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Original Research Article

Extracapsular dissection versus superficial parotidectomy in pleomorphic adenoma: a decade-long experience from a tertiary care center in Bangladesh

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ABSTRACT

Background: Pleomorphic adenoma is recognized as the most common benign tumor of the salivary glands, while malignant tumors like mucoepidermoid carcinoma, though less frequent, present complex management challenges. This study aims to evaluate the efficacy and safety of surgical techniques, specifically extracapsular dissection (ECD) and superficial parotidectomy (SP), in Bangladesh, where data on this topic is limited.
Methods: Conducted over ten years (2014-2024) at the national center for hearing and speech for children and green life medical college and hospital, this retrospective cohort study analyzed records of 50 patients with histopathologically confirmed pleomorphic adenoma. Data included demographics, tumor characteristics, and surgical outcomes, with statistical significance set at $p<0.05$.
Results: The cohort had a median age of 38 years, predominantly female (58%). The median tumor size was 4 cm, with most surgeries on the right side (52%). Preoperative diagnoses indicated 79.07% pleomorphic adenomas, with FNAC confirming 84.44% benign lesions. ECD was associated with larger tumors (mean size: 7.82 cm vs. 5.65 cm, $p=0.0459$) and a higher malignancy rate. Facial nerve preservation rates were 73.33% for ECD and 80.65% for SP. However, ECD had a higher complication rate, including temporary facial nerve paralysis (57.14% vs. 15.38%) and seroma formation (14.29% vs. 0%, $p=0.021$).
Conclusions: This study underscores that pleomorphic adenoma is the predominant parotid gland pathology in Bangladesh. Both ECD and SP are effective surgical options, but careful planning and patient selection are crucial to minimize complications and enhance outcomes.

Keywords: Parotidectomy, Pleomorphic adenoma, Superficial parotidectomy, Parotid gland tumors, Facial nerve preservation

INTRODUCTION

Parotidectomy is a surgical procedure performed to manage a variety of pathological conditions involving the parotid gland, ranging from benign lesions to malignant tumors.[1] The parotid gland, being the largest salivary gland, is unique in its anatomical complexity due to its proximity to critical structures such as the facial nerve.[2]

Accurate preoperative diagnosis and surgical planning are critical to achieving optimal outcomes while minimizing complications, particularly those involving facial nerve.[3] ECD and SP are two commonly employed surgical techniques, each with distinct indications and outcomes.[4] ECD is often preferred for smaller, benign lesions, while SP is more frequently used for larger or more complex cases.[4,5] However, choice of procedure may also depend on preop diagnostic uncertainty/surgeon preference.

Globally, benign tumors such as pleomorphic adenoma are the most prevalent pathology, comprising the majority of parotid gland surgeries.[6] However, a smaller proportion of cases involve malignant conditions such as mucoepidermoid carcinoma, adenoid cystic carcinoma, and squamous cell carcinoma, which require more comprehensive surgical planning and management.[7] Regionally, studies from South Asia, including countries such as India and Pakistan, have demonstrated similar trends, with pleomorphic adenoma accounting for a significant proportion of parotid tumors.[8] In these regions, challenges such as limited access to advanced diagnostic techniques and variability in surgical expertise often influence the choice of surgical approach and outcomes. The management of parotid tumors in these settings is further complicated by delays in seeking medical care, leading to larger tumors at presentation and, occasionally, more advanced diseases requiring complex surgical interventions.[9]

In Bangladesh, the pattern of parotid gland pathologies largely aligns with global and regional trends, with benign tumors being the most common. However, specific data on the demographic and clinical characteristics of patients undergoing parotidectomy, as well as the comparative outcomes of different surgical approaches, remain scarce.[9,10] The lack of comprehensive data hinders efforts to optimize surgical strategies and improve patient outcomes.

ECD and SP differ significantly in their approach, indications, and potential complications.[5] ECD is a less invasive surgical technique often reserved for small, benign tumors where facial nerve involvement is minimal, while SP is a more extensive procedure typically employed for larger tumors or cases with diagnostic uncertainty.[4,11]

Despite these differences, the choice of procedure is often influenced by preoperative findings, surgeon preference, and institutional practices. By analyzing the outcomes of these two approaches, this study provides critical insights into the efficacy and safety of parotidectomy techniques within the Bangladeshi context, contributing to the global understanding of parotid gland surgery.

