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ORIGINAL ARTICLE

Extracapsular dissection by the sternocleidomastoid muscle–parotid space approach reduces the risks of postparotidectomy sialocele and salivary fistula

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Abstract

Background: Postoperative sialoceles and fistulas are frequent surgical complications of parotid tumor resection. Extracapsular dissection by the sternocleidomastoid muscle–parotid space approach (ECD-SMPSA) is a minimally invasive technique. To our knowledge, the characteristics of sialoceles and fistulas secondary to ECD-SMPSA have not been reported.

Methods: This prospective study enrolled 52 patients who underwent ECD-SMPSA without sialocele/fistula prevention measures. Postoperative sialoceles and fistulas were evaluated during 2 months of follow-up.

Results: Among the 52 patients, only one male patient developed a mild sialocele. No salivary fistulas occurred. The overall rate of sialocele/fistula formation was 1.92%.

Conclusions: When treating clinically benign tumors that involve the sternocleidomastoid muscle–parotid space, ECD-SMPSA may prevent postoperative formation of sialoceles and salivary fistulas.

KEYWORDS
benign tumor, extracapsular dissection, parotidectomy, salivary fistula, sialocele

1 | INTRODUCTION

Surgical excision is considered the main treatment approach for parotid tumors. Injury to the parotid parenchyma results in intratissue sialorrhea. The increased salivary volume can exceed the absorptive capacity of the surrounding tissue, leading to the formation of sialoceles or fistulas. A sialocele is defined as an accumulation of saliva within a surgical site, which manifests as a nontender cystic mass.[1] A salivary fistula is defined as a channel of leaked saliva that overflows from a wound.[2] Postparotidectomy sialoceles or salivary fistulas are frequent surgical complications of parotid tumor resection. A recent systematic review indicated that the rates of sialocele and salivary fistula formation were 4.5% and 3.1%, respectively.[3] Routine sialocele/fistula preventive measures in parotidectomy are cumbersome to patients; these generally involve pressure dressing against the surgical region for 1–2 weeks[4] and the consumption of a bland diet.[5,6] Treatment modalities are initially conservative

Lin Lan and Diancan Wang have contributed equally to this study.

and uncomplicated; they include needle aspiration, drainage, pressure dressing, and anticholinergic medication. However, refractory salivary fistulas require invasive and radical treatments, such as an intra-oral approach using a pig-tail catheter,[7] botulinum toxin injection,[8,9] tympanic neurectomy,[5] repeat parotidectomy, and (in some cases) low-dose radiotherapy.[10]

We recently introduced extracapsular dissection by the sternocleidomastoid muscle–parotid space approach (ECD-SMPSA) as a minimally invasive technique for the treatment of clinically benign tumors in the parotid tail[11] and some tumors in the deep lobe of the parotid gland.[12] Because we did not observe postoperative formation of sialoceles or salivary fistulas in our previous two case series, we hypothesized that the treatment of clinically benign tumors with ECD-SMPSA would reduce the risks of postoperative sialoceles and salivary fistulas. In this prospective study, we intentionally abandoned all measures for the prevention and treatment of sialoceles and salivary fistulas (e.g., intraoperative sealants, postoperative surgical site pressure dressing, and dietary restrictions) for patients who underwent ECD-SMPSA. We then carefully assessed the occurrence of postoperative sialoceles and fistulas.

2 | MATERIALS AND METHODS

2.1 | Study design and inclusion criteria

This prospective study was conducted at the Department of Oral and Maxillofacial Surgery, School and Hospital of Stomatology, Peking University (Peking, China), between November 2019 and February 2022. Verbal informed consent was obtained from all patients, and approval for the study protocol was obtained from the institutional review board of the hospital.

We included patients with clinically benign tumors in the parotid tail, which protruded into the sternocleidomastoid muscle–parotid space (SMPS).[11] Clinically benign tumors generally comprise asymptomatic lumps with a long history and radiographically defined border; the final pathological diagnosis may be a benign entity (e.g., pleomorphic adenoma and Warthin tumor) or a low-grade malignancy (e.g., well-differentiated mucoepidermoid carcinoma and acinic cell carcinoma). We excluded patients with multicentric foci, which was a contraindication to extracapsular dissection; we also excluded patients who had previously undergone parotid gland surgery.

2.2 | Surgical procedures

Preoperative computed tomography or magnetic resonance images were acquired in a routine manner. The greatest tumor dimension was assessed. Tumors that involved the SMPS were classified as shallow or deep types as follows, according to the findings in preoperative computed tomography or magnetic resonance images. Tumors superficially located beneath the skin, with less than approximately 5 mm of gland tissue covering, were classified as shallow type (Figure 1A). Tumors located deep in the SMPS, with more than approximately 5 mm of gland tissue covering, were classified as deep type (Figure 1B).

