MINIMALLY INVASIVE ENDOSCOPIC RESECTION OF THE SUBMANDIBULAR GLAND: A NEW APPROACH

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Abstract: Background. This study evaluates the benefits of a new approach, endoscopic resection of the submandibular gland through the hyoid midline level skin incision by use of an ultrasonically activated scalpel.

Methods. Twelve operations for patients presenting with submandibular gland disease were performed via minimally invasive endoscopic resection by a single surgeon (M-KC).

Results. All 12 submandibular gland resections were successfully performed endoscopically, and no conversions to conventional open resection were necessary. Of the 12 patients who underwent excision, 3, 6, and 3 had mixed tumor, sialoadenitis with sialolithiasis, and chronic sialoadenitis, respectively. The procedures lasted 50 to 125 minutes (median duration, 70 minutes). No complications associated with the operation occurred, and the scar was almost invisible because of its concealed location with the neck in the natural position.

Conclusions. Endoscopic resection of the submandibular gland is a feasible method for treatment of benign lesions. The main advantages of this procedure are that the small operative scar is concealed in the submental skin crease, resulting in improved cosmetic results and minimization of the possibility of facial nerve injury.

Keywords: minimally invasive; endoscope; submandibular gland; new approach; invisible scar

Minimally invasive endoscopic surgery has emerged as the standard, and frequently preferred, technique in a number of surgical disciplines, including urological, general, and orthopedic surgery, because of its minimal invasiveness with short recovery time. However, such operations are not yet a standard procedure in the head and neck region because of anatomic complexity in this region. The head and neck applications have largely been limited to endoscopic cosmetic surgery, endoscopic thyroidectomy, and endoscopic sinus surgery. In this study, we present a new approach of endoscopic submandibular gland resection at a tertiary referral medical center.

MATERIALS AND METHODS

From March to December 2002, we performed 12 resections of the diseased submandibular gland. There were 7 male and 5 female patients. The median age of the patients was 41.3 years (range, 30–59 years). All patients underwent CT scan and
MRI before the operation. Indications for endoscopic resection of the submandibular gland included proximally located salivary calculus, chronic sialoadenitis, and benign neoplasms. Suspected cases of malignant submandibular tumor were excluded from the study.

All operations were done under general anesthesia with supine positioning and neck hyperextension. A 20- to 25-mm skin incision was performed over the skin crease at the hyoid midline (Figure 1). The platysma muscle was separated using Metzenbaum scissors, and the surgical plane was easily dissected under the endoscope. After identification of the submandibular gland capsule, with the assistance of the 4-mm diameter, 0° and 30° angle endoscope (Karl-Storz, Germany) and harmonic scalpel (Ethicon Endo-Surgery, Cincinnati, OH) at a power level of 3, we dissected between the capsule and the circumferential tissue to minimize the possibility of damage to the marginal mandibular branch of the facial nerve. The main task of the first assistant was to keep the endoscope in the correct position during the procedure. The second assistant provided working space by holding 2 retractors to lift up away from the skin. The facial artery and vein were identified at the superior border of the gland, which was ligated by using the Endoclips (Ethicon Endo-Surgery), with no bleeding occurring. Subsequently, Wharton’s duct was identified, and the submandibular gland was pulled out through the surgical wound. Finally, after palpational confirmation of the intraglandular, or intraductal calculus, Wharton’s duct was suture-ligated and divided at the distal point. The wound was closed by subcuticular suture with 4-0 dexon and a small hemovac was placed for drainage.

RESULTS

All 12 submandibular gland resections were successfully performed endoscopically by the first author, with no conversions to open procedure. The mean length of the skin incision was 23 mm. Of the 12 patients who underwent excision, 3, 6, and 3 had mixed tumor, sialoadenitis with sialolithiasis, and chronic sialoadenitis (chronic inflammation with stricture of the salivary duct without sialolithiasis), respectively. The mean size of the submandibular gland was 45 × 30 × 16 mm³. The procedures lasted 50 to 125 minutes (median duration, 70 minutes). The duration of the operation decreased considerably after the first 7 cases (Figure 2). The blood loss was minimal, and no operative complications occurred. Compared with the conventional approach using a skin incision over the lateral neck, the wound was smaller and hidden in the submental, midhyoid skin crease. The skin incision was invisible (Figure 3) except during neck hyperextension, resulting in improved cosmetic results. The follow-up average was 18 months. No recurrence of tumor occurred in this series.

DISCUSSION

Endoscopic operations have several benefits, including reduced tissue damage, improved cosmetic appearance, and fewer wound-related complications. However, such operations are not yet a standard procedure in the head and neck region. In 1997, Hüscher et al reported their first endoscopic thyroidectomy. They achieved good cosmetic results. In the same year, several studies of endoscopic parathyroidectomy were reported. In 2003, Terris et al reported the first endoscopic selective neck dissection in a porcine model. They concluded that the combination of selective neck dissection with endoscopic technology offers the promise of truly minimally invasive surgery for the node-negative neck.

