Comparison of endoscope-assisted versus conventional resection of parotid tumors

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Abstract

Endoscopically-assisted partial parotidectomy for benign tumours has been reported, but we have evaluated its feasibility through different concealed incisions compared with conventional parotidectomy. A total of 124 patients with parotid tumours were enrolled in this retrospective study: an endoscopically-assisted group (n = 37) compared with a group operated on conventionally (n = 87). The incision for endoscopically-assisted partial, total parotidectomy and selective neck dissection was based on location and pathological characters of the parotid tumour. The sex and age of the patients, diameter of the tumour, and histopathological features were comparable between the two groups. The mean length of the incision in the endoscopic group was significantly shorter than that in the conventional group. However, intraoperative blood loss, operating time, and duration of hospital stay were significantly reduced, and postoperative secretion of saliva was significantly improved in the endoscopic group, among whom there were no recurrences of tumour. More importantly, all patients who had endoscopically-assisted operations were satisfied with the cosmetic result. Endoscopically-assisted parotidectomy is superior to conventional resection as judged by postoperative cosmetic and functional outcomes. It is noteworthy that the site of incision depends mainly on location, and on the suspected low grade of malignancy of the parotid tumour seen on preoperative computed tomography and magnetic resonance images.
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Keywords: endoscopic surgery; parotidectomy; tumours; cosmetic outcome; complications

Introduction

Parotid tumours make up 2%-3% of tumours of the head and neck, and 80% of salivary gland tumours.[1] Conventional parotidectomies allow complete resection of the tumour with safe dissection of the facial nerve using an S- or Y-shaped skin incision. However, this conventional incision leaves a large scar. Endoscopic resection for the treatment of head and neck tumours is a relatively new method, and has been used more frequently since the end of the 1990s in an attempt to improve cosmesis.[2] Recently, endoscopically-

assisted partial-superficial parotidectomy has been reported in several studies.[3,4] In the present study we explored the benefits of endoscopic surgery over conventional surgery for benign and low grade malignant parotid tumours through different small and concealed incisions.

Patients and methods

Patients

From April 2010 to December 2017 a total of 124 patients with a diagnosis of parotid tumour was selected from the Department of Oral and Maxillofacial Surgery, the Affiliated Hospital of Qingdao University and Department of Head and Neck Surgery, Shaanxi Tumor Hospital. The inclusion criteria were a painless tumour, no history of radiotherapy, no pre-existing facial paresis, and the diameter of the tumour <6 cm. Malignant parotid tumours confirmed by fine needle aspiration cytology (FNAC), acute inflammation, sialadenitis, or a recurrent tumour were excluded. All patients had a computed tomographic (CT) scan, or magnetic resonance imaging (MRI), or both, before the operation to estimate the size and site of tumours and their relations to important surrounding anatomical structures. Patients were divided into two groups for treatment: 37 were treated with endoscopically-assisted surgery and 87 had conventional operations. Patients' personal details, diameter of the tumour, length of incision, intraoperative blood loss, operating time, intraoperative procedure, postoperative complications, histopathological result, duration of hospital stay, and recurrence of tumour were recorded. Total intraoperative blood loss was the postoperative weight of wet gauze minus preoperative weight of wet gauze plus volume of blood in the suction bottle (1g = 1 ml). The method of endoscopically-assisted operations was explained to all the patients and their written consent was obtained. The study was approved by the Hospital Ethics Committee.

Instruments

The endoscope (angle 0°, and diameter 4 mm), television monitor, and equipment for endoscopic surgery were from the Karl Storz Endoscope, Ltd. The harmonic scalpel was from Ethicon Endosurgery, LLC).

Surgical technique: endoscope assisted parotidectomy

The patient was placed supine under general anaesthesia with a pillow under the shoulders and the head inclined to the healthy side. The skin was prepared and draped as for the conventional operation. A skin incision about a 3-6 cm long was made along the temporal, postauricular-occipital hairline or retromandibular space according to the site of the tumour. The scalp flap was raised to expose the superficial layer of the parotid gland using monopolar cautery and right-angled

retractors, and the whole skin flap was separated so that it exceeded the size of the tumour under the endoscope. At this stage, the raising of the skin flap for surgical exposure was complete.

