Short-term outcomes of extracapsular dissection versus superficial parotidectomy in the management of benign parotid tumors: a prospective comparative study

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Background
For decades, surgery for the treatment of benign tumors of the parotid gland was debatable. Extracapsular dissection (ECD) is a new technique for the excision of parotid-gland tumors and greatly differs from the classical surgical treatment options in that the facial nerve is not dissected. The study aims to highlight the results of ECD by comparing them to superficial parotidectomy (SP) for benign lesions of the parotid gland, with a special concern for recurrence rate and facial nerve injury.
Patients and methods
From May 2017 to May 2020, according to the availability of cases, 50 patients were diagnosed with benign tumors of the parotid gland and were admitted to the General Surgery Department of Ain Shams University Hospitals. After completing a full history, clinical examination, and investigations, the patients were divided into two groups using the sealed-envelope method: the SP group included 25 patients who underwent SP, and the ECD group included 25 patients who underwent ECD. Benign parotid tumors with a diameter of less than 4 cm and no deep-lobe invasion were included in the study. The minimum proposed follow-up period was decided to be 1 year to estimate the recurrence rate in both groups.
Results
The most common complaint in both groups was preauricular swelling. The operative time in the ECD group was 42.80 ± 5.54 min compared with 127.36 ± 16.36 min in the SP group. The most common pathological type in both groups was pleomorphic adenoma. The mean follow-up period was 34 ± 3.2 and 33.01 ± 3.1 months for the patients subjected to SP and ECD, respectively. In SP, one patient had a disease recurrence and one patient had sustained facial nerve paralysis. In ECD, one patient had a disease recurrence.
Conclusion
In terms of recurrence rates, ECD was comparable to SP.

Keywords:
extracapsular, parotid, tumor

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Introduction

Benign parotid tumors manifest as a painless, slowly progressive preauricular lump with a single, moveable, well-defined boundary in the superficial parotid-gland lobe [1]. The most prevalent benign salivary lesions are pleomorphic adenomas, which account for 65% of benign salivary neoplasms and 80% of all salivary neoplasms [2–5]. Warthin's tumor is the second most common parotid neoplasm [6]. In the superficial parotidectomy (SP) approach, the superficial parotid lobe is completely excised, with special attention paid to preserving the facial nerve [7]. Extracapsular dissection (ECD) is conducted by making a cruciate incision above the tumor and removing a rim of 2 mm of normal tissue, including the capsule [8].

For many years, surgical treatment of benign parotid-gland tumors has been a source of contention. This is due to the risk of facial nerve injury and capsular rupture, as well as the high probability of local recurrence [9–12].

The traditional parotidectomy techniques entail the excision of a significant amount of normal-gland tissue as well as facial nerve dissection, resulting in facial nerve injury or one of its branches and the loss of normal physiological activities of the parotid gland [13]. That is why many surgeons prefer a less-invasive technique like ECD, which involves removing only the lesion and a small region of normal parotid tissue around it, retaining normal parotid physiology, and lowering

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the risk of facial nerve injury and Frey's syndrome [8, 14–16].

Patients and methods

This is a prospective comparative study from May 2017 to May 2020. According to availability of cases, the study included 50 patients who were diagnosed with benign parotid tumors. Study participants were randomly divided into two groups using the closed-envelope method.

ECD group: enrolled 25 patients who underwent ECD.

SP group: enrolled 25 patients who underwent SP.

The inclusion criteria were a benign parotid mass, no invasion of the deep lobe, and a diameter of less than 4 cm. The benign nature of the tumor was determined using ultrasonography and a computed tomography (CT) scan of the head and neck, fine-needle aspiration cytology, and biopsy. The malignant histopathology and tumor location in the deep lobe are exclusion criteria. The minimum planned follow-up duration was 1 year in order to evaluate the recurrence rate in both groups.

Ethical considerations

All patients signed a written formal consent describing the procedure and possible postoperative complications. The study was approved by the ethical committee and Institutional Review Board. All surgeries were performed by the same surgical team at Ain Shams University Hospitals.

Surgical procedures

Superficial parotidectomy

A modified Blair incision was created in the preauricular crease running down through the subcutaneous tissue and platysma muscle (Fig. 1). The anterior skin flap was elevated to expose the anterior surface of the parotid gland superior to the great auricular nerve and the facial covering of the parotid gland. Care should be taken to avoid injury to facial nerve branches. To expose the parotid gland's tail, the posterior and inferior flaps are also raised. The flaps are retracted using silk suture after elevation. Dissect the parotid gland's tail so that it is exposed from the sternocleidomastoid and the posterior belly of the digastric muscle.

