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Technical note

Utility of a rotation–suction microdebrider for tumor removal in endoscopic endonasal skull base surgery

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ABSTRACT

The microdebrider is a common tool used in endoscopic sinus surgery for removing polypoid and sinonasal tissue. It uses rotating blades and an integrated suction device for controlled removal of tissue under video–endoscopic visualization. To our knowledge, the application of the microdebrider for endoscopic removal of skull base tumors has not been reported. This study aimed to investigate the utility of the rotation–suction microdebrider as a tool for endoscopic endonasal removal of solid and fibrous skull base tumors. Thirty-two patients underwent endoscopic endonasal skull base surgery where the rotation–suction microdebrider was used as the primary tool for tumor removal and debulking. Pathologies included a variety of anterior skull base meningiomas, sinonasal skull base malignancies, juvenile nasopharyngeal angiofibromas, schwannomas, and other skull base lesions. Gross total and near total removal was achieved in 87.5% (28/32) of patients, and subtotal removal was performed in 12.5% (4/32) of patients. The microdebrider allowed efficient debulking and removal of solid and fibrous tumors, such as meningiomas, that were not responsive to standard ultrasonic aspiration. There were no complications of orbital or neurovascular injury, or thermal injury to the nostril. The rotation–suction microdebrider is a useful tool for endoscopic endonasal removal of skull base tumors. This is particularly useful for solid and fibrous tumors that are not responsive to standard ultrasonic aspiration. For intracranial tumors, it is critical to remain inside the tumor capsule during debulking so as to avoid injury to the surrounding neurovascular structures.

1. Introduction

The microdebrider is a cylindrical, electrically powered instrument that allows for effective removal of thin bone and soft tissue [1]. Originally developed for arthroscopic surgery, the microdebrider device was first introduced to skull base surgery by William House and Jack Urban in the 1970s for removal of acoustic neuromas [2]. The device was known as the "vacuum rotatory dissector" or "House–Urban dissector" at the time [2,3]. However, it was not until 1994 that Setliff and Parsons [4] introduced the microdebrider for use in endoscopic sinus surgery. This discovery quickly spawned the development of several varieties of microdebriders for nasal surgery. It is now a common tool used in endoscopic sinus surgery for removal of polypoid and sinonasal tissue [5–7]. It is preferred by many surgeons because the instrument is able to spare adjacent mucosa during surgery, allow for greater precision and rapid tissue removal, and provide better visualization of the surgical field. The use of a microdebrider offers excellent and safe atraumatic dissection of tissue and represents an important advance in endoscopic sinus surgery in properly selected patients in the hands of an experienced surgeon [6,8–10].

To our knowledge, the use of a microdebrider as the primary neurosurgical tool for endoscopic endonasal removal and debulking of skull base tumors has not been described. Fibrous and solid tumors of the skull base are often challenging to remove using standard ultrasonic aspiration. In many of these patients, the tissue is often firm and use of an ultrasonic aspirator as the primary tool may not provide optimal tumor debulking. In addition, heat generated from the ultrasonic aspirator can induce thermal injury to the skin around the nostril and upper lip during endoscopic endonasal skull base surgery. However, since the microdebrider does not rely on heat or light energy, the incidence of injury to the surrounding skin is reduced. In this technical note, we investigate the utility of

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the suction–rotation microdebrider as a tool for endoscopic endonasal removal of skull base tumors and describe our surgical technique and experience with this device.

2. Methods

A retrospective chart analysis of a prospective database was conducted to identify patients who underwent endoscopic endonasal skull base surgery in which the Gyrus Diego microdebrider device (Gyrus ACMI-ENT Division, Bartlett, TN, USA) was utilized as the primary tool for tumor removal between September 2009 and June 2012 (Fig. 1). The charts of patients undergoing this procedure were evaluated for patient age, sex, diagnosis, extent of resection, and postoperative complications. Thirty-two patients underwent endoscopic endonasal skull base surgery in which the microdebrider was used as the primary tool for tumor debulking and removal. A variety of skull base pathologies were removed including anterior skull base meningiomas, esthesioneuroblastomas, juvenile nasopharyngeal angiofibromas, and schwannomas (Table 1). The intracranial meningiomas that were treated were firm and fibrous, and not readily removed with standard ultrasonic aspiration.