The next step was to identify the connective tissue around the tumour. The postauricular-occipital hairline skin incision was made when the tumour was in the middle or inferior lobe, and we dissected between the posterior region of the parotid gland and the sternocleidomastoid (SCM) muscle using the harmonic scalpel. The great auricular nerve and the external jugular vein were identified over the SCM muscle. It is important that the posterior branch of the great auricular nerve is preserved unless the tumour involves the nerve or the nerve adheres to it. First, the main trunk of the facial nerve was identified, and the main landmark was the tympanomastoid fissure, then the peripheral branches of the facial nerve were dissected by dividing the glandular tissue. The temporal hairline skin incision was used to excise the tumour of the superior lobe, and the peripheral facial nerve branches were identified and dissected directly. A retromandibular skin incision was made for a deep or suspected malignant tumour, which facilitated extension of the incision directly as necessary (Fig. 1). Because of the amplification of the endoscope, the branches of the facial nerve could be identified directly and dissected clearly.

After removal of the gland and exposure of the facial nerve, the tumour could safely be excised together with a normal parenchymal parotid margin of 0.5-1 cm (Fig. 2). The specimen was then sent for frozen section, and if the result indicated that the tumour was malignant, the small incision in the mandibular angle was extended, and a total lobe parotidectomy and selective neck dissection were done. Finally, the operating field was irrigated, the wound was closed using a subcuticular suture of 4/0 polyglycolic acid (Dexon, Davis & Geck), after which a small Hemovac® (Zimmer) is placed for drainage.

For the conventional parotidectomy group, we used an S-shaped preauricular and submandibular incision.

Statistical analysis

All statistical analyses were made using SPSS (version 13.0, SPSS Inc). Variables are presented as mean (SD). Student's *t* test and the chi squared test were used for the comparisons between the two groups, and probabilities of less than 0.05 accepted as significant.

Results

The tumours were completely resected in both groups, and 37 patients had a successful endoscopically-assisted parotidectomy with no conversions to open operations. Table 1 summarises patients' personal and clinincal details according to operation).
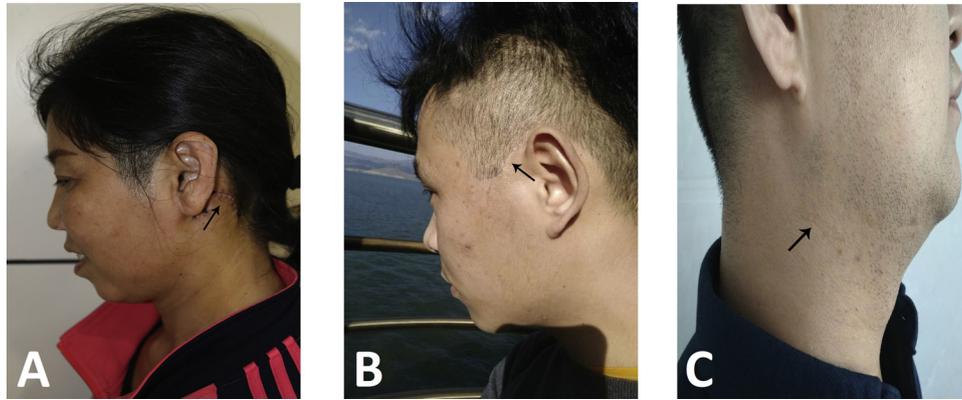
Fig. 1. The different incisions used in endoscopically-assisted parotid surgery.
The postauricular-occipital hairline skin incision: A = the preoperative incision design, B = the temporal hairline skin incision, and C = the retromandibular skin incision.
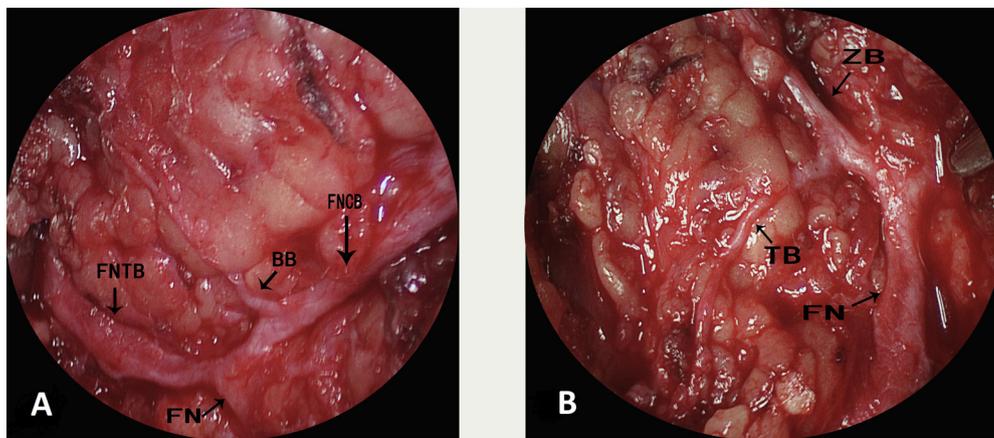

Fig. 2. A and B: the main trunk of the facial nerve and each peripheral nerve branch (PNB) were dissected under the endoscope. FN = facial nerve, FNT = the trunk of the facial nerve, FNTB = temporofacial branch of facial nerve, FNCB = the cervical facial branch of facial nerve, TB = temporal branch, ZB = zygomatic branch, BB = buccal branch, and GAN = the great auricular nerve.