Aim

This study aimed to evaluate the demographic and clinical characteristics of patients undergoing parotidectomy, with a focus on comparing outcomes between ECD and SP. Key parameters such as tumor size, facial nerve involvement, complications, and histopathological diagnoses were analyzed to provide insights into the efficacy and safety of these surgical techniques. Additionally, the study sought to identify factors influencing the choice of procedure and their impact on postoperative outcomes.

METHODS

Study setting

This study was conducted at the national center for hearing and speech for children (SAHIC) and Green Life medical college and hospital, a tertiary care center in Bangladesh, for ten years, from January 2014 to January 2024. The hospital is a major referral center for head and neck surgeries, particularly for salivary gland tumors, ensuring a diverse and representative sample of patients with pleomorphic adenoma of the parotid gland.

Study design

This was a retrospective cohort study comparing ECD and SP in the surgical management of pleomorphic adenoma. The study analyzed patient records over a decade to assess surgical outcomes, recurrence rates, complications, and post-operative recovery.

Study population

Patients who underwent surgical treatment for pleomorphic adenoma of the parotid gland between January 2014 and January 2024 were included.

Inclusion and exclusion criteria

The study included patients who underwent surgical treatment for pleomorphic adenoma of the parotid gland between January 2014 and January 2024. Eligible patients were those with histo-pathologically confirmed pleomorphic adenoma and who underwent either ECD or SP. Further inclusion required the availability of complete medical records, including demographic information, surgical details, histopathology reports, and follow-up data, with a minimum post-operative follow-up period of 12 months. Patients were excluded if they had malignant parotid tumors, recurrent pleomorphic adenoma at the time of presentation, or had undergone total parotidectomy or other surgical procedures outside of ECD and SP. Additionally, patients with incomplete medical records or who were lost to follow-up before completing 12 months were excluded from the study.

Data collection

Data for this study were collected retrospectively from hospital records, operative notes, histopathology reports, and follow-up visits of 50 patients who underwent

parotidectomy. The data collection process focused on several demographic and clinical parameters, which included age, sex, tumor size, tumor location, side of the tumor (right or left), and the duration of symptoms before surgery. These parameters were extracted to establish a comprehensive understanding of the study cohort and the outcomes related to the surgeries.

Data analysis

The demographic and clinical characteristics of the patients were analyzed, comparing the ECD and SP groups. Statistical comparisons were made between these groups for variables such as age, sex distribution, tumor side, tumor size, and symptom duration. The clinical significance of the differences was assessed using appropriate statistical tests (e.g., chi-square for categorical variables and t-tests for continuous variables). Statistical significance was considered at a $p<0.05$. Additionally, complications between the ECD and SP groups were compared to identify any significant differences, particularly in facial nerve preservation and the occurrence of postoperative complications. A $p<0.05$ was considered statistically significant. Statistical analyses were performed using STATA 15.

Operational definitions

ECD: A conservative surgical technique in which a parotid tumor is excised along with a margin of surrounding tissue, while attempting to preserve the capsule of the parotid gland. This technique may be referred to in various forms, such as total conservative parotidectomy and partial SP. These terms imply a more conservative approach that aims to retain as much healthy parotid tissue as possible, while still removing the tumor and adjacent areas.

SP: A surgical procedure involving the removal of the superficial lobe of the parotid gland. This approach is commonly used for benign tumors, such as pleomorphic adenomas. Variations of this procedure are referred to as SP, right SP, and left SP, depending on the side of the parotid gland being operated on.

RESULTS

Demographic and clinical characteristics of patients undergoing parotidectomy

The study included 50 patients undergoing parotidectomy, with a median age of 38 years (IQR: 26-48). Of these, 29 patients (58%) were female and 21 (42%) were male. The majority of surgeries were performed on the right side (52%), with the left side accounting for 48%. Among the surgeries, 30% were ECD and 70% were SP.

The median duration of surgery was 2 hours (range: 1 to 8 hours), and the median tumor size was 4 cm (IQR: 2 to 6 cm). In terms of preoperative diagnosis (clinical), the most common diagnosis was benign pleomorphic adenoma (79.07%), followed by chronic parotitis (4.65%). A small proportion had benign cystic lesions, benign lesions, and branchial cysts (6.99%), while 9.3% were diagnosed with malignant tumors.

On preoperative FNAC, 84.44% of diagnoses were benign, primarily pleomorphic adenoma, benign cystic lesions, benign neoplasm of the right parotid, or lipoma. The 4.44% had diagnoses of mucoepidermoid carcinoma, and 11.11% had chronic parotitis or atypical ductal hyperplasia.

