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Research paper

Endoscopic endonasal orbital and optic nerve decompression for traumatic orbital injuries: A review of outcome

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Abstract

Introduction: Orbital and optic nerve decompression has evolved over the years from an open surgery initially, to the current endoscopic approach. The current endoscopic approach is popularized on the idea of a safer surgery with better or similar outcome compared to open surgery.

Aim: To review the outcomes of endoscopic endonasal orbital and optic nerve decompression for traumatic orbital injuries in the Otorhinolaryngology-Head and Neck Surgery Department of a tertiary referral centre.

Material and methods: A retrospective review of data on orbital and optic nerve decompression which was done on a total of 10 eyes involving 9 patients from July 2015 to December 2017 were collected. Data that were collected includes demographic data, visual assessment, time to surgery and surgical outcomes with review of patients' status within three months postoperatively.

Results and discussion: Among the 9 patients operated, four presented with diplopia, another four with blurring of vision (BOV) and one with both the symptoms. Our review shows complete resolution of diplopia in 2 patients with another 3 reporting improvement in the symptom. Among the 5 patients with visual acuity impairment, 3 patients reported improvement while another 2 showed no worsening. There were no surgical complications reported throughout the study.

Conclusions: Endoscopic endonasal orbital and optic nerve decompression continues to evolve with increasing application in our surgical practice. Excellent outcomes in patients' status postoperatively should encourage us to consider endoscopic endonasal orbital and optic nerve decompression as the surgical approach of choice for such cases.

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1. INTRODUCTION

Over the past century, orbital and optic nerve decompression surgeries have been performed for various pathologies. The common indications for orbital decompression includes Grave's orbitopathy, infections, iatrogenic complications (orbital hematomas), trauma or neoplastic causes.[1,2] Orbital decompression has been reported for over 100 years with the earliest reports in 1911. Decompression techniques such as the Walsh-Ogura decompression which was the favoured technique in the 20th century has been replaced by the endoscopic decompression techniques.[3] The advent of endoscopes has developed the field of endoscopic sinus surgery and subsequently transnasal endoscopic orbital surgery has gained increased popularity. Endoscopic endonasal orbital and optic nerve decompression was first described by Kennedy[2] and Michel[4] in the early 1990s. This delicate approach of surgery averts the need for an incision, leading to minimal or without scarring and thus is more desirable for patients.[1] It also allows for enhanced visualisation of important anatomical landmarks and lower complication rates.[3]

2. AIM

The aim of our paper is to review the outcomes of endoscopic endonasal orbital and optic nerve decompression in traumatic orbital injuries in the Otorhinolaryngology-Head and Neck Surgery Department in Sarawak General Hospital, a tertiary referral centre in Sarawak, Malaysia.

3. MATERIAL AND METHODS

A retrospective review of medical records of patients whom have undergone endoscopic endonasal orbital and optic nerve decompression for traumatic injuries from July 2015 to December 2017 were collected and analysed. A total of ten orbital and optic nerves decompressions were performed on 9 patients who had traumatic orbital injuries of which all were due to motor vehicle accidents. All patients were examined at the Department of Ophthalmology taking into account parameters such as visual acuity using the Snellen test, presence of diplopia and impairment of extra ocular movement (EOM). Patients were monitored within 3 months post operatively.

Endoscopic endonasal orbital and optic nerve decompression were performed under general anaesthesia. The nasal cavity will be packed with moffat solution prior to the procedure. An uncinetomy was performed and followed by a wide middle meatal antrostomy. Subsequently, anterior and posterior ethmoidectomy were performed. Ethmoidal air cells were removed from the agger nasi cells to the face of the sphenoid. Air cells adjacent to the frontal recess were also removed. The lamina papyracea was then widely exposed, fractured and removed with preservation of the inferomedial orbital strut (Figures 1 and 2). The optic canal bone was drilled from the orbital apex to the lateral opticocarotid recess (OCR) (Figure 3) to expose the optic nerve circumferentially at least 180°. The optic nerve sheath and periorbital fascia were incised horizontally and postero-anteriorly using a sickle knife to provide more space for the traumatic optic nerve and orbit (Figure 4). Blakesley nasal forceps and Freer elevator were used to removed tissues and thin bones while Kerriso bone punch forceps (40° upwards) was used to remove compact bones. Adequate loose nasal packing with merocel was done in cases with bleeding especially those after trauma. Nasal packing was kept for a day postoperatively.

