

Endoscope-assisted versus conventional second branchial cleft cyst resection

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Abstract

Background This study evaluates the feasibility of endoscope-assisted second branchial cleft cyst resection via retroauricular approach by comparing it with conventional cervical incision for removal of second branchial cleft cyst.

Methods From January 2009 to December 2010, 25 patients were randomly assigned to the endoscope-assisted surgery group (13 patients) or the conventional surgery group (12 patients). The clinical characteristics of patients, operation time, operative bleeding volume, postoperative complications, and subjective satisfaction with incision scar checked by visual analog scale were compared between the groups, retrospectively.

Results All 13 second branchial cleft cyst resections were successfully performed endoscopically, and the wounds healed uneventfully. Endoscope-assisted surgery lasted 54.6 ± 6.3 min, and conventional surgery lasted 49.6 ± 6.9 min ($P = 0.069$). Degree of bleeding volume did not differ between the groups ($P = 0.624$). Mean patient satisfaction score was 9.2 ± 0.6 in the endoscope-assisted surgery group and 6.2 ± 0.8 in the controls ($P < 0.001$). All 13 patients in the endoscope-assisted surgery group were satisfied with their cosmetic results. One case showed temporary

numbness around the earlobe that recovered within 1 month after surgery. No marginal nerve palsy occurred. No complications such as bleeding, salivary fistula, or paresis of the marginal mandibular branch occurred. All 25 patients were disease free with follow-up of 6–24 months (median 16 months).

Conclusions Endoscope-assisted second branchial cleft cyst resection via retroauricular approach is a feasible technique. This procedure may serve as an alternative approach that allows an invisible incision and better cosmetic results.

Keywords Endoscope-assisted · Branchial cyst · Retroauricular approach · Invisible incision · Cosmetic results

Second branchial cleft cysts represent 67–93% of all branchial anomalies which are developmental disorders of the neck [1]. It typically presents as a painless, smooth, round neck mass located along the upper third of the anterior border of the sternocleidomastoid muscle and often appears after an upper respiratory infection [1]. Surgical resection of second branchial cleft cyst is considered the definitive treatment of choice. However, conventional resection requires a wide transverse cervicotomy incision, and sometimes leaves a prominent scar on the neck [2].

Endoscopic surgery, such as endoscopic parathyroidectomy and thyroidectomy, has been used more frequently in the head and neck area since the end of the 1990s [3, 4]. One of its advantages is that it leaves a minimal postoperative scar compared with the conventional approach [5, 6]. Based on our early experience of endoscope-assisted techniques in the head and neck area [7–10], a novel gasless endoscope-assisted second branchial cleft cyst

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resection via retroauricular approach was carried out and is presented in this study.

Patients and methods

Patients

From January 2009 to December 2010, 25 patients with a diagnosis of second branchial cleft cyst [confirmed by fine-needle aspiration cytology and computed tomography (CT) scan] were enrolled into this prospective clinical study. Patients were randomly assigned to the endoscope-assisted second branchial cleft cyst resection group or standard cervical incision group. Informed consent was obtained from each patient. A total of 13 consecutive patients who underwent the endoscope-assisted procedure for removal of second branchial cleft cysts were enrolled into the case group of this study. The group comprised six males and seven females ranging in age from 13 to 57 years (median 26.0 years) (Table 1). Their clinical symptoms and physical signs were painless masses located along the upper third of the anterior border of the sternocleidomastoid muscle. The surface of the mass was smooth with a clear border. CT scans before the operation showed that the longest cyst diameters ranged from 4 to 13 cm (median 5.8 cm). An additional control group consisted of five males and seven females with mean age of 31.7 years (range 13–57 years), who underwent conventional surgeries (Table 1).

Both groups of patients were matched in terms of age, sex, diameter of the cyst, and anesthesia. All patients who were identified as having received previous neck surgery or irradiation were excluded. Informed consent was approved by the institutional review board and obtained from all patients in this study.

Instruments

A 4-mm-diameter, 0° endoscope, television monitor, equipment for endoscopic thyroid surgery (Karl-Storz Corporation,

Tuttlingen, Germany), and the Harmonic scalpel (Johnson & Johnson Corporation, Shanghai, P.R. China) were used in the present study.

Surgical technique

In the endoscope-assisted group, all 13 patients were placed in supine position with a pillow under their shoulder, and were placed under general anesthesia. The operating team consisted of four people: the chief surgeon, the endoscope assistant, an assistant surgeon who helped to keep the working cavity using a retractor, and a scrub nurse. Patient positioning with right-side second branchial cleft cyst and the surgical team is shown in Fig. 1.