The preauricular space was opened performing blunt dissection to divide the attachment of the parotid gland from the cartilaginous part of the external auditory canal. This plane of dissection reveals the tragus cartilage, allowing anatomic landmarks to be identified, allowing the tragus pointer to be used to identify the facial nerve stem. The parotid is divided superficially by the facial nerve. Dissection continues to travel along the facial nerve, raising it and spreading it gently.

Figure 1

A 50-year-old male with right parotid swelling showing modified Blair incision.

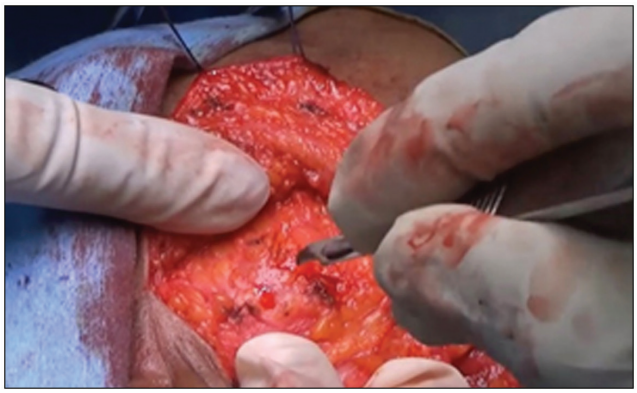
Surgical technique of extracapsular dissection

In a preauricular crease, a modified Blair incision was made that ran down into the subcutaneous tissues and platysma muscle as shown in Fig. 1. Elevate the anterior flap to the front of the gland just beneath the greater auricular nerve and the parotid fascia. After palpation for the tumor, a cruciate incision is performed to locate and dissect the loose areolar plane surrounding the bulk without rupturing the capsule as shown in Fig. 2. Application of four artery clips to the parotid fascia at the cruciate incision's center to retract the parotid fascia and allow for blunt dissection into the parenchyma until the tumor is delivered out as shown in Figs 3 and 4. The edges of the cruciate incision were reapproximated and sutured together.

Statistical analysis

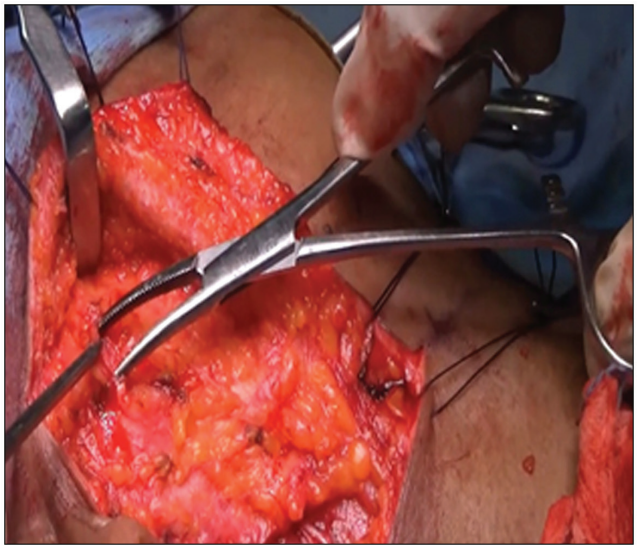
The data were entered into Excel 2013 and Statistical analysis was done using IBM SPSS statistics for windows, Version 23.0 (IBM Corp., Armonk, NY, USA). Statistical significance with a *P* value of 0.05 was considered. For the description of the data, different comparative parameters were presented as mean and SDs, or medians with quartiles for quantitative variables, and as absolute and relative frequencies for qualitative

Figure 2



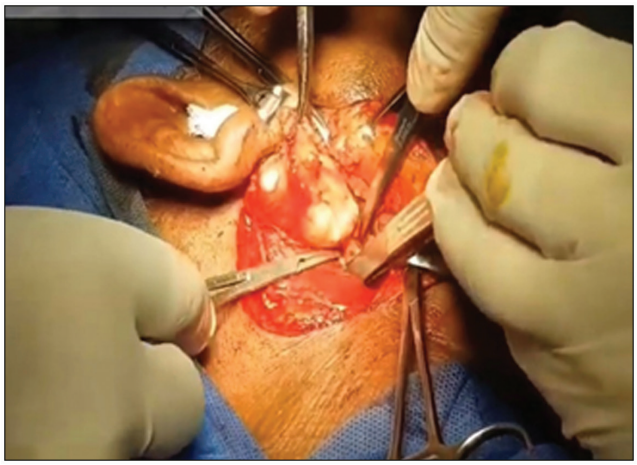
Cruciate incision in the parotid fascia overlying the tumor.

