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ANALYSIS OF POST TRAUMATIC OPTIC NERVE DECOMPRESSION IN PATIENTS WITH NO LIGHT PERCEPTION

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Abstract:
Objective: *To determine if optic nerve decompression has any efficacy in patients with traumatic optic nerve (TON) damage specifically those patients whose optic nerves have been severely damaged and as a result, they suffer no light perception (NLP).*
Material & Methods: *A retrospective study for group of 54 patients was observed for a period of between 3 to 12 months from 2018 to January 2019.*
Results: *35 patients still had no light perception at end of the study. By the time others were discharged some had gained a level or two of visual acuity but no cases of perfect vision restored were reported.*
Conclusion: *The methods were relatively useful in reducing discomfort in patients such as significant reduction in swelling but they were not in any way completely responsible for the total recovery of the patients.*
Key words: *Traumatic optic neuropathy, optic nerve decompression, optic nerve, vision loss.*

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INTRODUCTION:

First described by Hippocrates Traumatic Optic Neuropathy (TON) is defined as the loss of vision with no evidence of injury to the optic nerve [1]. Accordingly, TON is rare but very devastating. Optic neuropathy can be on the anterior or posterior of the optic nerve and each classically divided into direct or indirect injuries [2]. Direct TON can result from penetrating injury or broken bone fragment that may lead to optic nerve avulsion, stretch injury, shearing, contusion, lacerations, and disruption. Compressive optic neuropathy can result from orbital haemorrhages [3].

Indirect TON is the most common type of optic nerve injury and accounts for 0.5-5% of closed head injuries [4]. It is believed to result from transmission of shock from an orbital impact to the intracranalicular portion of optic nerve [4]. Due to lack of understanding of the pathophysiology involved and uncertainty of clinical results, treatment of TON remains generally controversial. Methods such as optic decompression and use of steroids have been brought forward to try alleviating the cases of TON. Our study focuses mainly on optic nerve decompression.

Optical decompression has been used for the treatment of optic canal fractures [5]. Un-roofing the optical canal could relieve pressure in the optic intracranalicular portion of the optic nerve halting further damage. However, some arguments brought forward voiced concern that further injuries could be meted on the optic nerve resulting in further loss of vision [6]. In this paper a retrospective study of patients with no light perception, admitted in our hospital was done during their admission time, to determine the efficacy of optic nerve decompression.

METHODOLOGY OF THE STUDY:

A group of 54 patients, 53 males and a female, who has suffered optic nerve trauma were put under observation. 23 of them had injured their left eye, 30 their right and 1 patient had injured both eyes. 27 had sustained injuries from car accidents, 23 from falls, 4 from motorcycle accidents. The timing from injury to treatment was more than 3-21 days. 12 cases took 3-7 days, 8 took 15-21 days and some 5 cases took more than 21 days. Examination of the patients was as follows:

RAPID AFFERENT PAPILLARY DEFECT (RAPD):

RAPD is elicited through the swinging flashlight test. The light stimulates the pupil of the eye to constrict as a normal response to stimuli to regulate the amount of light that enters the eye. This relative afferent pupillary defect is the basis for the light test. This is the most important clinical sign in an unresponsive patient [8]. An eye with optic injury exhibits less pupillomotor stimulation reaching the brain than an uninjured eye [9]. This is one of the tests that are used to test response in patients [10].

IMAGING:

This is one of the most appropriate tests for patients who are unconscious. A CT scan with clinical exploration is the most important method in acute emergency settings. Fractures through optic canal can be best depicted with thin-section CT scanning [11]. Patients that undergo head CT scans and the optic canal thin layer scanning and reconstruction are usually getting tested for optic canal fracture, ethmoid and sphenoid sinus haemorrhage, fracture of the lateral wall of orbit and head and face fractures [12]. While CT scan is superior to magnetic resonance imaging (MRI) in delineating fracture of bone, MRI is superior to CT scanning for soft tissue.

Prognosis:

Most of the patients had consciousness disturbed when their prognosis were made and this was sufficient information to conclude that their prognosis was poor as it could not be established if the trauma had occurred on impact or gradually. Only 4 patients were conscious when they were examined and were the only cases of good prognosis.

