Minimally Invasive Approach for the Parotid Gland Neoplasms: A Multicenter Retrospective Analysis

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Abstract

Aim: Recently extracapsular dissection (ECD) for the parotid gland neoplasm have gained popularity, but the data about functional outcomes and complication rates are still limited and surgical technique is not standard. In this multicenter study, we have evaluated the safety, complications, utility and functional outcomes of ECD and necessity of drain requirement.

Methods: This study was conducted as a retrospective multicenter study and two tertiary academic referral centers were involved. Records of the subjects who underwent extracapsular dissection between January 2015 and January 2017 were reviewed. Demographic data, size and location of tumors, results of fine needle aspiration cytology, intraoperative adverse events such as capsule rupture or facial nerve damage, postoperative complications, results of definitive pathology, and hospitalization time of the subjects were reviewed.

Results: A total of 37 subjects were included in the study. There were no subjects with permanent or transient facial nerve dysfunction in either group. No patient complained of symptoms of Frey syndrome. Seroma developed in two of 37 patients. No recurrence has been encountered during the follow up period (min: 36 and max: 72 months).

Conclusions: ECD is a safe technique with very low complications rates according to our results. Even without facial nerve monitoring, ECD could be performed without any damage to the nerve, if surgeon is experienced. Preoperative evaluation is important and patients with small, mobile and solitary benign parotid lesions are good candidates for ECD.

Keywords: *Neoplasm; parotid surgery; minimally invasive surgery; extracapsular dissection*

1. Introduction

The majority of salivary gland neoplasms originate from the parotid gland, and neoplasms of the parotid gland account for 3% of all head and neck neoplasms[1-3]. Pleomorphic adenomas, also known as benign mixed tumors, are the predominant histologic subtype, accounting for 85% of all salivary gland neoplasms[2]. The great majority (85%) of parotid gland neoplasms arise from the superficial lobe[3].

Surgical techniques are the primary method for treating salivary gland tumors. The range of surgical options for parotid gland tumors includes enucleation, partial superficial parotidectomy (PSP), superficial parotidectomy (SP), total parotidectomy, or radical parotidectomy[4-6]. The choice of surgical approach is determined by factors such as the size of the tumor, histological results, the extent of the tumor, the stage (if it is malignant), and the location of the tumor (e.g., whether it is in the superficial or deep lobe, or in the parotid tail).

The treatment objectives include the complete and en bloc excision of the lesion with clearly defined margins, the preservation of facial nerve functionality, and the maintenance of the natural facial appearance, especially in the case of benign lesions. Since traditional enucleation results in increased recurrence rates, SP was regarded as the acceptable least comprehensive surgery for treatment of parotid gland tumors for decades.

Enucleation is not commonly used as a surgical approach for treating these tumors due to the elevated risks of capsule rupture and inadequate therapy, which are associated with a high likelihood of tumor recurrence. The risks of tumor recurrence range from 20% to 45%[2,7]. Nevertheless, the utilization of the conventional parotidectomy procedure significantly decreases recurrence rates. The conventional procedure for parotidectomy involves a comprehensive dissection that begins with the identification of the facial nerve, followed by the removal of the tumor together with either the

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superficial or deep lobe of the parotid gland[8,9]. The risk of facial nerve injury is significantly higher in this surgical treatment[10]. In order to mitigate these hazards, certain surgical methods have been implemented, such as PSP or extracapsular dissection (ECD)[11,12]. ECD needs fewer incisions and attempt to protect the parotid parenchyma and minimize the need for facial nerve dissection, thus reducing the risk of facial nerve paralysis, injuries, and other problems[13,14]. The use of limited surgery leads to improved cosmetic outcomes.

Currently, there is a growing interest in ECD procedures. However, there is a lack of comprehensive data regarding the functional outcomes and rates of complications. Additionally, there is no universally accepted standard surgical approach for ECD. This multicenter study aims to assess the safety, complications, efficacy, and functional outcomes of ECD and determine the necessity of drain requirement.