ECD-SMPSA procedures have been described in detail elsewhere.[11] Notably, direct dissection into the SMPS is performed; the tumor is identified and removed without raising the skin flap (Figure 2A–D). When

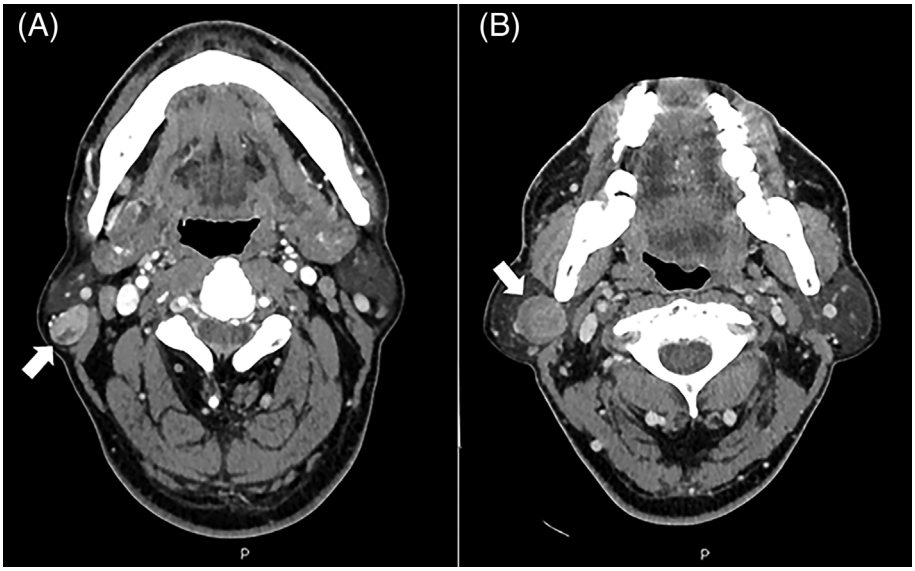

FIGURE 1 Enhanced computed tomography images show tumor location. (A) Shallow type and (B) deep type.

