Facial nerve palsy and Frey's syndrome in parotid surgery

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Objective: The purpose of this study was to examine the differences in histopathological type, surgical procedure, and recurrence among parotid gland tumor resection cases in relation to the frequency and type of postoperative complications.

Methods: A total of 111 lesions from 110 patients who underwent parotid gland resection were included. We analyzed the relationship between the parotid gland tumor histopathological type, surgical procedure, tumor recurrence, and the frequency of postoperative complications.

Results: No differences were observed in the frequency of postoperative complications for pleomorphic adenomas and Warthin's tumors or in the frequency of complications with conventional superficial and deep parotidectomy procedures for pleomorphic adenomas. Transient facial nerve palsy occurred in 21.4% of the cases and resolved within 5.3 ± 3.0 months. Frey's syndrome persisted for a mean duration of 5.0 ± 2.6 months after 12 months. Permanent paralysis occurred at a significantly high frequency in recurrence surgery cases. Although less invasive procedures, such as extracapsular dissection, are becoming more popular for parotid gland tumor excision, lobectomies are still commonly performed for recurrence cases and non-superficial tumors.

Conclusion: These results showed that to predict and understand the possibility of complications is important when obtaining preoperative informed consent from patients.

Key words: parotidectomy, facial nerve palsy, Frey's syndrome, complication

Introduction

During parotid gland tumor resection, operations involving the facial nerve must be performed with the utmost caution. Postoperative facial nerve palsy is a complication that should be avoided. However, even when the parotid gland tissue is carefully and atraumatically dissected, transient paralysis can occur. Although paralysis improves over time, the duration is variable. Frey's syndrome is another postoperative complication that requires the same level of caution as that for facial nerve palsy, particularly concerning the patient's postoperative course, because sweating during meals is often stressful to patients.

The objective of this study was to examine the differences in histopathological type, surgical procedure, and recurrence among parotid gland tumor resection cases in relation to the frequency of the complications and investigated their duration.

Materials and Methods

The study population consisted of 111 lesions from 110 patients who underwent parotid gland resection in our Department from April 1971 through May 2011. We investigated the frequency of postoperative complications and clinical courses in all the cases, focusing on pleomorphic adenomas and Warthin's tumors, which were the predominant histopathological diagnoses for these cases. The results were expressed as mean ± standard deviation (SD).

We made a lazy 'S' incision, and the facial nerve main trunk (FMT) was identified mainly by using the "pointer" cartilage in the deepest part of the cartilage of the external acoustic meatus. Irrespective of the tumor location, we performed antegrade facial nerve dissection from the FMT before conducting superficial lobectomy, without resecting the auriculotemporal nerve, to prevent Frey's syndrome. During skin suture, the parotid gland was
covered with SMAS (superficial musculoaponeurotic system) tissue.

In the present study, permanent paralysis was defined as facial nerve palsy that lasted for at least 1 year postoperatively, and transient paralysis was reported when the patient recovered to the preoperative state. Evaluation of the absence or presence of Frey's syndrome was based on subjective symptoms of sweating or not sweating during meals. We investigated the occurrence of Frey's syndrome postoperatively and the duration of symptoms.

We determined the frequency of complications in relation to surgical procedures that involved a superficial layer resection (superficial lobectomy or partial superficial lobectomy) or an operation on deep layers (total lobectomy or deep lobectomy). We also examined whether patients underwent initial surgery or surgery for a recurrence and if there were postoperative complications. Yates' correction, the $x^2$ test, and Fisher's exact test were performed to determine whether or not there were differences between the groups.

**Results**

The male : female ratio was 65 : 45, and the mean age was $40 \pm 16.6$ years of these 111 patients. Table 1 shows the number of cases and their histopathological diagnoses. Pleomorphic adenoma was the most common type, accounting for 68 cases. Two cases of pleomorphic adenoma originating from the accessory parotid gland were also noted. Warthin's tumors accounted for 14 sites in 13 cases. One was a 67-year-old male with bilateral Warthin's tumors. No recurrence was observed in any of the cases in which we performed initial surgical resections. Pleomorphic adenomas (61.3%) and Warthin's tumors (12.6%) were found in 73.9% of the cases, and the tumors were malignant in 14 cases (12.6%).

We investigated the frequency of postoperative complications in pleomorphic adenoma ($n = 68$) and Warthin's tumor ($n = 14$) cases as these tumors accounted for the majority of parotidectomy procedures (Table 2). Symptoms continued for a mean duration of $5.3 \pm 3.0$ months (2 days to 11 months). Permanent paralysis that continued for at least 1 year was observed in 3 pleomorphic adenoma cases (4.4%). Frey's syndrome was observed in 25% of the pleomorphic adenoma cases and in 14.3% of the Warthin's tumor cases.