Regarding tumor status, 83.33% of patients had tumors free of facial nerve involvement, while 16.67% had adhesion to the facial nerve. Facial nerve preservation was achieved in 78.26% of patients, with 15.22% experiencing facial nerve cut or temporary paralysis. In terms of complications, half of the patients (50%) had no complications, while 40% experienced temporary facial nerve paralysis, seroma, or sialocele. A smaller proportion (10%) had permanent facial paralysis or wound infection (Table 1).

Demographic and clinical characteristics of ECD and SP groups

The comparative analysis between ECD and SP groups reveals several important findings. There is no significant difference in mean age between the two groups, with the ECD group having an average age of 37 years (±14.44 years) and the SP group at 38.51 years (± 13.51 years), as indicated by a p-value of 0.7234. The sex distribution also shows no significant difference, with the ECD group having a ratio of 4:11 (M:F) and the SP group at 17:18, with a borderline $p=0.069$. When examining the tumor side distribution, the differences between the two groups are not significant ($p=0.621$), as the tumor sides are relatively evenly distributed in both groups. However, a statistically significant difference is observed in the mean tumor size, with the ECD group having larger tumors on average (7.82±4.05 cm) compared to the SP group (5.65±3.10 cm), as indicated by a $p=0.0459$. Finally, the mean symptom duration is nearly identical between the two groups, with no significant difference ($p=0.9856$). Overall, the main distinction between the two groups lies in tumor size, with the ECD group showing larger tumors compared to the SP group, while other clinical variables such as age, sex, tumor side, and symptom duration do not exhibit significant differences (Table 2).

Facial nerve status and potential complications for ECD group

Table 3 compares the facial nerve status and potential complications between the ECD and SP groups. The analysis reveals that while there were no significant differences in facial nerve preservation between the groups, certain complications were more prevalent in the

ECD group. Specifically, branch cut and buccal branch cut were observed in a higher percentage of ECD patients, while main trunk cut and not identified were more common in the SP group. The proportion of facial nerves that were preserved was 73.33% in ECD patients, slightly lower than the 80.65% seen in SP patients. Regarding potential complications, the none category was significantly more frequent in the SP group, whereas ECD patients experienced higher rates of seroma (14.29%) and temporary FN Paralysis (57.14%), with the latter being notably higher than the 15.38% in the SP group. Wound Infection was observed in 14.29% of ECD patients and 0% in SP patients. Notably, seroma had a significant p=0.021, indicating a substantial difference in complication rates between the two groups. Overall, the data suggest that while facial nerve preservation rates were similar, the ECD group experienced a higher frequency of complications, especially Temporary FN paralysis and seroma, highlighting the need for closer post-operative monitoring in these patients.

Table 1: Demographic and clinical characteristics of patients undergoing parotidectomy.

Characteristic	N (%)
Age (in years) (median, IQR)	38 (26-48)
Sex	
Female	29 (58)
Male	21 (42)
Side of operation	
Left	24 (48)
Right	26 (52)
Name of surgery	
ECD	15 (30)
SP	35 (70)
Median duration of surgery (hours)	2 hours (Range: 1 to 8 hours)
Median tumor size (cm)	4 cm (IQR: 2 to 6 cm)
Preoperative diagnosis-clinical, (n=43)	
Benign, pleomorphic adenoma	34 (79.07)
Chronic parotitis	2 (4.65)
Benign cystic lesion, benign lesion, branchial cyst	3 (6.99)
Malignant	4 (9.3)
Preoperative diagnosis-FNAC, (n=45)	
Pleomorphic adenoma / benign cystic lesion (rt parotid) / benign neoplasm (Rt parotid)/lipoma	38 (84.44)
Mucoepidermoid carcinoma / mucoepidermoid carcinoma (left parotid)	2 (4.44)
Chronic parotitis / atypical ductal hyperplasia	5 (11.11)
Tumor status, (n=48)	
Free of facial nerve/ free of facial nerve (lowercase)/free of facial nerve with skin adhesion/ free of facial nerve (Normal)	40 (83.33)
Adhesion to facial nerve	8 (16.67)
Facial nerve status, (n=46)	
Preserved	36 (78.26)
Branch cut /buccal branch cut /temporary facial nerve paralysis	7 (15.22)
Main trunk cut /not identified	3 (6.52)
Potential complications, (n=20)	
None	10 (50)
Temporary facial nerve paralysis/seroma/sialocele	8 (40)
Permanent facial paralysis/wound infection	2 (10)

Table 2: Comparison of clinical and tumor characteristics between ECD and SP groups.

