Partial Lesions of the Intratemporal Segment of the Facial Nerve: Graft Versus Partial Reconstruction

Ricardo F. Bento, MD, PhD; Raquel Salomone, MD; Rubens Brito, MD, PhD; Robinson K. Tsuji, MD; Mariana Hausen, MD

Objectives: In cases of partial lesions of the intratemporal segment of the facial nerve, should the surgeon perform an intraproductive partial reconstruction, or partially remove the injured segment and place a graft? We present results from partial lesion reconstruction on the intratemporal segment of the facial nerve.

Methods: A retrospective study on 42 patients who presented partial lesions on the intratemporal segment of the facial nerve was performed between 1988 and 2005. The patients were divided into 3 groups based on the procedure used: interposition of the partial graft on the injured area of the nerve (group 1; 12 patients); keeping the preserved part and performing tubulization (group 2; 8 patients); and dividing the parts of the injured nerve (proximal and distal) and placing a total graft of the sural nerve (group 3; 22 patients).

Results: Fracture of the temporal bone was the most frequent cause of the lesion in all groups, followed by iatrogenic causes (p < 0.005). Those who obtained results lower than or equal to III on the House-Brackmann scale were 1 (8.3%) of the patients in group 1, none (0.0%) of the patients in group 2, and 15 (68.2%) of the patients in group 3 (p < 0.001).

Conclusions: The best surgical technique for therapy of a partial lesion of the facial nerve is still questionable. Among these 42 patients, the best results were those from the total graft of the facial nerve.

Key Words: anastomosis, facial paralysis, graft, surgical therapy, trauma.

INTRODUCTION

Traumatic lesions on the intratemporal segment of the facial nerve can be caused by a fracture of the temporal bone,1,2 can be caused by a firearm wound, or can be iatrogenic lesions that occur during otological surgeries.1,2

Although the number of iatrogenic lesions has been decreasing because of the progress made by otology surgeons and intraoperative monitoring of the facial nerve, hundreds of cases have been treated at the Hospital das Clínicas da Faculdade de Medicina de São Paulo in the past 15 years. On the other hand, other types of causes have been increasing, mainly in big cities and due to violence (car accidents, falls, terrorism, and urban violence).

The Hospital das Clínicas da Faculdade de Medicina de São Paulo is a reference for potential emergency situations in the city of São Paulo, and it is also the largest hospital in Brazil.

After visualizing a segment of the injured facial nerve, surgeons face the following questions: whether to preserve the injured segment by placing a partial graft or to leave the injured stumps and perform tubulization.

The aim of this study was to present 42 cases of patients who had partial lesions of the facial nerve on the intratemporal segment and were treated by different techniques of anastomosis, with the purpose of helping surgeons decide on the best procedure for these controversial cases.

METHODS

A retrospective study was performed on 42 patients between 1988 and 2005. They presented traumatic peripheral facial paralysis, and during repair surgery on the facial nerve, at least 30% of the facial nerve diameter had been found preserved. A transmastoid approach was used in all cases, and every patient had a 1-year follow-up after surgery. The House-Brackmann scale was used to evaluate function before and after surgery.

The patients were chosen according to the following criteria: lesion present for less than a year; peripheral facial paralysis (House-Brackmann grade V...
or VI); and over 90% nerve degeneration displayed during electroneurographic examination performed from the three facial nerve branches (frontal, orbicularis oculis, and orbicularis oralis) and/or electromyography with no sign of reinnervation.

All surgeries such as partial or total anastomosis were performed by the same surgeon (R.F.B.) according to the technique previously described by Bento and Miniti* and using fibrin adhesive. Tubulization was performed with the fascia of the temporal muscle totally covering the injured segment of the nerve (Fig 1).

The patients’ records were analyzed to determine the cause of the lesion, the period between paralysis and surgery, the type of surgery, the facial nerve segment in which the lesion was found, the lesion extent on the facial nerve length, the lesion extent on the nerve diameter, the presence or absence of neuroma, and the clinical results 1 year after the surgery. All amputation neuromas found during surgery were removed (Figs 2 and 3).

The involved nerve segments were divided into first segment (labyrinth portion), second segment (tympanic portion), third segment (mastoid portion), and second and third segments (tympanic and mastoid portions).

The lesions were also divided by extent (length): less than 5 mm, between 6 and 10 mm, and larger than 10 mm.