2. Materials and Methods

This investigation was carried out as a retrospective multicenter study, involving two tertiary academic referral centers. The study received approval from the local ethics committee (No: 2015/043). The records of individuals who had ECD from January 2015 to January 2017 were examined. The surgical procedures were conducted by two proficient surgeons, specifically the first and last authors. Prior to surgical operations, all participants had evaluation using ultrasonography or magnetic resonance imaging, as well as fine needle aspiration cytology (FNAC). Participants with malignant neoplasms, suspected malignancy, deep lobe tumors, and revision procedures were not included in the study. The study examined many factors including demographic information, tumor characteristics such as size and location, results of FNAC, any challenges encountered during surgery such as capsule rupture or facial nerve injury, postoperative complications, results of definitive pathology, and length of hospital stay for the individuals.

Subjects in group I were operated on by the first author, while subjects in group II were operated on by the last author.

2.1. Surgical Technique

All of the procedures were performed general anesthesia. Nerve monitoring was used in group I and not used in group II. In group I, parotidectomy incision, Lazy S, was used but in subjects whose masses are located in parotid tail, a modified smaller incision was used. Skin incision of the pre-auricular region was avoided in these subjects. Quite small incisions were made in all subjects according to tumor location in group II. The skin flap is elevated in a plane immediately over the parotid fascia to expose the periphery of the tumor by a minimum of 1 cm in both groups shown in **Figure 1**. After the skin flap has been raised, the mobility and margins of the tumor is controlled, attention was paid to maintain the integrity of the tumor capsule by performing a wide dissection of the parenchyma surrounding the mass without identification of the facial nerve or branches nerve shown in **Figure 2**. Approximately two to three millimeters normal tissue cuff left around mass. Blunt dissection was performed parallel to the nerve. If a facial nerve branch was concurred, the branch was closely tracing during the dissection. If the lesion had intraoperative features such as infiltration into surrounding structures, a frozen section was performed. In case of malignancy in the frozen section pathology report, classical superficial parotidectomy or total parotidectomy was performed to obtain clean oncological margins. Latex penrose drains were used in group I and were not used in group II.

2.2. Statistical Analysis

T-test or Mann Whitney U test were used for continuous variables and Chi-square test was used for categorical variables between independent groups. Data expressed as means±SDs for continuous variables and as number (n) and percent (%) for categorical variables. The analyses were performed using the statistical package SPSS v22.0.

Figure 1

Small skin incision and minimally skin flap elevation

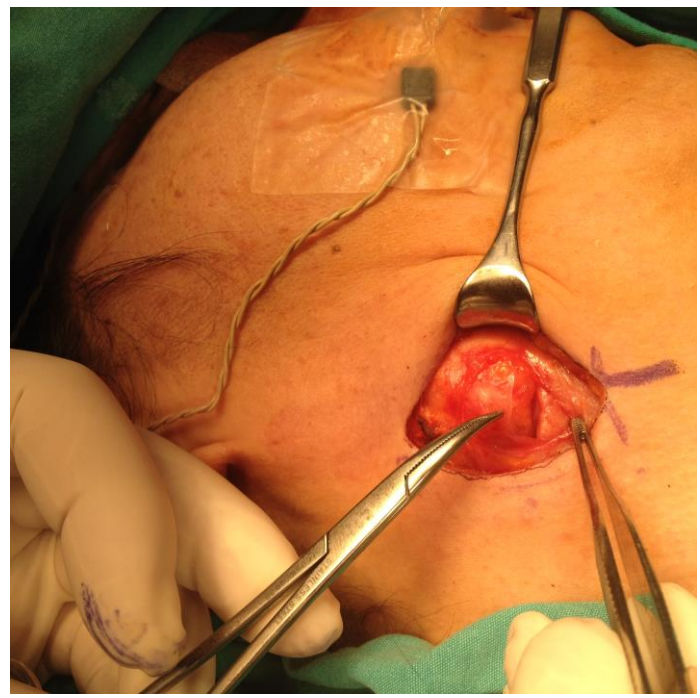
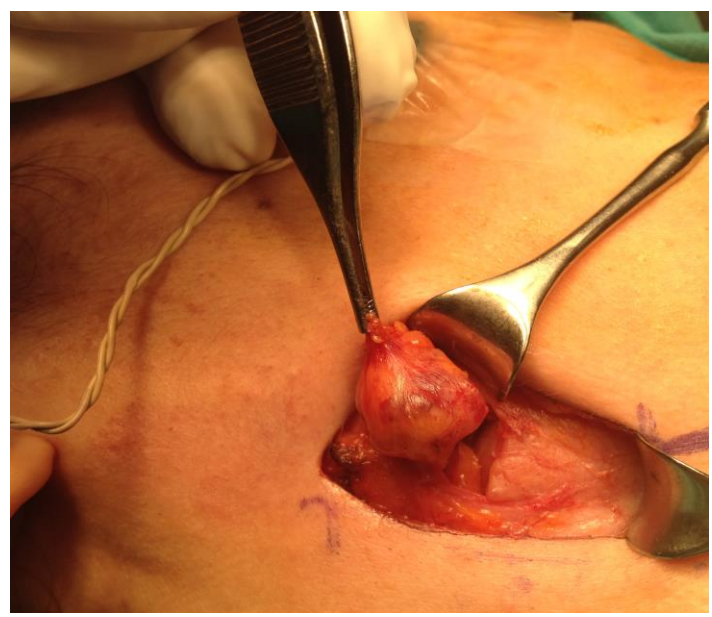


