transoral excision of the involved sublingual gland.

To avoid or decrease the complications associated with the surgical management of ranulas, other methods have been advocated. The carbon dioxide (CO₂) laser is a relatively new device used in the treatment of these cases. In 1985, Frame¹⁴ vaporized 9 ranulas. Mintz et al¹⁵ treated 8 patients with nonplunging ranulas with a CO₂ laser at a power setting of 10 W. Four were treated by a defocused vaporization beam technique and the other 4 by a combined focused beam excision and defocused beam vaporization. Postoperative follow-up at 6 months showed no recurrence, no lingual nerve dysesthesia, no ductal disruption, and only minimal scar formation in 1 patient in the vaporization group. They suggested the CO₂ laser, either in a pure vaporization or mixed excision-vaporization mode, for ablation of nonplunging ranulas. Intracystic injection therapy with OK-432 is relatively safe and can be used as a substitute for surgery in the treatment of ranulas.^{16,17} Disappearance or marked reduction of the lesion was observed in 31 patients (97%) who had this therapy, and local pain at the injection site and fever (37°C to 39°C) were observed in almost half of the patients, but such problems resolved within a few days.¹⁷ Thus,

newer modes of therapy may supersede the recommendations of this study.

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