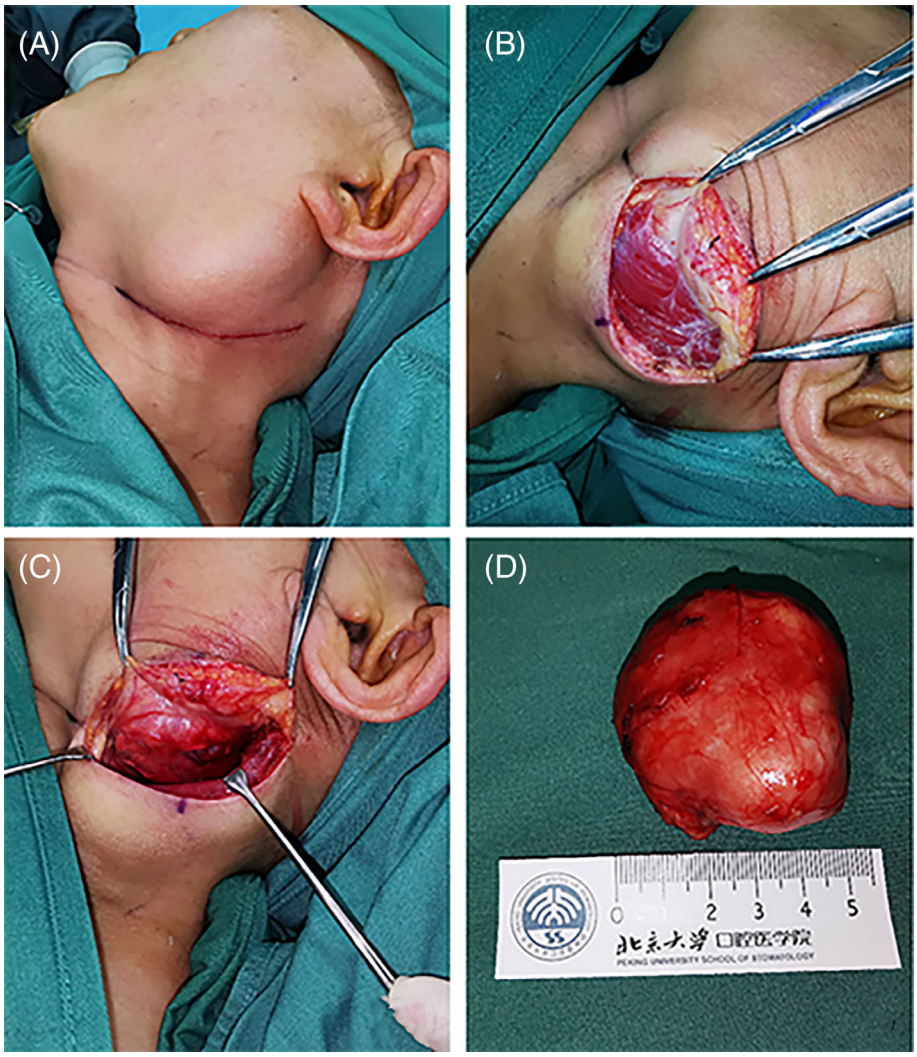

FIGURE 2 (A) The curved skin incision. (B) Identification of the sternocleidomastoid muscle, dissection along the muscle without raising skin flap. (C) Dissection along the tumor capsule and dissection plane within loose tissue plane approximately 2 to 3 mm from the tumor. (D) Tumor completely removed. [Color figure can be viewed at wileyonlinelibrary.com]

unexpected malignancy is identified during the operation, revision surgery is required. In this study, operative time was recorded from the initial skin incision to the completion of wound suturing. No blood loss was recorded because the volume was consistently <20 ml; such data are not clinically meaningful. No intraoperative sealants were used. In cases of seroma, a rubber drainage was placed during wound suturing; it was removed 1 day after surgery. The wound was slightly covered with thin gauze (Figure 3) and the patient was discharged 1–3 days after surgery. We intentionally avoided the use of postoperative pressure dressings and the provision of dietary restrictions. All sutures were removed 5–7 days after surgery.

Outcome assessments focused primarily on the formation of sialoceles and fistulas, as well as the onset of facial nerve palsy. Because most sialoceles and salivary fistulas develop within 1 month after surgery,[13] our patients were followed up for at least 2 months.

Patients were diagnosed with postoperative sialocele when a nontender cystic mass was present at the surgical site and the accumulation of saliva was confirmed by aspiration and/or drainage. They were diagnosed with postoperative salivary fistula when clear fluid leaked from the surgical wound. Purulent and bloody fluids were not considered indicative of sialoceles or salivary fistulas.

3 | RESULT

From November 2019 to February 2022, 54 patients were initially diagnosed with clinically benign tumors, which protruded into the SMPS; they underwent ECD-SMPSA under general anesthesia with laryngeal mask ventilation or tracheal intubation. Two patients were not included in the study cohort because they had unexpected malignancy identified intraoperatively and required extensive revision parotidectomy. Thus, we analyzed 52 patients

FIGURE 3 Wound covered with thin gauze alone (no pressure dressing) [Color figure can be viewed at wileyonlinelibrary.com]

(31 men and 21 women), with a mean age of 54.40 years. The greatest tumor dimension ranged from 1.5 cm to 6.0 cm (mean, 2.89 cm). The operations were performed by three of the authors (LL, WW, and DcW, with approximately 5, 10, and 15 years of parotidectomy experience, respectively). All tumors were completely resected within 30–120 min (mean, 71.63 min). There were no cases of capsular rupture. Pathology findings indicated that the most common type of tumor was Warthin tumor (24 cases, 46.2%), followed with pleomorphic adenoma (17 cases, 32.7%). The patient characteristics are summarized in Table 1.

None of the 52 patients were lost to follow-up during the study period. Only one male patient (case 40) developed mild sialocele; the patient was 62 years old and had a history of smoking. The tumor had been present for 12 months, was shallow type, and its greatest dimension was 2.5 cm. Postoperative pathology findings supported a diagnosis of Warthin tumor. Two needle aspiration treatments were sufficient for complete resolution of the sialocele within 3 weeks after surgery. No patients exhibited salivary fistulas. The overall rate of sialocele/fistula formation was 1.92%. Hematoma, wound infection, and paralysis of the facial nerve were not observed in 52 patients.

