Randomized Prospective Study of the Validity of the Great Auricular Nerve Preservation in Parotidectomy

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Objective: To evaluate the feasibility and validity of great auricular nerve preservation during parotidectomy.

Methods: Thirty patients with parotid tumors were randomized to 2 groups. Sixteen patients (group A) underwent classic parotidectomy with sacrifice of the great auricular nerve. The surgeon tried to spare the nerve in the 14 patients (group B). Tactile sensitivity, pain sensitivity, and tactile discrimination were evaluated preoperatively and at 7 days, 30 days, 6 months, and 12 months after surgery. The regions examined were the superior helix, lobule, and infra-auricular and posterior auricular regions.

Results: After surgery, both groups showed lower levels of sensitivity, mainly in the lobule and in the infra-auricular region. These alterations were less pronounced in group B. Both groups showed improvement over time. In group B the tactile sensitivity reached preoperative levels by 6 months after surgery. The recuperation in group A was partial and stabilized at 6 months after surgery.

Conclusion: Great auricular nerve preservation is technically feasible during parotidectomy, with a decrease of the sensitivity alterations in the early postoperative period and avoidance of the permanent sequelae that occur when the nerve is sacrificed.


THE GREAT auricular nerve (GAN) is usually cut at the level of the parotid inferior pole during a parotidectomy and many authors find this procedure inevitable.1-4 Surgeons who are involved in this type of surgery are familiar with the sensitive alterations in the operated area, a frequent complaint by the patient. Traditionally, little importance is given to this sequela and it is considered a small price to be paid for the removal of the main disease.5 But there are reports in the literature of complications due to hyposensitivity in the lobule region after parotidectomy.6,7

In recent years, we have seen an increasing concern not just in cure rates, but also in the functional results of all types of surgical treatment, including parotid surgery. The idea of GAN preservation is not new,8-10 but it has not been widely accepted. There are arguments over its viability and validity. To clarify these questions, we performed a prospective randomized study.

The GAN is a sensitive nerve that has its origin in the second and third spinal nerves.5 It becomes superficial in the posterior border of the sternocleidomastoid muscle. From there, it ascends to the parotid region where it splits. The nerve division pattern is important to the surgeon who intends to preserve it, and this subject was the secondary aim of this study.

PATIENTS AND METHODS

PATIENTS

From October 1995 to October 1997, patients about to undergo a parotidectomy without preoperative diagnosis of malignant tumor were divided in 2 groups. Group A (16 patients), underwent a classic parotidectomy and the GAN was sacrificed. In group B (14 patients) an attempt was made to preserve the nerve during the surgery.

The age and sex of the patients, size and location of the tumor, and histopathologic results were used to evaluate the comparability between the groups.

The average age for all patients was 47 years, ranging from 16 to 78 years. Group A had a mean age of 50 years (range, 27-73 years); group B had a mean age of 43 years (range, 16-78 years). There were 20 female patients, 13 in group A and 7 in group B.

Concerning the size of the lesions in all patients, 6 were less than 2 cm in diameter.
Tumors in the inferior parotid pole were present in 19 cases, 9 in group A and 10 in group B. In 5 patients, all in group B, there were extensions to the deep lobe of the parotid, and a total parotidectomy was necessary. In the other cases, a superficial parotidectomy was done. In all cases, the facial nerve and its branches were preserved.

The duration of the surgical procedure was recorded, as were the GAN branches that were preserved and their anatomic distribution.

The postoperative histopathologic examination revealed 27 benign lesions (14 pleomorphic adenomas, 2 monomorphic adenomas, 3 Warthin tumors, 2 lipomas, 1 hemangioma, 1 cystic lesion, 1 chronic inflammatory process, and 1 hyperplastic lymph node).

In 3 patients, the final diagnosis revealed a malignancy. The first case, a lower grade acinic cell carcinoma, had preoperative cytological examination findings that suggested a pleomorphic adenoma. The second case, a fibrosarcoma, had inconclusive preoperative fine-needle aspiration biopsies. The third case, an intraparotid metastasis of a breast cancer, had a cytological study that suggested an adenoma. The first 2 patients underwent postoperative radiotherapy and the third patient was referred to clinical oncology.

