Removal of the Submandibular Gland by a Retroauricular Approach

Jong-Lyel Roh, MD, PhD

Objective: To evaluate the benefit of a retroauricular approach by comparing it with a conventional transcervical approach for removal of the submandibular gland.

Design: Prospective clinical study.

Setting: Academic center.

Patients: Thirty patients with benign submandibular gland disorders.

Interventions: Patients were divided into 2 surgical groups to undergo retroauricular (n=15) and conventional (n=15) procedures matched by age, sex, marital status, and pathologic condition. The retroauricular approach used an incision along the postauricular sulcus and hairline and subcutaneous tunneling to the gland; the conventional approach used an incision along a natural skin crease overlying the gland.

Main Outcome Measures: The operation time, complications, hospital stay, and subjective satisfaction of incision scar checked by visual analog scale were compared between groups.

Results: The submandibular gland disorders were comparable between groups: pleomorphic adenoma (n=15), chronic sialadenitis with sialolithiasis in the gland (n=5) or hilum (n=8), and Kütter (n=1) or Kimura (n=1) disease. Mean±SD operation times were 49±17 minutes in the retroauricular group and 38±15 minutes in the controls (P=.08). Mean±SD hospital stay and complication rates were comparable between groups. The mean±SD score of patient satisfaction was 8.9±0.9 in the retroauricular group and 4.2±2.9 in the conventional group (P<.001). The incision scar was commonly less visible in the retroauricular group because of hiding by the auricle and natural hair when comparing with the control group.

Conclusion: The retroauricular approach can provide better cosmetic outcome than the conventional transcervical approach and without significant complications.

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Excision of the submandibular gland is often indicated for neoplasia, chronic sialadenitis with or without sialolithiasis, plunging ranula, tuberculous sialadenitis, and drooling.\(^1\) Submandibular gland excision is traditionally performed by means of a transcervical approach. However, this approach has several short- and long-term complications. Neurologic complications after surgery have been reported with the following nerves: the marginal mandibular (7.7%), hypoglossal (2.9%), and lingual (1.4%).\(^2\) Scar problems and reduced salivation have also been reported.\(^3\) To avoid visible scarring and neurologic risks, intraoral removal of the submandibular gland has been introduced.\(^4,6\) Despite the cosmetic benefit, the intraoral approach has the drawbacks of limited surgical visualization, longer operation time, and difficulty of neck node dissection. Therefore, another approach that provides less prominent incision scars and a less compromised operative view needs to be developed.

In an earlier report, I described the use of a retroauricular hairline incision to remove upper neck masses and achieve improved cosmetic outcomes.\(^7\) The incision was made along the postauricular sulcus and inside the hairline, and then masses in the upper neck were successfully removed after subcutaneous tunneling. This approach is indicated for benign masses of the upper neck, such as second branchial cleft cysts, abscesses, schwannomas, pleomorphic adenomas, and for salivary gland disorders of Kikuchi, Kimura, and Castleman diseases. However, in the limited experience evaluated by my earlier study there were only 4 cases of submandibular gland excision via the postauricular approach. It seems difficult to achieve safe and complete removal of the submandibular gland by this approach because the distance from the hairline to the

Author Affiliation: Department of Otolaryngology, Asan Medical Center, University of Ulsan College of Medicine, Seoul, South Korea.
hilum of the Wharton duct is approximately 10 cm. Since that study, the retroauricular approach has continued to be applied to submandibular gland excision, and more consecutive cases have been accumulated under prospective randomized design compared with the standard transcervical approach.

The aim of the present study was to evaluate the benefit of the retroauricular approach by comparing it with the conventional approach for removal of the submandibular gland. Both groups were matched by age, sex, marital status, and pathologic condition. Herein, the surgical method and outcomes including operation, complications, and cosmesis are presented.