The diameter of the injured portion of the nerve was classified as equal to or larger than 50%; the cases presented an injured nerve diameter of up to 70%, with at least 30% of the diameter preserved.

Regarding surgeries, patients were divided into 3 groups: cases in which the partial graft was placed on the preserved area of the nerve (group 1; 12 patients; Figs 4-6); cases in which the preserved area was conserved and tubulization was performed with temporalis muscle fascia (group 2; 8 patients); and cases in which parts of the injured nerve were di-

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**Fig 1.** Tubulization of facial nerve.

**Fig 2.** Amputation neuroma (arrow) on mastoid portion of left facial nerve (stylomastoid foramen).

**Fig 3.** Amputation neuroma of facial nerve.

**Fig 4.** Partial lesion of facial nerve on mastoid portion (second portion) of left facial nerve (arrow).
vided into proximal and distal parts and a total graft of the sural nerve was placed (group 3; 22 patients; Figs 7 and 8).

Continuous variables with homoscedasticity and equality of variances were compared between groups with a 1-way analysis of variance. Continuous variables that did not fit these criteria and the ordinal variables were compared between groups with a nonparametric Mann-Whitney U test. Categorical variables were compared with \( \chi^2 \) and Fisher’s exact tests. The adopted significance level was 5% (p < 0.05).

The approval for this study was obtained from the hospital ethics committee (No. 0291/05).

RESULTS

Regarding the cause of lesions, fracture of the temporal bone was the main cause in all groups, followed by iatrogenic causes and firearm projectiles (see Table). As with causes, gender and age factors did not present any significant statistical difference in selecting patients.

The period (mean ± SD) between the lesion and surgery was 27.8 ± 19.2 days for group 1, 32.8 ± 23.8 days for group 2, and 50.5 ± 28.4 days for group 3 (p = 0.05; see Table).

In all groups, the mastoid was the most involved segment, with 7 patients (58.3%) in group 1; 7 (87.5%) in group 2, and 14 (63.6%) in group 3. However, the tympanic segment was affected in 25.0% of patients (3) in group 1, 12.5% (1) in group 2, and 13.6% (3) in group 3. Those with both tympanic and mastoid segments involved were represented by 2 patients (16.7%) in group 1, no patients in group 2, and 5 patients (22.7%) in group 3 (p = 0.53; see Table). There was no lesion on the labyrinth segment of the facial nerve in any of the groups.

Regarding the lesion extent on the nerve, in group 1, 75% of patients (9) presented lesions smaller than or equal to 5 mm, and 25% (3) presented them between 6 and 10 mm. In group 2, 87.5% of patients (7) presented lesions smaller than or equal to 5 mm, and 12.5% (1) presented lesions between 6 and 10 mm. There was no lesion larger than 10 mm in groups 1 and 2. However, in group 3, 40.9% of patients (9) showed lesions smaller than or equal to 5 mm, 18.2% (4) presented lesions between 6 and 10 mm, and 40.9% (9) presented lesions larger than 10 mm (p = 0.02; see Table). In all groups, only 15
### PATIENT DATA