Characteristics	ECD, (n=15)	SP, (n=35)	P value
Mean age (in years ± SD)	37±14.44	38.51±13.51	0.7234
Sex (M:F ratio)	4:11	17:18	0.069
Tumor side (Right/left)	7 (46.67%)/ 8 (53.33%)	19 (54.29%)/ 16 (45.71%)	0.621
Mean tumor size (cm±SD)	7.82±4.05	5.65±3.10	0.0459
Mean symptom duration (months±SD)	3.21±2.27	3.23±2.57	0.9856

Table 3: Facial nerve status and potential complications for ECD group.

Characteristics	ECD, N (%)	SP, N (%)	P value
Facial nerve status, (n=46)			
Branch cut	2 (13.33)	1 (3.23)	0.138
Buccal branch cut	2 (13.33)	0 (0.00)	
Main trunk cut	0 (0.00)	1 (3.23)	
Not identified	0 (0.00)	3 (9.68)	
Preserved	11 (73.33)	25 (80.65)	
Temporary FN paralysis	0 (0.00)	1 (3.23)	
Potential complications, (n=20)			
None	1 (14.29)	9 (69.23)	0.021
Permanent facial paralysis	0 (0.00)	1 (7.69)	
Seroma	1 (14.29)	0 (0.00)	
Sialocele	0 (0.00)	1 (7.69)	
Temporary FN paralysis	4 (57.14)	2 (15.38)	
Wound infection	1 (14.29)	0 (0.00)	

Preoperative diagnosis and comparison between ECD and SP groups

This Table 4 presents the distribution of preoperative clinical and FNAC diagnoses for patients who underwent ECD compared to those who underwent SP. Among the clinical diagnoses, the majority of cases in both groups were benign lesions, representing 66.67% of ECD cases and 74.19% of SP cases.

Malignant tumors were identified more frequently in the ECD group (25.00%) compared to the SP group (3.23%). The p value for clinical diagnoses was 0.453, indicating no statistically significant difference between the two groups.

In terms of FNAC diagnoses, pleomorphic adenoma was the most common finding in both groups (64.29% in ECD and 83.87% in SP). Notably, mucoepidermoid carcinoma was found only in the ECD group (21.43% combined for two different classifications), while it was absent in the SP group. The p value for FNAC diagnoses was 0.048, indicating a statistically significant difference in the distribution of FNAC diagnoses between the two groups.

This data highlights that while both procedures are commonly performed for benign lesions, ECD was more frequently associated with malignant diagnoses on both clinical and FNAC evaluation, suggesting a possible selection bias toward more challenging cases for ECD or diagnostic uncertainty preoperatively.

Post-operative histopathological diagnosis

The post-operative histopathological diagnosis findings demonstrate that pleomorphic adenoma is by far the most common diagnosis, comprising 73.17% of all cases. This confirms pleomorphic adenoma as the dominant pathology in parotid gland surgeries.

The remaining 26.83% of cases consist of a diverse mix of diagnoses, including both malignant and benign conditions.

These include mucoepidermoid carcinoma, adenoid cystic carcinoma, non-Hodgkin's lymphoma, squamous cell carcinoma, Warthin's tumor, papillary cystadenoma lymphomatosum, chronic sialadenitis with sialolithiasis, salivary ductal cyst, and sialoblastoma.

This highlights the spectrum of less common pathologies, reinforcing the importance of histopathological confirmation in parotid surgery to differentiate between benign, malignant, and the inflammatory lesions (Figure 1).

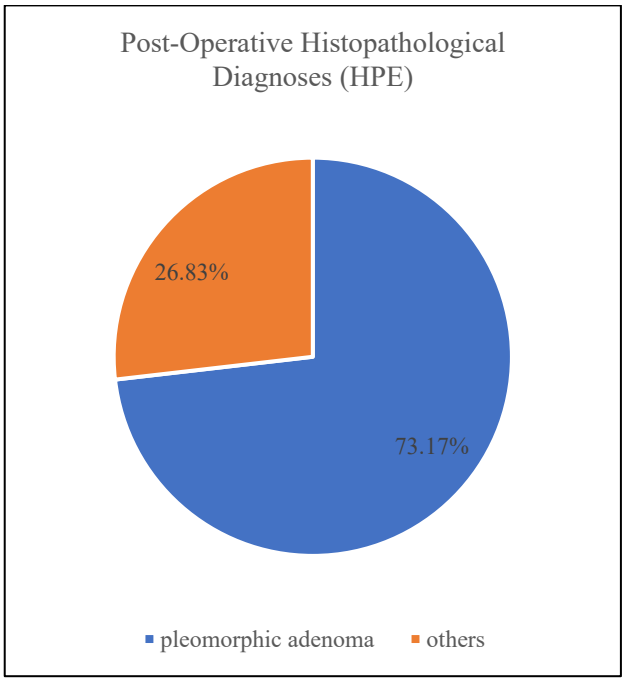

Figure 1: Distribution of post-operative histopathological diagnoses.