Figure 2

Performing a wide dissection of the parenchyma surrounding the mass without identification of the facial nerve and its branches



3. Results

A total of 37 (26 female, 11 male) subjects were included in the study. There were 17 patients (8 male/9 female) in group I and 20 patients (3 male/17 female) in group II. The mean ages were 45.5 (SD 13.8 years) and 53.3 (SD 13.1 years) in groups I and II, respectively. Demographic characteristics of the study population are described in **Table 1**. Results of preoperative FNAC of all subjects were either benign or non-diagnostic (**Table 2**). In all subjects, the early postoperative period was uneventful without any local complication (edema and/or surgical site bleeding, facial paralysis) or systemic complications (fever, etc.). There were no subjects with permanent or transient facial nerve dysfunction in either group. No patient complained of symptoms of Frey syndrome. Seroma developed in two of 37 patients (One patients in group I and another in group II) and there was not any statistical different between group I and II (p>0,9). Seroma was recovered after aspiration and pressure dressing in two days in both subjects. Mean largest tumor diameter was found 2,1-/+0,7 in group I and 1,8-/+0,2 in group II. No recurrence has been encountered during the follow up period (min: 36 and max: 72 months).

Table 1

Demographic features of patients.

		Group I	Group II	Total
Gender	M	8	3	11
	F	9	17	26
Age (Min-Max)		45.5(19-64)	53.3(18-73)	49.4(18-73)
Tumor localization	R	11	11	22
	L	6	9	15

Table 2

Preoperative FNAC results

FNAC Results	Group I (%)	Group II (%)	Total (%)
Benign lesion	3(17)	1(5)	4(10.8)
Atypic cells	5(29.4)	0	5(13.5)
Pleomorphic adenoma	7(41.2)	4(20)	11(29.7)
Basaloid neoplasm	1(5.9)	4(20)	5(13.5)
Lymphoid cells	1(5.9)	3(15)	4(10.8)
Warthin tumor	0	5(25)	5(13.5)
Mesenchymal tumor	0	1(5)	1(2.7)
Chronic sialadenitis	0	1(5)	1(2.7)
Lipomatosis	0	1(5)	1(2.7)

FNAC: Fine needle aspiration cytology

4. Discussion

Ensuring a wide tumor free margin, even if benign tumors, has paramount importance to prevent recurrences in benign neoplasms of the parotid gland. In case of recurrence, there is a risk of malignant transformation, especially in pleomorphic adenoma. Aside from achieving tumor-free margins, the identification of the facial nerve and its branches is also a crucial concern. Superficial parotidectomy, facial nerve branches are dissected and entire superficial lobe is resected has been the standard of surgery for a long time. Although the rates of tumor recurrence have reduced with SP, there are significant risks associated with completely dissecting the facial nerve. Additionally, removing normal parotid tissue might result in cosmetic abnormalities and other problems, such as salivary fistula or Frey syndrome[14,15].

