SHORT COMMUNICATION

Neurologia i Neurochirurgia Polska
Polish Journal of Neurology and Neurosurgery
2022, DOI: 10.5603/PJNNS.a2022.0071

ISSN: 0028-3843, e-ISSN: 1897-4260

Endoscopic two-port technique for orbital tumours: combined transnasal and sublabial approach

Petr Matoušek[1, 2], Michaela Masárová[1, 2], Jakub Lubojacký[1, 2], Adam Kopecký[2, 3], Jan Němčanský[2, 3], Eva Misiorzová[4, 5], Tomáš Krejčí[4, 5], Pavel Komínek[1, 2], Radim Lipina[4, 5]

[1]Department of Otorhinolaryngology and Head and Neck Surgery, University Hospital Ostrava, Czech Republic
[2]Department of Craniofacial Surgery, Faculty of Medicine, University of Ostrava, Czech Republic
[3]Department of Ophthalmology, University Hospital Ostrava, Czech Republic
[4]Department of Neurosurgery, University Hospital Ostrava, Czech Republic
[5]Department of Clinical Neurosciences, University Hospital Ostrava, Czech Republic

ABSTRACT

Introduction. The aim of this study was to present the indications for a combined endoscopic transnasal and sublabial transantral approach for the surgical treatment of orbital lesions.

Material and methods. This case study enrolled 10 patients scheduled for endoscopic transnasal surgery for treating orbital lesions from 2009 to 2020. When the tumour was localised to the medial part of the orbit, patients underwent endoscopy with a transnasal mononostril approach. Alternatively, when the tumour was localised to the mediocaudal part of the orbit, and when instrument manoeuvreability was limited, the transnasal approach was combined with a sublabial transantral approach. Herein, we evaluate the indications, complications, and advantages of monoportal and combined two-portal approaches.

Results. 8/10 patients (80%) underwent surgery with the transnasal mononostril approach, and 2/10 (20%) underwent surgery with the combined transnasal mononostril and sublabial transantral approach. In the two latter cases, visualisation of the operation field was excellent, and there was adequate room for manipulating instruments.

Conclusions. The combined mononostril-transantral approach provided the space necessary to manoeuvre instruments and to visualise the surgical field in treating mediocaudal orbital lesions.

Clinical implications. This two-portal approach enables extensive resections of intraconal lesions. It should be considered to be a suitable and safer alternative to the binostril approach.

Key words: orbital tumours, endoscopy, transnasal approach, sublabial transantral approach, two-port surgery

Introduction

The choice of surgical approach for orbital lesions — notwithstanding that all approaches are extremely demanding — is dictated mainly by the location of the lesion [1, 2]. In addition, the anatomy of the orbit calls for microsurgical preparation. That's why three- or four-handed techniques are often required; thus, the emphasis is placed on the width of the access corridor [3, 4].

To achieve medial and mediocaudal intraorbital lesions, an endoscopic transnasal approach is mostly used, that typically provides sufficient space for manoeuvring the endoscope and

Address for correspondence: Petr Matoušek, Department of Otorhinolaryngology and Head and Neck Surgery, University Hospital Ostrava 17, Listopadu 1790, 708 52 Ostrava, Czech Republic; e-mail: petr.matousek@fno.cz

Received: 07.06.2022 Accepted: 04.10.2022 Early publication date: 25.11.2022

two instruments with the three-handed technique [1, 2, 5]. But, in some cases, instrument manoeuvreability is limited and the surgical field has to be enlarged [5].

The present study aimed to evaluate the combined transnasal and transantral approach for orbital tumours and to assess the advantages and disadvantages of a purely mononostril approach as opposed to a combined approach. Only a few studies have previously described the combined transnasal and sublabial transantral approach [6, 7].

Material and methods

This case study included patients who had undergone transnasal endoscopic resections of orbital tumours (the medial part of orbit) at the University Hospital Ostrava, Czech Republic, between 2009 and 2020. The endoscopic approach was indicated for patients with medial or mediocaudal orbital lesions, either intraconal or extraconal.

Patients were treated with the surgical mononostril approach, with either the 3- or 4-handed technique (involving two surgeons). When instrument manoeuvreability was limited during tumour dissection, the transnasal approach was combined with a sublabial transantral approach.

Computed tomography (CT) and magnetic resonance (MR) investigations were conducted pre-operatively. Additionally, an endoscopy of the nasal cavity and an ophthalmological examination were carried out.