Figure 3



Application of four-artery forceps in extracapsular dissection (ECD).

Figure 4



Delivery of the tumor with surrounding tissue after completion of extracapsular dissection.

variables. Counts and percentages were used to express discrete variables. Comparisons of continuous variables were performed using the Student t test. The χ^2 test with or without the Fisher exact test was used for categorical and binary variables. The Mann–Whitney test was utilized for other nonparametric quantitative data.

Results

In total, 50 patients diagnosed with benign parotid lesions were included in that study: 27 (54%) females and 23 (46%) males. The patient demographic data and tumor characteristics are listed in Table 1. The main presenting symptom in all cases was unilateral, painless preauricular swelling. The majority were pleomorphic adenomas on FNAB (78%). ECD was performed in 25 (50%) patients (10 males and 15 females), and SP was performed in the other 25 (50%) patients (13 males and 12 females).

The mean size of the lesion was 3.0 ± 0.5 and 2.5 ± 0.8 for SP-treated and ECD-treated patients, respectively. The mean follow-up was 34 ± 3.2 months for ECD-treated patients and 33 ± 3.1 months for SP-treated patients. The duration of the operative procedure in the ECD group was 42.80 ± 5.54 min compared with 127.36 ± 16.36 min in the SP group. No locoregional or systemic complications were encountered postoperatively (Table 2), and all the patients were discharged an average of 2–3 days after surgery.

Histopathological examination of the excised specimen agreed with the preoperative biopsy results in all patients, confirming the benign nature of the tumor. The follow-up visits were planned monthly for the first 3 months, then every 3 months for the next 1 year, and then annually. Ultrasonography was scheduled every 3 months for the first year and every 6 months for the second and third years. A head and neck CT scan or MRI were planned at the end of first and second years.

In our study, an increased complication rate was found in the SP group compared with the ECD group. Temporary facial nerve injury was statistically significantly lower in the ECD group than in the SP group (4 vs. 20%, respectively, P=0.001). Furthermore, no statistical significance was observed regarding permanent paralysis of the facial nerve in either group: it was lower in the ECD group than in the SP group (0 vs. 4%, respectively, P=0.065).

The main involved branch of the facial nerve in injuries was the mandibular branch in both approaches. No statistical difference was observed regarding capsular rupture and local recurrence after SP or ED: 4 versus 4% (P=0.587), and 4 versus 4% (P=0.741), respectively. None of the patients in our study developed either Frey's syndrome or salivary fistula.

Table 1 Patients' demographic data and presenting disease characteristics

	Superficial parotidectomy (*N*=25)	Extracapsular dissection (*N*=25)	*P* value
Mean age (years)	36.86±7.2	38.9±7.5	0.161
Sex [*n* (%)]			0.540
Male	13 (52)	10 (40)	
Female	12 (48)	15 (60)	
Symptoms [*n* (%)]			
Swelling	25 (100)	25 (100)	0.690
Pain	2 (8)	2 (8)	0.640
Pathology [*n* (%)]			0.960
Pleomorphic adenoma	20 (80)	19 (76)	
Warthin tumor	4 (16)	5 (20)	
Oncocytoma	0	1 (4)	
Basal-cell adenoma	1 (4)	0	
Mean tumor size (mm)	30±5	25±8	0.451
Mean operative time (min)	127.36±16.36	42.80±5.54	0.034
Mean follow-up (months)	34±3.2	33.01±3.1	0.573

Table 2 Postoperative complications

Complications [*n* (%)]	Superficial parotidectomy (*N*=25)	Extracapsular dissection (*N*=25)	*P* value
Transient facial nerve injury	5 (20)	1 (4)	0.001
Facial paralysis	1 (4)	0	0.065
Capsular rupture	1 (4)	1 (4)	0.578
Recurrence	1 (4)	1 (4)	0.741
Frey syndrome	0	0	
Salivary fistula	0	0	

P value according to χ^2 test (statistical significance with a $P<0.05$).

Discussion

In the early 20th century, intracapsular enucleation was developed to prevent damaging the facial nerve while conducting a partial excision of the tumor capsule [17]. Due to recurrence rates of up to 45%, there was a trend for more extreme measures. Since tumor recurrence rates were as low as 2%, SP became universally acknowledged as the gold standard by the mid-20th century [18–20]. Patients were at a higher risk of having facial nerve palsy, Frey syndrome, and loss of facial morphology by increasing the volume of gland removed. In the modern period, partial SP (dissection of only the nerve terminals closest to the tumor) became the preferred strategy to allow for complete tumor excision with fewer issues [2]. ECD, a technique of removing the tumor and its capsule together with a thin rim of normal glandular tissue without formal identification and dissection of the facial nerve, has been advocated by experienced salivary surgeons over the last few years [4].

