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Original article

Advantages and limitations of endoscopic endonasal odontoidectomy. A series of nine cases

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ABSTRACT

Introduction: Transoral odontoidectomy is the treatment of choice in cases of anterior bulbo-medullary compression. The development of endoscopic procedures has made it possible to perform odontoidectomy via a minimally invasive endoscopic endonasal approach. We discuss the feasibility, advantages, and limitations of this surgical approach.
Materials and methods: We report a two-center retrospective series of patients who underwent endoscopic endonasal odontoidectomy between September 2011 and February 2013. Preoperative characteristics, intraoperative data, clinical course, and postoperative complications were studied. The patients were followed for a minimum of 6 months. Cervico-occipital posterior fusion was performed during the same hospital stay in cases of preoperative instability.
Results: Nine patients underwent decompressive odontoidectomy, for rheumatoid pannus in five cases and basilar impression in four cases. All had progressive neurological symptoms. Seven patients also underwent posterior fusion. In six patients, the C1 anterior arch was preserved. Decompression was achieved satisfactorily in all nine cases. The patients were able to resume oral feeding the day after the intervention. No patient required tracheostomy. We observed no dural fistulae or infectious complications. One patient died 2 months after the intervention of a pulmonary embolism. All patients improved in terms of their preoperative neurological status.
Conclusion: This short series shows the feasibility of the endoscopic endonasal approach for resection of the dens. This approach allows optimal viewing when using angulated instrumentation and seems to result in low morbidity. In some cases, this approach makes it possible to preserve the C1 anterior arch, thus limiting the risk of cranial settling.
Level: IV retrospective study.

1. Introduction

Certain malformations and progressive pathologies of the craniocervical junction can result in anterior bulbo-medullary compression, requiring decompression including odontoidectomy. To perform this anterior decompression, the transoral approach is the historical standard [1,2]. The development of endoscopic endonasal approaches has progressively led to envisaging endoscopic endonasal odontoidectomy [3]. Series using this approach have been described in the literature with relatively low numbers of patients given the rarity of the indications [4–7]. Most indications for anterior decompression are related to compressive rheumatoid pannus, sometimes associated with basilar impression. Rheumatoid pannus is usually treated with posterior fusion, which most often suffices so that regression of the compression can be obtained by treating the underlying instability. When the situation does not improve despite this absence of fusion, secondary decompression can be performed. Decompression is the first-line treatment in cases of particularly voluminous pannus that causes neurological involvement threatening the patient's vital prognosis and therefore requiring rapid treatment, or, in cases of craniocervical junction malformations inducing compression that cannot be reduced by the apex of dens.

2. Material and methods

2.1. Patients

The nine patients in this series were operated on in two centers with the same technique (described below) between September 2011 and February 2013.

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Table 1
Patients' clinical data.

Patient	Sex	Age	Symptoms	Etiology	C1 arch intact	Fixation	Progression	Comments
1	F	84	Tetraparesis	Rheumatoid pannus	Yes	No	Rapid improvement	Death at 2 months, pulmonary embolism
2	M	58	Walking problems + upper right limb involvement	Occipitalization of atlas	No	Yes (occipito-cervical)	Slow progressive improvement (2 months)	Persistent neuropathic pain
3	M	79	Tetraparesis	Nonrheumatoid pannus	Yes	No	Rapid improvement	
4	M	78	Upper limb involvement	Rheumatoid pannus	Yes	No	Rapid improvement	
5	F	63	Upper limb involvement	Rheumatoid pannus	Yes	Yes (C1/C2)	Rapid improvement	Hypovolemic shock during posterior phase
6	F	58	Tetraparesis	Rheumatoid pannus	Yes	Yes (occipito-cervical)	Rapid improvement	
7	F	32	Bulbar involvement	Basilar impression	No	Yes (occipito-cervical)	Slow progressive improvement	
8	M	73	Upper limb involvement	Basilar impression	No	Yes (occipito-cervical)	Rapid improvement	Postoperative myocardium infarct
9	M	48	Tetraparesis	Os odontoideum	Yes	Yes (occipito-cervical)	Rapid improvement	

The patients presented progressive bulbo-medullary compression related to rheumatoid pannus in five of them and a craniocervical malformation in four of them (os odontoideum, occipitalization de the atlas, and two basilar impressions). All of them presented invalidating neurological symptoms of progressive myelopathy possibly advancing to quadriparesis.