Nine cases of pleomorphic adenoma, 1 case of monomorphic adenoma, 3 cases of Warthin tumors, and the hemangioma case were in group B. The rest of the tumors, including the 3 cases of cancer, were in group A.

**GAN PRESERVATION TECHNIQUE**

The skin incision starts at the infra-auricular area and is limited to the superficial subcutaneous layer. A blunt dissection is done at the sternocleidomastoid muscle posterior border until the GAN trunk is identified. The nerve is dissected upward and usually 3 branches can be visualized: an anterior branch that goes to the parotid parenchyma and preauricular skin, a posterior superficial branch that goes to the auricle, and a posterior deep branch that goes along the anterior border of the sternocleidomastoid muscle. The anterior branch is usually sacrificed. The last 2 branches can be technically preserved during the surgery. Occasionally an inferior anterior branch is identified and it can be preserved. The anatomy of the GAN is demonstrated in Figure 1A. With the main trunk and the posterior branches protected, we proceed with the parotidectomy. We had no major problem in preserving the posterior branches of the auricular nerve, even in big tumors, since these branches do not go to the tumor. They run vertically and can be preserved by careful dissection when the fascia connecting the parotid gland to the sternocleidomastoid muscle is cut (Figure 1B).

Tactile sensitivity in the superior helix, lobule, and infraauricular and posterior auricular regions was evaluated during preoperative examination and 7 days, 30 days, 6 months, and 12 months after the surgery. The superior helix was defined as the superior part of the auricle. The lobule was defined as the inferior part of the auricle without cartilage. The posterior auricular area was defined as an area between the posterior auricle insertion and the hairline. The infra-auricular area is located between the auricle and the angle of the mandible. Tactile sensitivity was evaluated using cotton wool, which was gently applied at least 3 times in each of the 4 areas. The patient, with eyes closed, would give a signal if he or she felt the cotton. Pain sensitivity was evaluated by touching the 4 areas, sometimes using a pointed instrument, sometimes with a blunt instrument, and recording the patient capacity to identify the right stimulus with the eyes closed. Tactile discrimination was evaluated using a 2-point discriminator. We started with a 3-cm distance and decreased 1 cm each time, until the patient was not able to identify the difference between a 2- and 1-point touch. The results for tactile and pain sensitivity range from 0 to 3 depending on the percentage of right stimulus identification, with 0 representing the worst result and 3 the best result. The tactile discrimination results represent the shorter distance between the 2-point sensation that the patient can discriminate. When the patient was not able to discriminate a 3-cm distance, a grade of 4 was given. So, 4 represents the worst result and 1 the best result.

The average results for each group were obtained and a comparative analysis was done.

![Figure 1. Great auricular nerve anatomy (A) and identification of great auricular nerve during parotidectomy (B).](Image)
RESULTS

The sacrifice of the GAN anterior branch was necessary in all group B patients. In 1 case the posterior superficial branch was also sacrificed, preserving the posterior deep branch. In all other cases, it was possible to preserve both the superficial and the deep posterior branches of the GAN. The anterior inferior branch was preserved in the 2 cases where it was identified.

The mean duration of surgery in group A was 118 minutes, ranging from 70 to 180 minutes. In group B the mean duration was 121 minutes, ranging from 80 to 180 minutes.

There were 11 cases of postoperative temporary facial nerve paresis, 5 in group A and 6 in group B. All patients had complete recovery of this motor deficit.

Two patients in group B presented infra-auricular area hyperesthesia 6 months after surgery. During the first year of follow-up, no patient complained of Frey syndrome or had local recurrence.

The results of the preoperative and postoperative sensitivity evaluations are shown in Figures 2, 3, and 4.

COMMENT

The unnecessary sacrifice of anatomic structures is not justified, mainly if it implies significant dysfunction. Besides the discomfort provoked, the postparotidectomy hyposensitivity of the lobule has been associated with traumatic lesions secondary to deficiency in defense mechanisms mediated by pain.\(^6\) Another frequent complaint is the difficulty in wearing earrings.

Theoretically, the preservation of the GAN would avoid such complications. But to actually confirm the validity of the procedure, we have to answer some questions: First, whether preservation of the GAN is technically feasible during parotidectomy and, second, whether the preservation is associated with any undesirable factor, such as prolonged surgical time, a higher tumor recurrence rate, or any other complication. Finally, we need to know if the preservation of the GAN is really related to better functional results. This work was undertaken to answer these questions.