A retroauricular incision was made through the skin, subcutaneous tissue, and platysma muscle. The incision was made along the postauricular sulcus and hairline, starting from the lower end of the postauricular sulcus, moving upward to the middle or upper third of the sulcus, and then smoothly angulating downward to 0.5 cm above the hairline (Fig. 2A). The skin flap was dissected under platysma with the help of the 4-mm-diameter, 0° endoscope. During this step, careful attention to the overlying sternocleidomastoid muscle prevented injury to the great auricular nerve and external jugular vein (Fig. 2B). The working space was then produced by elevating the skin flap just above the sternocleidomastoid muscle onto the carotid triangle. The cyst was exposed anterior and deep to the sternocleidomastoid muscle at the level of the carotid bifurcation after careful dissection of the accessory nerve and posterior belly of digastric muscle (Fig. 2C). Then, dissection using the ultrasonic scalpel was carried out to free the attachments of the cyst, and the cyst was completely removed (Fig. 2D). In very large cysts (longest diameter ≥ 8 cm), decompression was often performed by fluid aspiration and needle-pricking. For final histologic examination, all specimens were sent for paraffin section. Finally, the wound was closed by subcuticular suture with 4-0 Dexon, and a small Hemovac was placed for drainage.

In the control group, a curvilinear incision was made along natural skin creases overlying the lesions of the

Table 1 Comparison of endoscopy-assisted surgery and conventional surgery

	Endoscopy-assisted surgery (13 cases)	Conventional surgery (12 cases)	<i>P</i> value
Sex: male/female (cases)	6/7	5/7	0.821
Age (years)	26.0 \pm 11.9	31.7 \pm 12.9	0.414
Cyst diameter (cm)	5.8 \pm 2.5	6.2 \pm 2.8	0.527
Operation time (min)	54.6 \pm 6.3	49.6 \pm 6.9	0.069
Operative bleeding volume (ml)	15.0 \pm 4.6	15.0 \pm 6.7	0.624
Subjective satisfaction with incision scar (VAS)	9.2 \pm 0.6	6.2 \pm 0.8	<0.001

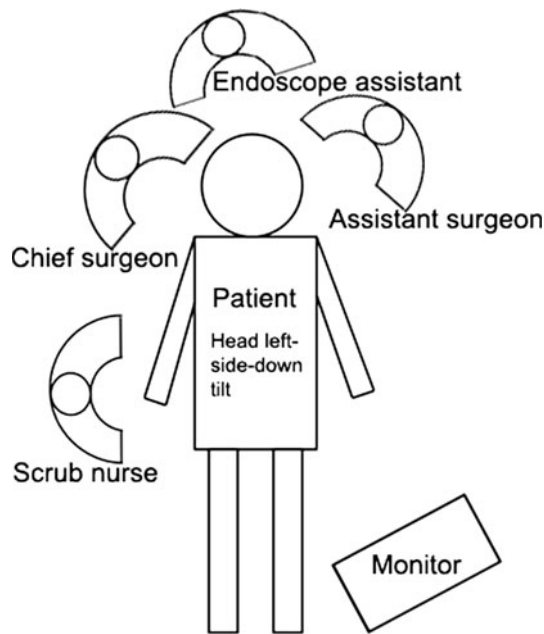


Fig. 1 Positioning of patient, operating team, and monitor

upper neck, usually 3–4 cm below the lower border of the mandible. The other procedures for extirpation of lesions were the same as the above-mentioned surgical methods.

Statistical analysis

The outcomes of the two groups were compared in terms of operation time, operative bleeding volume, complication rates, and subjective satisfaction with incision scars evaluated at 6 months after surgery by visual analog scale ranging from 0 to 10, with higher score meaning better patient satisfaction. The data for each group are expressed as mean \pm standard deviation (SD). Statistical comparison between the two groups was performed with Student's *t* test using SPSS 11.0 (SPSS Inc., Chicago, IL) for Windows. $P < 0.05$ was regarded as statically significant.

Results

The cysts were completely resected in all 25 cases (both groups). All 13 operations were successfully performed endoscopically, and no conversions to conventional open resection were necessary. All wounds healed uneventfully. Postoperative pathological examination showed branchial cleft cyst.

In the endoscope-assisted surgery group, the diameter of the cyst was 5.8 ± 2.5 cm, the operative bleeding volume was 15.0 ± 4.6 ml, and the operating time was 54.6 ± 6.3 min. In the conventional surgery group, the diameter of the cyst was 6.2 ± 2.8 cm, the bleeding volume was

15.0 ± 6.7 ml, and the operating time was 49.6 ± 6.9 min. Using *t* test analysis, the bleeding volume of endoscopic surgery was found to be consistent with that of conventional surgery ($P = 0.624$), and the operation time was the same for both groups ($P = 0.069$). The mean score of patient satisfaction with incision scars checked by visual analog scale was much higher in the endoscope-assisted group compared with the control group ($P < 0.001$) (Table 1). The scars of the patients in the endoscope-assisted group were less prominently seen because of hiding by the auricle and natural hair (Fig. 3).