4. RESULTS

Patients' age ranged between 14–66 years with 6 of Malay descent, 1 Chinese and 2 ethnics Bidayuh. In total, 8 patients were males with only 1 female. Four had rectus mus-

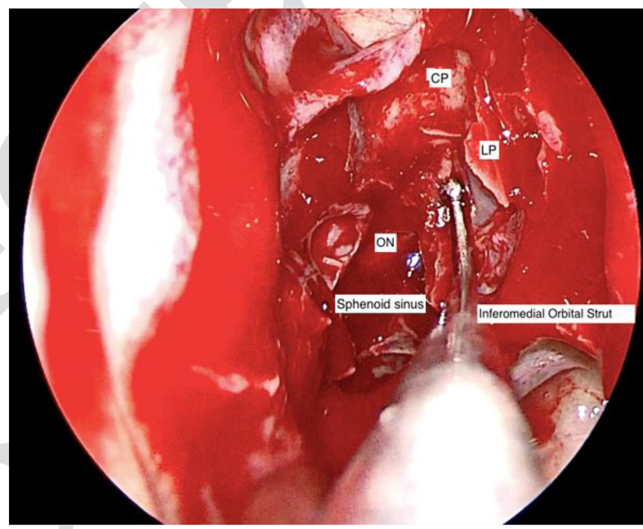

Figure 1. After removal of ethmoid air cells, lamina papyracea is fractured and removed. Comments: LP – lamina papyracea, ON – optic nerve, CP – cribriform plate.

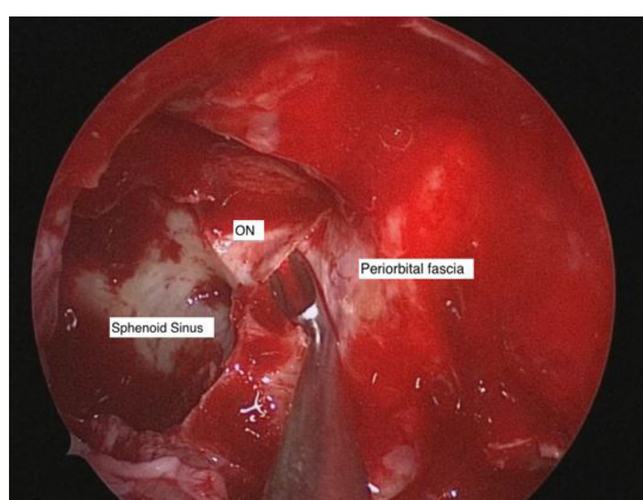

Figure 2. Lamina papyracea was removed until the orbital apex and orbital canal bone was gently removed with drill and curette.

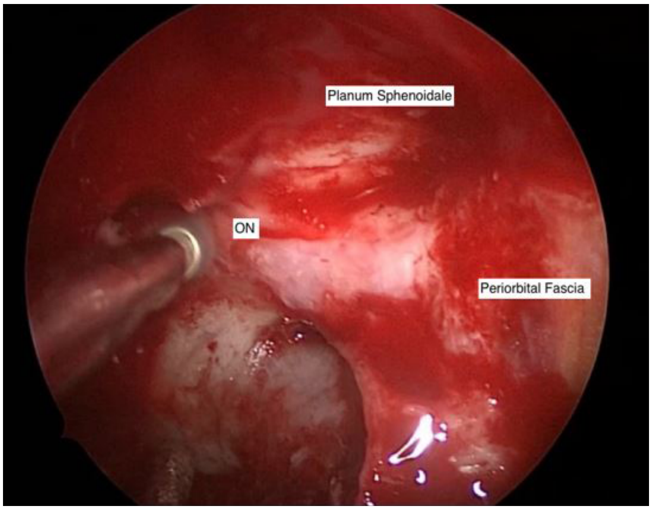

Figure 3. The optic canal bone was drilled until medial opticocarotid recess (OCR).