We investigated whether the complication frequency was affected by a surgical operation involving a superficial resection or a resection of deep layers for cases of pleomorphic adenoma of the parotid gland, excluding the accessory parotid gland (Table 3). For superficial resection, transient paralysis was observed in 22.9% and permanent paralysis in 4.1%. For deep-layer resections, transient paralysis was observed in 27.7% and permanent paralysis in 5.6%. Frey's syndrome occurred in 27.0% of the patients who underwent

**Table 1.** Number of cases and the histopathological diagnoses

<table>
<thead>
<tr>
<th>Diagnoses</th>
<th>N = 111</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pleomorphic adenoma</td>
<td>66</td>
</tr>
<tr>
<td>Pleomorphic adenoma (accessory gland)</td>
<td>2</td>
</tr>
<tr>
<td>Warthin tumor</td>
<td>14</td>
</tr>
<tr>
<td>Basal cell adenoma</td>
<td>2</td>
</tr>
<tr>
<td>Myoepithelioma</td>
<td>2</td>
</tr>
<tr>
<td>Mikulicz syndrome</td>
<td>2</td>
</tr>
<tr>
<td>Schwannoma, neurinoma</td>
<td>2</td>
</tr>
<tr>
<td>Monomorphic adenoma</td>
<td>1</td>
</tr>
<tr>
<td>Capillary hemangioma</td>
<td>1</td>
</tr>
<tr>
<td>Adenocarcinoma</td>
<td>4</td>
</tr>
<tr>
<td>Carcinoma ex pleomorphic adenoma</td>
<td>2</td>
</tr>
<tr>
<td>Ductal papilla carcinoma</td>
<td>2</td>
</tr>
<tr>
<td>Acinic cell carcinoma</td>
<td>2</td>
</tr>
<tr>
<td>Squamous cell carcinoma</td>
<td>1</td>
</tr>
<tr>
<td>Myoepithelioid carcinoma</td>
<td>1</td>
</tr>
<tr>
<td>Mucoepidermal carcinoma</td>
<td>1</td>
</tr>
<tr>
<td>Malignant schwannoma</td>
<td>1</td>
</tr>
<tr>
<td>Other</td>
<td>5</td>
</tr>
</tbody>
</table>

**Table 2.** Frequency of postoperative complications for pleomorphic adenomas and Warthin's tumors

<table>
<thead>
<tr>
<th>Complication</th>
<th>Pleomorphic adenoma</th>
<th>Warthin tumor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n = 68</td>
<td>n = 14</td>
</tr>
<tr>
<td>Transient palsy</td>
<td>16 (23.5%)</td>
<td>3 (21.4%)</td>
</tr>
<tr>
<td>Permanent palsy</td>
<td>3 (4.4%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Frey's syndrome</td>
<td>17 (25.0%)</td>
<td>2 (14.3%)</td>
</tr>
</tbody>
</table>

**Table 3.** Frequency of complications according to the type of surgical operation conducted on 66 pleomorphic adenoma cases

<table>
<thead>
<tr>
<th>Complication</th>
<th>Superficial</th>
<th>Deep</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n = 48</td>
<td>n = 18</td>
</tr>
<tr>
<td>Transient palsy</td>
<td>11 (22.9%)</td>
<td>5 (27.7%)</td>
</tr>
<tr>
<td>Permanent palsy</td>
<td>2 (4.1%)</td>
<td>1 (5.6%)</td>
</tr>
<tr>
<td>Frey's syndrome</td>
<td>13 (27.0%)</td>
<td>4 (22.2%)</td>
</tr>
</tbody>
</table>
superficial resection and in 22.2% of the patients who underwent deep layer resection.

We examined the frequency of complications according to the surgical procedure in the recurrence cases (Table 4). Permanent paralysis occurred in 10.5% of the patients who underwent surgery for initial onset, and Frey's syndrome occurred in 22.3%. In contrast, permanent paralysis occurred in 53.8% (n = 7) of the patients who underwent surgery for recurrence, and this difference was statistically significant (P < 0.01). All of these cases were for malignant tumors in patients who underwent combined neurectomies.