Conservative surgical techniques have been increasingly popular for treating benign parotid neoplasms. This is because they help reduce complications and enhance functional results, in besides achieving good oncological outcomes. The most often employed conservative procedures for parotid surgery are PSP and ECD[4,13,15]. ECD is distinct from conservative parotid procedures. During this procedure, the facial nerve is not identified and the parotid mass is meticulously dissected and excised with surgical margins of 2-3 mm[12,14].

Recent studies indicate that the extracapsular dissection approach can reduce problems without increasing the recurrence rate[13-15]. In a study, the authors found that there was no significant disparity in recurrence rates (2%) between ECD and SP[15]. This analysis included 503 patients who underwent ECD and 159 patients who underwent SP. A comparative study was conducted to assess the surgical results and cost-effectiveness of ECD vs SP[16]. This study covered a total of 46 surgeries, which consisted of both ECD and SP procedures. According to their report, ECD is a successful, cost-effective, and safe technique for treating benign parotid lesions. A study provided highly promising initial findings about the efficacy of ECD as the exclusive treatment for specifically chosen patients with small-sized malignant tumors that are low-stage, low-grade, and placed inferiorly[17].

Our study has found that ECD is a safe approach, even without facial nerve monitoring, when performed by an experienced surgeon. We did not detect any early local surgical complications such as edema, surgical site hemorrhage, or facial paralysis, nor did we observe any systemic symptoms like fever. No nerve dysfunction or Frey syndrome was observed in any group. Another surgical option for benign parotid neoplasms is PSP. A recent systematic review and meta-analysis has been conducted to compare the effectiveness of ECD and PSP for treating benign lesions of the parotid glands[18]. The analyzed outcomes pertain to the complications. This meta-analysis comprised seven trials, encompassing a total of 1641 patients. The incidence of temporary facial nerve damage and Frey syndrome was lower in the ECD group. There was no significant difference between the two groups in terms of the rates of persistent facial nerve injury, recurrence, infection, and salivary fistula/sialocele. Based on this study, it was seen that ECD had a lower likelihood of problems. However, the current findings do not provide enough evidence to definitively state that ECD is more successful than PSP.

Our study demonstrates that meticulous dissection and surgical expertise are crucial factors for achieving a successful ECD. Facial nerve monitoring is beneficial for avoiding legal concerns, although doing ECD without nerve monitoring can still be done without causing injury to the facial nerve. Another distinction between the two doctors and hospitals was the utilization of drains. Based on our findings, if a meticulous dissection is conducted with a small incision in specific individuals, the use of a drain would be unnecessary. Postoperative scar and quality of life may be improved by closure without drainage.

One primary constraint of our investigation is the limited size of the study population. Despite the small study population, our findings about the preservation of facial nerve function and the absence of complications after ECD without nerve monitoring and drainage usage are significant contributions to the improvement of the ECD technique. Another constraint would be the presence of selection bias among the subjects. Nevertheless, it is important to note that ECD should only be conducted on a certain subset of individuals with parotid tumors, and we strongly recommend meticulous pa-

tient selection to maximize outcomes.

5. Conclusion

To summarize, our results indicate that ECD is a safe method with minimal rates of problems. Even in the absence of facial nerve monitoring, a competent surgeon can conduct ECD without causing any harm to the nerve. If a precise and careful dissection can be performed using a small incision, drainage is not required. Preoperative assessment is crucial, and individuals with small, mobile, and solitary benign parotid lesions are suitable candidates for ECD.

Statement of ethics

Ethical approval was obtained from the Cukurova University Ethics Committee (ethical approval number: 2021/116).

Conflict of interest statement

The authors declare that they have no conflict of interest.

Author Contributions

Concept – CE, MD, OT, UA; Design - CE, OS, OT, SO; Supervision - OS, YK, UA; Resources – CE, MD, SO, YK; Data Collection and/or Processing – CE, OS, UA; Analysis and/or Interpretation – CE, OT, YK, UA; Literature Search – CE, OS, SO; Writing Manuscript – CE, OS, MD, OT, SO, YK, UA; Critical Review – CE, OS, MD, OT, SO, YK, UA.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

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