

Original Article

Long-term Study of Sialodochoplasty for Preventing Submandibular Sialolithiasis Recurrence

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Objectives. The transoral removal of stones by sialodochoplasty has been popularized in the treatment of submandibular sialolithiasis. However, the effectiveness of sialodochoplasty is controversial, and there are no reports on the long-term outcomes of this procedure. The purpose of this study was to assess the effectiveness and long-term outcomes of sialodochoplasty in patients with submandibular sialolithiasis.

Methods. We conducted a cross-sectional study that included retrospective chart reviews and prospective telephone or interview surveys of 150 patients treated for submandibular sialolithiasis from March 2001 to January 2008. The patients were treated with two different procedures by two different surgeons. One surgeon performed a transoral sialolithectomy without sialodochoplasty in 107 patients (SS group), and the other surgeon performed a transoral sialolithectomy with sialodochoplasty in 43 patients (SP group).

Results. The success rate of transoral sialolithectomy was 98.1% in the SS group and 93% in the SP group. The recurrence rates of symptoms or stones were 1.9% and 4.7% in the SS and SP groups, respectively. The incidence of postoperative transient hypoesthesia was 13.1% in the SS group and 34.9% in the SP group. The mean operating times were 29.79 and 47.44 minutes in the SS and SP groups, respectively. The mean percentage of general anesthesia was 42.1% in the SS group and 83.7% in the SP group.

Conclusion. Sialodochoplasty in addition to transoral sialolithectomy for submandibular sialolithiasis did not affect the rate of symptom or stone recurrence, but did increase the postoperative hypoesthesia incidence and general anesthesia percentage.

Key Words. Stone, Sialolithiasis, Sialodochoplasty

INTRODUCTION

Sialolithiasis is the most common cause of salivary ductal outflow obstruction (1). Approximately 90% of submandibular stones are located in the distal portion of Wharton's duct or at the hilum of the gland (2). Many studies have shown that extir-

pation of the affected gland may not be the treatment of choice for submandibular stones, because a significant percentage of the removed submandibular gland was histologically normal with resumable function (3-6). However, success rates for stone removal and prevention of disease recurrence are controversial (1). The transoral removal of submandibular stones, even those in the hilum of the submandibular gland, has been reported as a successful treatment modality (1, 7, 8). In addition to transoral sialolithectomy, sialodochoplasty has been introduced for the prevention of stone or symptom recurrence. This short procedure of salivary outflow appears to be helpful, but the long-term outcome of sialodochoplasty is not clear (1, 8). The aim of this study was to assess the effectiveness of sialodochoplasty in preventing disease recurrence during a long-term follow-up period.

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MATERIALS AND METHODS

Patients

We conducted a cross-sectional study that included retrospective chart reviews and prospective telephone or interview surveys. From March 2001 to January 2008, 213 consecutive patients with submandibular sialolithiasis were treated by transoral sialolithectomy at the Department of Otolaryngology-Head and Neck Surgery, Soonchunhyang University Bucheon Hospital. Exclusion criteria for this study included insufficient responses to the survey, follow-up period of <6 months, revision cases, and transoral sialolithectomy surgery combined with another operation. A total of 63 cases were excluded, and 150 patients were enrolled.

All of the operations in this study were performed by two different surgeons. From March 2001 to January 2008, one surgeon performed a transoral sialolithectomy without sialodochoplasty in 107 patients (SS group). From May 2005 to January 2008, a different surgeon performed a transoral sialolithectomy with sialodochoplasty in 43 patients (SP group). The SS group comprised 62 females and 45 males, with a mean age of 31.9 years (range, 5 to 77 years). The SP group comprised 16 females and 27 males, with a mean age of 31.7 years (range, 6 to 65 years). The gender distribution was significantly different between the two groups ($P=0.022$), while the age distribution was similar between the groups ($P=0.930$). The mean follow-up period was significantly longer in the SS group (35.6 months) than in the SP group (14.1 months, $P=0.000$).