1. After placing the patient under general anaesthesia and navigational alignment (Medtronic StealthStation), the ophthalmologist performed a dynamic retraction of the medial and (when necessary) inferior rectus muscles. A sphenoethmoidectomy was performed. The middle turbinate was resected to improve instrument manoeuvreability. The lamina papyracea was removed with Kerrison rongeurs or a Freer elevator. For inferomedial tumours, the inferior orbital wall was thinned and partially removed, medially, to the infraorbital nerve. The periorbita was opened with a sickle knife or diamond knife to the extent necessary for tumour resection. The tumour location was confirmed with navigation.
2. When the surgical space in the transnasal corridor was inadequate for performing a 4-handed technique, a small anterior maxillary opening, approximately 2 × 2 cm, was made for a sublabial approach. An endoscope and one other instrument, typically suction, were introduced through the opening. At the end of the procedure, suturing was performed with absorbable sutures.
3. Extraconal lesions were accessed by making a posteroanterior incision in the periorbita. Intraconal lesions were accessed through a surgical window between the inferior and medial orbital rectus muscles, which were retracted as needed into the frontal sinus with a ball probe. Identification of the rectus muscles was aided intra-operatively by retracting a suture placed around the rectus at its insertion into the globe. No reconstruction of periorbital defects was carried out.
4. An ophthalmological examination and endoscopy were conducted postoperatively, at one day, one week, and three weeks after surgery. Patients were strictly instructed not to blow their nose due to the risk of orbital emphysema. Patients were encouraged to perform nasal irrigation with saline 10 times per day for two weeks. The extent of resection was determined with MR imaging. Postoperative symptoms, results, and complications were observed.

Results

Between 2009 and 2020, 10 patients (four males and six females, mean age: 61 years, range: 29 to 83) underwent surgery with the transnasal endoscopic approach (Tab. 1). The intraorbital lesions were located extraconally in one case, and intraconally in nine cases. A mononostril transnasal approach was performed in 8/20 (80%) cases, and a combined mononostril and sublabial approach was performed in 2/10 (20%) cases. The sublabial approach was indicated when the surgical space was inadequate for manoeuvring instruments with multi-handed techniques.

In the two patients who required the two-port approach, the tumour was located in the inferomedial orbit; therefore, the transantral approach provided the shortest direct route to the lesion (Tab. 2, Fig. 1).

In one of these two cases, a total gross resection was achieved. The lesion was identified histologically as a cavernous haemangioma (Fig. 2). The other patient had a metastatic lesion from breast cancer, and a partial resection and orbital decompression were performed (Fig. 3).

In the combined approaches, no emphysema, facial oedema, or dysesthesia were observed postoperatively in the region of infraorbital nerve innervation.

Discussion

The present study describes the endoscopic transnasal approach for orbital lesions medial and inferior to the optic nerve. This approach had been shown to provide excellent visualisation of the surgical field without having to resort to globe retraction [1, 4, 8]. The downside of this approach is that the width of the surgical corridor might be insufficient for the multi-handed techniques required for surgery in the orbit.

In the mononostril approach, there is typically sufficient space for the 2- and 3-handed techniques routinely employed for extraconal lesions. For intraconal lesions that require a 4-handed approach, instrument manoeuvreability may be limited. Therefore, further expansion of the surgical corridor may be required [5, 9]. Sufficient space can be gained by resecting the middle turbinate or by creating a corridor through the nasal septum (binostril approach), either with a posterior septectomy, for lesions in the orbital apex, or by creating

Table 1. Patient demographics, tumour characteristics, approach, and outcome

Patient	Age (y)	Sex	Symptoms	Intraconal/ /extraconal	Approach	Diagnosis	Resection outcome	Complica-tions	Postoperative symptoms
1	72	M	Pain, ophtalmoplegia, vision loss	Intraconal	Transnasal	Metastatic adenocarcinoma	Partial	–	Unchanged
2	59	M	Diplopia	Intraconal	Transnasal	Neurofibroma	Partial	Temporary paresis; cranial nerve III	Diplopia resolved
3	67	F	Diplopia	Extraconal	Transnasal	Angioleiomyoma	Total	–	Diplopia resolved
4	53	F	Proptosis	Intraconal	Transnasal+ Sublabial	Cavernous haemangioma	Total	–	Proptosis improved
5	29	F	Diplopia, pain	Intraconal	Transnasal	Cavernous haemangioma	Total	Lower lid haematoma	Diplopia resolved, pain resolved
6	70	F	Proptosis, Diplopia	Intraconal	Transnasal+ Sublabial	Metastatic breast carcinoma	Partial	–	Diplopia improved
7	72	F	Diplopia	Intraconal	Transnasal	Lymphoma	Partial	–	Unchanged
8	83	M	Diplopia	Intraconal	Transnasal	Metastatic neuroendocrine carcinoma	Near total	–	Diplopia improved
9	39	M	Diplopia, pain	Intraconal	Transnasal	Inflammatory pseudotumour	Partial	–	Diplopia unchanged, pain resolved
10	71	F	Proptosis, diplopia,	Extraconal/ /intraconal	Transnasal	Squamous cell carcinoma	Partial	–	Unchanged

