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ORIGINAL ARTICLE

# Role of microscope in parotidectomy for identification and preservation of facial nerve: An institutional experience at Tertiary Care Hospital.

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**ABSTRACT… Objective:** This study presents the authors' experience with performing parotidectomy while using the microscope and its outcomes, particularly concerning the identification and preservation of the facial nerve and its branches. **Study Design:** Prospective study. **Setting:** Tertiary Care Hospital; in Rawalpindi. **Period:** January 2020 to December 2023. **Methods:** Enrolled 70 patients with parotid lesions treated patient selection was based on the presence of parotid lesions. Data was entered and analysed by using SPSS V.26. **Results:** The gender distribution was 29 males (41.43%) and 41 females (58.57%), with a mean age of 38.2 years. The majority of cases involved pleomorphic adenoma, constituting 74.28% (n=52) of the total cases. Other tumor types included Warthin tumor (5.71%, n=4), monomorphic adenoma (2.86%, n=2), Mucoepidermoid carcinoma (14.29%, n=10), and adenoid cystic carcinoma (2.86%, n=2). In terms of the type of surgery performed, 82.86% (n=58) of cases underwent superficial parotidectomy, while 17.14% (n=12) underwent total conservative parotidectomy. Regarding facial nerve outcomes, temporary facial nerve paralysis was observed in 8.57% (n=6) of cases, while permanent facial nerve palsy occurred in 2.86% (n=2) of cases. **Conclusion:** We have seen that a microscope is a very valuable assistant in the identification and preservation of the facial nerve. Thus, we can recommend its use during the procedure in order to prevent morbidity of the patient.

**Key words:** Adenoma Pleomorphic, Facial Nerve, Facial Paralysis, Head and Neck Surgery, Parotid Neoplasms.

## INTRODUCTION

The lion's share of neoplasms which involve the salivary glands start at the parotid.[1] In surgical interventions for parotid neoplasms, the primary objective is the complete removal of tumors while preserving all facial nerve branches. Surgeons and patients alike consider paralysis of the facial nerve, whether it is temporary or permanent, a challenging complication of parotidectomy. Temporary facial paresis has been reported at incidences ranging from 25 to 60%, while permanent facial palsy is reported at rates of 2–6%.[2-6] In these, a malignant neoplasm often translates to a higher chance of postoperative palsy.[1] Maintaining facial nerve function requires precise localization of the facial nerve trunk and intent tracking of its branches.

Various techniques, including forwards and backwards dissection of the facial nerve, as well as the use of nerve monitors, have been recommended for locating the facial nerve during parotidectomy. The application of a facial nerve monitor for identification and preservation remains a topic of debate, with some studies supporting its utility whereas others find no significant impact.[7,8] Historically, microscopy has not been used for parotidectomy, as it has always been an open procedure.[2,3,9] Even in studies mentioning the use of a microscope, surgical settings are not mentioned, which limit their credibility.[1,5,10,11]

As the availability of surgical advances remain limited in our country, even the microscope is only available at limited tertiary care hospitals. As such, local literature regarding this scenario is limited. Thus, in this study we have attempted at providing a comprehensive overview of the use of

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a microscope during parotidectomy, emphasizing the surgical settings of the microscope and its outcomes, particularly concerning facial nerve preservation.

## METHODS

This prospective study enrolled 70 patients with parotid lesions treated at the Department of Ear, Nose, and Throat (ENT) and Head & Neck Surgery at a tertiary care hospital in Rawalpindi from January 2020 to December 2023. Patients requiring surgery for parotid lesions were selected, and their medical records were meticulously analyzed for comprehensive data extraction. Synopsis was reviewed and cleared by the ethical review board (ID-25-49-2019-17/10/19) of our institution before beginning. Written informed consent was obtained from the patients for publication of the details of their medical history and any accompanying images.

Preoperative assessments were conducted using detailed medical history, a clinical examination (including facial nerve functional status), high-resolution ultrasonography (US), computerized tomography (CT), magnetic resonance imaging (MRI), and fine needle aspiration cytology (FNAC). These diagnostic tools collectively facilitated a detailed preoperative evaluation, offering insights into the nature and extent of the parotid lesions. Patients under 18 years and those having history of previous similar surgery or pre-existing facial paralysis were excluded

Patients underwent either superficial or total parotidectomy, dictated by the tumor's size and invasiveness. Superficial parotidectomy was favored for cases with less extensive lesions, while total parotidectomy was reserved for tumors with more widespread involvement. All surgeries were performed by 3 right-handed surgeons with a similar level of experience.

