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# Endoscopic submandibular gland resection preserving great auricular nerve and periaural sensation

Doh Young Lee, Kwang-Yoon Jung, Seung-Kuk Baek\*

Department of Otorhinolaryngology-Head and Neck Surgery, Korea University College of Medicine, Seoul, South Korea

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## ABSTRACT

**Objective:** The preservation of periaural sensation is one of the most important things to improve the postoperative quality of life after performing the surgical procedures via retroauricular approach. The aim of this study is to describe the surgical technique of endoscopic submandibular gland (SMG) resection through the potential plane between great auricular nerve (GAN) and sternocleidomastoid muscle (sub-GAN dissection) and to evaluate its technical feasibility and advantage.

**Methods:** The present study enrolled 22 patients who underwent endoscopic SMG resection through linear hairline incision and sub-GAN dissection. The assessment was performed on the following: the cosmetic satisfaction after surgery and surgery-related variables.

**Results:** There was one case of a postoperative hematoma, which resolved with conservative management via a compression dressing, and one case of transient numbness at the surgical site, which spontaneously resolved within two months. In all other patients, no complications, such as seroma, skin necrosis, or marginal mandibular nerve palsy, occurred. The mean scores of pain and paresthesia evaluated with the graded scale approximated 0 (no pain or paresthesia). The cosmetic result score was as low as 1.5 (“extremely satisfied” or “satisfied”).

**Conclusion:** Linear hairline incision and sub-GAN dissection were feasible to acquire the sufficient working space for endoscopic SMG resection without sensory deterioration of GAN. This procedure may be useful to apply the surgery of other upper neck masses or thyroidectomy via retroauricular approach.

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## 1. Introduction

Until recently, to improve cosmetic results, endoscopic resection of the submandibular gland (SMG) through various routes has been assessed [1–3]. Endoscopic SMG resection via a facelift incision has shown superior cosmetic results than the conventional approach [4] and a better visual field than the transoral endoscopic approach [5,6]. However, it is sometimes difficult to achieve sufficient working space during the surgical procedure, thus, necessitating an additional long curvilinear incision along the postauricular sulcus and hairline as well as wide extension of the subcutaneous dissection [6–9]. Of most importance is that the risk of great auricular nerve (GAN) damage may be increased when elevating the skin flap or using endoscopic instruments. In addition, the posterior portion of the SMG is obscured by its

course, which runs near the mandibular angle (Fig. 1). However, the literature contains minimal discussion regarding the effective management of the GAN and its proper approach including flap elevation. We report our experience and technique of endoscopic SMG resection through the potential plane between the GAN and the sternocleidomastoid muscle (sub-GAN dissection) and show its technical feasibility and advantages.

## 2. Materials and methods

### 2.1. Patients

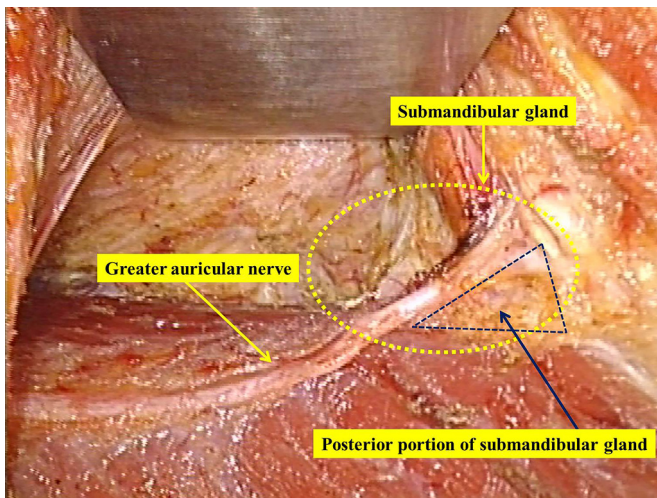
The protocol of this prospective study has been approved by the Institutional Review Board of Korea University Hospital, and the investigators have obtained written informed consent from each participant or each participant’s guardian. From February 2011 to May 2013, 22 patients with endoscopic SMG resection through a linear hairline incision and sub-GAN dissection were included in the study. All of the subjects were given detailed information about this technique and provided informed consent. To estimate the feasibility of this surgical approach, we performed the assessment

\* Corresponding author at: Department of Otorhinolaryngology-Head and Neck Surgery, Korea University Anam Hospital, 73, Incheon-ro, Seongbuk-gu, Seoul, South Korea. Tel.: +82 2 920 6618; fax: +82 2 920 5233.

E-mail address: [mdskbaek@gmail.com](mailto:mdskbaek@gmail.com) (S.-K. Baek).

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**Fig. 1.** Surgical field after performing superficial dissection over greater auricular nerve. Great auricular nerve (GAN) has a course crossing over submandibular gland (SMG) and the important structures such as facial artery, mylohyoid, lingual nerve, and hypoglossal nerve are identified through the posterior portion of SMG (dotted triangle) during endoscopic SMG resection.

of the cosmetic result and surgery-related variables, including histopathologic diagnosis, surgery time, amount of drainage, hospital stay, and complications. At postoperative 1 month, pain, paresthesia of the surgical wound, and cosmetic improvement were evaluated by questionnaires two months postoperatively. Pain was measured with the visual analog scale (VAS), which is a 10 cm scale, ranging from “no pain” to “pain as bad as it can be”. Paresthesias of the neck, ear lobe, and tongue were rated between 0 (none), 1 (mild), 2 (moderate), 3 (severe), and 4 (very severe). In addition, the cosmetic result was evaluated on a graded scale of 1 (extremely satisfied), 2 (satisfied), 3 (average), 4 (dissatisfied), and 5 (extremely dissatisfied).

