The European Research Journal 2023;9(5):1005-1014 Original Article

DOI: 10.18621/eurj.1286422 *Otorhinolaryngology*

Surgical, histopathological, and clinical outcomes of parotid gland neoplasms: a 10-year tertiary single-center experience

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ABSTRACT

Objectives: This study aims to contribute to the literature by presenting an overview of a 10-year experience by retrospectively examining the cases with a parotid mass from a tertiary referral center

Methods: Two hundred fourteen patients were diagnosed with a parotid mass in the Otorhinolaryngology Clinic of HSU Izmir Bozyaka Training and Research Hospital between January 2009 and January 2019. Sociodemographic characteristics, diagnostic methods, surgical operations and complications, pathology results, and long-term follow-up results were retrospectively analyzed over the patients' files. SPSS Version 21.0 computer for data analysis.

Results: Of 214 parotidectomies, 140 (75%) were male, 74 (35%) were female, mean age was 55 ± 14 years (15-85 years). The most common diagnoses were 87 (40.7%) pleomorphic adenomas and 48 (22.4%) Wharton tumors. The most prevalent malignant tumors were reported as 18 (8.1%) mucoepidermoid carcinoma. The main type of surgery was superficial parotidectomy, performed in 192 (90%) patients. Facial paralysis was observed in 11 (5.1%) patients as the main postoperative complication.

Conclusions: Considering the histopathological diagnosis of parotid tumors, the stage and grade of the tumor, surgery is generally preferred for treatment. More males are affected than women, especially in the middle ages.

Keywords: Parotid neoplasm, salivary gland, Warthin tumor, pleomorphic adenoma

Salivary gland tumors constitute 3% of all neoplasms in the body and 5-10% of head and neck tumors [1]. The most common period is between the ages of 20-60 and occurs equally in both sexes. Salivary gland tumors originate at rate of 80% from the parotid gland [2]. Although minor salivary gland tumors are generally malignant (65%), 80% of parotid tumors are benign, and 60% of benign tumors are

Received: ***April 22, 2023;*** *Accepted:* ***May 10, 2023;*** *Published Online:* ***August 8, 2023***

How to cite this article: *Aliyeva A, Yagiz Agayarov O, Aksoy Yildirim G, Muderris T, Dalgic A. Surgical, histopathological, and clinical outcomes of parotid gland neoplasms: a 10-year tertiary single-center experience. Eur Res J 2023;9(5):1005-1014. DOI: 10.18621/eurj.1286422*

e-ISSN: 2149-3189

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pleomorphic adenomas [3]. The appropriate treatment method varies according to the localization and histopathology of the parotid tumor [4]. Usually, partial and total parotidectomy surgery is performed, and sometimes neck dissection, neoadjuvant, and additional treatment methods are combined [5]. Parotid surgery is important as the parotid gland produces saliva, protects the ear canal, and facilitates facial expression [6]. The parotid gland is also a common site for benign and malignant tumors, which can cause discomfort and affect the patient's quality of life. Early diagnosis and treatment are crucial for better outcomes in parotid tumors. The histopathology type of the tumor plays an important role in determining the appropriate treatment and predicting the prognosis [7]. Pleomorphic adenomas, the most common benign tumor, have a low recurrence rate but can have malignant transformation. Other benign tumors, such as Warthin's tumor and oncocytoma, have a low risk of recurrence and metastasis. On the other hand, malignant tumors such as mucoepidermoid carcinoma and adenoid cystic carcinoma have a higher chance of recurrence and metastasis and require aggressive treatment [8, 9].

This study aims to contribute to the literature by presenting an overview of a 10-year experience by retrospectively examining the cases with a parotid mass and evaluating the surgical procedures, histopathological results, complications, and long-term follow-up results.

METHODS

Patients

The study included two hundred fourteen patients diagnosed with a parotid mass in the Otorhinolaryngology Clinic at Izmir Bozyaka Traning and Research Hospital between January 2009 and January 2019. The study was retrospectively conducted with the approval of the Local Ethics Committee with No. 06 (KA-21.11.2018).