**METHODS**

**PATIENTS AND OUTCOME MEASUREMENTS**

Thirty patients who underwent submandibular gland excision through a transcervical or retroauricular approach between March 2003 and December 2004 were enrolled in this prospective study. All of the patients had submandibular gland lesions, and the patient characteristics are summarized in Table 1. The lesions were preoperatively diagnosed by fine-needle aspiration cytology and computed tomography scans (Figure, A) in all patients and confirmed by permanent pathologic sections. Patients with preoperative suspected malignancies were excluded, and only patients with surgically indicated benign submandibular disorders were included in this study. Patients with chronic sialadenitis were included only if they had recurrent symptoms and stones in the hilum or the gland. The patients were randomly assigned to 2 groups: conventional transcervical and retroauricular approaches. This study was planned so as to evaluate 15 patients in each group matched for age, sex, marital status, and pathologic condition. Nonmatching cases were excluded. I performed all of the surgical procedures. The primary goal of this study was to evaluate the cosmetic outcome of the retroauricular approach by postoperative photographic documentation and subjective patient satisfaction with the incision scar 6 months after surgery. The subjective score was evaluated by visual analog scale ranging from 0 to 10, with higher scores meaning better patient satisfaction. The second goal was to compare incision length, operation time, complication rates, and hospitalization days between groups. The data of each group were expressed as the mean ± SD. Statistical comparison between the 2 groups was performed with the Mann-Whitney test using SPSS 11.0 for windows (SPSS Inc, Chicago, Ill). A P value less than .05 was considered statistically significant. All of the patients were observed with no evidence of recurrence to a median of 12 months after initial surgery. Informed consent was received from all of the patients, and the study was approved by the institutional review board.

**SURGICAL TECHNIQUE**

Under general anesthesia, the neck of each patient was extended, and the head was rotated to the side opposite the operative site. A skin incision was made along the postauricular sulcus and hairline (Figure, B), starting from the lower end of the postauricular sulcus and moving upward to the middle or upper third point of the sulcus, and then smoothly angulating downward to 0.5 to 1 cm inside the hairline. Great care was used to avoid damage to the hair follicles during the incision and subcutaneous dissection. The skin flap was elevated just above the sternocleidomastoid muscle onto the submandibular gland (Figure, C). The sensory nerves overlying the sternocleidomastoid muscle were carefully preserved. The submandibular gland and lesions were exposed anterior to the muscle. The gland and lesions were carefully dissected with forceful retraction of the skin flap to facilitate exposure of the surgical field (Figure, D).

The anterior vein was ligated, transected, and retracted upward to protect the marginal mandibular nerve during further dissection. The facial artery was ligated, transected, and freed from the attachment of the gland. The gland was mobilized to separate from the free edge of the mylohyoid muscle. This allowed exposure of the deep portion of the gland and its duct and the lingual and hypoglossal nerves. After careful separation of the submandibular ganglion from the lingual nerve, the Wharton duct was doubly ligated and divided. Great care was taken to avoid injury to the lingual and hypoglossal nerves. Finally, the facial artery was divided a second time, and the gland and lesions were removed (Figure, E and F). After excision, a suction drain was inserted behind the lower end of the hairline incision, and the skin incision was tightly closed with interrupted sutures using 4-0 Vicryl and nylon. The drain was usually removed on the second or third postoperative day.

Fifteen control patients underwent excision of the gland through a conventional transcervical approach. A curvilinear incision was made in a natural skin crease overlying the submandibular gland, usually 3 to 4 cm below the lower border of the mandible. The incision was carried down through the subcutaneous fat and the platysma. The other procedures for excision of the gland were the same as in the retroauricular approach.

**RESULTS**

The disorders of the submandibular gland were pleomorphic adenoma (n=15), chronic sialadenitis with sialolithiasis (n=13), and inflammatory salivary gland diseases of Küttn er (n=1) or Kimura (n=1) and were comparable between groups (Table 1). The stones were found in the hilum (n=8) or the gland (n=5). Pleomorphic adenomas were completely removed with the gland. Gross specimens and margins of the tumors were the same.
between groups. Careful reviews of permanent pathologic sections also showed no close or positive tumor margins in either group. The mean size of the tumor was 2.5 cm (range, 1.5-5 cm) in the retroauricular group and 2.8 cm (range, 1.8-5.4 cm) in the control group. The gland sizes in other inflammatory disorders were comparable between groups. No tumor spillage occurred during the procedures, and no conversions to the conventional approach were necessary in any patients. Although bleeding control was usually difficult in the retroauricular group because of the narrow working space, significant bleeding and vascular complications were not encountered in either group.

The incision was significantly longer in the retroauricular approach than in the transcervical approach (Table 2). Average operation time of the retroauricular group was approximately 10 minutes longer than that of the control group, which did not reach statistical differences (P=.08). Average hospital stays were comparable between groups (P=.48). All wounds healed well, without hemorrhage, infection, salivary fistula, or necrosis of skin flap in either group. Median wound healing time was approximately 3 weeks after surgery and did not differ between groups. Severity and duration of postoperative pain were comparable between groups, and oral analgesic agents were commonly administered to the patients of each group until 5 days after surgery. Marginal nerve palsy developed in 2 patients (13%) in the control group, in one permanently, but did not occur in any patients of the retroauricular group. Transient palsy of the lingual nerve occurred in 1 patient in each group but cleared within 3 months of surgery. Transient numbness of the earlobe developed in 2 patients in the retroauricular group but cleared within 3 months of surgery. There was no recurrence of symptoms or stones postoperatively, and no cases required reoperation.