Frey's syndrome was not observed in any of the patients who underwent surgical operations for recurrence. All of the patients who suffered permanent paralysis after surgeries for recurrences had malignant tumors; and, although permanent paralysis was observed after surgery to remove the malignant tumor, Frey's syndrome did not occur in any of the cases (data not shown). In cases with postoperative Frey's syndrome, symptoms appeared from 12 months postoperatively and continued for a mean duration of 5.0 ± 2.6 months.

**Discussion**

Pleomorphic adenomas and Warthin's tumors are the predominant histopathological types of parotid gland tumors.1-3 We did not observe any differences in the complication frequency related to these types of tumors. Thus, we deduce that postoperative complication rates for benign parotid gland tumors are not affected by the histological type.

The frequency of facial nerve palsy occurring after benign parotid gland tumor surgery is influenced by the use of extracapsular dissection (ECD) or conventional nerve dissection. Although it occurs in <10% of the ECD cases, this rate rises to approximately 60% in cases undergoing conventional nerve dissection.4-6 We perform the parotidectomy using the lazy 'S' incision, making the dissection above the parotid gland capsule and identifying the FMT. Various features of FMT identification have been reported,7 and we use this technique in a comprehensive manner. Although FMT identification is reliable with normal anatomy, the presence of a tumor or tumors alters the anatomy of the FMT and facial nerve. We performed antegrade nerve dissection on almost all the patients and performed superficial lobectomies and partial lobectomies as basic surgical procedures, irrespective of preoperative tumor diagnoses. O'Regan, et al.5,8 reported various complication frequencies for antegrade and retrograde approaches.

In the literature, ECD leads to lower rates of onset of transient paralysis compared to superficial lobectomy, and no differences in recurrence rates have been reported.1-9 Roh et al.10 reported that functional parotidectomy preserving the great auricular nerve, with minimal nerve dissection performed depending on the location and size of the tumor, led to lower rates of onset of transient weakness and decreased sensation compared to conventional surgery. Dell'Aversana Orabona, et al.1 suggested performing a lobectomy on tumors of ≥3 cm, in the deep portion or parapharyngeal portion, and on recurrence cases. Although less invasive surgical procedures such as ECD are becoming more common, conventional lobectomies remain highly useful. In the present study, results indicated no differences in the onset rate of nerve palsy for superficial or deep resection in pleomorphic adenoma cases. For non-neuroinvasive benign tumors, the possibility of nerve palsy does not increase for a resection of the deep portion when nerve dissection is accurately performed.

We believe that it is not possible to diagnose a malignant parotid gland tumor based on preoperative clinical presentation, findings, and diagnostic imaging. Facial nerve palsy can occur preoperatively due to inflammation, and paralysis may not occur at all in some malignant tumor cases. This difficulty in diagnosis means that nerve invasion by the tumor can only be determined intraoperatively. Even histopathological diagnosis using intraoperative frozen sections can be inaccurate. When performing parotid gland tumor surgery, patients should always be informed of the risks of complicated nerve resection and paralysis. All recurrence cases in the present study of patients who suffered permanent paralysis had malignant parotid gland tumors. Although not all cases underwent neurectomy, it seems likely that the re-dissection of scar tissue formed after nerve dissection in the initial surgery can easily cause permanent paralysis.

Frey's syndrome may not have occurred in any recurrence surgery cases in the present study because the large amount of scar tissue formation after the second
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surgical procedure prevented the proliferation of aberrant nerve fibers. The presence of scar tissue, which is a disadvantage for nerve dissection, was therefore advantageous in this scenario.

Postoperative facial nerve palsy also affected the mental state of patients. This complication must be avoided; nevertheless, transient facial nerve palsy that improves over time can occur. Thus, it is important to inform patients that transient paralysis may develop. Surgical procedures such as partial lobectomies and extracapsular resection, which are less invasive than conventional lobectomies, are also becoming more common. There is a growing trend for parotid gland tumor resection, thus moving away from the classical superficial lobectomy to less invasive procedures, such as function-preserving parotid surgery, partial parotidectomy, limited superficial parotidectomy, retrograde partial superficial parotidectomy, extracapsular lumpectomy, and ECD, with no differences observed in the frequency of complications.

Commonly performed surgical procedures for parotid gland tumor resection are, therefore, undergoing change. However, we believe that surgical procedures should be selected on a case-to-case basis. We found that the classical surgical procedure that we routinely perform is strongly associated with a high frequency of facial nerve palsy in recurrence cases but leads to a lower incidence of Frey's syndrome. Therefore, conventional lobectomies are useful for cases that cannot be resolved with procedures such as ECD. It is also important to understand the possibility of the development of certain complications after a specific treatment strategy.

References