## 2.2. Surgical procedure

Each patient was placed in the supine position under general anesthesia. The neck was extended and the head was rotated to the opposite side of the operative site. A skin incision was made linearly along the hairline, 6 cm in length (Fig. 2A). A skin flap was dissected and elevated just above the sternocleidomastoid muscle; the GAN and the external jugular vein attached to the flap elevated (Fig. 2B). Below the mandibular angle, the posterior belly of digastric muscle was identified in front of the anterior border of sternocleidomastoid. After the posterior-inferior border of the SMG was carefully exposed, the enveloped capsule of the SMG was incised. When the SMG and adjacent tissue were partly exposed, a self-retractor was applied and the skin flap was raised using a lifting device to create a working space. A sheath for the endoscope was tied at the upper corner of the skin incision and a 10-mm 30° rigid endoscope was manipulated by an assistant. The other laparoscopic equipments employed were a laparoscopic dissector and Harmonic scalpel (Harmonic Ace 23E; Johnson & Johnson Medical, Cincinnati, OH) for surgical dissection and tissue resection, and an Allis clamp for the SMG or adjacent tissue traction. The surgical dissection was performed in the plane deep to the superficial layer of the deep cervical fascia that envelops the SMG. The facial artery was identified at the posterior portion of the SMG and its distal branches were transected with the Harmonic scalpel (Fig. 2C). The gland was separated first from the free edge of the mylohyoid and then at the deep portion of gland; this was done following careful separation of the submandibular ganglion from the lingual nerve with precautions taken to avoid hypoglossal

nerve injury. Then, Wharton's duct was transected (Fig. 2D). After removing the gland, a suction drain was inserted at the lower margin of incision line and the skin incision was closely approximated with interrupted sutures.

## 3. Results

The age at diagnosis of the 16 female and 6 male patients ranged from 21 to 71 years (mean, 41.5 years). The mean surgery time (including flap elevation) was  $109.0 \pm 23.8$  min and the mean drainage was  $85.5 \pm 40.2$  cc. The mean hospital stay was  $4.6 \pm 0.7$  days. There was one case of a postoperative hematoma, which resolved with conservative management via a compression dressing, and one case of transient numbness at the surgical site, which spontaneously resolved within two months. In all other patients, no complications, such as seroma, skin necrosis, or marginal mandibular nerve palsy, occurred. The mean scores of pain and paresthesia evaluated with the graded scale approximated 0 (no pain or paresthesia) (Table 1). The cosmetic result score was as low as 1.5 (“extremely satisfied” or “satisfied”).

## 4. Discussion

This study showed that it is possible to develop an adequate working space with a linear hairline incision without any extension of the skin incision and the sub-GAN dissection through the potential plane between the GAN and sternocleidomastoid muscle; this finding is in contrast to previous studies in which the skin flap was elevated over the GAN [8–10]. A benefit of the sub-GAN dissection technique is the ability to make a direct and wide exposure of the posterior portion of the SMG. Since the endoscopic SMG resection was performed at the posterior side of the SMG, in contrast with the conventional approach performed at the lateral side of SMG, an adequate exposure and approach from the posterior portion of the SMG is extremely important for the identification of key structures. Therefore, elevating the skin flap with the GAN, which obscures the operative field because it courses below the facial skin just superficial to the mandibular angle, facilitates a more effective exposure of the SMG and its adjacent structures. Furthermore, since the GAN is a cutaneous sensory nerve that has no connection with sternocleidomastoid muscle, a sub-GAN dissection may facilitate the reduction of GAN injury by preserving microvasculature between the GAN and skin flap. Additionally, when performing endoscopic surgery, most of the endoscopic instruments are supported at the lower margin of surgical field. Therefore, if the GAN is at the lower margin of the surgical field, surgical trauma to the GAN by endoscopic instruments may be inevitable. In addition, another benefit with a sub-GAN dissection is that it facilitates avoidance of injury to the marginal and cervical branches of the facial nerve because the plane of the sub-GAN dissection is located below those branches.

When the skin flap elevated and the GAN is raised with a self-retractor and lifting device, traction injury of the GAN may occur. However, since most of the traction force is applied to the distal portion of the self-retractor, the tension on the GAN, which is located at the proximal portion of the self-retractor, may be relatively low. In the present study, the assessment of paresthesia of the GAN innervation region by using a self-estimation questionnaire showed no significant difference before and after surgery. In addition, our data showed that the surgery time was longer than the previous report [11]; we believe that the difference resulted because our study had more cases with sialolithiasis (36.4%) where the severe adhesion of inflamed SMG could influence the surgery time.

We believe that a sub-GAN dissection with a linear hairline incision can be applied to endoscopic resection for other upper

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