Our 2 groups in the present study were similar with regard to age, size of the lesions, and extension of the inferior parotid pole. Group A had more female patients and group B had all the cases of deep parotid lobe extension.

In all but 3 cases the final histopathologic study confirmed the preoperative diagnosis of a benign lesion. The cancer cases were in the group in which the GAN was sacrificed. For this reason it is not possible to evaluate the preservation of the GAN in malignant tumors.

Most authors describe 2 branches of the GAN, an anterior one and a posterior one.\(^8\) As we observed, at least 3 branches were identified: (1) an anterior branch that directs to the gland, whose preservation in all our cases was not possible. (2) One branch is superficially posterior and goes to the auricular lobe. It runs a high risk of being cut if careful dissection is not done. (3) The last branch is deeply posterior, located along the anterior border of the sternocleidomastoid muscle, and goes to the posterior auricular area. In a few patients it is possible to identify a fourth branch that is inferior and anterior and is located at a lower level than the limit of the inferior parotid. Its preservation is possible during parotidectomy (Figure 1). The present study showed that the preservation of the 2 posterior branches is technically feasible and, in group B, it was possible in all but 1 patient whose posterior superficial branch was sacrificed. Even large tumor located in the inferior part of the parotid does not avoid the preservation of the posterior branches of the auricular nerve.

There was no major difference in the operative time between group A and group B. The main factor affecting the surgery duration was facial nerve dissection. The identification and preservation of the GAN took 5 to 10 minutes. The occurrence of temporary facial nerve paresis was similar in both groups, despite the fact that all 5 cases of total parotidectomy were in
Late occurrence of infra-auricular hyperesthesia was found in 2 group B patients, but without causing major discomfort. The absence of complications such as Frey syndrome and recurrence probably is due to the 1-year limited follow-up. We did not intend to evaluate the incidence of Frey syndrome in this study. We have not routinely done starch iodine testing. But, it was interesting to notice that, during the first year of follow-up, none of our patients complained of Frey syndrome. After this period, some patients developed this syndrome.

Seven days after the surgery, both the tactile and pain sensitivity showed worse results compared with the preoperative evaluation. This occurred in all regions, but mainly in the lobule and infra-auricular region. The fact that we tested areas such as the superior auricular area and the posterior auricular area may give an idea of too good results. These areas had not much sensitivity change by the nerve sacrifice. If we limit our analysis to the lobule and the inferior auricular area, a greater postoperative change in the sensitivity will be noticed.

The decline in sensitivity was greater in group A. After 30 days, the results improved in both groups, but were still better in group B. At the 6-month postoperative evaluation, the results in group B reached the preoperative level. In group A, there was still a sensitivity deficit that tended to stabilize and remain the same at the 12-month postoperative evaluation.

There was some difficulty in evaluating the tactile discrimination. Many patients had a preoperative 2-point discrimination of 2 cm or higher and a 4-cm evaluation was not possible because it would have gone beyond the limits of the researched regions. Despite these problems, we noticed a difference in favor of group B. At the 7-day postoperative evaluation, both groups showed worse discrimination compared with preoperative results, mainly in the lobule and infra-auricular region. The results for

Figure 3. Tactile sensitivity after auricular sacrifice (A) and after auricular nerve preservation (B). 0 Represents the worst result and 3 the best result (see the “Patients and Methods” section for more detailed explanation).

Figure 4. Tactile discrimination after auricular sacrifice (A) and after auricular nerve preservation (B). 4 Represents the worst result and 1 the best result (see the “Patients and Methods” section for more detailed explanation).
group B returned to the preoperative level 30 days after the surgery. A tactile discrimination deficit persisted at group A, even at 1 year after the surgery.

**CONCLUSIONS**

Preservation of the GAN posterior branches is technically feasible during parotidectomy. This procedure does not result in significant increase in operative time and is not associated with major complications. Preservation of the GAN decreases the early postoperative sensitivity deficit and avoids the permanent sequelae that occurs when the nerve is sacrificed. Therefore, the routine sacrifice of the GAN during parotidectomy should be avoided, mainly in cases of benign disease.

*Accepted for publication March 11, 2002.*

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**REFERENCES**