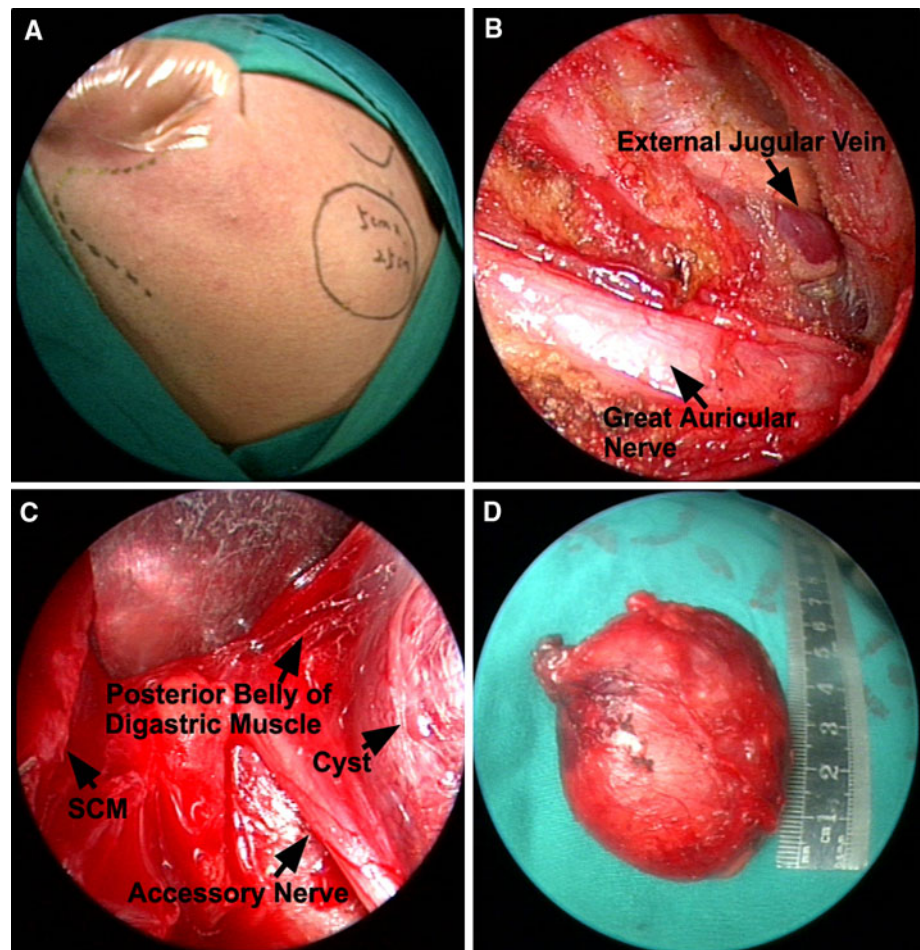
One patient suffered from weakness of the great auricular nerve, but recovered within 1 month after surgery. No marginal nerve palsy occurred. No complications such as bleeding, salivary fistula, or paresis of the marginal mandibular branch occurred. All patients were disease free with follow-up of 6–24 months (median 16 months).

Discussion

Second branchial cleft cyst usually occurs in young adults between the ages of 10 and 50 years [1]. It often appears after an upper respiratory infection. If sufficiently large, these anomalies can cause asymmetry of the neck as well as dyspnea, dysphagia, and dysphonia [11]. Surgical resection of second branchial cleft cysts is considered the definitive treatment of choice. However, conventional open branchial cleft cyst resection usually requires a long incision line (more than 5.0 cm) on the neck, which is always opened, and sometimes leaves a prominent scar on the anterior neck [11], occasionally disturbing both patients and doctors. To overcome this obstacle, various approaches have been reported during the past decades, such as facelift approach [12], retroauricular approach [11, 13, 14], and endoscope-assisted neck approach [15, 16]. These various approaches and methods have their own advantages and pitfalls, and which approach is the best choice for branchial cyst resection is still controversy.