Sociodemographic characteristics, comorbid diseases, diagnostic methods, surgical operation type and complications, pathology results, added treatment and surgical procedures, and close and long-term follow-up results were analyzed over the patients' files in a 10-year retrospectively.

Patient Evaluation

All patients with a parotid mass underwent routine otolaryngology and detailed head-neck examinations. Patient's medical history was reviewed, including recent upper respiratory tract infections, chronic diseases such as diabetes mellitus, hypertension, coronary artery disease, smoking, and alcohol use. Patients were also asked about accompanying symptoms such as sweating, difficulty swallowing, and weight or voice changes.

Imaging and Biopsy

After the necessary routine examination and anamnesis information, detailed imaging of the head and neck region was performed on the patients. This included head and neck ultrasonography (USG) covering the thyroid region, and computed tomography (CT) or contrast magnetic resonance imaging (MRI) examinations were performed beforehand. After imaging examinations, a fine needle aspiration (FNA) biopsy was performed on the patients. The histopathological and cytological diagnoses of all parotid gland neoplasms were based on the World Health Organisation (WHO) pathological classification system.

Patient Classification

Patients who underwent surgery were evaluated based on pre-operative, intra-operative, and post-operative data. The effect of parotid masses on a patient's life was determined using prognostic criteria such as survival, remission, and revision. Tumors were divided into groups as primary and secondary, malignant and benign parotid masses, and the groups were compared according to prognostic factors.

Surgical Procedures

The main surgical procedure was the superficial parotidectomy. The patient was placed in a supine position with the head slightly elevated. A curvilinear incision was made in the preauricular area, extending to the neck crease. The skin flap was elevated, and the facial nerve branches were identified and preserved. The parotid gland was then dissected from the surrounding tissue, and the tumor was removed. Hemostasis was achieved, and a drain was placed. The skin was closed with sutures, and a dressing was applied. The patient was transferred to the recovery room in stable condition. The drain was removed on postoper-

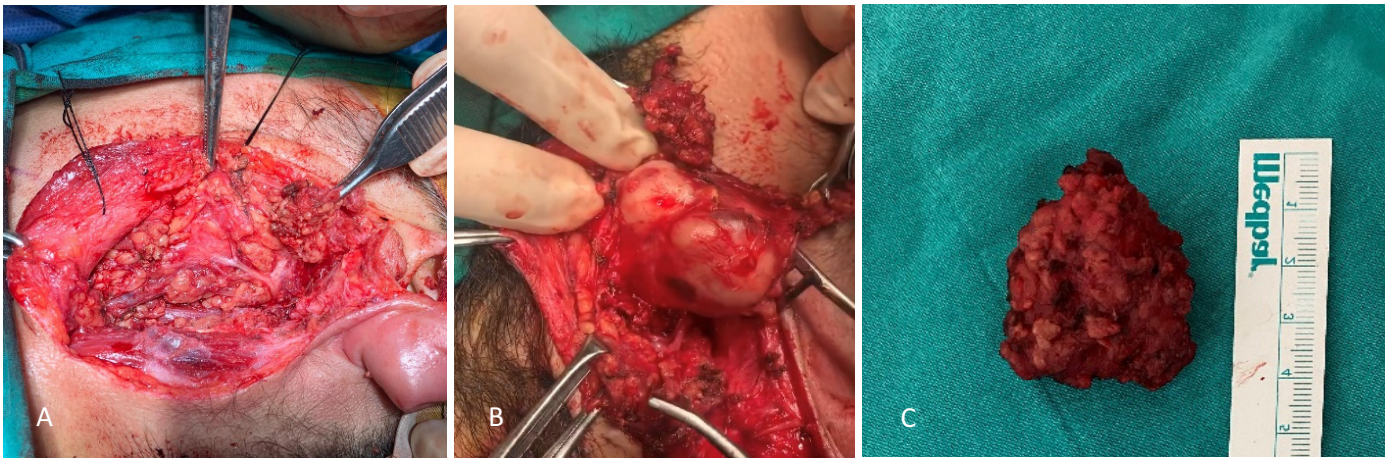

Fig 1. Parotidectomy surgery images (Different cases). (A) Superficial parotidectomy surgery: Facial nerve preserved after completely removing the tumor (female, right side). (B) Superficial parotidectomy surgery: Fixed adeno cystic carcinoma (male, left side). (C) Macroscopic view of the tumor removed from the parotid gland (3×4 cm).