All the incisions healed completely, and all the patients in the endoscopic group were satisfied with the cosmetic results of the operation. There were no recurrences over a follow-up period of 12 months in the endoscopic group, and one recurrence at follow-up of at least 14 months in the conventional group.

Discussion

Parotid surgery commonly begins with an S-shaped preauricular and submandibular incision that may leave an obvious scar on the surface of the face and neck. To reduce or hide visible scars, several different procedures have been reported during past decades. We previously used a face-lift incision for parotidectomy that ran in a preauricular direction, behind the tragus, followed the fold of the earlobe, and ended in the postauricular hair. The incision scar from a preauricular incision is still obvious on the face although it does not extend to the neck, and this cannot improve cosmetic results and achieve the purposes of minimally-invasive surgery.[5]

Endoscopically-assisted operations have been used more often in the head and neck area since the end of the 1990s,[2,6] and these provide a magnified, illuminated, and adequate operative view, which allows the surgeon to identify pertinent anatomical features more easily and finish with a minimal or concealed scar compared with the conventional approach. However, sometimes surgeons have to return to an open approach because of bleeding that cannot be controlled through a small incision. The endoscopically-assisted dissection of benign tumours, together with the use of a harmonic scalpel, has recently been reported in several studies,[7–9] but at present there is no unified standard incision for endoscopic parotid surgery, which is still in the exploratory stage. Huang et al did endoscopically-assisted partial parotidectomies through two 20 mm – 25 mm retromandibular and postauricular incisions[10] and 30 mm – 35 mm postauricular skin incisions.[3] In addition, the single cephaloauricular furrow incision,[11] hairline incision,[12] and retroauricular incision,[4] were also reported for the dissection of benign parotid tumours.

Table 1
Patients' personal and clinical details, operative data and follow-up results. Data are mean (SD) or number.

Variable	Endoscopic group (n = 37)	Conventional group (n = 87)	p value
Sex, male/female	17/20	55/32	0.075
Age (years)	47.00 (16.97)	51.37 (15.27)	0.161
Diameter of tumour (cm)	2.35 (0.76)	2.38 (1.11)	0.881
Length of incision (cm)	4.66 (0.78)	12.98 (1.28)	<0.001
Intraoperative blood loss (ml)	26.76 (12.2)	65.29 (141.42)	0.014
Conversion to open procedure	0	–	
Operating time (mins)	97.84 (23.7)	120.34 (80.95)	0.020
Intraoperative procedure:			
Preserving branch of greater auricular nerve	35	84	0.612
Preserving parotid duct	29	22	<0.001
Implanting biomembrane[a]	0	61	<0.001
Suturing stump of parotid	0	80	<0.001
Selective neck dissection	2	5	0.94
Postoperative complications:			
Numbness of earlobe	7	19	0.715
Temporary facial paresis	8	18	0.907
Salivary fistula	4	10	0.912
Salivary secretion	26	15	<0.001
Frey syndrome	2	5	0.940
Histopathology:			0.141
Pleomorphic adenoma	23	54	
Warthin tumour	9	19	
Inflammatory hyperplasia[b]	2	7	
Basal cell adenoma	1	2	
Other malignant tumours[c]	2	5	
Duration of hospital stay (days)	9.12 (1.12)	11.33 (3.94)	<0.001
Recurrence of tumour	0	1	

[a] Yantai Zhenghai Bio-tech Co Ltd.

[b] Inflammatory hyperplasia including reactive lymphoid hyperplasia, fibroplasia, chronic inflammation of salivary gland.

[c] Including mucoepidermoid carcinoma, adenoid cystic carcinoma, carcinoma in pleomorphic adenoma, and myoepithelial carcinoma.

In the present study we used several different incisions independently, including temporal and occipital hairline, and postauricular and retromandibular skin incisions for parotidectomy, based on the site of the tumour. Our main purpose was to achieve an adequate operative field through more effective working space. Total parotidectomy could also be done through a combination of the two incisions. The exposure of the tumour for removal was uniform for both groups, while the amount of subcutaneous dissection was less through the endoscopic working space than through the conventional S-shaped incision. Finally, all patients who had endoscopic surgery were satisfied with the postoperative scars compared with the conventional S-shaped scar.