SURGICAL METHODS:

Endoscopy:

The fact that the optical canals protrude into the sphenoid sinus wall is the basis for endoscopy. The procedure is performed under anaesthesia. The bulge caused by internal carotid artery and optic nerve is identified in the lateral wall of sphenoid sinus after ethmoidectomy and sphenoidotomy. The optic canals medial wall is thinned out with a micro-drill and removed with a microcurrete. No incisions are made on the annulus of Zinn [13,14].

RESULTS:

In the group of 54 patients who were followed up for a period between 3 to 12 months. At the end of the follow up, 7 patients had recovered visual acuity to different degrees. The other cases showed ineffectiveness and one patient was lost to the follow up. The earliest time that a period recovered visual acuity was one day and the latest recovery was fifteen days after the operation. Improvement of visual acuity was 1 level in 1 patient, two levels in 1 patient, 3 levels in 1 patient and 4 levels in 2 patients. Recovery

occurred between 1 and 2 weeks after recovery but ceased by the end of 2 months and remained as was. 5 could count number of fingers shown to them, 4 could perceive finger movement 50 cm away and 7 could see the eye chart.

case	age (yr)	Cause of injury	DOC	Time of lost vision (day)	Result of CT scan	Injured to operation time (day)	Preoperative vision	Time of vision recovery (day)	Vision at discharge	Time and postopera-tive vision during follow up
1	23	CA	yes	7	FBF,SH	6	NLP	15	NLP	0.04 (12)
2	28	TF	yes	20	FOC,SH ,OF	30	NLP	8	Light perception	Finger movement (10)
3	31	TF	yes	30	CLB, FOC,SH	51	NLP	—	NLP	NLP (10)
4	30	TF	yes	3	FOC,OF,SH	10	NLP	—	NLP	NLP (7)
5	29	TF	yes	10	ASBF,SH	18	NLP	7	Finger movement	Finger movement (6)
6	20	TF	yes	1	CLB, SH	14	NLP	—	NLP	NLP (7)
7	33	TF	yes	3	FBF,FOC,SH	3	NLP	13	NLP	light (6)
8	17	CA	yes	9	CLB,SH	24	NLP	—	NLP	Lost of follow up
9	30	TF	Yes	1	OF	8	NLP	—	NLP	NLP (4)
10	33	CA	Yes	1	FOC	4	NLP	—	NLP	NLP (3)
11	19	TF	Yes	14	CLB,SH,OF	21	NLP	—	NLP	NLP (3)
12	34	CA	Yes	2	SH, FBF	7	NLP	3	Finger movement	0.6 (6)
13	26	TF	Yes	3	FOC,SH	13	NLP	—	NLP	NLP (4)
14	46	CA	Yes	2	FOC, TBF	6	NLP	—	NLP	NLP(6)
15	38	TF	Yes	14	SH,OF	23	NLP	—	NLP	NLP(7)
16	23	CA	Yes	4	FOC, TBF	6	NLP	—	NLP	NLP(9)
17	24	TF	Yes	1	FOC,SH	7	NLP	11	light	light (12)
18	29	CA	Yes	2	SH	6	NLP	—	NLP	NLP(8)
19	31	TF	Yes	1	FOC,SH	8	NLP	—	NLP	NLP(4)
20	26	CA	Yes	1	FBF	3	NLP	—	NLP	NLP(8)
21	29	CA	Yes	1	FOC,OF	7	NLP	10	NLP	light(9)
22	30	CA	Yes	5	SH	8	NLP	—	NLP	NLP(3)
23	36	CA	Yes	3	FBF, OF	5	NLP	8	NLP	light(6
24	24	TF	Yes	2	FOC,SH	15	NLP	—	NLP	NLP(6)
25	28	CA	Yes	4	SH, FBF	22	NLP	—	NLP	NLP(5)
26	28	CA	Yes	3	SH	5	NLP	7	light	light(7)
27	31	TF	Yes	5	OF, TBF	8	NLP	—	NLP	NLP(6)
28	34	TF	Yes	2	FOC,SH	20	NLP	—	NLP	NLP(7)
29	33	CA	Yes	4	FOC,SH	18	NLP	—	NLP	NLP(3)
30	20	CA	Yes	2	SH	10	NLP	—	NLP	NLP(4)
31	13	CA	Yes	1	FOC,OF	2	NLP	—	NLP	NLP(3)
32	43	MA	Yes	2	FOC,OF	3	NLP	2	Finger Movement	Finger Movement (7)

