

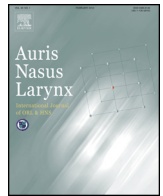


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ORIGINAL PAPER

Endoscopic endonasal management of esthesioneuroblastoma: A retrospective multicenter study

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ABSTRACT

Objective: The aim of the present study was to illustrate the safety and utility of the endoscopic endonasal approach (EEA) for the treatment of esthesioneuroblastomas (ENB).

Methods: We retrospectively reviewed patients with a diagnosis of ENB between March 2008 and February 2016 at 10 tertiary referral hospitals in Japan, and assessed demographic data, stage of disease, surgical approach, outcomes and postoperative complications.

Results: A total of 22 patients (10 males and 12 females; mean age at presentation, 49.0 years) underwent endoscopic endonasal resection of newly diagnosed ENBs. Dulguerov staging at presentation was T1, 6 patients; T2, 9 patients; T3, 5 patients; and T4, 2 patients. As surgical procedures, unilateral resection via EEA was performed in 12 patients aiming preservation of the contralateral olfactory system, and bilateral resection via EEA was done in 10 patients. Post-operative radiotherapy was done in 20 patients. Pathological margin studies revealed margin-free resections in 21 patients (95.5%). The mean period of follow-up was 44 months. Local recurrence was observed in one T2 patient 12 months after bilateral resection. All patients were alive at the last follow-up, and 21 patients showed no evidence of disease. No post-operative complications including bleeding, CSF leak and meningitis were identified. Preservation of olfactory function was achieved in 11 patients (91.7%).

Conclusion: The results of the present study indicate the safety and utility of multilayer resection using EEA for treatment of ENBs.

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1. Introduction

Esthesioneuroblastoma (ENB), or olfactory neuroblastoma, is a rare malignant tumor arising in the nose and/or skull base. Because of its rarity, there is variability in treatment strategies for ENB. According to the meta-analysis reported by Dulguerov et al. [1], the combination of surgical resection and post-operative radiotherapy has become the standard treatment for ENB.

In past decades, *en-block* resection via craniofacial approaches was the gold standard surgical modality for ENB. In recent decades, treatment modalities have changed. An endoscopic endonasal approach (EEA) has gained acceptance as an alternative standard for surgical treatment of ENB based on remarkable progress in technology. In 2006, Castelnuovo et al. [2] reported a new surgical concept of endoscopic endonasal resection of ENB, namely multilayer resection. According to this technique, the resection area is distinctly determined by repeated intraoperative margin studies, and tumor resection is divided into three layers: the intranasal tumor, the cribriform plate and ethmoidal roof, and the dura matter. In 2007, this group reported the efficacy of the combination of endoscopic multilayer resection and post-operative radiotherapy in selected patients with ENBs [3]. In addition, publications from other groups supported their advocacy of an EEA for the surgical resection of early-stage ENBs [4–9]. Based on those previous reports, we initiated the use of multilayer resection using EEA for surgical treatment of ENBs in 2008.

We used Dulguerov and Calcaterra staging [10] to determine surgical approach for resection of ENBs. For T1 or T2 tumors, EEA was planned. For T3 or T4 tumors, we chose a surgical approach, EEA or EEA with transcranial approach, according to the extent of the primary lesion in the intracranial and/or orbital region according to a previous report [11]. In cases that were planned EEA, unilateral or bilateral resection was chosen depending on the presence of contralateral invasion. In unilateral resection, the contralateral olfactory system was intentionally preserved. To examine the safety and utility of our surgical modality, we reviewed medical records of patients with newly diagnosed ENBs that were resected via EEA.

2. Materials and methods

2.1. Data collection

We retrospectively reviewed patients treated at 10 tertiary referral hospitals (Kyoto University Hospital, Oita University Hospital, Mie University Hospital, Kumamoto University Hospital, University of Tsukuba Hospital, Chiba University Hospital, Aichi Cancer Center, Japan Red Cross Medical Center, Kyorin University Hospital and Nagoya City University Hospital) in Japan with a diagnosis of ENB between March 2008 and February 2016. Patient records were reviewed for demographic information, clinical stage (modified Kadish classification [12] and Dulguerov and Calcaterra classification [10], histological grading Hyams' grading [13]), pathological

margin, surgical approach, post-operative complications, preservation of olfaction, post-operative treatment, length of follow-up and disease status at last follow-up.

As post-operative complications, the occurrence of post-operative bleeding, cerebrospinal fluid (CSF) leakage or meningitis were examined. Olfaction was assessed by an interview (preserve or lose). All patients were informed about the method of treatment and gave their consent to the therapy. This study was approved by the Kyoto University Institutional Review Board (R0363).

2.1.1. Treatment

Staging was determined based on enhanced computed tomography, enhanced or plain magnetic resonance imaging, and positron emission tomography and otolaryngology examinations. The surgical approach was planned by the extent of the primary lesion. Decisions regarding surgical approach were determined according to the extent of invasion of the primary lesion into the orbital or intracranial region, in which EEA with transcranial approach was chosen. In cases with no invasion into the contralateral side, unilateral resection, in which the olfactory system including the olfactory bulb in the contralateral side was intentionally preserved, was planned. In an affected side, the olfactory bulb was routinely resected. All newly diagnosed patients were recommended to undergo post-operative radiotherapy.

Our multilayer resection technique for EEA is divided into three steps. The initial step is tumor resection from the nasal cavity and paranasal sinuses. In cases where intraoperative margin studies within the nasal cavity are possible without tumor resection, only intraoperative margin studies were performed as the primary step, and intranasal lesions were resected together with the skull base bones. The second step is resection of the skull base bones, including the ethmoidal roof, cribriform plate and crista galli. The third step is the resection of the dura matter, olfactory bulb and intracranial lesions. Intraoperative margin studies of the dura matter are routinely performed. The reconstruction of the skull base is performed in a multilayer fashion. In general, two-layer fascia and vascularised nasoseptal or inferior turbinate flaps are used.

3. Results

3.1. Demographic data and stage

Our series included 32 patients with ENBs. Of 32 patients, two patients presented with recurrent disease, and eight patients underwent EEA with transcranial approach. A total of 22 patients who underwent EEA for treatment of newly diagnosed ENBs were analysed in the present study (Fig. 1).

Table 1 shows demographic data, presenting symptoms, stages of diseases and Hyams histological grading, for newly diagnosed ENBs that were operated via EEA. Ten males and 12 females were included. The mean age at presentation was 49 years (age range, 27–83 years). The Dulguerov staging at presentation was T1 in 6 patients, T2 in 9 patients, T3 in 5 patients and T4 in 2 patients. The modified Kadish staging at

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