Facial nerve dissection and preservation, a critical aspect of the surgical procedures, was consistently executed using the intraoperative microscope ZEISS OPMI Sensera with a focal length of 400 mm. This advanced optical instrument provided enhanced magnification, facilitating precise visualization during facial nerve dissection. In instances of malignant lesions, neck dissection spanning levels II-V was performed, adhering to Oncology Guidelines.

Monopolar cautery was stopped once the Tragal pointer was exposed, and a fine tip bipolar cautery was used after that. In order to protect the marginal mandibular branch, the flap near the submandibular was raised with caution, mostly without the use of cautery.

As soon as the patient was sufficiently awake, as well as on the first postoperative day; every branch of the facial nerve was examined to determine their functional status. Paresis was defined as the presence of aberrant facial nerve functional status on the first postoperative day and was rated using the House-Brackmann scale.[12] Every patient experiencing paresis had their condition reassessed every three months or, at the latest, every nine months, depending on when the condition resolved completely.

### Statistical Analysis

Data was entered and analysed by using SPSS V.26. The qualitative variables were expressed as frequencies and percentages. Quantitative variables were expressed as mean and standard deviation.

## RESULTS

The study cohort comprised 70 participants, with a gender distribution of 29 males (41.43%) and 41 females (58.57%), with a mean age of 38.2 years. This gender representation reflects a relatively balanced distribution within the sample population as shown in Figure-1.

The majority of cases involved pleomorphic adenoma, constituting 74.28% (n=52) of the total cases. Other tumor types included Warthin tumor (5.71%, n=4), monomorphic adenoma (2.86%, n=2), Mucoepidermoid carcinoma (14.29%, n=10), and adenoid cystic carcinoma (2.86%, n=2). Pleomorphic adenoma was the most prevalent tumor type in this study, while the total number of malignant tumors was 17.14% (n=12) as shown in Table-I.

| Type of Tumor | N | Percentage |
|---|---|---|
| Pleomorphic Adenoma | 52 | 74.28 |
| Warthin Tumor | 4 | 5.71 |
| Monomorphic Adenoma | 2 | 2.86 |
| Mucoepidermoid Carcinoma | 10 | 14.29 |
| Adenoid Cystic Carcinoma | 2 | 2.86 |

**Table-I. Showing number and types of parotid tumors observed.**

In terms of the type of surgery performed, 82.86% (n=58) of cases underwent superficial parotidectomy, while 17.14% (n=12) underwent total conservative parotidectomy. The distribution of surgical procedures indicates a predominant utilization of superficial parotidectomy in the study population as shown in Figure-2.

Regarding facial nerve outcomes, temporary facial nerve paralysis was observed in 8.57% (n=6) of cases, while permanent facial nerve palsy occurred in 2.86% (n=2) of cases as shown in Table-II which shows the details of the cases which suffered and the recovery times. These findings highlight the occurrence of postoperative facial nerve complications, with temporary paralysis being more prevalent than permanent palsy in the studied cohort.

| Study | Parotidectomies performed | | Immediate post-op paresis | | Permanent paresis | |
|---|---|---|---|---|---|---|
| | $n^a$ | $n^b$ | $n^a$ (%) | $n^b$(%) | $n^a$ (%) | $n^b$ (%) |
| Present study | 70 | 58 | 8.57 | 2.86 | 2.86 | 0 |

**Table-II. Showing details of facial paralysis observed**

N=number of cases

$^a$=Includes both benign and malignant tumors

$^b$=Includes malignant tumors only

## DISCUSSION

If the facial nerve did not traverse the parotid gland, parotidectomy would lack its inherent intricacies and challenges. Throughout the course of time, modifications to the procedure of parotidectomy have been made, all with a shared objective of preserving the facial nerve.[2,13] Elements such as surgical technique, the utilization of adjunctive equipment, tumor pathology, and its extent have emerged as pivotal determinants influencing the postoperative function of the facial nerve.[10,11,13]

The established gold standard for treating tumors of the parotid gland involves superficial and/or total conservative parotidectomy.[14-16] The viability of limited parotidectomy or focused extra capsular tumor dissection for benign parotid lesions has also been discussed in order to mitigate complications related to the facial nerve.[13,17,18] A lower recurrence after superficial parotidectomy when compared to extra capsular dissection was reported by Witt et.al and Colella et al.; in contrast Albergotti et al. found no such variance.[4,19,20] In addition to preventing parotid asymmetry, superficial parotidectomy is beneficial in reducing the chance of a residual metachronous Warthin's tumor as well.[1] In the current study, we solely used superficial parotidectomy for tumors in the superficial lobe for these reasons.