3. Results

The rotation–suction microdebrider was used in a series of 32 patients (Fig. 2–5). The patient demographics, diagnosis of tumor types, extent of resection, and postoperative outcome are presented in Table 1. The average age of patients treated was 47.4 years (range 19–91) with 37.5% of patients being women. Gross total resection was achieved in 81.3% (26/32) of patients. Near total resection (defined as greater than 98% removal with residual microscopic disease) was achieved in 6.3% (2/32) and subtotal resection in 12.5% (4/32) of patients. Incomplete removal was primarily due to tumor adherence to critical structures, such as the optic nerve, cavernous carotid artery, and paraclival carotid artery. The five intracranial meningiomas (four olfactory groove, one tuberculum sellae) were quite firm and fibrous, and thus not amenable to standard ultrasonic aspiration. In one patient, the heat generated from the ultrasonic aspirator resulted in a minor ther-

Table 1
Summary of microdebrider experience in endoscopic endonasal skull base surgery

Number of patients	32
Demographics	
Age, mean (range)	47.4 (19–91)
Sex	62.5% M, 37.5% F
Follow-up in months, mean (range)	17 (2–34)
Diagnosis	
Meningioma	5
Esthesioneuroblastoma	4
Juvenile nasal angiofibroma	4
Adenoid cystic carcinoma	2
Sinonasal osteoblastoma	2
Basaloid squamous cell carcinoma	1
Chordoma	1
Malignant peripheral nerve sheath tumor	1
Nasoseptal cholesterol granuloma	1
Inflammatory pseudotumor	1
Recurrent pituitary tumor	1
Plasma cell granuloma	1
Respiratory epithelial adenamatous hemartoma	1
Rosai-Dorfman disease	1
Sinonasal melanoma	1
Small cell neuroendocrine carcinoma	1
Sinonasal schwannoma	1
Sinonasal squamous cell carcinoma	1
Sinonasal teratocarcinoma	1
Vidian nerve schwannoma	1
Outcome	
Gross total resection	26 (81.3%)
Near total resection	2 (6.3%)
Subtotal resection	4 (12.5%)
Postoperative complications	1

F = female; M = male.

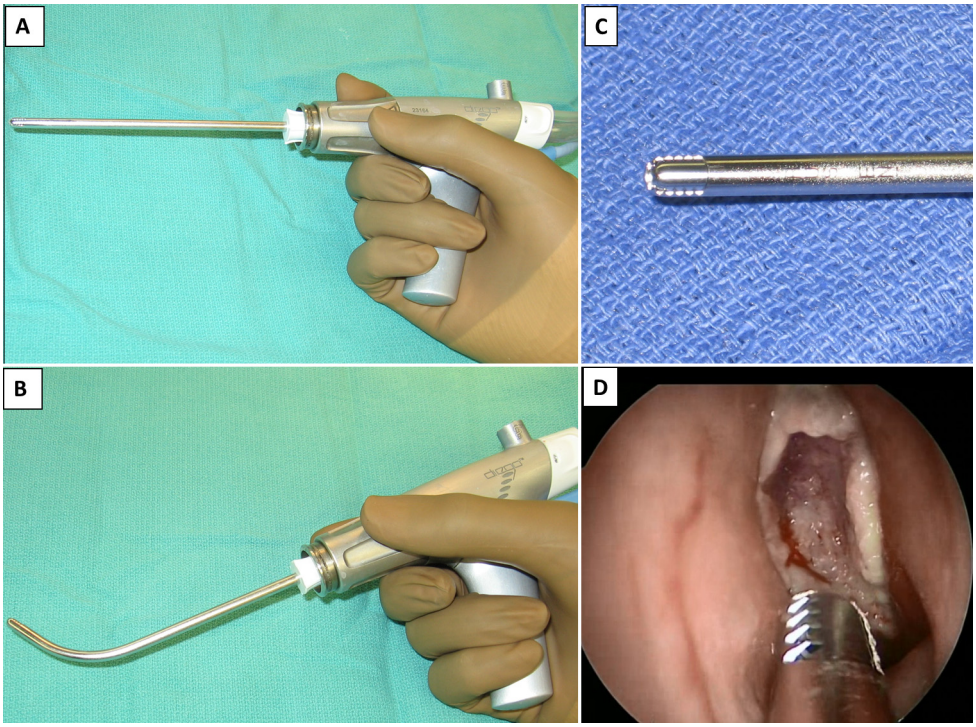

Fig. 1. Photographs showing the rotation–suction microdebrider. Straight (A) and angled, 60-degree (B) microdebrider handpiece, (C) serrated microdebrider blade, and (D) endoscopic intraoperative image showing the microdebrider used in tumor debulking.