Resection of the submandibular gland is performed classically through a lateral cervical incision. The lateral cervical approach can result in a visible and prominent scar, which is troublesome not only in young girls but also in other patients. Another common complication is damage of the marginal mandibular branch of the facial nerve, which has been reported to happen in 1% to 7% of
There have been a few reports of endoscopic resection of the submandibular gland. In 2001, Guerrissi and Taborda reported 2 cases of endoscopic excision of submandibular gland sialolithiasis by an intraoral approach. However, we think the increased potential risk of postoperative neck space infection should be taken into consideration with regard to the transoral approach. Also in 2001, Komatsuzaki et al performed video-assisted submandibular sialadenectomy for 4 cases of intraglandular part sialolithiasis. Although the skin incision was shorter in length, the skin incision was just above the inferior margin of the submandibular gland lying parallel to the mandible, like the conventional incision in the lateral neck. In 2002, Monfared et al reported the endoscopic resection of the submandibular gland in a porcine model. In the study, the skin incision was 4 cm lateral to the sternal notch. The authors performed 12 resections of the submandibular gland in porcines. An operative pocket was created by means of balloon dissection and maintained by low-pressure CO\textsubscript{2} insufflation. Three openings were made for placement of one 12-mm and two 5-mm trocars. The operative time ranged from 42 to 165 minutes, but decreased with training, from 120 minutes for the first cases to 35 minutes for the later cases. All the reported studies concluded that endoscopic submandibular gland resection is possible. In our study, the endoscopic resection of submandibular gland from the new approach was feasible for both inflammatory diseases and benign tumors. However, in applying this technique in patients with benign tumors, the operator has to avoid the tumor spillage. As we mentioned in the Methods section, we identified the submandibular gland capsule and carefully dissected between the capsule and the circumferential tissue under the endoscope, minimizing the possibility of tumor spillage. In the field of endoscopic neck surgery, some authors have applied CO\textsubscript{2} insufflations to create a working space. This is associated with possible decreased with training, from 120 minutes for the first cases to 35 minutes for the later cases. All the reported studies\textsuperscript{8–11} concluded that endoscopic submandibular gland resection is possible. In our study, the endoscopic resection of submandibular gland from the new approach was feasible for both inflammatory diseases and benign tumors. However, in applying this technique in patients with benign tumors, the operator has to avoid the tumor spillage. As we mentioned in the Methods section, we identified the submandibular gland capsule and carefully dissected between the capsule and the circumferential tissue under the endoscope, minimizing the possibility of tumor spillage. In the field of endoscopic neck surgery, some authors have applied CO\textsubscript{2} insufflations to create a working space. This is associated with possible
Complications such as massive subcutaneous emphysema, hypercarbia, and some types of arrhythmia. In this new approach, the skin incision is not far from the submandibular gland and the working space can be created without CO₂ insufflation.

Since its introduction in 1993, the harmonic scalpel (Ethicon Endo-Surgery) has gained popularity in a variety of surgical procedures. Potential advantages of the harmonic scalpel include less lateral thermal tissue damage with no electrical energy transferred to the patient when compared with monopolar or bipolar electrocautery. The harmonic scalpel cuts and coagulates via ultrasonic vibrations of the blade at 55,000 Hz, denaturing proteins and forming a coagulum that seals the vessels. Vessels up to 2 mm in diameter can be sealed by coaptation. Because ultrasonic vibration is the basis for the cutting and coagulation properties of the harmonic scalpel, no electrical energy is transferred to the patient. The unique properties of the harmonic scalpel make it a good choice for procedures in which control of blood loss in a limited surgical field and preservation of nerve function are of concern.¹²

With respect to the cosmetic results, the advantages of endoscopic resection of submandibular gland via the new approach include an almost invisible operative scar and avoidance of facial nerve injury. Compared with the conventional submandibular operation or the reported video-assisted submandibular sialadenectomy,⁹ the new approach resulted in shorter wound length and a concealed scar in the submental skin crease. The scar is only visible during neck hyperextension. Second, compared with conventional surgery in which injury of the marginal mandibular branch of the facial nerve is a common complication,⁶ ⁷ no damage to the facial nerve was noted in our series. The reason is due to the combined usage of the endoscope and harmonic scalpel, resulting in no electrical current and minimal invasiveness. During the endoscopic operation, the dissection and operation was performed below the plane of platysma muscle; therefore, it is not necessary to trace the loop of the marginal branch of the facial nerve. In addition, the unique properties of the harmonic scalpel make it a good choice for procedures in which control of blood loss in a limited surgical field and preservation of nerve function are of concern.¹²

The major disadvantage of endoscopic resections of the submandibular gland via the new approach is that this procedure is more time consuming compared with the conventional open method. The procedures lasted 50 to 125 minutes (median duration, 70 minutes). However, the duration of the operation decreased considerably after the first 7 cases. With advanced endoscopic instruments and increased surgeon experience, we believe the disadvantage can be overcome in the future.

**CONCLUSIONS**

The advantages of endoscopic resection of submandibular gland via our new approach include superior visualization, magnification of key structures, avoidance of facial nerve injuries, and concealment of the scar in the submental crease. This new operative method is feasible for inflammatory disease and benign tumors of the submandibular gland.

**REFERENCES**