Transnasal Endoscopic Resection of Clival Chordoma

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ABSTRACT

Objective: Skull base clival chordomas present as a surgical challenge for traditional transcranial resections. The Endoscopic Endonasal approach (EEA) utilizes a natural corridor and provides a direct route to tumor resection.

Methods: A Consecutive case series of patients undergoing EEA at UCLA Medical Center were retrospectively evaluated.

Results: Eight patients (5 Male and 3 Female) underwent endoscopic resection of chordomas. We were able to achieve significant resection of the tumor in 75% (6/8) of patients. Those that had a subtotal resection had involvement of vital vascular structures. Two patients had CSF leaks. There were no other major complications and no neurological sequela.

Conclusion: Endoscopic endonasal approach allows for dynamic visualization and improved access and removal of clival chordomas.

INTRODUCTION

Chordomas are rare benign tumors theorized to originate from embryonic notochord remnant. (1) These lesions are typically slow growing but locally aggressive tumors. While they only make up 0.15% of all primary intracranial neoplasms, (2) of these lesions, approximately 25-35% arise in the clivus. They have been found in all age groups and appear to have an equal sex distribution.

Several various surgical approaches have been attempted for treatment; however, approaching midline tumors with lateral/paramedian approaches requires significant brain retraction and increases the morbidity resection. A microscopic trans-sphenoidal approach was first described in the 1980s. More recently, with the incorporation of the rigid endoscope and active collaboration between sinus surgeons and neurosurgeons, extended endonasal endoscopic approaches have become well-accepted, minimally invasive routes to the midline/paramedian skull base.

The aim of this present study is to present a series of patients successfully treated with endonasal endoscopic resection of clival chordomas. We demonstrate the technical feasibility of endonasal endoscopic approach for excision of clival chordomas and elucidate regions of the skull base which are difficult to treat from this approach.

METHODS AND MATERIALS

We retrospectively reviewed a database of all patients undergoing endoscopic endonasal surgery at UCLA Medical Center from the years 2005 through 2010. Patients with a final pathology of Chordoma were then identified for inclusion within our study. The patients’ characteristics are outlined in Table 1. The senior authors, neurosurgeons (MB) and (NM) and otorhynolaryngologists (MW) and (JIS) were the primary surgeons in all of the cases.

The patient demographics, lesion size and volume, pathology, complications, adjuvant treatment and clinical outcomes were analyzed.

Table 1. Characteristics of 8 patients who underwent endoscopic transclival chordomas resection

<table>
<thead>
<tr>
<th>Case #</th>
<th>Sex</th>
<th>Age</th>
<th>Presentation</th>
<th>Initial Tumor Dimensions (cm)</th>
<th>Initial Vol (cm³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M</td>
<td>50</td>
<td>Decreased vision in Right eye</td>
<td>2.4x2.2x1.8</td>
<td>9.5</td>
</tr>
<tr>
<td>2</td>
<td>F</td>
<td>50</td>
<td>Diplopia; CN V3 palsy</td>
<td>2.6x2.4x2.2</td>
<td>13.728</td>
</tr>
<tr>
<td>3</td>
<td>M</td>
<td>67</td>
<td>CN VI palsy; R TVC palsy</td>
<td>3.2x3.0x3.1</td>
<td>29.76</td>
</tr>
<tr>
<td>4</td>
<td>M</td>
<td>71</td>
<td>CN VI palsy; diplopia</td>
<td>1.3x2.1x1.7</td>
<td>4.8</td>
</tr>
<tr>
<td>5</td>
<td>M</td>
<td>31</td>
<td>incidental finding; tinnitus</td>
<td>2.1x1.5x1.6</td>
<td>5.04</td>
</tr>
<tr>
<td>6</td>
<td>F</td>
<td>59</td>
<td>incidental finding; tinnitus</td>
<td>4.4x16.15</td>
<td>10.56</td>
</tr>
<tr>
<td>7</td>
<td>M</td>
<td>67</td>
<td>CN VI palsy; left eyelid droop;</td>
<td>3.7x5.1x3.1</td>
<td>5.8</td>
</tr>
<tr>
<td>8</td>
<td>F</td>
<td>42</td>
<td>Incidental finding; rhinorhea</td>
<td>3.9x4.1x3.3</td>
<td>52.76</td>
</tr>
</tbody>
</table>

RESULTS

Eight patients underwent endoscopic expanded endonasal resection of a clival chordoma. The ages ranged from 31 to 71 (mean = 55), there were 5 males and 3 females. Seven individuals had a new diagnosis of a skull base lesion. Three of these patients presented with cranial neuropathies (CN VI palsy and hypoesthesia in distribution of the third division of CN V). Four patients had incidental findings after imaging was obtained for other indications (2 with tinnitus and 2 with nasal obstruction).

Case 2 had a complicated history of a clival chordoma. She was initially diagnosed with the lesion 10 years prior to presentation and underwent two external approaches 7 years apart, each followed by post-operative radiation. She presented to us with a third recurrence.

Gross tumor resection (GTR) was achieved in 5 patients, a >95% reduction in tumor size was achieved in one additional patient and two patients had a subtotal resection of their lesions.

In both of these patients, Cases 5 and 7, the tumor could not be safely removed. Case 5 had tumor stuck to the horizontal petrous segment of the carotid artery. Case 7 had a large destructive lesion and tumor was left on the basilar artery and brainstem.

Follow up time ranged from 5 months to 27 months (mean = 15 months). All patients are alive. All patients were referred for postoperative radiation therapy. Five of the seven patients completed post-operative radiation. One patient refused, and an additional patient was not deemed a candidate given her prior dose.

DISCUSSION

Clival chordomas, due to their unique embryologic origin as midline notochord remnants, provide an ideal target for transphenoidal endoscopic procedures. We report successful surgical outcomes in 75% of our cases, where we were able to achieve either GTR or >95% resection without significant neurologic sequelae.

Case Selection: In the two patients where there was subtotal resection, gross disease was left behind in the operating room due to invasion of vital structures (internal carotid artery and the basilar artery). While, gross tumor resection is the primary goal, in the face of significant neurological or vascular morbidity, a subtotal resection with post-operative radiation provides the best alternative.

Complications: Two patients in our series had CSF leaks (25%). We employed a nasoseptal flap in all cases where a leak was noted during the operation. In case 5, a significant defect was noted during the case and the patient underwent a fascia lata graft prior to tissue sealant (the “Gasket-seal”). However, the patient still developed a CSF leak on post-op day 6 which resolved with a Lumbar Drain and conservative management. Case 2 presented a complex past surgical history, with two courses of radiation which likely contributed to the failure of the initial surgical repair.

Advantages of Endoscopic Approach: The transnasal endoscopic approach allows for dynamic visualization of the clivus. When operating with the microscope, the surgeon has a static, tunnel view of the operative field; with the angled endoscopes, the surgeon is able to maneuver the scopes and achieve improved access to the lateral, superior, and inferior aspects of the clivus with more complete tumor removal.

Further Follow-up: Maximum follow up time in our series was 27 months with a mean of 15 months. Of those that obtained >95% resection or GTR none of the patients were noted to have a recurrence.

CONCLUSIONS

The last decade has shown a significant paradigm shift in surgical management of clival chordomas. The refinement of surgical endoscopic equipment and techniques has allowed for high rates of tumor control and progression-free survival while limiting the morbidity and improving recovery rate when compared with open techniques. These early results suggest an equivalency to other techniques, however long term studies will be needed for the impact on patients’ outcomes.