<table>
<thead>
<tr>
<th></th>
<th>Group 1 (n = 12)</th>
<th>Group 2 (n = 8)</th>
<th>Group 3 (n = 22)</th>
<th>p</th>
<th>Total (n = 42)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age (mean ± SD; y)</strong></td>
<td>37.1 ± 16.7</td>
<td>30.4 ± 17.0</td>
<td>32.7 ± 13.8</td>
<td>0.59</td>
<td>33.5 ± 15.0</td>
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<td><strong>Gender</strong></td>
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<td>8</td>
<td>5</td>
<td>13</td>
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<tr>
<td>Female</td>
<td>4</td>
<td>3</td>
<td>9</td>
<td></td>
<td>16</td>
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<tr>
<td><strong>Cause of lesion</strong></td>
<td></td>
<td></td>
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<tr>
<td>Fracture</td>
<td>50.0% (6)</td>
<td>62.5% (5)</td>
<td>45.5% (10)</td>
<td></td>
<td>50.0% (21)</td>
</tr>
<tr>
<td>Iatrogenic</td>
<td>41.7% (5)</td>
<td>37.5% (3)</td>
<td>36.4% (8)</td>
<td>0.70</td>
<td>38.1% (16)</td>
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<tr>
<td>Projectile</td>
<td>8.3% (1)</td>
<td>0.0%</td>
<td>18.2% (4)</td>
<td></td>
<td>11.9% (5)</td>
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<tr>
<td><strong>Period (mean ± SD; d)</strong></td>
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<tr>
<td>Tympamic</td>
<td>27.8 ± 19.2</td>
<td>32.8 ± 23.8</td>
<td>50.5 ± 28.4</td>
<td>0.05</td>
<td>40.6 ± 26.7</td>
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<tr>
<td>Mastoid</td>
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<tr>
<td>Tympanic and mastoid</td>
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<td><strong>Length of lesion</strong></td>
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<tr>
<td>≤5 mm</td>
<td>75.0% (9)</td>
<td>87.5% (7)</td>
<td>40.9% (9)</td>
<td></td>
<td>59.5% (25)</td>
</tr>
<tr>
<td>6-10 mm</td>
<td>25.0% (3)</td>
<td>12.5% (1)</td>
<td>18.2% (4)</td>
<td>0.02</td>
<td>19.0% (8)</td>
</tr>
<tr>
<td>&gt;10 mm</td>
<td>0.0%</td>
<td>0.0%</td>
<td>40.9% (9)</td>
<td></td>
<td>21.4% (9)</td>
</tr>
<tr>
<td><strong>Diameter of lesion ≥50%</strong></td>
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<tr>
<td>Neurona</td>
<td>25.0% (3)</td>
<td>12.5% (1)</td>
<td>50.0% (11)</td>
<td>0.11</td>
<td>35.7% (15)</td>
</tr>
</tbody>
</table>

In parentheses are numbers of patients.

patients (35.7%) had their facial nerve injured over 50% of the diameter (p = 0.11). In addition, only 13 patients (31.0%) presented facial neuromas.

One year after surgery, the following results were obtained: in group 1, 66.7% of patients (8) presented House-Brackmann grade IV and 25% (3) House-Brackmann grade V; in group 2, 27% of patients (6) presented House-Brackmann grade IV and 25% (2) House-Brackmann grade V; and in group 3, 27.3% of patients (6) presented House-Brackmann grade IV and 4.5% (1) House-Brackmann grade V (p = 0.001; Fig 9).

### DISCUSSION

The position of the temporal bone favors its involvement in head and neck wounds, which can cause peripheral facial paralysis. It is difficult to compare cases of peripheral facial paralysis because of the diversity of lesions; moreover, systematic comparison between large groups with similar lesions is difficult to perform.

Several authors consider that early surgery (up to 3 weeks after peripheral facial paralysis) yields better results. However, most patients can undergo therapy within 60 days of peripheral facial paralysis.

It has been the practice at the Hospital das Clínicas da Faculdade de Medicina de São Paulo to submit each patient with temporal bone trauma and peripheral facial paralysis to computed tomographic scanning, audiometric tests, and electroneurography. According to Fisch, the use of electroneurography or electromyography provides a reasonable indication of when surgery should occur.

The most acceptable and easy-to-use scale of grading for peripheral facial paralysis is the House-Brackmann (HB) grade III, IV, or V.
Brackmann scale; all of the others are subjective and have deficiencies.

The surgical approach that will be performed depends on the surgeon and the patient. Once the lesion has been found to affect either the geniculate ganglion or the labyrinthine segment, the translabyrinthine approach is chosen (if the patient presents profound deafness) via the medium fossa (preserved hearing) or a combined approach is used, depending on where the lesion is found.

If there is either total or partial rupture, then anastomosis should be performed. It is important to avoid closure by tension, and when there is a lesion with extensive neural tissue loss, we perform a graft of the sural nerve. The anastomosis performed between stumps is attached with fibrin adhesive. Fibrin adhesive helps to prevent foreign body reaction and scars, and it causes fewer difficulties than does nylon suture material. Previous studies showed statistical results that were similar between suture and fibrin adhesive.

All patients with peripheral facial paralysis at the Hospital das Clínicas da Faculdade de Medicina de São Paulo are submitted to a rehabilitation program for the facial nerve that covers physiotherapy, repair surgery, electrophysiological testing, and psychological therapy. The patients in the study who remained with House-Brackmann grade V or VI were submitted to evaluation for hypoglossal-facial nerve anastomosis.

In conclusion, the patients from group 3 (total graft) achieved better results than did those from group 1 (partial reconstruction) or group 2 (tubulization).

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REFERENCES

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