

Surgical Approaches for Optic Nerve Sheath Fenestration for Idiopathic Intracranial Hypertension and Review of the Literature

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ABSTRACT

Idiopathic Intracranial Hypertension is one of the causes of blindness in the modern world. It affects usually overweight female patients in their childbearing age. Unfortunately, there are no clear guidelines in respect of the best possible approach to treat this rare condition. Conservative treatment which means weight loss, acetazolamide prescription and close follow up and on the other hand surgical treatments are the main options. Ventriculoperitoneal shunt to relieve intracranial pressure and Optic Sheath Fenestration are both surgical options that can be also combined treat patients and save their vision decline [1,2]. In this study, we retrospectively reviewed different techniques of optic sheath fenestration and measured the outcome and the complication rate of each one.

Keywords

IIH, Optic nerve sheath fenestration, Papilledema.

Introduction

Idiopathic intracranial hypertension (IIH) has been increasing in prevalence during the past decade [3]. When medical treatment is inadequate to control vision decline, surgical treatment options must be considered. Optic nerve sheath fenestration (ONSF) is a well-established surgical technique to stabilise or improve vision decline and numerous surgical approaches have been described.

Purpose

The aim of this study is to retrospectively review which are the preferred surgical approaches for optic nerve sheath fenestration, in which surgical approach results are better and assess the safety of its approach in terms of complication rate. Furthermore, we searched for evidence regarding the pathophysiology of the therapeutic effect and the effect on internal cranial pressure (ICP).

Materials and Methods

We used the following keywords and phrases: optic sheath fenestration for pseudotumor cerebri, optic sheath fenestration for idiopathic intracranial hypertension, optic sheath fenestration and

surgical techniques to perform web-based search in PubMed and Google Scholar.

Inclusion and exclusion criteria have been defined before performing the search.

Inclusion criteria

Optic nerve sheath fenestration for IIH, report of complication rate, follow up of vision postoperatively, report of surgical method used, English language.

Exclusion criteria

Cerebral vein thrombosis, trauma, ischemic optic neuropathy, optic nerve glioma, animal studies, CNS infection cases, experimental studies.

Prisma 2009 flow diagram was used to identify screen and include the eligible studies for further qualitative synthesis. A total of sixty-two (62) articles retrieved from the database search and after removing 5 duplicates fifty-seven (57) articles screened. Seventeen (17) articles excluded by title or abstract [4-10] and forty (40) full-text articles assessed for eligibility. Twenty-three (23) [11-16] articles were excluded with reasons and seventeen (17) articles finally included for qualitative synthesis.

	Author	Patients	Male	Female	Eyes	Method	Results	Complications	Effect on ICP
1	Wilkes [17]	1	0	1	2	Medial	VA further declined	Not procedural	ICP remained high
2	Vaidya [18]	102	4	98	205	Medial	VA improved VF improved Papilledema n=121 eyes showed resolution n=84 improved	Include transient diplopia post-operatively in 7 patients (6.7%) 17 patients (16.3%) developed some degree of efferent pupillary dysfunction, either unilaterally or bilaterally	Not reported
3	Rizzo [19]	2	0	2	4	Medial	Initially improved	Choroidal infraction decreased VA	Not reported
4	Prabhakaran VC [20]	1	0	1	1	Vertical lid split approach	VA improved VF improved Papilledema improved	No complications reported	Not reported
5	Pineles SL [21]	42	5	37	50	Medial	VA improved n=8 stable n=20 deteriorated n=9	abscess n=1 transient diplopia n=1 tonic pupil n=1	Not reported
6	Malik AI [22]	12	N/A	N/A	24	Superomedial eyelid crease approach	VA improved	Ptosis, pupillary deficit, acute orbital inflammation	Not reported
7	Kaur N [23]	1	0	1	1	Endoscopic Optic Nerve Decompression EOND 2 fenestrations	VA improved	No complications reported	Not reported
8	Hagen SM [24]	10	0	10	11	Medial superonasal transconjunctival	VA improved	Chemosis periorbital oedema n=2 minor subconjunctival bleeding n=5 lacrimation n=1 periorbital oedema n=2	Not reported
9	Fonseca PL [25]	14	3	11	16	Medial	VA improved VF improved	3 patients required shunt procedure	Not reported
10	Chandrasekaran S [26]	32	3	29	51	Medial	VA improved VF improved	No complications reported	Not reported
11	Alsuhaibani AH [27]	62	10	52	31	Lateral canthotomy 95% Lateral orbitotomy 5%	Papilledema reduction VA improved VF improved	No complications reported	Not reported
12	Al Othman B [28]	1	0	1	1	Medial upper Eyelid	VA declined	Retrolubar oedema requiring IV steroids	Not reported
13	Tarrats L [29]	23	4	19	27	EOND	VA improved VF improved	No complications reported	Not reported
14	Shuaib MM [30]	1	0	1	1	Medial	VA improved	No complications reported	Not reported
15	Pelton RW [31]	12	6	6	12	Superomedial lid crease incision	VA improved VF improved	tonic pupil n=1 vertical diplopia n=2 transient medial ptosis n=1	Not reported
16	Agarwal MR [32]	8	5	3	20	Medial	VA improved VF improved	No complications reported	Not reported
17	James J Corbett [33]	28	8	20	40	Lateral	Papilledema improved 24/8 VA improved 12/40 Stabilized 22/40 6/40 decreased VF improved 21/40 Stabilized 10/40	Tonic pupil n=16 Loss of vision one month post op n=5 Retrolubar haemorrhage n=1 VI nerve palsy n=1	Not reported