Table 4: Preoperative clinical and FNAC diagnoses comparison between ECD and SP groups.

Characteristics	ECD, N (%)	SP, N (%)	P value
Preoperative diagnosis-clinical, (n=43)			
Benign	8 (66.67)	23 (74.19)	0.453
Benign cystic lesion	0 (0.00)	1 (3.23)	
Benign lesion	0 (0.00)	1 (3.23)	
Branchial cyst	0 (0.00)	1 (3.23)	
Chronic parotitis	0 (0.00)	2 (6.45)	
Malignant	3 (25.00)	1 (3.23)	
Pleomorphic adenoma	1 (8.33)	2 (6.45)	
Preoperative diagnosis-FNAC, (n=45)			
Atypical ductal hyperplasia	0 (0.00)	1 (3.23)	0.048
Benign cystic lesion in RT parotid gland	0 (0.00)	1 (3.23)	
Benign neoplasm RT parotid gland	1 (7.14)	0 (0.00)	
Chronic parotitis	0 (0.00)	2 (6.45)	
Lipoma	0 (0.00)	1 (3.23)	
Mucoepidermoid carcinoma	1 (7.14)	0 (0.00)	
Mucoepidermoid carcinoma (left parotid)	2 (14.29)	0 (0.00)	
Pleomorphic adenoma	9 (64.29)	26 (83.87)	

DISCUSSION

The findings of the study provide a comprehensive overview of the demographic and clinical characteristics of patients undergoing parotidectomy, with a particular focus on the comparative outcomes of ECD and SP. The results highlight several important aspects of parotidectomy management and outcomes, both globally and within the Bangladeshi context.

The study included 50 patients, with a median age of 38 years, indicating that parotid gland pathologies commonly affect individuals in their third to fifth decades of life. The female predominance observed in this study is consistent with global trends, where benign parotid tumors, particularly pleomorphic adenomas, are more frequently diagnosed in women. Another study found that pleomorphic adenoma incidence is twice more in females than in males.[12] The majority of surgeries were performed on the right side, and the median tumor size was 4 cm, with a wide range of 2 to 6 cm, reflecting variability in disease presentation. Another study show that patients with nonfunctioning pancreatic endocrine tumors have their tumor size and malignancy correlated.[13]

Preoperative clinical diagnoses identified pleomorphic adenoma as the most common pathology, followed by chronic parotitis and malignant tumors. Similarly, fine-needle aspiration cytology (FNAC) confirmed that higher number of cases were benign, with pleomorphic adenoma being the predominant diagnosis.[14] However, malignant conditions such as mucoepidermoid carcinoma and atypical ductal hyperplasia also identified, underscoring the importance of FNAC in preoperative evaluation.[15]

Facial nerve preservation was achieved in 78.26% of cases, while 15.22% of patients experienced temporary facial nerve paralysis, and a smaller proportion had permanent nerve damage. Postoperative complications were observed in half of patients, with temporary facial nerve paralysis being the most common, followed by seroma, sialocele, and wound infections.[16] These findings align with global data, where facial nerve involvement remains a key determinant of surgical complexity and postoperative outcomes.

The comparative analysis between ECD and SP revealed significant differences in clinical and surgical outcomes. While there was no significant difference in demographic factors such as age and sex, tumor size was notably larger in the ECD group (mean size: 7.82 cm) compared to the SP group (mean size: 5.65 cm, p=0.0459). This suggests that ECD was more frequently employed for larger tumors, potentially reflecting surgeon preference or a selection bias toward more challenging cases for this approach. Additionally, malignant tumors were more prevalent in the ECD group, as indicated by both clinical and FNAC diagnoses, further supporting the notion that ECD was often reserved for complex cases.[17]

Facial nerve preservation rates were similar between the two groups (ECD: 73.33% vs. SP: 80.65%), indicating that both techniques are effective in minimizing nerve damage. However, the ECD group experienced a higher frequency of complications, particularly temporary facial nerve paralysis (57.14% vs. 15.38%) and seroma (14.29% vs. 0%, p=0.021). These findings highlight the need for careful postoperative monitoring and management in patients undergoing ECD, as the procedure may carry a higher risk of complications despite its efficacy in tumor removal.[18]