There was no significant difference in the number or size of

the stones between the SS and SP groups ($P>0.05$). The mean numbers of stones were 1.26 (range, 1 to 4) and 1.42 (range, 1 to 5) in the SS and SP groups, respectively ($P=0.199$). The mean stone size calculated from CT scans was 7.2 mm (range, 1.0 to 32 mm) in the SS group and 7.6 mm (range, 1.0 to 17 mm) in the SP group ($P=0.626$) (Fig. 1). There was also no significant difference in the location of stones between the SS and SP groups ($P=0.722$) (Fig. 2). Fifty patients (46.7%) in the SS group and 19 (44.2%) in the SP group had stones in the distal duct at the edge of the mylohyoid muscle. Stones were located in the proximal duct to the edge of mylohyoid muscle in 27.1% of the patients in the SS group and 20.9% of the SP group, in the hilum of the gland in 20.6% of the SS group and 27.9% of the SP group, and inside the parenchyma of the submandibular gland in 5.6% of the SS group and 7.0% of the SP group.

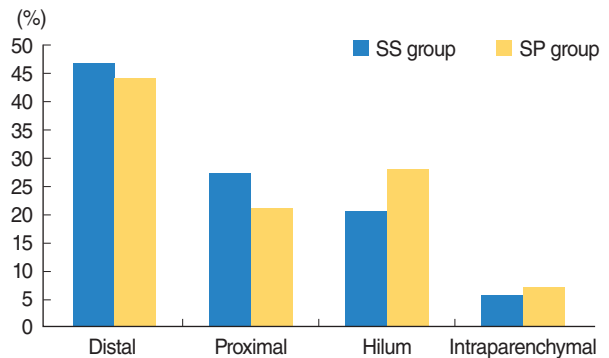


Fig. 2. Locations of submandibular stones in 150 patients. $P>0.05$, Fischer's exact test. SS group, sialolithectomy without sialodochoplasty; SP group, sialolithectomy with sialodochoplasty.

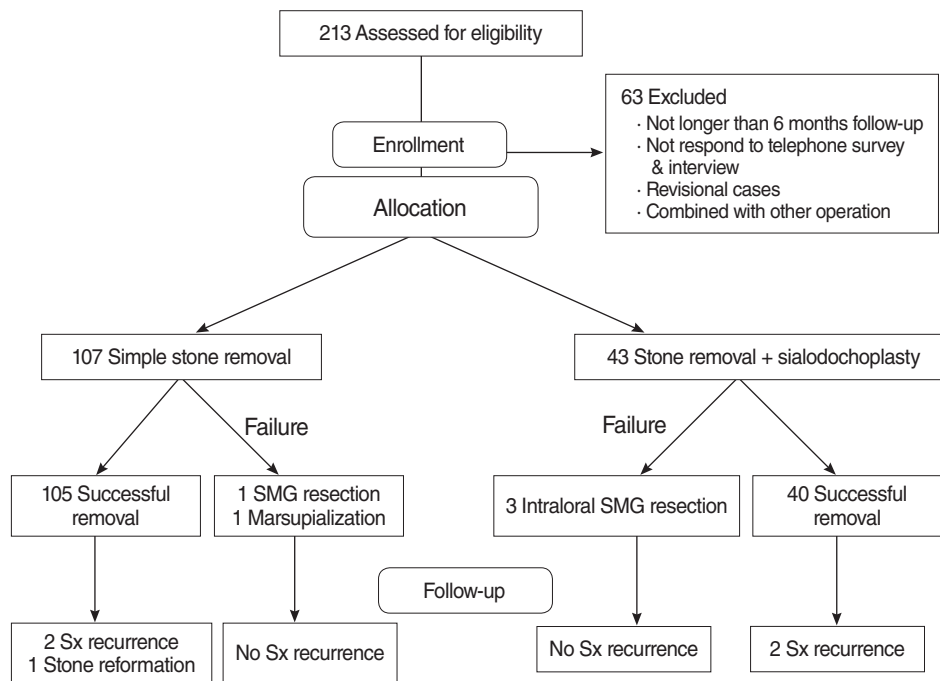


Fig. 1. Schematic of patients who underwent transoral sialolithectomy. SMG, submandibular gland; Sx, symptom.