There are two main concerns regarding parotid-gland surgery. The first is the total excision of the lesion with enough safety margin of healthy parotid tissue to preserve the physiological salivary functions and to decrease the rate of local recurrence. The second concern is preserving the facial nerve and its branches while maintaining their functions. Either superficial or total parotidectomy was utilized in the removal of benign parotid-gland lesions, including pleomorphic adenoma, due to high rates of local recurrence. Local recurrence rates were always attributed to incomplete excision of the lesion or capsule rupture, which can lead to dissemination in the tumor cells [8–16].

The ECD of benign parotid-gland lesions involves removal of the tumor itself with a surrounding cuff of 2 mm of normal parotid tissue and much less dissection of the facial nerve and its branches. Many studies support the usefulness of ECD through reporting a lower incidence of Frey syndrome, salivary fistulae, and injury to the great auricular nerve in comparison with SP. A recent meta-analysis by Albergotti *et al.* [21] and other studies consistently find similar rates of recurrence between ECD and SP, but with lower incidences of facial nerve paresis and Frey syndrome with ECD. In an updated meta-analysis, Xie *et al.* [22] endorsed ECD as a safer alternative for selected smaller, superficial, mobile benign lesions without facial nerve involvement. Nonetheless, the dispute over which approach should be used remains.

In addition, data collected from literature suggest that ECD has the same efficacy as that of SP, with a lower incidence of facial nerve paralysis and local recurrence rates and good cosmetic outcomes [23,24]. The current data in our study agree with these facts and

confirm the previously mentioned data. The incidence of temporary facial nerve injury was reported to be higher with SP compared with ECD (20% in SP vs. 4% in ECD) [2,15]. In the case of ECD, the facial nerve and its branches are not totally injured or cut as a result of a nervous neurotemesis. This temporary injury was directly proportional to the length of exposure of the nerve during the operation. The facial nerve is not dissected in the procedure, unless it is in direct contact with the tumor, where a few branches of the facial nerve are manipulated.

In terms of operating time, when compared with SP, the operating time in ECD was much shorter (127.36 ± 16.36 min vs. ECD's 42.80 ± 5.54 min, *P*=0.034). This was expected considering the time necessary to locate the major stem of the facial nerve and then dissect its multiple branches in SP [25].

In our study, the SP group had a higher rate of complications than the ECD group. Temporary facial nerve injury was considerably lower in the ECD group than in the SP group (4 vs. 20%, *P*=0.001). However, there was no statistical significance in either group for persistent paralysis of the facial nerve: it was lower in the ECD group than in the SP group (0% vs. 4%, respectively, *P*=0.065). This is because tumors in the ECD group located away from facial nerve branches, thus, no cases of permanent facial nerve injuries have been reported in the ECD group. However, we believe that if the tumor is located in close proximity to one of the facial nerve branches, it will be temporarily affected, but to a lesser degree in the ECD approach than in the SP approach. Through the long term of mean follow-up course in our study (33.02 ± 3.1 and 34 ± 3.2 months) for the cases subjected to ECD and SP, respectively. We observed no statistical difference concerning capsule rupture or local recurrence after either SP or ED: 4 versus 4% (*P*=0.587), and 4 versus 4% (*P*=0.741), respectively. None of the cases in our study developed either Frey's syndrome or salivary fistulae.

According to the literature studies, the incidence of Frey's syndrome ranges from 18% after SP to 4% after ECD. Although we did not report such a consequence in our cases, it should be mentioned that Frey's syndrome is more common after SP than after ECD [8,11,12,14]. ECD is a microsurgical technique: in the hands of an inexperienced and skilled parotid surgeon, it can be risky, leading to many serious problems [24].

The data collected in our study demonstrated a significant relationship between SP and at least one of the complications (*P*=0.04). That is why ECD may be considered the surgery of choice for benign lesions located in the superficial parotid gland lobe. It is recommended to perform SP for lesions greater than 4 cm in diameter, or when the tumor is deeply seated in the deep portion of the parotid gland, or in cases of recurrent lesions.

In a study conducted concerning capsular invasion and vascular involvement in pleomorphic adenoma by Maruyama *et al.* [26], they reported that more frequent capsular invasion in pleomorphic adenomas greater than 4 cm contains more myxoid stroma and growth factors that promote vascular involvement.

Conclusion

ECD has a comparable recurrence rate to SP and could be an appropriate therapeutic option for benign parotid tumors located in the superficial lobe (the diameter is <4 cm).

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Conflicts of interest

No conflict of interest.

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