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ORIGINAL ARTICLE

Single-port endoscope-assisted resection of forehead osteoma

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forehead osteoma;
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Summary *Background/Introduction:* Endoscope-assisted resection of forehead osteoma is a well-established procedure with the advantages of improved safety, accessibility, and visualization of the mass, avoidance of visible scarring or pigmentation on the forehead, and reduced risk of bleeding, hematoma formation, nerve injury, or paresthesia. The potential drawbacks are alopecia on the scalp incision sites and injury of the deep supraorbital nerve branch.

Purpose/Aim: This study aimed to evaluate the feasibility of using a single scalp access point to remove forehead osteomata.

Methods: From 2003 to 2008, 13 patients diagnosed with forehead osteoma were retrieved from the pathology database of Taipei Veterans General Hospital, Taipei, Taiwan. Ten of the 13 patients underwent endoscope-assisted resection of the osteoma with a single scalp incision. Retrospective data collection and chart reviews were performed.

Results: The mean age of patients undergoing the operation was 49 years. The mean size of the osteoma was 13.5 mm and the mean operative time was 27 minutes (25–30 minutes). No complications such as hematoma, alopecia, nerve injury, or infection were identified and the patients were satisfied with the esthetic results. Mean follow-up duration was 76.3 months (63–122 months).

Conclusion: Removal of forehead osteoma from a single remote access with the aid of endoscopy is a safe and effective alternative. It can achieve the same esthetic and therapeutic results as the conventional two- or three-port approach without increasing the operative time or morbidities.

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Conflicts of interest: The authors declare that they have no conflict of interest.

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1. Introduction

Endoscope-assisted resection of forehead masses is a well-established, widely accepted procedure. This technique is used to treat lesions including lipoma, hemangioma, dermoid cyst, epidermal cyst, neurofibroma, and osteoma.¹ In comparison with simple direct excision of the forehead mass, forehead endoscopic surgery has advantages in safety, accessibility, visualization of the mass, avoidance of visible scar or pigmentation on the forehead, reduction in the risk of bleeding, hematoma formation, nerve injury, and paresthesia. Osteoma is a benign osseous tumor. It is a protruding mass and easily identified in the forehead. It is fixed, nontender, and slow growing. Most of the time, it is asymptomatic and can be differentiated from lipoma, hemangioma, or other soft tissue tumors by physical examination.¹ It is juxtacortically located and can be separated from the underlying normal frontal bone easily.² The incidence of forehead osteoma is low (0.014–0.43%) and the reported average size is small.^{1–3}

The increasing number of reports of endoscope-assisted forehead has indicated that endoscopy is important for the treatment of forehead soft tissue tumors. Because of the unique location and characteristics of forehead osteoma, experienced surgeons can diagnosis this condition preoperatively and perform superficial osteotomy from remote access with the aid of endoscopy.^{1–4}

The supraorbital nerve is an important sensory nerve in the forehead and scalp, which is at risk in many forehead surgeries. Injury to the deep branch of the nerve will result in scalp numbness and paresthesia, which is a distressful sequela for both patients and surgeons. Theoretically, surgeons should be able to use their understanding of anatomy and function to avoid injury to the nerve.⁵ However, the deep branch of the supraorbital nerve is vulnerable in forehead endoscopic surgeries, and caution should be exercised to avoid injury to the nerve. For endoscope-assisted osteoma resection, two- or three-port approaches are routinely suggested with a mean operative time of around 15–30 minutes.^{2,4,6–9} However, our experience has shown that a single port is enough for the resection of an osteoma. The fewer incision sites needed may also be instrumental in minimizing the risk of injury to the supraorbital nerve. In our hospital, most forehead osteomata have been excised through single remote scalp incision since 2003, and we here describe our experiences.

2. Materials and methods

Records of 13 patients diagnosed with forehead osteoma from 2003 to 2008 were retrieved from the pathology database of Taipei Veterans General Hospital, Taipei, Taiwan. Retrospective data collection and chart review were performed. Three were removed by the direct approach and were excluded.