Hughes et al. [11] reported second branchial cleft cyst resection via facelift approach. In this method, the skin incision still leaves a visible scar, which is at the anterior border of the earlobe. To avoid this problem, Chen [11] and Roh [13, 14] carried out second branchial cleft cyst resection via retroauricular approach, the postoperative scar of this approach being invisible because it is hidden by the auricle and natural hair; however, the narrower surgical view can be easily disturbed by poor illumination and smoke or fumes created by use of electrical cautery or the Harmonic scalpel. To overcome the poor operative field of view, Guerrissi [15] and Matsui [16] introduced the endoscope-assisted approach for branchial cleft cyst resection, but this procedure results in a scar 1.5–2.0 cm in

Fig. 2 Resection of second branchial cleft cyst via retroauricular approach. A skin incision was made along the postauricular sulcus and hairline (A). The working space was constructed after tissue under platysma was undermined by sharp dissection. During this step, careful attention to the overlying sternocleidomastoid muscle prevented injury to the great auricular nerve and external jugular vein (B). The cyst was exposed anterior and deep to the sternocleidomastoid muscle (SCM) at the level of the carotid bifurcation after careful dissection of the accessory nerve and posterior belly of digastric muscle (C). The cyst was then completely removed (D)



length on the neck. Therefore, another procedure that results in less prominent incision scars and a less compromised operative view is required. Based on our early experience of endoscope-assisted technique used in the head and neck area [7–10], the present study showed that endoscope-assisted second branchial cleft cyst resection via retroauricular approach gives a better cosmetic outcome than the conventional transverse cervicotomy incision. In this current study, all patients were satisfied with the concealed postauricular scars, because they were hidden by the auricle and natural hair. No significant complications were associated with this surgical method. Another advantage of this method is that, during the operative procedure, the cysts are palpable and the operative instruments used in open surgery can also be used. Moreover, this randomized controlled study overcomes the limitation of the absence of a control group in previous studies [11, 14].

Endoscopic technique provides good illumination and magnification of surgical procedures using a video monitor. Tissues, such as the carotid sheath and the spinal accessory and hypoglossal nerves, are identified and visualized clearly, and can be dissected efficiently. A potential

disadvantage of retroauricular approach may be the slightly longer operating time compared with conventional trans-cervical approaches, because the retroauricular approach gives a narrower surgical view. However, in this current study, the operating time of endoscope-assisted second branchial cleft cyst resection was the same as that of the conventional group ($P = 0.069$). The main reason could be the good illumination and magnification of surgical procedures using a video monitor.

This study reveals that magnification of tissues during surgical procedures is helpful for prevention of surgical trauma. Damage to tissues during the surgery is minimized also because of the use of the Harmonic scalpel [17]. The Harmonic scalpel cuts and coagulates via ultrasonic vibrations of the blade at 55,000 Hz, denaturing proteins and forming a coagulum that seals vessels. Vessels up to 5 mm in diameter can be sealed by coaptation [18]. Thus, the operative field is clean and bloodless, and accidental injury or abrasion of surrounding structures can be avoided. In this present study, complications for both the endoscope-assisted group and conventional group were also in line with those observed after conventional surgery [13, 14]. In the endoscope-assisted group, one case showed transient



Fig. 3 Photograph of patient taken at 6 months after surgery shows good cosmetic outcome because the incision scar is usually hidden by the auricle and hair

numbness around the earlobe, but recovered within 1 month after surgery. This complication can be prevented by careful preservation of great auricular nerve overlying the sternocleidomastoid muscle. The incidence of damage to the great auricular nerve was not increased in our series compared with previous studies [13, 14]. Sometimes, skin flap necrosis can develop, mainly along the angular margin of incision, but can usually be avoided by making a more obtuse angle and elevating a thicker cutaneous flap. In the current study, the wounds healed uneventfully, and there were no cases of skin flap necrosis. Moreover, paresis of marginal mandibular nerve may occur after the surgery, but this can be prevented by direct identification of the nerve along the mandible angle from the parotid gland or by upward retraction after ligation of the facial vein. In our current study, no cases of marginal mandibular nerve paresis occurred.

Today, endoscopic branchial cleft cyst surgery is still in its infancy; only a few studies have been reported, and the surgical method is far from perfect [15, 16]. The major advantages of this new approach include the almost imperceptible scars, and avoidance of injuries to important tissues with the help of good illumination and magnification provided by the endoscope. However, there are still some limitations to this study. Investigation of avoidance of great auricular nerve paresis, cyst recurrence, and shorter hospitalization needs a larger series of patients with longer follow-up. However, our early results appear encouraging.

Conclusions

Endoscope-assisted second branchial cleft cyst resection via retroauricular approach offers strong cosmetic advantage with no significant complications compared with

standard cervical incision. To the best of the authors' knowledge, endoscope-assisted removal of second branchial cleft cyst via retroauricular approach has not been performed. This approach will be helpful for patients with second branchial cleft cysts who hope for invisible external scar after surgery.

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