ative day 2, and the patient was discharged on postoperative day 3 with instructions for wound care and follow-up. In need the were performed total parotidectomy and neck dissection (Fig. 1A-C).

Statistical Analysis

'Chi-square test, Fisher's chi-square test, and Fisher–Freeman–Halton test' were used to compare the two groups' recovery levels and evaluate the prognostic criteria. The 'Mann–Whitney U test' was used to calculate the difference between the two groups' numerical measurements and evaluate prognostic criteria based on numerical measurements. SPSS Version 21.0 computer program was used, and a p - value of < 0.05 was considered to be significant

RESULTS

Two hundred fourteen patients were operated on for parotid surgery, and 140 (75%) of the patients had been performed males, 74 (35%) were females, mean age was 55 ±14 years (range: 15-85 years). The most common reason for admission was a mass in the

Table 1. Histopathological examination of the surgical specimens: Benign pararid tumor classification

Histopathological classification	Frequency	Percentage in total	Percentage in benign parotid lesions	Operation type	Additional treatment	Complication
Pleomorphic adenoma	87	41%	51%	70 (85%)	17 (15%)	2
Warthin's tumour	48	22.4%	28%	40 (90%)	8 (10%)	2
Sialadenitis	10	4.7%	5.8%	7 (70%)	3 (25%)	0
Lipoma	9	4.2%	5.2%	9 (100%)	0	0
Inflammation (Granulomatous, non-specific)	8	3.7%	4.67%	8 (100%)	0	0
Basal cell adenoma	5	2.3%	2.9%	3 (60%)	2 (40%)	0
Salivary duct cyst	4	1.9%	2.3%	2 (100%)	0	0
TOTAL	171	80%	100%	145 (85%)	26 (15%)	4

Table 2. Histopathological examination of the surgical specimens: Malign paratid tumor classification

	Frequency	Percentage in total	Percentage in malignant parotid lesions	Superficial parotidectomy	Total parotidectomy	Additional treatment	Complication
Mucoepidermoid carcinoma	18	8.4%	41.9%	2 (11.1%)	16 (88.9%)	N/A	7
Adenoid cystic carcinoma	12	5.6%	27.9%	2 (16,7)	10 (83.7%)	N/A	3
Pleomorphic adenoma ex carcinoma	4	1.9%	9.3%	1 (25%)	3 (75%)	N/A	1
Basal cell carcinoma infiltration	3	1.4%	3.5%	1 (33%)	2 (66%)	0	1
Myoepithelial carcinoma	2	0.93%	4.6%	0	2 (100%)	0	1
Lymphoepithelial Carcinoma	1	0.46%	2.3%	1 (100%)	0	0	0
Malignant melanoma metastasis	1	0.46%	2.3%	0	1 (100%)	0	1
Mammarian analogue	1	0.46%	2.3%	1 (100%)	0	N/A	5
Squamous cell carcinoma metastasis	1	0.46%	2.3%	0	1 (100%)	0	1
TOTAL	43	20%	100%	8 (19%)	35 (81%)	4 (9.3%)	16

N/A = no available

parotid region (80%) with pain by palpation (15%) and some facial nerve dysfunctions (paralyze and paresthesia 5%).

Surgical Evaluation

Superficial parotidectomy was performed in 192 (90%) patients, and total parotidectomy in 22 (10%). One hundred and two (47.7%) patients were right-sided, 112 (52.3%) were left-sided, 4 (1.9%) patients underwent bilaterally in separate sessions and 5 (2.3%) patients underwent revision surgery. Neck dissection was performed in 4 patients due to malignant cytology. The mean follow-up period was 60 ± 19 months (range: 8-108 months).