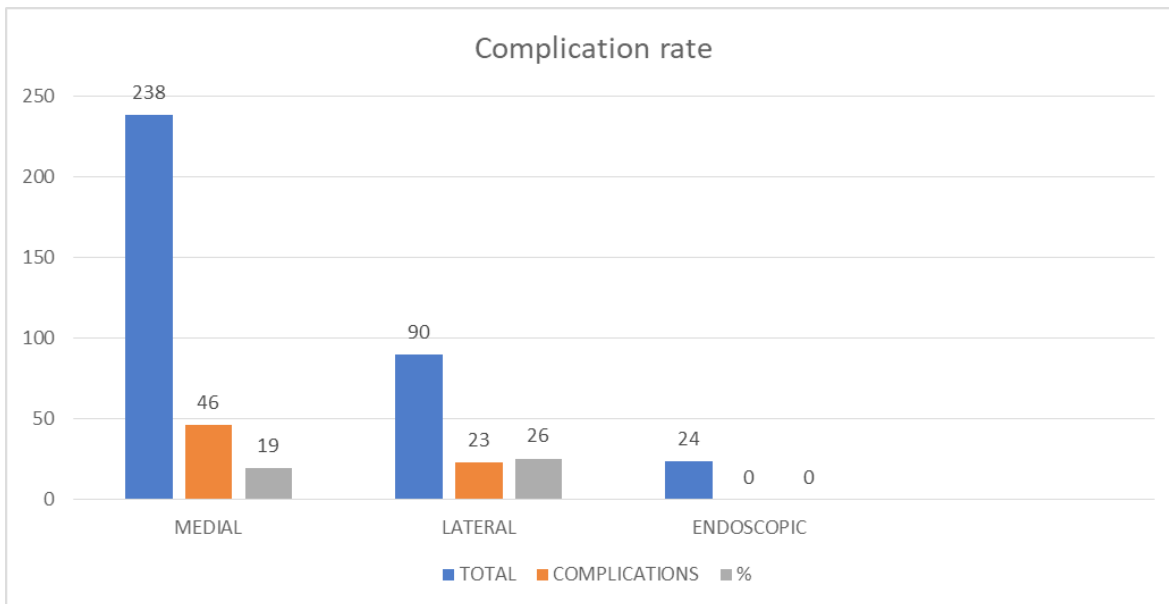


Figure 1: Rough estimation of complication rate for its approach.