The use of the harmonic scalpel is essential in endoscopically-assisted parotid surgery, as it gives low thermal radiation to seal and divide the vessels with effective haemostasis. Two studies (by Huang et al and Markkanen-Leppanen and Pitkaranta)[10,13] indicated that the amount of operative bleeding and the duration of operation of the endoscopically-assisted partial parotidectomy were the same as that of the conventional approach. However, we compared the conventional "bracing-clamping-cutting-ligation" procedure with the harmonic scalpel, which excels at coagulating and cutting the gland, and this could obviously reduce both operative bleeding and operating time. In addition, the endoscopic technique also achieves satisfactory exposure of the

surgical field through good magnification and illumination, which is similar to those in the conventional S-shaped incision. The surgeon can accurately dissect and protect the main trunk and branches of the facial nerve to prevent them from being injured.

Much attention has been paid to the potential complications of parotidectomy, including numbness of the earlobe, temporary facial paresis, salivary fistula, saliva secretion, and Frey syndrome. Because of the small skin incision in our endoscopically-assisted group, damage to the parotid gland was less than that with conventional surgery, and the parotid duct was preserved as far as possible, so the postoperative salivary secretion was superior to that in the conventional group. As the harmonic scalpel was used for endoscopically-assisted resection of parotid tumours, we were able to do the parotidectomy without implanting a biomembrane and suturing the stump of the parotid, so the rate of Frey syndrome was no worse than that with conventional surgery. In addition, Huang et al[10] found that the great auricular nerve could be preserved through retromandibular and postauricular incisions, so the risk of cutting the great auricular nerve was minimised. A study by Fan et al[11] showed that morbidity that involved numbness of the earlobe and temporary facial paresis was more frequent in the conventional group than in those who had the endoscope-assisted cephaloauricular furrow incision. However, there was no significant difference.

Because our endoscopically-assisted operations included different incisions, both occipital and postauricular incisions might injure great auricular and facial nerves, resulting in numbness of the earlobe and temporary facial paresis.

Recently, Liang et al[14] indicated that endoscopically-assisted selective neck dissection was a feasible and safe technique in patients with early-stage (T1-2N0M0) squamous cell carcinoma of the head and neck through a small lateral neck incision, and this included cancers of the oral cavity, oropharynx, hypopharynx, and larynx. We found no postoperative complications such as chylous fistula, infection of the incision, or injury to the facial nerve or accessory nerve, but nor was there any report in the endoscopically-assisted group of malignant tumours of the parotid gland being operated on.[14] Although only two patients with malignant parotid tumours were treated by the endoscopically-assisted approach in our study, neither tumour recurred during at least two years' follow-up.

It is worth emphasising that a single small incision cannot provide an effective working space and adequate operative field for exposure of the total parotid gland and neck. We therefore consider that a retromandibular skin incision should be used for patients with tumours localised to the deep parotid gland, and tumours that are suspected of low grade malignancy on preoperative CT scan or MRI examination; a temporal hairline incision may also be used as necessary. The main advantages of the retromandibular incision are that not only does it expose the middle and inferior of the parotid gland and the level III area of a selective neck dissection, but it also extends the incision directly according to the requirement of the operative field, in case intraoperative frozen section indicates that the tumour is malignant.

It is noteworthy that the marginal mandibular branch of the facial nerve lies below the horizontal ramus of the mandible, and this should be carefully protected against accidental injury if the retromandibular approach is used. However, we recommend that a conventional approach should be used if malignancy is diagnosed by FNAC before operation. The excision principle of parotid tumours is the same for both endoscopically-assisted and conventional groups based on NCCN Guidelines.[15] We recommend that radical neck dissection is done for patients with aggressive or malignant parotid tumours through a conventional incision.

Conclusion

In summary, endoscope-assisted resection of parotid tumours is a potentially effective and safe procedure that leads to good cosmetic and functional outcomes. To our knowledge, our study is the first to report removal of deep lobe and low grade malignant parotid tumours by an endoscopically-assisted total parotidectomy and selective neck dissection. The anatomical structures are identified and visualised clearly, and can be dissected efficiently with the help of the good illumination and magnification that are provided by the endoscope. The main advantage of endoscopically-assisted surgery is that it results in a minimal postoperative scar compared with that of the conventional approach. Patients also spend less time in hospital and have fewer complications. However, its long-term results as far as safety and functional outcomes are concerned require further exploration with larger scale and randomised prospective studies.

Ethics statement/confirmation of patients' permission

The study was approved by the Hospital Ethics Committee. Patients gave their informed consent.

Conflict of interest

We have no conflicts of interest.

Acknowledgements

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