These patients' clinical characteristics are summarized in Table 1.

The endonasal approach was retained after a meticulous study of the preoperative CT scan to ensure that there was no anatomical conformation contraindicating this approach. The preoperative CT scan included vascular sequences to study the trajectory of the carotid and vertebral arteries.

The stability of the craniocervical junction was assessed in all patients with systematic lateral X-rays with dynamic sequences in flexion and extension with particular attention paid to C1–C2 diastasis. This was done before and after dens resection so as to assess the necessity for posterior fixation.

All patients were followed up for a minimum of 3 months (range, 3–24 months) with regular clinical and radiological evaluation with CT, MRI, and X-rays.

2.2. Surgical technique

All surgical interventions were performed with intraoperative image intensifier guidance and neuronavigation.

The material used included a short 0° endoscope, a long 30° angulated endoscope, a long angulated reamer with a high-speed motor, an ultrasonic dissector and long instrumentation designed for endoscopic hypophyseal surgery.

The patients were installed in a semi-seated position with the head held in a neutral position by a Mayfield head holder.

After topical preparation of the mucous membranes, a binasal approach was begun with lateral luxation of the middle concha and in some cases, unilateral resection of a concha depending on the anatomical configuration. Whenever possible, a sparing approach was used by passing through the choanae without reaming the sphenoid sinus, the nasal septum, or the palate. The apex of the clivus was reamed in the four cases of basilar impression and in one case of rheumatoid pannus.

After identification of the anatomical landmarks (pharyngeal recesses, orifices of the Eustachian tubes), a U-shaped flap of mucous membrane was created using a monopolar scalpel, in a single plane to the bony structures, thus exposing the C1 anterior arch and the clivus apex (Fig. 1). During resection by reaming the dens and its pannus, we were able to preserve the continuity of the C1 anterior arch in six cases; in the other cases, the C1 arch was reamed to access the dens, which was resected by alternating use of the reamer, ultrasonic dissector, and Kerisson gouges, taking care not to overextend laterally and damage the C1 joint eminences. The dens was separated from the body so as to remove it en bloc whenever possible, then the pannus was progressively removed by fragmenting it under regular scopic guidance to verify

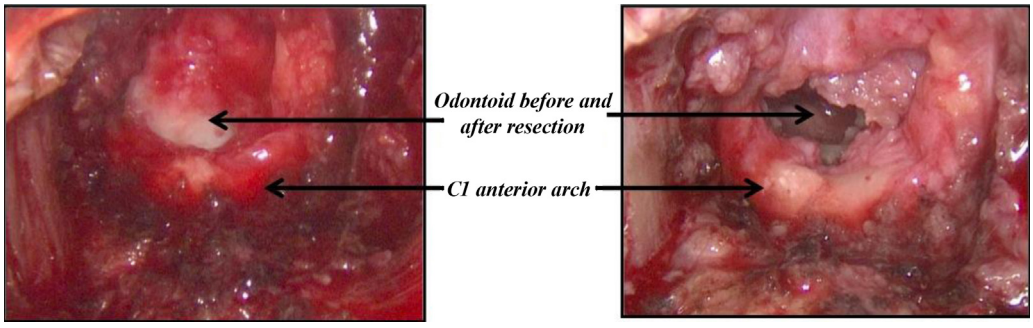

Fig. 1. Intraoperative view at the beginning and end of the operation showing the resection of the dens and the C1 anterior arch kept intact.