Table 2. Patients who underwent two-port approach for resecting lesions in orbit

Case 1

- Patient: female, 53-years-old
- Symptom: proptosis
- Examinations: CT and MR demonstrated a well-defined extra- and intraconal lesion, with heterogeneous enhancement on post-contrast images, and spatial displacement of optic nerve (Fig. 2)
- Diagnosis: histology identified a cavernous haemangioma
- Outcome: no residua on postoperative MR; minor haematoma of lower eyelid, no diplopia, vision normal.

Case 2

- Patient: female, 70-years-old
- Clinical history: breast carcinoma treated nine years prior to this study; treated with breast ablation, exenteration of axilla, and adjuvant radiochemotherapy
- Symptoms: intermittent diplopia for 6 months pre-operatively, with increasing proptosis (2 mm) for 3 months; restricted globe movement in all directions, particularly in moving upwards and in abduction
- Examinations: CT and MR demonstrated an intraconal tumour infiltrating inferior rectal muscle, with homogeneous post-contrast enhancement, T1 and T2 hypointensities; it was softly defined, and inferior to optic nerve (Fig. 3)
- Diagnosis: histology identified it as a metastasis of breast cancer
- Outcome: diplopia with downward eye movements persisted.

a septal window, for intraorbital lesions [5]. The trans-septal approach provides the surgeon with a good angle for dissection, but can increase nasal morbidity and may adversely influence nasal function.

An alternative approach is to create an auxiliary sublabial transantral corridor. Then, an endoscope and one other instrument can be introduced through the anterior wall of the maxillary sinus (Fig. 4). This approach provides the shortest direct route to caudal orbital lesions. Few studies have investigated the combined transnasal-sublabial approach to the orbit [6, 7]. Alimomahadi et al. [6] described their treatment experience with the combined endonasal and sublabial transantral approach for four patients with orbital and pterygopalatine fossa pathologies. Har-El et al. [7] described this combined approach for two patients with orbital apex lesions. They highlighted the advantages of this approach: it provided excellent visualisation