Forehead osteoma was diagnosed from history and physical examination. Sonography was performed in uncertain cases to rule out soft tissue tumors. None of the lesions was larger than 3 cm in diameter. The presurgery medications prescribed included midazolam (Dormicum; Roche, Basel, Switzerland) 7.5 mg and tramadol

(Grünenthal, Aachen, Germany) 50 mg administered via the oral route 60 minutes before surgery, and regional block of the supraorbital nerve was routinely used. After adequate sensory block, the planned vertical incision line of about 2–3 cm in length was drawn above the hairline and infiltrated with 2% xylocaine with 1:200,000 epinephrine. The dissection area from the incision point to 1 cm distal to the osteoma with a width of around 2–3 cm was infiltrated with tumescent solution (0.1 mL epinephrine 1 mg/mL, 4 mL 2% xylocaine, and 2 mL 7% sodium bicarbonate added to 100 mL Ringer's lactate solution) subperiosteally (Figure 1). After gentle massage of the infiltrated area for a few minutes, a vertical scalp incision about 2–3 cm in length was made directly to the level of the bone. Subperiosteal dissection straight towards the osteoma with periosteal elevation can be performed under the guidance of the fingers of the opposite hand.^{3,4} Total elevation and separation of the tumor from the surrounding soft tissue was easy in all cases, and this is the key to successful surgery. Endoscopic inspection was carried out after isolation of the tumor to confirm the diagnosis of osteoma and ensure adequate release of the tumor from other soft tissues.

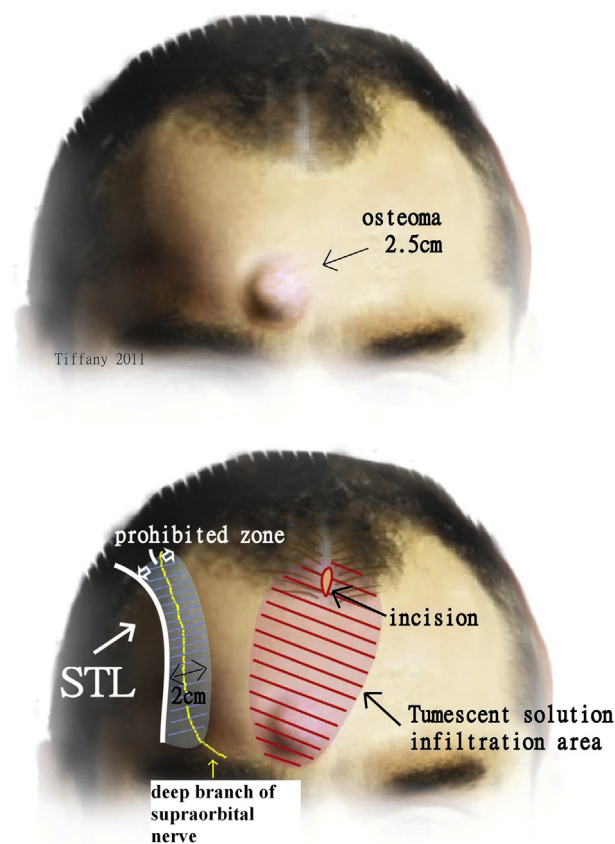


Figure 1 The planned vertical incision line (arrow) about 2–3 cm in length was drawn above the hairline and tumescent solution was infiltrated into the operative area (hatched zone from incision to 1 cm distal to the osteoma, with width around 2–3 cm). No incisions were made in the zone between the superior temporal line (STL) and a line 2.0 cm medial to the STL to avoid injury to the deep branch of the supraorbital nerve.

After the withdrawal of the endoscope, a curved osteotome of a suitable size was engaged at the junction of the tumor and frontal bone. The osteoma was levered gently with the osteotome until experiencing a sudden *give* feeling, indicating that the tumor had disconnected from the bony forehead. The wound was irrigated with normal saline and then the removed osteoma was *squeezed* toward the scalp incision manually. After the osteoma was removed, the endoscope was again inserted through the incision to ensure the result. The scalp incision was closed with 4-0 Nylon interrupted sutures. Patients were instructed to use cold packs over the forehead for a couple of days, and acetaminophen 500 mg four times/d was prescribed. Stitches were removed 1 week after surgery.

3. Results

Ten patients underwent endoscope-assisted excision of osteoma from a remote access site using a single port. There was one male and nine female patients and their ages ranged from 30 years to 62 years. The mean size of the osteoma was 13.5 mm, ranging from 5 mm to 25 mm in diameter. The mean operative time was 27 minutes (25–30 minutes). No complications such as hematoma, alopecia, nerve injury, or infection were identified, and the patients were satisfied with the esthetic results. Mean follow-up duration was 76.3 months (63–122 months; Table 1). There were no cases of residual tumor or tumor recurrence during a follow-up period of >5 years.

