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Original research article

Endoscopic drainage of orbital abscesses aided with intraoperative sonography

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ARTICLE INFO

Article history:
Received 25 June 2014
Accepted 13 August 2014
Available online 23 August 2014

Keywords:
Orbital abscess
Surgical treatment
Endoscopy
Orbital ultrasonography

ABSTRACT

Background and purpose: Accurate localization and adequate visualization of the superiorly or inferiorly located subperiosteal orbital abscesses or intraorbital abscess is difficult with transnasal endoscopic approach. Sonography is a well-known and effective tool for evaluation of orbital pathologies but no paper documenting intraoperative application of this method in orbital abscess surgery has been published to date.

Material and methods: We present a series of 12 patients in whom orbital abscesses were drained endoscopically with an aid of neuronavigation and intraoperative ultrasonography. The abscesses were localized subperiosteally in the medial ($n = 6$), superior ($n = 2$) or inferior ($n = 1$) part of the orbit whereas in 3 patients the abscess was localized in the intraconal space.

Results: According to intraoperative sonographic imaging complete drainage of the abscess was achieved in 11 out of 12 patients and no complications occurred. Intraoperative sonography helped to limit opening of the orbital wall in the medial subperiosteal abscesses, enabled check-up for completeness of drainage of the far extending pouches in the superior and inferior subperiosteal abscesses and enabled visualization of the tip of surgical instrument when reaching deeply located intraorbital abscesses.

Conclusions: Intraoperative ultrasonography facilitates the endoscopic management of orbital abscesses, especially those which are difficult to reach due to subperiosteal location in the superior and inferior parts of the orbit, or abscesses localized intraorbitally.

1. Introduction

Endoscopic drainage is an accepted method of treatment in the case of medially located subperiosteal orbital abscess (SPOA) because endoscopy enables almost uncompromised visualization of the medial orbital wall [1]. However, endoscopic drainage of superiorly or inferiorly located SPOAs or intraconal abscesses raises more controversies as transnasal access to this region is rather limited [2–6].

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http://dx.doi.org/10.1016/j.pjnns.2014.08.001

Many authors recommend in such cases rather external approaches, the main rationale being problematic localization of the abscess and lack of adequate endoscopic control of the completeness of drainage. This may result in relapse of the disease and necessity of reoperation [7–9]. In previously published reports, the efficacy of drainage was assessed by simple endoscopic observation of puss outflow when pressure was applied on eye globe, by palpation of changing orbital firmness or by estimation of proptosis and eyelid opening at the end of the procedure [7,8,10]. Nevertheless edema and reactive thickening of the extraocular muscles can make such subjective assessment less accurate.

A low invasive reliable bed side imaging is demanded for estimation of drainage efficacy and these conditions are fulfilled by sonography which is a well-known and effective tool for evaluation of orbital pathologies [11–13]. While both preoperative or postoperative use of orbital sonography was previously reported, to the best of our knowledge, no papers documenting intraoperative application of this method were published to date. We present a series of patients in whom intraorbital abscesses were drained endoscopically with an aid of intraoperative ultrasonography.

2. Material and methods

Table 1 shows summary of twelve patients who underwent endoscopic transnasal surgery for SPOA or intraorbital abscess drainage by an interdisciplinary team consisting of ENT surgeon and neurosurgeon between February 2007 and September 2013. Neuronavigation and ultrasonographic guidance was used in all cases. The abscesses were located subperiosteally in the medial ($n = 6$), superior ($n = 2$) or inferior ($n = 1$) part of the orbit whereas in 3 patients the abscess was localized within the intraconal space. The predominant agents from the culture was *S. aureus* in 8 patients, followed by *S. pyogenes* in 2 patients, *S. pneumoniae* in one and *Enterococcus faecalis* in the last one. In all patients different degree of exophthalmos and chemosis was observed preoperatively, accompanied by disturbances of visual acuity. Diplopia was present in all but 2 patients.

2.1. Surgical technique

All the abscesses were drained via transnasal endoscopic approach under intraoperative ultrasonographic control, using 4 mm 0° and 45° endoscopes. In patients with medial SPOAs a standard ethmoidectomy was performed, followed by partial resection of the lamina papyracea, usually starting from the point where pus was oozing from bony dehiscence. In patients with superior or inferior SPOAs, the frontal sinus or maxillary sinus were widely opened, followed by limited resection of the (respectively) superior or inferior margins of the lamina papyracea. A curved blunt suction was used to separate the periorbit from the orbital bony framework to create a tunnel leading laterally to the abscess cavity. Because of an awkward angle of access only medial parts of abscess cavity could be visualized endoscopically in this class of abscesses. Gentle pressure exerted over the orbital content helped to promote puss release, while cautious manipulation with suction tip was continued inside the abscess. Repeated ultrasonographic examination helped in monitoring of gradual decrease of the abscess volume (Fig. 1).

In patients with intraorbital abscesses the periorbit was incised horizontally near the inferior pole of the abscess to allow better postoperative gravitational drainage. An exact site of the incision was determined with a neuronavigation system (Treon Plus, Medtronic). The intraconal space was accessed between the medial and the inferior rectus muscles as described by Karaki et al. [14]. Intraorbital fatty tissues were spread using curved blunt elevator or suction to reach the abscess. Excessive fat tissue prolapsing into the nasal cavity was coped with using cautious bipolar electrocauterization. The position of surgical instruments inside the orbit could be controlled with sonography to avoid creation of the surgical corridor to the abscess in a ''blind manner'' (Fig. 2). One must also take into consideration that endoscopic visualization of the abscess cavity is usually inadequate thus making repeated intraoperative sonography an only means of current control of the efficacy of drainage (Fig. 3).

Nasal packing was avoided except some fibrin sponge placed in the middle nasal meatus at the end of the procedure. Intravenous antibiotic was administered until patient's

Table 1 – Table summarizes information about 12 patients who underwent endoscopic transnasal surgery with the guidance of neuronavigation and intraoperative ultrasonography for orbital abscess drainage.

Case no	Age/ sex	Localization within the orbit	Exophthalmos (mm) pre-op/post-op	Chemosis	Diplopia	Visual acuity pre-op/post-op	Bacterial culture
1	31/M	Medial	5/2	+	+	0.7/1.0	*Staphylococcus aureus*
2	43/F	Superior	6/2	+	+	0.6/0.6	*Streptococcus pyogenes*
3	42/F	Intraorbital	5/1	+	+	0.03/0.1	*Staphylococcus aureus*
4	52/M	Medial	6/1	+	+	0.6/0.6	*Enterococcus faecalis*
5	56/F	Medial	4/3	+	+	1.0/1.0	*Staphylococcus aureus*
6	23/M	Medial	1/0	+	–	0.7/0.7	*Staphylococcus aureus*
7	59/M	Superior	6/1	+	+	0.7/0.9	*Streptococcus pyogenes*
8	15/M	Intraorbital	5/3	+	+	0.7/0.9	*Staphylococcus aureus*
9	42/F	Medial	5/0	+	+	0.5/0.7	*Streptococcus pneumoniae*
10	61/M	Medial	4/2	+	+	0.7/0.7	*Staphylococcus aureus*
11	47/M	Inferior	5/1	+	–	0.7/0.7	*Staphylococcus aureus*
12	46/M	Intraorbital	4/2	+	+	0.4/0.9	*Staphylococcus aureus*