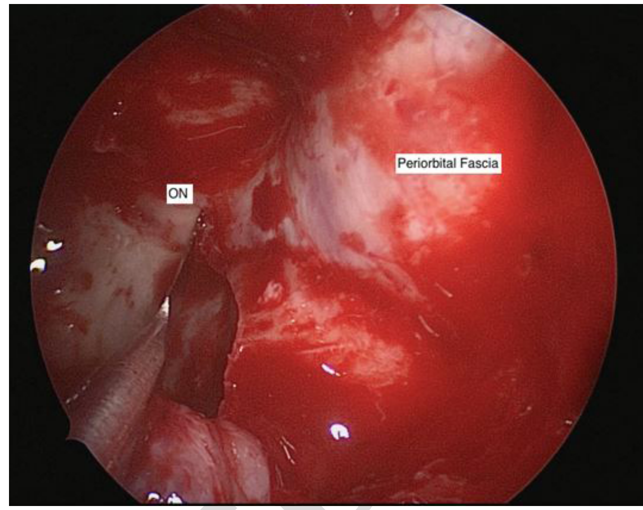

Figure 4. Incising the optic nerve sheath and periorbital fascia.

cle entrapment, 3 of which involved the inferior rectus muscles and 1 involved the medial rectus muscle. Five patients had optic neuropathy, 4 due to hematoma while 1 was due to optic nerve entrapment. Intravenous methylprednisolone was started for all patients with traumatic optic neuropathy from the moment of diagnosis till the time of surgery. All the surgical decompressions were performed within 72 h after trauma. Surgical indications of the patients included in the review were optic neuropathy and traumatic ocular muscle entrapment diagnosed through clinical findings of impaired visual acuity and restricted eye movements. One patient had concurrent traumatic optic neuropathy and muscle entrapment. Eight patients were operated unilaterally and one patient had bilateral operation (Table 1).

Among the 9 patients operated, 4 presented with diplopia, another 4 with blurring of vision (BOV) and 1 with

Table 1. Demographics of patients undergoing EEOD.

Parameter	Value
Men/Women	8/1
Age range, years	14–66
Ethnicity	
Malay	6
Chinese	1
Bidayuh	2
Indication	
Traumatic optic neuropathy (eye)	5
Traumatic rectus muscle entrapment (eye)	5
Operated eye (Bilateral/Right/Left)	1/4/4

Comments: EEOD – endonasal endoscopic orbital decompression.

Table 2. Preoperative and postoperative information on EEOD patients.

Patient	Presenting complaint	Preoperative findings	Indication	Outcomes
A	Diplopia	EOM restricted all directions BE	Traumatic inferior rectus muscle entrapment	Diplopia resolved EOM full
B	Diplopia	EOM restricted RE elevation	Traumatic inferior rectus muscle entrapment	Diplopia resolved EOM improved
C	Diplopia	EOM restricted LE elevation	Traumatic inferior rectus muscle entrapment	Diplopia improved EOM improved
D	Diplopia	EOM limited all directions except adduction LE	Traumatic medial rectus muscle entrapment	Diplopia improved EOM improved
E	BOV	VA: LE NPL	Traumatic optic neuropathy	VA : LE HM
F	BOV	VA: LE 6/24	Traumatic optic neuropathy	VA : LE 6/7.5
G	BOV	VA: RE CF	Traumatic optic neuropathy	VA : RE 6/24
H		VA: RE NPL	Traumatic optic neuropathy	VA : RE NPL (post op) Defaulted follow up
I	BOV and diplopia	VA: RE 6/60 EOM limited all directions RE	Traumatic optic neuropathy and rectus muscle entrapment	VA : RE 6/60 Diplopia improved EOM improved

Comments: BOV – blurring of vision; HM – hand movement; CF – counting fingers; NPL – no perception to light; EOM – extra-ocular movement; LE – left eye; RE – right eye; BE – both eyes).

both the symptoms (Table 2). All 5 patients with diplopia on presentation showed improvement of diplopia and EOM post operatively. Among the 5 patients with diplopia, our review shows completely resolved diplopia in 2 (40%) patients while another 3 (60%) reported improvement in symptoms, with no new onset of diplopia. Ophthalmic assessment showed 1 had full EOM after surgery; while another 4 had improved EOM. In our review, 3 (60%) patients reported improved visual acuity, the most significant noted from counting fingers to 6/24. The other 2 patients presented with blurring of vision showed no worsening of visual acuity postoperatively (Table 2).

We did not encounter any surgical complications such as bleeding of the sphenoid-palatine artery, ethmoidal arteries, ophthalmic artery, or internal carotid artery; lesion of the optic nerve, chiasm, medial rectus muscle, cerebrospinal fluid leak, or pneumocephalus were observed.