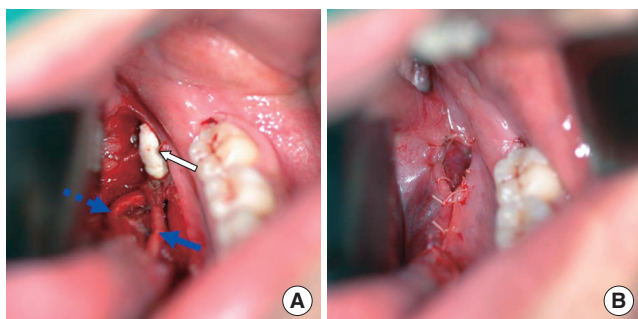


Fig. 3. Intraoperative findings of sialodochoplasty. (A) Lingual nerve (dotted arrow), Wharton's duct (blue arrow), and stone (white arrow). (B) Immediate postoperative appearance of sialodochoplasty.

Surgical technique

Transoral sialolithectomy was performed under local or general anesthesia. An oral mucosal incision was made in the floor of the mouth just over the stone, to expose the submandibular duct. For impalpable stones, a lacrimal probe was inserted into the ductal orifice to trace back toward the hilum of the gland along the duct, and a mucosal incision was made just distal to the suspected location of the stone and extended back to the hilum of the gland (Fig. 3). During this procedure, the lingual nerve and intermingled Wharton's duct were identified and preserved. A careful ductal incision was made over the stone or just distal to the stone and was extended slightly toward the proximal portion of the duct. In the operation without a sialodochoplasty (SS group), the ductal incision was laid open without suturing the ductal margins with oral mucosa after removal of the stone. In the SP group, the ductal margins were meticulously sutured with oral mucosa, using 5-0 Vicryl. A large neo-opening was made to bypass salivary flow, and then a small piece of gauze strip soaked in mitomycin solution (0.4 mg/mL) was topically applied to the sialodochoplasty site for a few minutes, to prevent restenosis of the neo-ostium. Finally, the sialodochoplasty site was washed using a saline-soaked gauze strip.

Study design and outcome assessment

This study had a cross-sectional design consisting of a retrospective medical review and prospective telephone or interview survey, and was approved by the institutional review board before data collection (No SCHBC-IRB-08-44). Objective evaluations included assessments of stone size, number, location, and palpability; operating time; surgical technique; percentage of general anesthesia; and success rate of the transoral sialolithectomy. A subjective evaluation was performed using a 5-point visual analog scale for postoperative pain, hypoesthesia, present sensation, and recurrences of symptoms, and operation satisfaction scores. Answers to all questions except the satisfaction scores were graded from 0 (normal) to 5 (worst). Satisfaction scores were graded from 1 (worst) to 10 (most excellent).

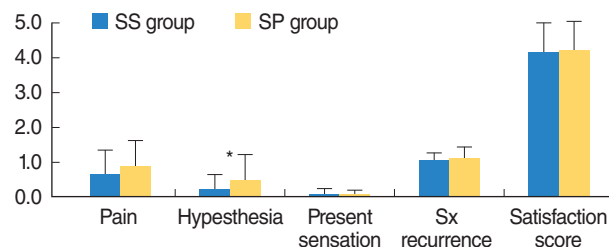


Fig. 4. Scores for postoperative pain, hypoesthesia, present sensation, recovery time, symptom recurrence, and operation satisfaction score based on a 5-point visual analog scale. SS group, sialolithectomy without sialodochoplasty; SP group, sialolithectomy with sialodochoplasty; Sx, symptom. * $P < 0.01$, paired t -test.

Statistical analysis

Student t -test, chi square test, and Fischer's exact test were used to analyze the results. A $P < 0.05$ was considered to indicate statistical significance.

RESULTS

The mean scores for the subjective assessments in the SS and SP groups, respectively, were as follows: pain, 0.61 and 0.84; postoperative hypoesthesia, 0.17 and 0.44; present sensation level, 0.04 and 0.02; symptom recurrence, 1.03 and 1.07; and satisfaction, 8.29 and 8.38. The postoperative hypoesthesia score was significantly higher in the SP group than in the SS group ($P = 0.033$), with 34.4% of the patients in the SP group and 12.1% of those in the SS group reporting postoperative hypoesthesia ($P = 0.002$). No other scores differed significantly between the two groups ($P > 0.05$) (Fig. 4).