Histopathological evaluation confirmed pleomorphic adenoma as the most common pathology (73.17% of

cases), consistent with global data on parotid gland surgeries. However, a diverse range of less common pathologies was also identified, including both benign and malignant tumors such as mucoepidermoid carcinoma, adenoid cystic carcinoma, and Warthin's tumor.[7] This underscores the importance of histopathological confirmation in guiding postoperative management and ensuring accurate diagnosis. The identification of inflammatory conditions and other rare pathologies further highlights the complexity of parotid gland surgery and the need for multidisciplinary collaboration in managing such cases.

Strengths and weakness

This study has several strengths. First, the study includes detailed demographic, clinical, preoperative, and postoperative data on 50 patients undergoing parotidectomy. This thorough data collection provides a robust foundation for drawing meaningful conclusions about parotidectomy outcomes. Second, by comparing ECD and SP, the study provides valuable insights into the relative efficacy, complications, and surgical outcomes of these two commonly used techniques. Third, the detailed assessment of facial nerve preservation and postoperative complications, such as temporary facial paralysis and seroma, highlights an important aspect of parotidectomy outcomes, which is critical for both surgical planning and patient counseling. Fourth, the study examines preoperative clinical and FNAC diagnoses and correlates these findings with postoperative histopathological evaluations. This allows an analysis of diagnostic accuracy and highlights the importance of preoperative planning. Fifth, the study contributes to the limited body of literature on parotidectomy outcomes in Bangladesh, offering insights into the local trends and challenges in managing parotid gland pathologies. Finally, study identifies potential risk factors for complications, such as tumor size and choice of surgical procedure, which can guide surgical decision-making and postoperative care.

This study also has several limitations. First, the study includes only 50 patients, which limits the generalizability of the findings. Larger sample sizes would allow for more robust statistical analyses and greater confidence in the conclusions. Second, the data is likely collected from a single institution, which may not represent the practices, patient demographics, or outcomes in other centers across Bangladesh or different healthcare settings. Third, the study has an unequal distribution of cases between the ECD (30%) and SP (70%) groups. This imbalance may introduce bias in the comparative analysis and limit the ability to generalize the findings for ECD outcomes. Fourth, the study focuses primarily on immediate postoperative findings, such as complications and facial nerve status. Long-term outcomes, such as recurrence rates, quality of life, and long-term nerve function, are not addressed. Fifth, the study does not include randomization or blinding, which could introduce selection bias, particularly in the choice of surgical approach (ECD vs. SP). The higher prevalence of malignancy in the ECD group suggests a possible selection bias toward more complex cases. Sixth, the study does not account for differences in surgical expertise or technique, which could influence outcomes such as complication rates or facial nerve preservation. Seventh, while the study highlights rare pathologies in the histopathological findings, these are not studied in depth. This limits the ability to conclude their management or outcomes.

CONCLUSION

This study provides valuable insights into the demographic and clinical characteristics of patients undergoing parotidectomy in Bangladesh, as well as the comparative outcomes of ECD and SP. The findings underscore the importance of individualized surgical planning, preoperative evaluation, and postoperative care in optimizing outcomes and minimizing complications. By addressing these factors, healthcare providers can improve the quality of care for patients with parotid gland pathologies and contribute to the global understanding of parotidectomy outcomes.

Recommendations

The results of this study have several implications for surgical practice in Bangladesh and similar settings. First, the predominance of pleomorphic adenoma and other benign tumors suggests that most parotidectomy procedures can be effectively managed with careful preoperative evaluation and planning. However, the higher complication rates associated with ECD highlight the importance of patient selection and surgical expertise in minimizing risks. Surgeons should consider factors such as tumor size, location, and preoperative diagnostic uncertainty when choosing between ECD and SP.

Second, the study underscores the need for standardized protocols for preoperative evaluation, including the routine use of FNAC and imaging studies, to improve diagnostic accuracy and guide surgical decision-making. Given the higher prevalence of malignant tumors in the ECD group, targeted interventions such as enhanced imaging techniques or intraoperative frozen section analysis may help refine surgical planning and reduce complications.

Finally, the findings highlight the need for robust postoperative care, particularly in patients undergoing ECD, to address complications such as temporary facial nerve paralysis and seroma. Closer monitoring, early intervention, and patient education can help optimize recovery and improve long-term outcomes.

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