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Frontal Sinus Osteoma Removal with the Ultrasonic Bone Aspirator

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Abstract:

Objectives/Hypothesis:

Osteomas, the most common skull tumors, are typically excised through either an open or endoscopic ostectomy using a high-speed drill, a technically challenging procedure which can result in injury to adjacent soft tissue structures. Osteoma removal through ultrasonic bone emulsification and aspiration (UBA) offers the advantages of decreased blood loss, preservation of adjacent soft tissue structures and precise bone removal.

Results:

UBA was used to successfully remove a forehead osteoma without injury to adjacent nerves and with a satisfactory cosmetic outcome.

Conclusion:

We describe skull osteoma removal with an ultrasonic bone aspirator, which offers potential advantages over conventional bone removal techniques.

Introduction:

Osteomas, the most common benign tumors of the skull, represent bony outgrowths of skeletal structures that develop through intramembranous ossification. [1] Most osteomas arise in the skull,[2] affecting the cranial vault and facial skeleton as well as the paranasal sinuses and, most frequently, the skull base. Histologically, osteomas consist of abnormally dense but otherwise normal bone, with a well-differentiated periosteum, which consists of osteogenic as well as fibrous components. Osteomas have been reported to occur in 0.014-0.43% of the population, comprising 1% of all bone tumors.[3] While osteomas can recur, they rarely possess malignant potential.

Osteomas grow slowly, blocking or compressing adjacent structures and frequently causing aesthetic deformity. Although most patients remain asymptomatic, development of facial pain and headaches due to compression of adjacent sensory nerves is not uncommon. Osteomas that arise near the paranasal sinuses may obstruct mucosal outflow, leading to chronic sinusitis[4] refractory to antibiotic treatment. In addition, paranasal tumors can result in orbital compression, leading to recurrent epiphora, proptosis, diplopia, visual loss, and malposition of the globe.[5] Osteomas may also result in auditory dysfunction, such as conductive hearing loss and otorrhea, and possess the potential for intracranial complications, such as pneumocephalus, meningitis, mucocele with intracranial extension, and seizures.[6]

Surgery is indicated in symptomatic patients, for rapidly growing lesions, and in cases involving the nasofrontal outflow tract, ethmoid sinus, or greater than 50% of the frontal sinus.[7] In the absence of the above, elective surgical excision may be undertaken for cosmesis, or a patient may opt for observation alone.

Open forehead ostectomy is performed under direct visualization with a chisel or burr, though this may be associated with complications such as unsightly forehead scarring, as well as potential damage to the supratrochlear and supraorbital nerves.[8] Endoscopic removal utilizes a vertical incision behind the hairline with dissection in the subperiosteal plane.[9] This ensures protection of the supraorbital and supratrochlear neurovascular bundles.[10] Complications of this procedure may include significant postoperative edema, prolonged healing time, and increased risk of hematoma formation.

The Sonopet ultrasonic bone aspirator (Stryker, Inc., Kalamazoo, MI) utilizes ultrasonic waves to emulsify bone with concurrent irrigation and suction, providing a clean surgical field. This enables precise, graded bone removal, without damage to the surrounding soft tissue. We have previously applied this technology with success to several surgical procedures involving the internal and external nose, including septoplasty and turbinate reduction, contouring of the nasal dorsum and spine, deepening of the glabellar angle, as well as the rounding of flat nasal contours, and the correction of additional bony asymmetries[11]. Pagella, et al. describe the use of the UBA to successfully remove a fronto-ethmoidal sinus osteoma.[12] We have applied this technology to removal of a forehead osteoma.

Case:

A 34-year-old man with a history of trauma to his right frontal region presented with a slow growing mass over the right frontal sinus, associated with right sided supraorbital pain and discomfort (Fig. 1A). Following the diagnosis of osteoma via computed tomography, an open ostectomy was performed with the UBA. A direct suprabrow incision was made and the supraorbital neurovascular trunk was identified and preserved (Fig. 1B). The UBA, equipped with the Spetzler Claw tip, was used to remove the osteoma and contour the bone to match the

contralateral side (Fig. 1C). At 4 week follow-up, the patient denied supraorbital hypesthesias, pain, or discomfort and was pleased with his cosmetic outcome (Fig. 1D).

Discussion:

For the removal of exostotic skull osteomas adjacent to vital structures, an UBA may pose less danger to surrounding tissue than a high-speed burr. UBA will not spool or injure surrounding soft tissue and generates significantly less heat than a rotating burr. Heat that is generated from the shaft of the instrument is insulated from adjacent tissue by a plastic guard of adjustable length. Additionally, the UBA incorporates simultaneous suction and irrigation, obviating the need for an assistant. Various tip configurations exist to permit either endoscopic or microscopic dissection. Disadvantages include the expense of acquiring the instrumentation, though the costs may be shared across surgical departments.

Conclusion

UBA may be successfully employed to remove exostotic skull osteomas without injury to adjacent vital structures.

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