5. DISCUSSION

Traumatic orbital injuries accounts for about 3% of all emergency department visits or about 2.0 to 2.4 million cases in the United States.[5,6] Common causes include motor vehicle accident, fall and assault.[6] It is more commonly seen in males than females.[6] Traumatic orbital injuries also tend to be unilateral (75%).[6] In our study, the patients were predominantly male (88.8%) and all but one had only one orbit involvement. The diagnosis of traumatic optic neuropathy is made primarily clinical based on a constellation of history and physical exam findings (visual acuity, visual fields, fundoscopic examination, visually evoked potentials).[7] Patients with a history of trauma, and have significant visual loss, decreased colour vision, visual field deficit, an afferent papillary defect, and a dilated fundus can point towards traumatic optic neuropathy. It is important to obtain imaging, usually a high-resolution CT of the orbit to visualize the optic nerve and canal to search for evidence of fracture.[5] This can help assess for the cause of the optic nerve compression.

The aim of the surgical decompression varies depending upon the indication for the procedure. In patients with compressive optic neuropathy, restoration of visual acuity deficits is the main outcome. For cases with orbital muscle entrapment, ocular movement and resolution of diplopia may be the primary goal. However, there is still no general consensus on the preferred treatment (medical treatment involving high dose corticosteroids or surgical intervention) for traumatic optic neuropathy.[8–10]

The timing for endoscopic endonasal orbital and optic nerve decompression has also generally been controversial with no consensus so far. Improvement of visual acuity of patients in traumatic optic neuropathy depends greatly on the time elapsed between trauma and surgery. Visual improvement is seen best if decompression was done within 3 days as the outcome diminishes the longer the surgical intervention is delayed.[11,12] A study by Peng et al. on children as young as 6 years old with traumatic orbital injuries showed better outcome if the endoscopic surgical intervention was performed within 7 days of trauma.[13] Visual improvement can still be seen if surgical intervention was performed up to 2 weeks post trauma in patients with no light perception and up to 1 month post trauma in patients with residual vision.[14] In the present study, our patients were subjected to early intervention within 72 h after adequate preoperative preparation such as imaging and eye examinations.

Patients with gradual onset of vision loss also responds better to treatment compared to those with sudden or immediate vision loss.[15] However, even patients whose initial assessment showed no light perception may still benefit from endoscopic surgical decompression[16]. Failure of diplopia to improve after surgery is common. Our review shows alleviated or resolved diplopia in all patients with no new onset of diplopia postoperatively. Yu et al. in their series, reported an overall visual acuity improvement rate of 46.9% post surgery.[17] The improvement rate of visual acuity of patients who received treatment within 3 days of injury, 3– 7 days after injury and later than 7 days were 63.6%, 42.9% and 35.7% respectively. In our series, 3 of 5 patients (60%) reported improved visual acuity after EEOD.

Endonasal endoscopic approach brings comparable results to traditional external approach of orbital decompression especially in decompression of the medial orbital wall and the orbital apex, while avoiding the morbidities of open methods.[18] Advantages include clearer and magnified visualisation of the surgical field, enabling better distinction between mucosa and herniated orbital contents. This method also eliminates the need for an external incision, leading to less scarring, shorter recovery time and greater patient acceptability.[18] Furthermore, it avoids infraorbital nerve hyperaesthesia which is a recognized complication of the external approach. Other complications such as bleeding and total hospitalisation days are both reduced as well. However, a surgeon with vast experience in endoscopic intranasal surgery is required to perform these surgeries.[2] Surgeons need adequate training and experience to be familiar with the surgical technique and an in-depth knowledge of the anatomical structures and landmarks. Complications include epistaxis, nasal adhesions, sinusitis, cerebrospinal fluid leak, and pneumoencephalus.[3,17] No complications were reported in any of the patients included in our study. However, the review includes only 10 orbits and a short follow up duration of three months due to compliance and logistical issue. Future studies should include more patients with longer follow up duration to better quantify the outcome of endoscopic endonasal orbital and optic nerve decompression and to look for possible long-term complications that may arise from the procedure, such as those involving the development of sinusitis or mucocele formation.

6. CONCLUSIONS

(1) Endonasal endoscopic orbital and optic nerve decompression continues to evolve to be the surgical approach of choice with minimal complications.

(2) Adequate respect for anatomical landmarks and familiarity with technical aspect of the surgery is vital to achieve good outcomes.

Conflict of interest

None declared.

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