To Drill or Not to Drill: Prominence of the Suprameatal Tubercle and its Impact on Microvascular Decompression for Trigeminal Neuralgia—A proposed classification system

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Introduction

The suprameatal tubercle (ST) is a bony prominence of variable size on the posterior surface of the petrous bone, located above the porus of the internal acoustic meatus. Drilling of the ST has been described as a component of the posterior intradural petrous apicectomy (PIPA) approach to expose tumors of the cerebellopontine angle (CPA) that extend into Meckel’s Cave. An enlarged ST however can also pose an impediment to adequate surgical exposure of the trigeminal nerve root from the pontine root entry zone to the porus trigeminus in microvascular decompression (MVD) for trigeminal neuralgia. Drilling of the suprameatal tubercle to expose the trigeminal nerve within Meckel’s cave has been described namely for the removal of trigeminal schwannomas or other tumors; however, the use of this maneuver is not well documented. Furthermore, the technique of ST drilling and its identification from radiographic imaging before any neurosurgical procedure have not been discussed previously.

We present two cases in which we deemed it necessary to drill the ST in order to achieve adequate exposure for trigeminal MVD. We describe the anatomy of the ST in order to impart to neurosurgeons a greater comfort level with safety, utility and effectiveness of ST reduction. We compared the anatomic relationships of the ST, the cisternal segment of the trigeminal nerve, and the cistern itself in our two index patients compared to 20 control patients. From this information, we developed a Grading Scale that will allow neurosurgeons to predict the adequacy of exposure on pre-operative MRI, and help to predict whether the prominence of the tubercle may necessitate drilling.

Methods and Materials

Preoperative thin-cut T2 (FIESTA) MRIs were reviewed in the drilling cohort. Twenty patients operated on within the past four years, for which there was a preoperative FIESTA sequence available for review, served as historical controls. A line of sight, parallel to the posterior half of the suprameatal tubercle, was projected on the trigeminal nerve. A visibility grade (A-D) was provided for each patient, based on how much of the trigeminal nerve (from root entry zone to Meckel’s cave) was contained within the projected line of sight (A=75-100%, B=50-75%, C=25-50%, D=0-25%) (Fig 1A). Additionally, the cisternal distance (in mm) from root entry zone to petrous bone was recorded (Fig 1B). Each patient was then given an alphanumeric score containing both the visibility grade and cisternal distance.

Results

Drilling of the suprameatal tubercle in both index patients was without complication and resulted in adequate visualization to complete the microvascular decompression. Both of these patients had a preoperative visibility grade of “D” and a cisternal distance less than 1mm (designated as D1) see figures. Within the historical controls, visibility grades ranged from “A-D” (A= 10 patients, B=5, C=3, D=2) and cisternal distance ranged from 3-7mm (mean 4.6 mm). The cisternal distance of both patients with a grade-D visibility in the historical control group was 3mm.

Discussion

Exposure during microvascular decompression surgery for trigeminal neuralgia exists on a spectrum, and at times may be limited by a prominent suprameatal tubercle.

The definition and prevalence of a “prominent” suprameatal tubercle remain unclear. In a study of 106 patients in whom three-dimensional head CT was performed, Oiwa et al. reported a suprameatal prominence greater than 3 mm above the posterior surface of the petrous bone was observed in 5% of cases.4 In a cadaveric study using 50 dry temporal bone samples, Ebner et al. found a suprameatal tubercle greater than 6 mm in 9/50 (18%) cases, between 3-6 mm in 37/50 (74%), and less than 3mm in 4/50 (8%) cases.5 There has been no association to date with the presentation of TN and the size of the suprameatal tubercle, or a subpopulation in which the tubercle is predicted to be larger in size. In an effort to better define clinically significant ST prominence, as it relates to crowding of the cerebellopontine angle and exposure of the trigeminal nerve, we developed a simple grading scale. This overall alphanumeric score is a composite of the expected degree of nerve exposed and working distance between the petrous bone and trigeminal nerve root entry zone. A retrospective review of the cases performed over the last four years revealed 4 patients with a type “D” (0-25%) of nerve exposure. Two of these patients (both D1) required drilling of the ST, and one (D3) was noted to have a mildly obstructive ST at the time of surgery, but did not require drilling. For the large majority of cases that don’t require drilling, the score also affords the surgeon with a rough estimate of the ease of exposure prior to surgery.

Conclusions

A composite score, combining the degree of visibility of the trigeminal nerve and distance from nerve to petrous bone, appears to be a reasonable surrogate for anticipating quality of exposure. Duration and difficulty of neurosurgical procedures may be assessed preoperatively based on presence of a prominent tubercle with our proposed grading system. Neurosurgeons should determine the need for, and extent of drilling of the suprameatal tubercle on an individual basis based on anatomic size variability and degree of access during surgical approach. Care must be taken during drilling to preserve the superior and posterior semicircular canals, and to avoid injury to neurovascular structures. In our experience, the need for drilling of the tubercle is rare, but when required, can be performed safely.

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References