TABLE 1 Patient characteristics ($n = 52$) and operative variables

Characteristics	No. of patients (%)
Age, y, mean (SD, range)	54.40 (±11.27; 28–74)
≤40	8 (15.4)
>40, ≤60	25 (48.1)
>60	19 (36.5)
Sex	
Male	31 (40.4)
Female	21 (59.6)
Smoking history	
Never	27 (51.9)
Former smoker	3 (5.7)
Smoker	22 (42.3)
History of tumor, month, mean (SD, range)	21.33 (±33.05; 1–180)
1–2	11 (21.2)
3–6	15 (28.8)
7–12	7 (13.5)
13–36	13 (25.0)
37–180	6 (11.5)
Tumor location	
Shadow type	36 (69.2)
Deep type	16 (30.8)
Tumor size, cm, mean (SD, range)	2.89 (±1.05; 1.5–6.0)
1.5 to <2.0	4 (7.7)
2.0 to <3.0	23 (44.2)
3.0 to <4.0	13 (25.0)
4.0 to <5.0	9 (17.3)
5.0 to <6.0	3 (5.8)
Operative time, minute, mean (SD, range)	71.63 (±25.24; 30–120)
<60	15 (28.8)
60 to <90	20 (38.5)
90 to <120	17 (32.7)
Histology	
Warthin tumor	24 (46.2)
Pleomorphic adenoma	17 (32.7)
Cyst	6 (11.5)
Basal cell adenoma	3 (5.8)
Reactive hyperplasia of lymph node	2 (3.8)

4 | DISCUSSION

In this prospective study, ECD-SMPSA was used to treat 52 clinically benign tumors in the parotid tail, which protruded into the SMPS. Our outcome assessments focused primarily on the formation of sialoceles and fistulas. Only one of the 52 patients exhibited mild postoperative sialocele; two needle aspiration treatments were sufficient for complete resolution. No patients develop salivary fistulas. The overall rate of sialocele/fistula

formation was 1.92%; to our knowledge, this rate is among the lowest in the literature.[3,4]

Importantly, patients in this prospective case series did not receive any specific intraoperative and/or postoperative measures for prevention or treatment of sialocele/fistula (e.g., medication sealant, pressure dressing, and dietary restrictions). In particular, postoperative pressure dressing is the most widely used measure (and probably oldest measure that remains in clinical use) for prevention and treatment of postparotidectomy sialoceles and fistulas.[14] Our results suggest that postoperative pressure dressing has limited efficacy and indicate a need for further research concerning postparotidectomy sialoceles and fistulas.

Iatrogenic sialoceles and fistulas secondary to parotid tumor resection are clearly caused by injury to gland tissue (i.e., ducts) surrounding the tumor. The use of minimally invasive surgical methods is important for reducing the incidences of sialocele and fistula. The relationship between sialocele/fistula formation and the extent of dissection remains controversial,[15–18] probably because of the considerable heterogeneity in parotidectomy definition and practice. Extracapsular dissection, as the name implies, may be defined as resection of the tumor outside the capsule, with minimal damage to surrounding gland tissue. For convenience, the extent of damaged gland tissue may be regarded as <1.0 cubic centimeters. By involving the SMPS, which is between the parotid gland and sternocleidomastoid muscle, this minimally invasive technique can be applied to clinically benign tumors, including deep type tumors, which comprised approximately one-third of the tumors in the present study. The overall parotid gland, including the covering tissue above the tumors, was subjected to minimal invasion and was therefore completely preserved.

The inferior parotid surgical site, which is associated with less frequent sialocele occurrence than anterior parotid site,[1,4,19] may also have contributed to the low rate of postoperative sialoceles and salivary fistulas in the present study. Histological analysis has shown that the secretory portion of the parotid gland comprises acini and a collecting web of ducts. The ducts, when traveling from the proximal Stensen's duct toward the terminal acini, exhibit a treelike branching pattern, which becomes progressively larger.[20] We presume that the resection of collecting ducts, rather than injury to secretory acini, causes most clinical intratissue sialorrhea (e.g., formation of sialoceles and secondary fistulas). Compared with the central and anterior portions of the parotid gland (where Stensen's duct originates and traverses, respectively), the fewer and smaller striated ducts in the inferior portion of the parotid gland may lead to lower sialocele risk.

Extracapsular dissection is reportedly not indicated for tumors in the deep lobe of the parotid gland.[21,22] We have preliminarily revised this perception and practice by using the SMPS approach. Extracapsular dissection can be applied in the resection of tumors in deep regions, both in the deep lobe of parotid when a tumor is beneath the facial nerve[12] and when a tumor is above the facial nerve but covered by a thick layer of gland tissue. Otherwise, the tumor must be approached by removing gland tissue that covers the tumor; this carries a greater risk of iatrogenic intratissue sialorrhea.

This study had some important limitations. First, it was conducted in single institution and the sample size was small, which limits the generalizability of the findings. Second, the outcome assessment was focused on the formation of sialoceles/fistulas secondary to parotidectomy and the follow-up period was short. Other surgical complications (e.g., clinical Frey syndrome and first bite syndrome) and tumor recurrence will be assessed during long-term follow-up in future studies.

5 | CONCLUSION

Our prospective study provides fundamental evidence to support our hypothesis that postoperative sialoceles and salivary fistulas can generally be avoided by using a minimally invasive technique (i.e., ECD-SMPSA) for the treatment of clinically benign tumors that protrude into the SMPS.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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