The average score of patient satisfaction with the incision scar was significantly higher in the retroauricular group than in the control group (P<.001). The incision scars were less prominent because they were hidden by the natural hairline and auricle of the patient 6 months after surgery.

Figure. Surgical procedures and cosmetic outcome of a retroauricular approach. A, A well-defined, low contrast-enhanced mass was found in the right submandibular gland on an axial computed tomography scan. B, A skin incision was made along the postauricular sulcus and hairline. C, The skin flap was elevated above the gland and lesion. D-F, The gland and mass were completely removed with careful dissection without tumor spillage. G, The incision scar was hidden by the natural hairline and auricle of the patient 6 months after surgery.
dibular angle from the parotid gland or by upward
served by direct identification of the nerve along the man-
gery can be completed with no great difficulty by careful
surance from the hairline to the hilum of the submandibu-
crease complication rates in this study. In fact, the dis-
however, the surgical visualization was not so limited
ative field than the conventional transcervical approach.
retroauricular approach with no preauricular incision but only an incision made
along the natural sulcus behind the auricle and hairline. The retroauricular hairline incision is commonly less
prominent, or even invisible, because it is hidden by the
auricle and hair after surgery. In the present study, this
approach showed better cosmetic outcome than the con-
tional transcervical approach after submandibular
gland excision. Most patients in the retroauricular
group were satisfied with the invisible incision scar postop-
tory, and in 1 case was permanent, which seemed to be
due to the careless dissection of the skin flap or forceful
upward elevation of the skin flap with the mandible using
retractor. Other important neurovascular struc-
tures can also be preserved by careful dissection of the
gland from the surrounding structures. The wider and
longer flap elevation caused a slight increase in opera-
tion time but left no permanent sequelae such as flap ne-
crosis, excessive fibrosis, or hypesthesia.

A cosmetic intraoral approach for submandibular gland
excision has been suggested. However, this approach
seems to provide a narrower surgical view, more unfam-
iliar anatomic delineation, longer operative time, and
greater risk of subsequent possible injury to the lingual
nerve than the conventional approach. The retroauricu-
lar approach appears to have better surgical exposure than
the intraoral removal of the submandibular gland. A po-
tential disadvantage of the retroauricular approach is
slightly increased operative time compared with the con-
trol group. This resulted from the need for a longer in-
cision and wider flap elevation than is needed for the con-
tventional approach. In comparison with the conventional
approach, another possible disadvantage of the retroau-
ricular approach may be increased risk of the need for reopera-
tion to treat recurrent disease or when unusual
abnormalities are encountered during surgery. How-
ever, a smaller incision than that of the conventional
approach may be added at the submandibular or submen-
tal area if these events happen. Furthermore, incisions
extended along the posterior and lower neck may be added to
the lower end of the hairline incision if malignancy is
strongly suspected during surgery or neck node dissec-

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Transcervical</th>
<th>Retroauricular</th>
<th>P Value†</th>
</tr>
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<tbody>
<tr>
<td>Incision</td>
<td>Upper cervical</td>
<td>Postauricular sulcus, hairline</td>
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</tr>
<tr>
<td>Length, cm</td>
<td>5.5 ± 1.7 (4.2-6.6)</td>
<td>12.2 ± 1.4 (10.5-13.2)</td>
<td>&lt;.001</td>
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<td>Operation time, min</td>
<td>38 ± 15 (25-49)</td>
<td>49 ± 17 (29-65)</td>
<td>.08</td>
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<tr>
<td>Hospital stay, d</td>
<td>3.2 ± 0.6 (2-4)</td>
<td>3.4 ± 0.9 (2-5)</td>
<td>.48</td>
</tr>
<tr>
<td>Subjective satisfaction score of incision scar†</td>
<td>4.2 ± 2.9 (2.2-7.4)</td>
<td>8.9 ± 0.9 (7.2-10)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Hypertrophic scar, No. (%)</td>
<td>3 (20) 3 (20)</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Hiding of incision scar</td>
<td>No</td>
<td>Yes</td>
<td>NA</td>
</tr>
<tr>
<td>Complication, No.</td>
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<td></td>
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<tr>
<td>Marginal nerve palsy</td>
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<td>Transient LNP (1)</td>
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<td>NA</td>
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<tr>
<td>Transient numbness of the earlobe</td>
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<td>2</td>
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<tr>
<td>Alopecia of the hairline</td>
<td>0</td>
<td>2</td>
<td>NA</td>
</tr>
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</table>

Abbreviations: LNP, lingual nerve palsy; NA, not applicable.