Sensation recovery time of the operative site (16.9 ± 23.6 days in the SS group and 20.3 ± 29.5 days in the SP group) was not significantly different between the groups ($P = 0.115$). Two patients in the SP group showed stenosis of the neo-ostium, but had no clinical problems; none of the patients in the SS group had restenosis. Ranula formation at the incision site was observed in one SS patient and one SP patient, and these patients underwent marsupialization procedures. Stone reformation occurred in one patient in the SS group during the follow-up period; no SP patient had stone reformation. A total of four patients, two in each group ($P = 0.324$), had symptom recurrence (Fig. 4).

Other factors assessed included mean operating time (29.79 and 47.44 minutes in the SS and SP groups, respectively) and mean percentage of general anesthesia (42.1 and 83.7% in the SS and SP groups, respectively). Both factors were significantly higher in the SP group than in the SS group ($P = 0.000$ for each). The success rate of transoral sialolithectomy was 98.1% in the SS group and 93% in the SP group, and 98.1% of the SS patients had successful intraoral stone removal compared with 93.1% of the SP patients. The success rate did not differ significantly between the two groups ($P = 0.142$) (Fig. 5).

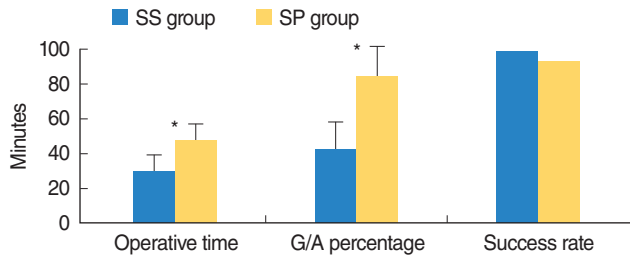


Fig. 5. Outcomes of the operations. SS group, sialolithectomy without sialodochoplasty; SP group, sialolithectomy with sialodochoplasty; G/A, general anesthesia.

DISCUSSION

Sialodochoplasty following intraoral removal of stones from Wharton's duct creates a new ductal opening and has been popularized for the treatment of submandibular sialolithiasis (9, 10). Sialodochoplasty was first described by Wilkie (11) in 1970 as a treatment method for drooling in cerebral palsy patients. Theoretically, sialodochoplasty, which makes a bypass for salivary outflow and widens the neo-opening, seems to be an effective strategy to prevent submandibular stone recurrence (9, 12). However, there has been no study on the long-term outcome of sialodochoplasty. In the present study, the success rates for transoral sialolithectomy without (SS group) and with (SP group) sialodochoplasty were 98.1% and 93%, respectively, and were not significantly different (1, 10, 13-16). Five patients had unsuccessful transoral removal of stones from the hilum or the parenchyma of the submandibular gland.

Unexpectedly, sialodochoplasty with stone removal did not improve symptom recurrence compared with simple stone removal in the present study. Similar findings have been reported by Roh and Park (8), who noted that symptom recurrence and recovery of salivary function after stone removal were unaffected by the presence or absence of a neo-ostium. The authors suggested that sialodochoplasty had no effect on postoperative outcomes and minimal effectiveness in preventing symptom recurrence after transoral stone removal.

Our postoperative outcomes were different from those in previous reports. We observed a significantly higher rate of transient hypoesthesia of the operative site, longer duration of operating time, and greater percentage of general anesthesia in the SP group than in the SS group. However, postoperative complications did not differ significantly between the SS and SP groups. Other authors (1, 7, 16) have also reported the difficulty of transoral removal of stones from the hilum or parenchyma of the gland. This procedure may be hazardous to the lingual nerve in cases targeting small impalpable stones or stones in the duct posterior to the first molar, particularly the more proximal portion where the duct turns inferiorly at the posterior border of the mylohyoid muscle. Similar to observations in previous reports (1, 7, 16), all patients with postoperative hypoesthesia and five

patients who had unsuccessful transoral sialolithectomy in the present study had stones in the hilum or parenchyma of the gland. However, there was no significant difference between the patients with proximal and distal duct stones.

In conclusion, transoral stone removal is a useful treatment modality, is safer than surgery under local anesthesia, and is associated with less scarring. Rates of successful sialolithectomy, recurrence, and post operative complications do not depend on the addition of sialodochoplasty to the procedure of transoral sialolithectomy. In fact, sialodochoplasty increases postoperative hypoesthesia, percentage of general anesthesia, and operating time. Thus, sialodochoplasty is not recommended as a routine addition to transoral sialolithectomy for intraoral stone removal from Wharton's duct.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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