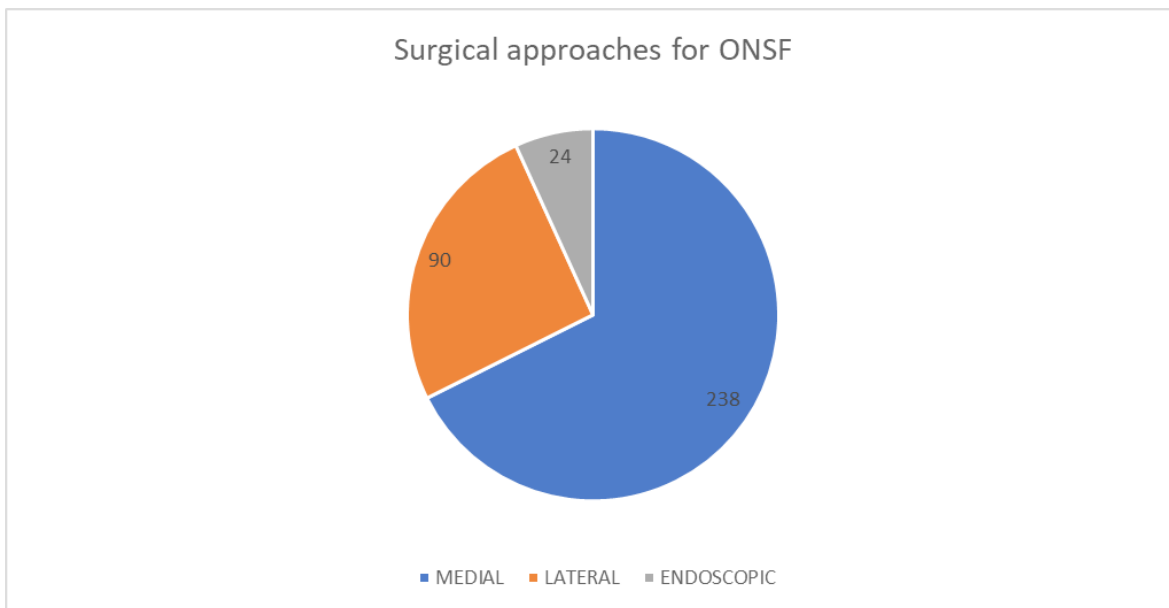


Figure 2: Diagram depicting the relative percentage of its approach in our cohort.

Results

A total of 17 studies included for qualitative synthesis of the results. (Table 1) 13 studies reported results of medial approaches, 2 studies reported results of lateral approaches and 2 studies results of transnasal endoscopic ONSF. Studies using medial approaches reported 238 patients and 398 eyes, female were 200 and male patients were 38, studies using lateral approaches reported 90 patients, 71 eyes and female were 72 and male 18, studies referring to endoscopic ONSF reported 24 patients, 28 eyes, female were 19 and male 5. Different rates of complications were reported between the studies. We summarized the total number of reported complications in studies utilizing medial approaches in 46 of 238 patients (19%), in studies that described lateral approaches there

were 23 complications of 90 patients (25%) and at last there were no complications reported in the 24 patients were endoscopic approach was used (0%). Vision was improved in 189 (80%) patients and decreased in 11 (4%) regarding medial approaches, improved in 74(82%) regarding lateral approaches and in 24 (100%) regarding endoscopic approaches.

In conclusion, optic nerve sheath fenestration is a vision saving technique. The duration of the procedure in experienced hands is short, usually less than an hour and it has reasonable rate of complications. There is evidence that even unilateral approach affects both eyes. There is no clear data about the effect of ONSF on ICP control and patients need ICP follow up. There is no clear data about the pathophysiology of the therapeutic effect of ONSF.

Discussion

Our results depicted that Optic nerve sheath fenestration is rather a safe technique with zero morbidity and mortality. Complications regarding the orbit could happen in a reasonable rate [34,35]. The workhorse of these approaches seems to be medial techniques in respect to lateral techniques. It is very interesting the fact that endoscopic optic nerve sheath fenestration utilizing the transnasal approach has very good results with no complications reported [29]. We have to mention though that the population studied in the endoscopic cohort was much smaller than the medial and lateral groups and as a result we cannot make definite conclusions. Further studies are needed to elucidate more the value of transnasal endoscopic optic sheath fenestration.

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