*Unless otherwise indicated, data are reported as mean ± SD (range).
†Evaluated by each patient 6 months after surgery by visual analogue scale, ranging from 0 to 10, with higher scores indicating better patient satisfaction.
‡Mann-Whitney test.

The skin incision in the retroauricular approach was de-
signed in part by reference to previous descriptions of
incisions for cervicofacial rhytidectomy and parotidec-
tomy. However, the present modified method re-
quires no preauricular incision but only an incision made
along the natural sulcus behind the auricle and hairline. The retroauricular hairline incision is commonly less
prominent, or even invisible, because it is hidden by the
auricle and hair after surgery. In the present study, this
approach showed better cosmetic outcome than the con-
tventional transcervical approach after submandibular
gland excision. Most patients in the retroauricular
group were satisfied with the invisible incision scar postoper-
tively. Even hypertrophic scarring or alopecia on the in-
cision line was commonly hidden by the patient’s hair
or auricle in the retroauricular group.

In the present study, the submandibular gland was
safely removed by way of the retroauricular approach with
no significant morbidity. This approach often requires a
longer operative time and results in a narrower oper-
tative field than the conventional transcervical approach.
However, the surgical visualization was not so limited
as to cause blind resection of the gland or lesions or to
increase complication rates in this study. In fact, the dis-
tance from the hairline to the hilum of the submandibu-
lar duct was approximately 10 cm. However, the sur-
gery can be completed with no great difficulty by careful
dissection and forceful retraction of the skin flap. In ad-
dition, the marginal mandibular nerve can be safely pre-
served by direct identification of the nerve along the man-
dibular angle from the parotid gland or by upward
retraction after ligation of the facial vein. Retroauricular
dissection begins more posterior on the neck than the con-
tventional approach and only the skin flap is el-
evated with no mandibular retraction. Conversely, mar-
ginal mandibular nerve palsy temporarily occurred in
2 of the 15 patients who underwent conventional sur-
gery, and in 1 case was permanent, which seemed to be
due to the careless dissection of the skin flap or forceful
upward elevation of the skin flap with the mandible using
retractor. Other important neurovascular struc-
tures can also be preserved by careful dissection of the
gland from the surrounding structures. The wider and
longer flap elevation caused a slight increase in opera-
tion time but left no permanent sequelae such as flap ne-
crosis, excessive fibrosis, or hypesthesia.
tion needs to be performed. In addition, it seems possible to perform reoperation through the prior retroauricular incision for recurrent cases. However, this must be evaluated in future studies.

The retroauricular approach is indicated for most benign submandibular gland diseases. It might prove less useful for treating inflammatory disorders of the submandibular gland because these often involve adhesions with surrounding tissues. However, the gland can be safely removed by means of careful dissection. Most benign neoplasms can be easily separated from surrounding normal tissues and completely removed by using this approach without tumor spillage. However, the retroauricular approach may be limited in its use for the removal of large benign submandibular gland tumors that commonly hinder clear surgical visualization. In the present study, a 5-cm pleomorphic adenoma was removed by this approach.

The retroauricular approach is contraindicated for most malignant lesions. It does not allow full wide visualization of the central or lower compartment of the neck. This approach appears not to be adequate in dissecting neck nodes. However, more cosmetically acceptable incisions of neck dissections can be made if this approach is combined with posterior and lower neck incisions. In addition, the sites or lesions difficult to visualize by the naked eye can be accessed with endoscopes after the hairline incision is made, which has been suggested by reports on endoscopic removal of the submandibular gland.10,11

In conclusion, the retroauricular approach for submandibular gland excision has been suggested in this study. The general population has been increasingly concerned about prominent or even visible postoperative scars on the neck. This approach, using an incision along the postauricular sulcus and hairline, appears to provide better cosmetic outcome without significant complications compared with a standard transcervical approach. This approach may provide an alternative to transcervical or intraoral removal of the submandibular gland by allowing better cosmetic results without compromising surgical exposure.

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Correspondence: Jong-Lyel Roh, MD, PhD, Department of Otolaryngology, Asan Medical Center, University of Ulsan College of Medicine, 388-1, Pungnap-dong, Songpa-gu, Seoul 138-736, South Korea (rohjl@amc.seoul.kr).

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REFERENCES