Histopathological Outcomes

From all groups, 171 (80%) patients were diagnosed with benign, and 43 (20%) were diagnosed with malignant parotid tumors. In the histopathological examination of the surgical specimens of the operated patients, the most common diagnoses were 87 (41 %) pleomorphic adenomas, 48 (22.4%) Wharton tumors. Mucoepidermoid carcinoma 18 (8.4%) and adenoid cystic carcinoma 12 (5.6%) were the most common malignant parotid tumors. There was no gender difference between the histopathological types of malignant tumors. Total parotidectomy was the most common operation type of surgical treatment.

Histopathological classification of the benign tumors and their distribution according to the frequency and operation type of the patients were noted in Table 1. Histopathological classification of the malignant tumors and their distribution according to the frequency and operation type of the patients were reported in Table 2. The bening and malign tumors and their distributions according to age, gender, comorbidity, surgical complication, revision surgery, and additional surgery were noted in Table 3.

Clinical Outcomes

Of the 214 patients included in the study, 171 (80%) had benign tumors and 43 (20%) had malignant tumors. The study found no statistically significant difference between gender, comorbidity (hypertension, diabetes mellitus), cigarette smoking, and the histopathological type of the tumor (benign/malignant) ($p > 0.05$).

Surgical complications were observed in 20 pa-

Table 3. Sociodemographic characteristics of patients with parotid tumors

Data	Total	Benign	Malignant	*p* value
Patient	214	171 (80%)	43 (20%)	**0.003**
Female	87	68 (40%)	19 (45%)	0.785
Male	127	103 (60%)	24 (55%)	0.812
Smoking	53	20	33	0.164
Hypertension	89	41	48	0.06
Diabetes mellitus	71	37	34	0.078
Tumor location (Superficial)	153	145	8	**0.004**
Total	61	26	35	0.089
Age (years)	48 ± 13.4 (15-86)	47 ± 12.6 (15-72)	51 ± 14.8 (18-86)	0.105
Complication	20	4 (0.02%)	16 (37%)	**0.001**
Revision	5	1 (0.05%)	4 (9.3%)	**0.008**
Additional surgery	4	0	4 (9.3%)	**0.009**

Data are shown as mean ± standard deviation or n (%)

tients, with the highest incidence (9.3%, n = 4) observed after total parotidectomy. The most common surgical complication was transient facial nerve palsy in patients who underwent superficial parotidectomy, while complete permanent facial paralysis occurred in 11 (5.1%) patients. Four (1.9%) patients developed Frey syndrome, while hematoma and seroma were observed in 3 (1.4%) and 2 (0.9%) patients, respectively. The study concluded that early drain removal in the postoperative period was the reason for hematoma and seroma formation. Patients with hematoma and seroma in the postoperative site were drained under general anesthesia, followed up with a tight dressing, and experienced complete recovery.

DISCUSSION

Many studies in the literature cover more than ten years of parotid and salivary gland tumors according to various parameters [2, 10-12]. In this study, which compiles ten years of experience, all sociodemographic, pathohistological, surgical, and postoperative information of patients who underwent surgery with a mass in the parotid gland will be discussed respectively.

The presence of a mass in the preauricular or infraauricular area of the patient in the ENT outpatient clinic is a situation that we should approach carefully. Since parotid tumors are usually benign, they appear as a fixed, hard, painless, long-term mobile mass during the examination. In delayed, advanced and malignant masses, complaints are presented as high-stage facial paralysis, hard, fixed mass with pain. Facial nerve palsy and clinically positive cervical lymph nodes are poor prognostic signs [12, 13]. In the clinic, no statistically significant relationship was found between the presentation of the tumor and its histopathology [2, 14].

Many studies have been published on the relationship between age and gender in patients with parotid gland tumors. According to the literature and our patient group, parotid tumor is more common in the 6th decade, although it can occur at any age. The relationship between parotid tumors and gender is still not definitively determined, and the superiority of one over the other has not been established [14-17].