4. Discussion

Endoscope-assisted facial surgeries have been performed for >10 years. This method provides a different and excellent surgical field. Blunt dissection of the forehead area to create the optical cavity is recommended in the literature and textbooks.^{2–4,6–13} In general, lifting of the forehead and scalp is accomplished both by blind dissection and by endoscopically assisted release in the more critical areas. Initially, the surgeon dissects the periosteum from the forehead frontal bone, via vertical incisions behind the hairline, down to the level of the superciliary arches and out laterally to the superior temporal line without the assistance of the endoscope. Usually, frontal pocket dissection begins blind in a subperiosteal plane.^{10–13} With the increase in the use of facial endoscopic surgery, Cronin et al⁴ suggested that the endoscope should be used *routinely* for a mobile and soft mass or in patients with any

residual forehead scar. The endoscopic access incision was made behind the hair line, the same site as in standard endoscopic access. This technique avoids scars on patients' foreheads through the use of a remote access site during excision of forehead tumors. In our hospital, we use the same guidelines to evaluate, diagnose, and remove all mobile soft forehead masses such as lipoma, dermoid cyst, or other soft tissue tumors. *Direct* vision of the surgical field with endoscopic aid is necessary since surgeons have to incise the galea aponeurotica and then dissect the soft tissue masses from the surrounding soft tissues. Under these circumstances, an at least two- or three-port approach is mandatory. The endoscope provides a different and improved surgical field for soft tissue tumor excision and reduces possible adverse outcomes such as soft tissue injury, nerve damage, or visible scars. However, in some cases, endoscope-assisted forehead surgery is not convenient. For example, to treat skin lesion such as epidermal cysts, it is necessary to excise the involved skin together with the tumor. For nerve tumor excision, to strip the peripheral nerve from the tumor under microscopic dissection is mandatory.

In 1995, a forehead osteoma was reported to have been removed with the aid of endoscopy for the first time.⁶ However, Sewell et al¹ preferred the direct approach instead of remote access, and reported that one of the drawbacks of remote access is the inability to palpate the frontal bone directly. With the improvement of technology and increase in the use of endoscopic equipment, the traditional approach with a direct incision over the forehead mass may not be accepted by patients because of concerns of prominent forehead scars, even transiently.^{2–4,6–9}

For the orientation of the endoscopic entrance ports, Foustanos et al⁷ recommended three incisions parallel to the hair line. This might endanger the superficial or deep branches of the supraorbital nerve.⁵ In our series, a vertical scalp incision above the hairline was preferred, with no incision in the zone between the superior temporal line and the line 2.0 cm medial to the superior temporal line, to avoid injury to the deep branch of the supraorbital nerve (Figure 2).⁵ Subperiosteal dissection was performed directly towards the osteoma with periosteum elevation without the need for endoscopy, similarly suggested by Mun et al² and Meningaud et al.⁸

Forehead osteomata can be removed by burring⁸ or osteotome chiseling.^{2,3,7} Comparing these two methods, bone burring is not an efficient method for removing osteomata. It also increases the risk of soft tissue injury or a

Table 1 Comparison of operative time, complication, access port number, and postoperative follow up of endoscope-assisted forehead osteoma resection in representative series.

	No. of cases	Age (y)	Operative time (min)	Port number	Size of osteoma (mm)	Follow-up (mo)	Complication
Mun et al ² 2006	12	47.8 (20–67)	15 (10–20)	2	11 (8–22)	16 (2–39)	None
Meningard et al ⁸ 2008	5	40 (30–55)	30 (20–40)	3	15 (10–28)	12	None
Lai et al ³ 2008	6	45.5 (34–59)	59.5 (50–75)	1	10.9 (8–14)	12.3 (8–16)	None
This series 2013	10	49.3 (30–62)	27 (25–30)	1	13.5 (5–25)	76.3 (63–122)	None



Figure 2 Patient marking of forehead osteoma 25 mm in diameter. No incision should be made in the zone between the superior temporal line (STL, marked by xxxxx) and a line 2.0 cm medial to STL to avoid injury of the deep branch of the supraorbital nerve.