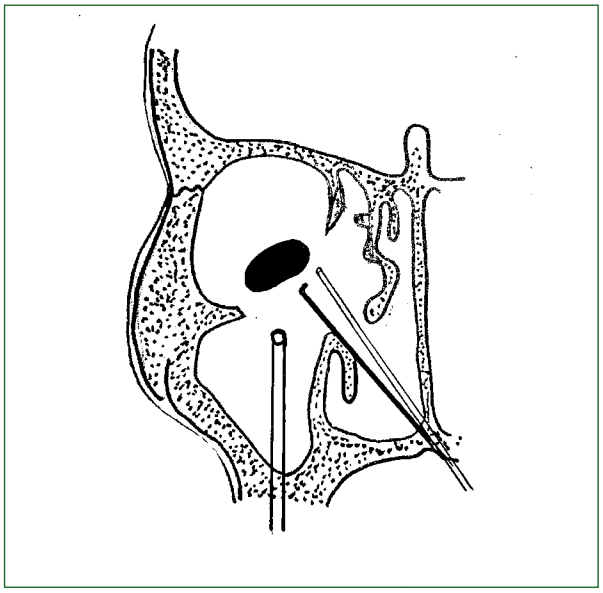

Figure 1. Schematic diagram of two-port transnasal and transantral approach

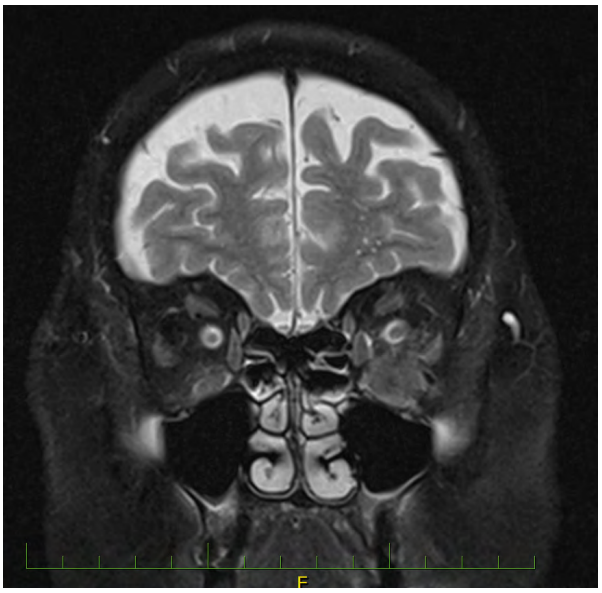

Figure 3. Magnetic resonance image of metastasis from breast cancer, coronal view

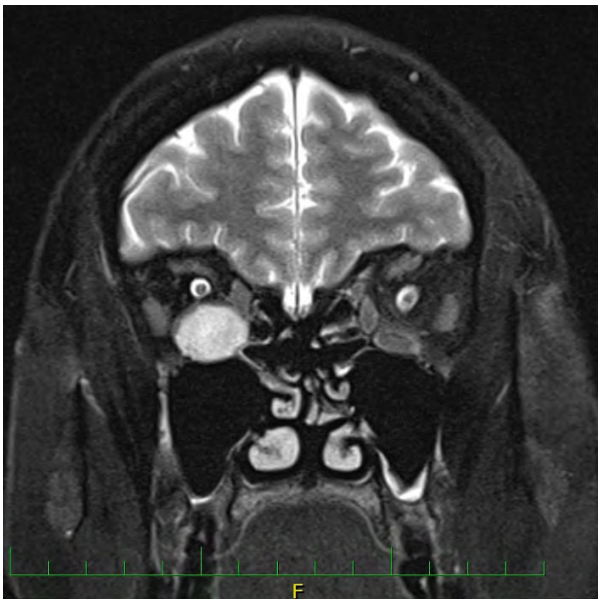

Figure 2. Magnetic resonance image of orbital haemangioma, coronal view

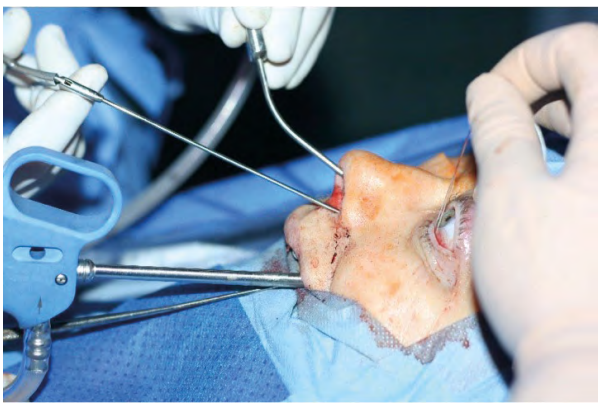

Figure 4. Perioperative view of combined transnasal-transantral approach

and averted the struggle between surgical instruments and endoscope which is often encountered with the transnasal approach alone.

In our study, the combined mononostril transnasal and sublabial transantral endoscopic approach was employed in two patients with tumours in a mediocaudal location (Fig. 1). In these cases, the single nostril approach alone did not permit sufficient manoeuvreability for the instruments, even after performing a middle turbinate resection. However, the sublabial approach allowed the introduction of an endoscope and other instruments as necessary, and it provided excellent visualisation of the anterior and lateral borders of the tumour. The endoscope did not hinder the manipulation of the surgical instruments, and the field of view was sufficiently wide without resorting to an orbital bone resection.

Introducing an endoscope requires a fenestration greater than 4 mm wide, and at least 7–8 mm, when irrigation is required. A more extensive resection (2 × 2 cm) of the anterior maxillary bone allows other instruments (typically, suction) to be introduced alongside the endoscope. We considered this approach beneficial for several reasons: it provided excellent visualisation of the surgical field without interference from the instruments introduced transnasally; the procedure was relatively simple and brief; and the technique is generally

familiar to otolaryngologists. Moreover, this approach reduced the risk of interfering with nasal function, compared to the trans-septal approach, which requires a resection or incision of the nasal septum.

The sublabial transantral approach can lead to postoperative complications, including dysesthesia in regions innervated by the trigeminal nerve, emphysema, and facial oedema. These complications occur mainly with the classic wide approach (the Caldwell-Luc procedure), which involves a large resection of the anterior wall of the maxillary sinus. However, the minimally invasive approach is typically associated with only temporary complications, such as oedema or facial hypoesthesia [7]. No complications were observed in our study.