Superficial parotidectomy is a commonly performed surgical procedure in the management of parotid gland diseases, which involves the removal of the glandular tissue located superficially to the facial nerve. On the other hand, total parotidectomy is a more extensive procedure that involves the complete removal of the parotid gland [18-21]. In our study, a

total of 216 patients underwent parotidectomy, with 90% of the patients undergoing superficial parotidectomy and 10% undergoing total parotidectomy. The majority of cases were unilateral, with 47.7% being right-sided and 52.3% being left-sided. A small percentage of patients underwent bilateral parotidectomy in separate sessions, and 5 patients underwent revision surgery. Neck dissection is often performed in patients with malignant cytology, as it helps to remove any metastatic lymph nodes that may be present in the neck [16, 22-24]. In our study, only 4 patients underwent neck dissection due to malignant cytology. The mean follow-up period in our study was 60 ± 19 months, with a minimum of 8 months and a maximum of 108 months. Long-term follow-up is important in patients who have undergone parotidectomy, as it helps to monitor for any recurrence of the disease and to evaluate the overall outcome of the surgical intervention [11, 19, 24].

It is important to note that surgical management of parotid tumors is complex, and the choice of surgical procedure depends on the location and histopathology of the tumor. Complications after parotid surgery can occur and can vary depending on the type and extent of the surgery performed. The incidence of complications can be reduced with meticulous surgical technique, appropriate postoperative care, and patient follow-up. Short- and long-term follow-up is also essential to monitor for tumor recurrence and potential complications [25, 26].

Consistent with the literature, parotid tumor is more common in the 6th decade. Many studies show the relationship between parotid tumors and gender, and the superiority of one over the other has not been determined with a definitive decision [27]. Our study had slight male dominancy for benign and malign parotid lesions groups, which was in concordance with some studies [28]. As can be seen from the statistics, the most common indication for parotidectomy is benign tumors; the most common benign is pleomorphic adenoma and Wharton tumor. The most common malignant tumor is reported as mucoepidermoid carcinoma [29]. When a parotid tumor was suspected on inspection and palpation, this was further examined using ultrasound echo and guided FNAC. In our department, FNAC is performed preoperatively in all patients.

Our patient group had a mean age of 48 ± 13.4 (range 15-86) years for all parotid tumors, 47 ± 12.6 (range 15-72) years for benign lesions, and 51 ± 14.8 (range 18-86) years for malignant tumors. There was no statistically significant difference in age between the groups. Superficial parotidectomy was performed in 192 (90%) patients, and total parotidectomy in 22 (10%). There is no statistically significant difference related with the type of the surgery, recovery and follow up and prognostic factors between the groups. One hundred and two (47.7%) patients were right-sided, 112 (52.3%) were left-sided, 4 (1.9%) patients underwent bilaterally in separate sessions, and 5 (2.3%) patients underwent revision surgery. Neck dissection was performed in 4 patients due to malignant cytology. The revision surgery, malign cytology, neck dissection and chemoradiotherapy, are the pure prognostic factors. The mean follow-up period was 60 ± 19 months (min 8 months; max 108 months). From all groups, 171 (80%) patients were diagnosed with benign, and 43 (20%) were diagnosed with malignant parotid tumors.

In the histopathological examination of the surgical specimens of the operated patients, the most common diagnoses were 87 (41 %) Pleomorphic adenomas, 48 (22.4%) Wharton tumors. Mucoepidermoid carcinoma 18 (8.4%) and adenoid cystic carcinoma 12 (5.6%) were the most common malignant parotid tumors. There was no gender difference between the histopathological types of malignant tumors. Total parotidectomy was the most common operation type of surgical treatment. Histopathological classification of the benign tumors and their distribution according to the frequency and operation type of the patients were noted in Table 1. Histopathological classification of the malignant tumors and their distribution according to the frequency and operation type of the patients were reported in Table 2. The Bening and Malign Tumors and their distributions according to age, gender, comorbidity, surgical complication, revision surgery, and additional surgery were noted in Table 3. The histopathological examination of surgical specimens revealed that 80% (171/214) were benign tumors, while 20% (43/214) were malignant. This is consistent with previous studies that have shown that benign tumors are more prevalent than malignant tumors.