In literature, using a nerve monitor and microscope to augment the location and protection of the facial nerve has been explored. The results have shown inconsistent rates of both transient and persistent facial paralysis (Table-II). When Nicoli et al.[21] initially described microsurgical dissection of the facial nerve, they did not disclose any incidents of persistent facial palsy. According to Carta F et al.'s study, in which parotidectomy was done with a microscope with a concurrent facial nerve monitor, there was no likelihood of facial nerve damage in benign extra-facial parotid lesions and a 2.7% rate of long-term facial palsy in parotid lesions that did not involve the nerve.[1] Facial nerve identification may be inaccurate due to factors that affect nerve monitor responses, for e.g., using electro cautery, muscle relaxants during anaesthesia, and neurological diseases. A microscope, on the other hand, is not affected by these variables.[7] In this study, a microscope was the singular instrument to identify the facial nerve in benign parotid lesions, similar to a study by Bhardwaj et.al.[22]

For surgeons, switching from unassisted to assisted vision is a difficult adaptation. A surgeon can more easily and quickly respond to this shift if they place their microscope correctly and alter its magnification and focal length in accordance with the particular surgical dissection area. These adjustments also contribute to the maintenance of proper form during surgery, thus averting potential musculoskeletal problems in the future. Microscope positioning adjustments during various steps ranged between 7'O and 10'O clock for right-sided lesions and between 5'O clock and 12'O clock for left-sided lesions in this study. For left-handed surgeons, these settings should be reversed. While using a microscope, surgeons must adapt to the enlarged image of a particular area while everything else in the surgical field is concomitantly blurry. It can be challenging to maneuver instruments or ask the assisting surgeon for help. However, in this study, surgeons accustomed to using the microscope during ear, laryngeal, or thyroid surgeries were comfortable with it during parotidectomy as well.

In every instance, an eccentric strategy to facial nerve dissection was employed, with the primary goal being to locate the trunk of the nerve and then trace its branches. Accurate recognition of the body of the nerve as well as its branches was achieved using the microscope. Although peripheral branches were not initially attempted in six cases, they were identified by the help of the microscope after flap elevation. This suggests potential enhanced delineation of peripheral nerve branches compared to unaided vision during retrograde nerve dissection in parotidectomy. For microscope-assisted parotidectomy, Nicoli et al. performed retrograde dissection with the marginal mandibular nerve serving as the starting landmark.[21]

The facial nerve's branching pattern is highly variable and can only be confirmed intraoperative.[23,24] Using a microscope assisted in recognizing the nerve and all of its branches, including the diminutive ones that are invisible to the unaided eye. The microscope also aided in avoiding unnecessary traction on nerve branches, reducing the risk of temporary paresis. Additionally, it facilitated a better identification of the perineural blood supply of facial nerve branches, which is crucial for nerve function. The improved visibility of blood vessels running through the parotid aided in effective hemostasis while circumventing accidental cauterization of parotid tissue. Even minimal bleeding appeared significant under the microscope, warranting careful management by the surgeon.

Temporary facial paralysis can resolve in as little as 20 days or may take up to 18 months.[1,2,11] Nicoli et al. reported complete resolution of all incidences in which the facial paralysis was temporary by 3 months but in the study by Eviston et al, it took as much as 18 months.[2] If the anatomy of the nerve is sufficiently intact, the maximum chance of resolution of any deficit is within 12 weeks followed by a considerable decline.[1,25] Table-I shows the details of the recovery times observed in this study. The variations may be attributed to differences in degree to which the nerve is stretched, the amount of damage to the nerve's blood supply, and to whether any communicating nerve branches are present.[22] For surgeries involving the parotid, microscopy with a nerve monitor is an efficient learning set-up. Due to the narrow area of dissection, unaided demonstrations limit the residents' view and might necessitate interrupting the surgery. The microscope accelerates the residents' growth curve by enabling numerous residents to be taught at once with enhanced visibility.

The cost of a microscope is its sole drawback. However, as a crucial surgical tool in otolaryngology practice, the microscope's cost is justified and carries an advantage over a nerve monitor. In the authors' opinion, the reduced surgical complications related to the facial nerve with the use of a microscope outweigh the associated costs. A limitation of this study is its small sample size, resulting in a minimal number of patients with malignant parotid lesions. Consequently, the results may not be extrapolated to the malignant category. Another limitation is the lack of a comparator group, which meant that we could not conduct any analysis on the data that we collected.

## CONCLUSION

In our study, we have seen that a microscope is a very valuable assistant in the identification and preservation of the facial nerve and its branches during parotidectomy. However, due to the limitations mentioned, there remains the room for further studies that might validate and extrapolate the results that we have obtained.

## CONFLICT OF INTEREST

The authors declare no conflict of interest.

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