The dreaded complications of enophthalmos and diplopia, which may arise with infraorbital resections, can also occur with the transantral approach. However, the extent of resection is no greater with the combined approach than with the transnasal approach. We observed only a small 1–2 mm enophthalmos after surgery. In the patient with metastatic cancer, diplopia with downward eye movements persisted.

The combined mononostril transnasal and sublabial transantral approach ensured sufficient space for multi-handed techniques, allowed the shortest direct route to mediocaudal lesions, and provided a suitably wide field of view. This approach could be considered an appropriate alternative to the binostril approach.

Conclusions

The combined mononostril endonasal and sublabial transantral approach is a safe, easily-performed and very effective method that enables the utilisation of multi-handed techniques. It allows free and comfortable instrument manoeuvres to reach intraconal lesions located in the inferomedial orbit when space in the nasal cavity is restricted. It represents a suitable, and relatively elegant, alternative to the binostril approach.

Clinical implications

This two-port surgical approach should be preferred over a trans-septal approach (binostril approach), because it could expand the operating field in the medial part of the orbit, it is a safer method, and it enables microsurgery preparation.

Conflicts of interest: *None.*

Funding: *This study was supported by the Ministry of Health, Czech Republic, Conceptual Development of Research Organization, MH CZ – 17/DRO - FNOs/2021.*

Ethics approval and consent to participate: *This study has been performed in accordance with the Declaration of Helsinki, and was approved by the Ethics Committee of the University Hospital Ostrava, Czech Republic. Informed consent to participate was obtained from the patients presented in the work.*

Consent for publication: *Consent to publish was obtained from the patients described in this study.*

References

5. Castelnuovo P, Dallan I, Locatelli D, et al. Endoscopic transnasal intraorbital surgery: our experience with 16 cases. Eur Arch Otorhinolaryngol. 2012; 269(8): 1929–1935, doi: 10.1007/s00405-011-1917-z, indexed in Pubmed: 22237761.
6. Muscatello L, Seccia V, Caniglia M, et al. Transnasal endoscopic surgery for selected orbital cavernous hemangiomas: our preliminary experience. Head Neck. 2013; 35(7): E218–E220, doi: 10.1002/hed.23027, indexed in Pubmed: 22715119.
7. Bleier BS, Castelnuovo P, Battaglia P, et al. Endoscopic endonasal orbital cavernous hemangioma resection: global experience in techniques and outcomes. Int Forum Allergy Rhinol. 2016; 6(2): 156–161, doi: 10.1002/alr.21645, indexed in Pubmed: 26623968.
8. Paluzzi A, Gardner PA, Fernandez-Miranda JC, et al. „Round-the-clock" surgical access to the orbit. J Neurol Surg B Skull Base. 2015; 76(1): 12–24, doi: 10.1055/s-0033-1360580, indexed in Pubmed: 25685644.
9. Healy Jr DY, Lee NG, Freitag SK, et al. Endoscopic bimanual approach to an intraconal cavernous hemangioma of the orbital apex with vascularized flap reconstruction. Ophthalmic Plast Reconstr Surg. 2014; 30(4): e104–e106, doi: 10.1097/IOP.0b013e3182a22ed1, indexed in Pubmed: 24833438.
10. Arai Y, Kawahara N, Yokoyama T, et al. Endoscopic transnasal approach for orbital tumors: a report of four cases. Auris Nasus Larynx. 2016; 43(3): 353–358, doi: 10.1016/j.anl.2015.10.009, indexed in Pubmed: 26642943.
11. Melder K, Zwagerman N, Gardner PA, et al. Endoscopic endonasal approach for intra- and extraconal orbital pathologies. J Neurol Surg B Skull Base. 2020; 81(4): 442–449, doi: 10.1055/s-0040-1713940, indexed in Pubmed: 33072484.
12. Har-El G. Combined endoscopic transmaxillary-transnasal approach to the pterygoid region, lateral sphenoid sinus, and retrobulbar orbit. Ann Otol Rhinol Laryngol. 2005; 114(6): 439–442, doi: 10.1177/000348940511400605, indexed in Pubmed: 16042101.
13. Alimohamadi M, Hajiabadi M, Gerganov V, et al. Combined endonasal and sublabial endoscopic transmaxillary approach to the pterygopalatine fossa and orbital apex. Acta Neurochir (Wien). 2015; 157(6): 919–29; discussion 929, doi: 10.1007/s00701-015-2402-z, indexed in Pubmed: 25845548.