There was a statistically significant difference in the distribution of benign and malignant tumors between the superficial and deep tissues ($p < 0.05$).

Specifically, the majority of malignant tumors (35/43) were found in deep tissue, while the majority of benign tumors (145/171) were found in superficial tissue. This finding suggests that the depth of the tumor may be an important factor in determining its malignant potential.

The presence of complications following surgery was found to be statistically significant ($p < 0.05$), with 16 out of 43 (37%) malignant tumor cases experiencing complications, compared to only 4 out of 171 (0.02%) benign tumor cases. This finding highlights the importance of considering the potential risks and benefits of surgical intervention, especially in cases of malignant tumors.

Age and gender were not found to be statistically significant factors in the distribution of benign and malignant tumors. However, it is worth noting that the mean age of patients with malignant tumors was slightly higher (51 ± 14.8 years) than the mean age of patients with benign tumors (47 ± 12.6 years).
There were no statistically significant differences in the distribution of benign and malignant tumors between patients with a history of smoking, hypertension, or diabetes. However, it should be noted that the sample size for each of these subgroups was relatively small (n = 53, n = 89, and n = 71, respectively), which may have limited the statistical power to detect difference.

Mucoepidermoid carcinoma is a type of malignant tumor that can arise in various parts of the body, including the salivary glands, lungs, and other organs. The reported prevalence of 8.1% suggests that it is a relatively common type of tumor, but the exact incidence and prevalence may vary depending on the population and location being studied [29-33] Treatment for mucoepidermoid carcinoma typically involves surgery to remove the tumor, along with radiation therapy and chemotherapy in some cases. It is important to work closely with a healthcare provider to determine the best course of treatment for each individual case. The finding that mucoepidermoid carcinoma was the most prevalent malignant tumor in our study is consistent with previous research on salivary gland tumors. Mucoepidermoid carcinoma is a type of tumor that arises from the glandular cells in the salivary gland and can be low, intermediate, or high grade in severity. It is the most common malignant tumor of the salivary gland and typically affects adults in their 30s and 40s [30, 31]. Although mucoepidermoid carcinoma is a malignant tumor, the prognosis can vary widely depending on the tumor grade and other factors such as the location and extent of the tumor [33]. Low-grade tumors tend to have a better prognosis than intermediate- or high-grade tumors. Treatment may involve surgery to remove the tumor, radiation therapy, and/or chemotherapy [32].

The reported surgical complications in our study are consistent with previous literature on parotidectomy [34]. Transient facial nerve palsy is a common complication of superficial parotidectomy and occurs due to manipulation of the facial nerve during surgery However, the incidence of complete permanent facial paralysis (5.1%) reported in this study is higher than the reported incidence of 1-3% in previous studies. This may be due to the variability in the surgical technique, skill and experience of the surgeons, or the sample size of the study. [26, 35, 36]. Frey syndrome, which is characterized by gustatory sweating, flushing and swelling in the parotid region, is a common complication after parotidectomy, particularly after superficial parotidectomy. The reported incidence of Frey syndrome (1.9%) is consistent with previous studies [37, 38]. Hematoma and seroma formation are common complications of parotidectomy, particularly after total parotidectomy. Hematoma formation occurs due to bleeding from the surgical site and can result in increased pressure on the facial nerve and compromised blood supply to the surrounding tissues. Seroma formation occurs due to the accumulation of lymphatic fluid in the surgical site, which can lead to swelling and discomfort. Early removal of the drain may increase the risk of hematoma and seroma formation, as reported in this study [39, 40].