depressed bony surface. Removal of an osteoma by a curved osteotome is, however, both effective and safe.^{2-4,6-9}

Usually the number of ports is not a concern, and the number of ports and sites can be chosen based on the surgeon's preference (Figure 3). Lai et al³ reported a series of six forehead osteoma cases. Resection of osteoma was achieved by a single remote port with a technique in which both the endoscope and instruments were introduced simultaneously into the port. However, the operative procedures were a little tedious and the operative time was relatively lengthy (average ~1 hour). In our series, the operative time was short (~30 minutes), and the benefit of endoscopic aid was notable.^{2,8,9} Furthermore, the procedure is relatively easy to perform. The technique can be learnt quickly to a high standard, in comparison with other techniques.⁸ Current guidelines recommend a single vertical scalp incision hidden by the hair for resection of forehead osteoma, except in alopecia patients, in routine clinical practice. In case the diagnosis is changed after endoscopic examination, another vertical incision can be easily added to facilitate endoscopic excision of the mobile soft tissue masses. Forehead osteoma is a benign tumor and the recurrence rate of the tumor is very low. In our series, no tumor recurrence was noted. Our series is the first to have a follow-up period of >5 years.

There are very few complications of endoscope-assisted resection of forehead osteoma. Possible complications are similar to those described for the conventional forehead endoscopic procedure, mainly neurosensory damage and vascular injury. Again, the vertical incision was recommended instead of an incision parallel to the hairline because the course of the sensory nerves is longitudinal in the suprapariosteal plane. The site most susceptible to injury is the scalp port; the risk might be higher if two ports or more are necessary for endoscope-assisted manipulation.^{5,7,8} Massive bleeding is not likely to occur in the rough surface of the bone,³ although it is considered possible.^{2,9} Since the osteoma is mainly a laminated bone tumor and the frontal bone is a membranous bone, bleeding is usually not a concern.

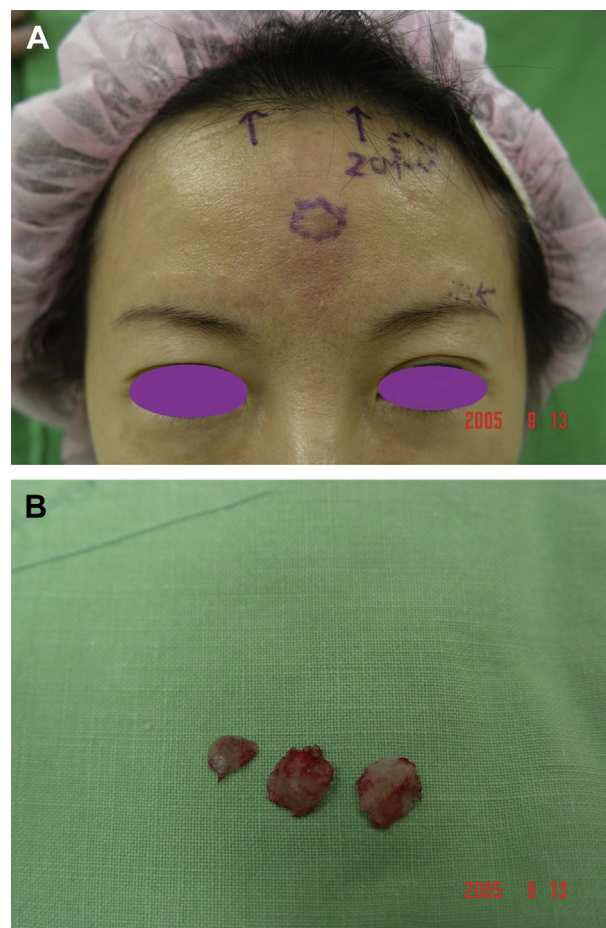


Figure 3 (A) The surgeon may choose a single or two incisions as the arrows indicate to remove the osteomata. (B) Osteomata removed from the forehead.

5. Conclusion

Removal of forehead osteomata through a single remote access with the aid of endoscopy is a safe and effective alternative. It can achieve the same esthetic and therapeutic results as the conventional two- or three-port approach with minimal morbidity. Moreover, long-term follow-up (>5 years) of single-port endoscopic resection of forehead osteomata showed reliable results.

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