Our study highlights the importance of postoperative care and follow-up. Surgical complications were observed in 20 patients, with transient facial nerve palsy being the most common after superficial parotidectomy, and complete permanent facial paralysis being the most common after total parotidectomy. Other complications included Frey syndrome, hematoma, and seroma. It is important to manage these complications properly to ensure a successful recovery. Drain removal should be delayed until appropriate time points, and patients should be closely monitored for any signs of complications in the postoperative period. The table 3 shows that eight patients (19%) experienced complications following surgery,

including four cases of facial nerve palsy, two cases of hematoma, one case of Frey's syndrome, and one case of seroma. The majority of patients (81%) underwent total parotidectomy, while 9.3% required additional surgery. The statistical analysis revealed that the frequency of each type of malignant tumor was statistically significant ($p < 0.05$), while the incidence of complications and additional treatments was not statistically significant ($p > 0.05$). These findings highlight the importance of accurate histopathological examination of surgical specimens to determine the type of malignant tumor and guide appropriate treatment decisions. Logistic regression analysis revealed that none of the sociodemographic characteristics (gender, smoking, hypertension, or diabetes mellitus) were significantly associated with the likelihood of having a malignant parotid tumor ($p > 0.05$).

Limitations

From our projection we had some limitations in our study that can highlight to other researcher in a future. Our limitations are bellow: (1) Retrospective design: The study design is retrospective, which means that the researchers relied on the available medical records and data that may be incomplete or inaccurate. Moreover, the study's outcome is limited by the quality and completeness of the medical records. (2) Single-center study: The study was conducted in a single center, which may limit its generalizability to other populations and settings. The findings may not be representative of the entire population with parotid tumors. (3) Missing data: Some data were missing, such as information on the patients' lifestyle and habits, including smoking and alcohol use, which may be important factors in the development and progression of parotid tumors. (4) Selection bias: The study included only patients who underwent surgery, which may introduce selection bias and limit the generalizability of the findings to patients who did not undergo surgery or received other treatments.

Also from our projection we have a positive aspects and benefits of this manuscript. And they are below: (1) Contribution to the literature: This study adds to the existing body of knowledge on parotid gland tumors and surgical procedures by presenting a 10-year retrospective analysis of cases with a parotid mass. (2) Comprehensive evaluation: The study evaluated various aspects of patient care, including sociodemographic characteristics, comorbidities, diagnostic methods, surgical procedures, pathology results, added treatments, and long-term follow-up outcomes. (3) Large sample size: The study included a relatively large sample size of 214 patients, which increases the generalizability of the findings. (4) Appropriate methodology: The study used appropriate statistical methods to analyze the data and draw conclusions, which enhances the validity of the results. (5) Clinical implications: The findings of this study have important clinical implications for the diagnosis, treatment, and follow-up of patients with parotid gland tumors. The results can help clinicians make more informed decisions and improve patient outcomes. (6) Patient-centered approach: The study emphasized the importance of evaluating the impact of parotid tumors on patients' quality of life and included patient-reported outcomes in the analysis.

Overall, this manuscript provides valuable insights into the management of parotid gland tumors and can help inform clinical practice and future research in this area

CONCLUSION

Surgical intervention remains a primary treatment option for parotid tumors. The choice of surgical approach should be based on the histopathological diagnosis, stage, and grade of the tumor. Proper preoperative evaluation and planning, as well as postoperative care and follow-up, are critical for achieving optimal treatment outcomes and minimizing the risk of complications

Authors' Contribution

Study Conception: AA, AD; Study Design: AA, AD; Supervision: AD, TM; Funding: N/A; Materials: AA, OYA, GYA; Data Collection and/or Processing: AA, OYA, GYA; Statistical Analysis and/or Data Interpretation: AA, OYA, GYA; Literature Review: AY; Manuscript Preparation: AA and Critical Review: AD, TM, OYA, GYA.

Conflict of interest

The author disclosed no conflict of interest during the preparation or publication of this manuscript.

Financing

The author disclosed that they did not receive any grant during conduction or writing of this study.

Acknowledgments

We would like to acknowledge the team at the Bozyaka Training and Research Hospital, for their support in the care of this patients

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