33	20	CA	Yes	2	FOC,OF	3	NLP	2	Visual Acuity(0.04)	0.04(3)
34	28	CA	Yes	1	FOC,SH	2	NLP	3	Index	Index(5)
35	47	TF	Yes	7	OF,TBF	8	NLP	3	LP	LP(8)
36	51	CA	Yes	3	OF,SH	4	NLP	—	NLP	NLP(6)
37	20	CA	Yes	3	FOC,OF,TBF	5	LP	3	VISUAL ACUITY 0.2	0.2(4)
38	18	CA	Yes	4	OF	5	NLP	2	INDEX	INDEX (10)
39	22	CA	Yes	2	OF	3	NLP	5	FINGER MOVEMENT	FINGER MOVMENT (3)
40	17	MA	Yes	2	FOC,OF	3	NLP	—	NLP	NLP(9)
41	32	TF	Yes	5	OF,TBF	6	NLP	6	INDEX	INDEX(5)
42	21	MA	Yes	3	FOC,OF	4	LP	—	NLP	NLP(8)
43	39	TF	Yes	2	FOC,SH	3	NLP	1	LP	LP(6)
44	42	CA	Yes	1	FOC,OF	2	LP	4	VISUAL ACUITY 0.08	0.08(9)
45	16	CA	Yes	5	OF	6	LP	3	VISUAL ACUITY 0.6	0.6(7)
46	29	TF	Yes	3	FOC,OF	4	NLP	7	INDEX	INDEX(3)
47	35	MA	Yes	8	FOC,OF,TBF	10	NLP	—	NLP	NLP(10)
48	41	TF	Yes	1	FOC,OF	2	NLP	3	VISUAL ACUITY 0.04	0.04(4)
49	19	CA	Yes	3	FOC,OF,SH	4	NLP	—	NLP	NLP(6)
50	28	TF	Yes	1	FOC,OF	2	NLP	3	INDEX	INDEX (11)
51	31	CA	Yes	1	FOC,OF,TBF	3	NLP	5	NLP	NLP(6)
52	32	TF	Yes	4	FOC	5	NLP	—	NLP	NLP(4)
53	18	CA	Yes	5	FOC	2	NLP	—	NLP	NLP(3)
54	23	TF	Yes	8	FOC	4	NLP	—	NLP	NLP(5)

CLB=contusion and laceration of brain,; FOC=fracture of optic canal,;
SH=Sinuses hematoma, ; OF=orbital fractures, ; NLP=no light perception, DOC-Disturbance of Consciousness
CA- car accident. TF- to fall FBF- frontal bone fracture TBF-Temporal bone fracture ASBF- Anterior skull base fracture

DISCUSSION:

Generally any blindness sustained immediately after an injury exhibits a poor prognosis but gradual loss of vision exhibits a better prognosis. Immediate treatment of injuries is believed to be of paramount importance if desired results are expected [18]. However, there has been no observed correlation between immediate treatment and recovery in patients [19]. In the event that surgical decompression occurred immediately after the accident then it meant that the optic nerve was severely damaged or that majority or all the nerves were fractured, and surgical decompression would be of insignificant effect [20, 21]. In a report by Ohlsson and Svensson early decompression of the injured optic nerve reduces axonal degeneration and showed significant improvement in adult rats [23]. However, there was little evidence to support that these cases improved as a direct result of the surgery [8].

A study by the International Optic Nerve Trauma the largest multicentre study of TON to date analysed 133 people with indirect TON who were treated within 7 days of trauma. No clear evidence was found to support benefits of optic nerve decompression surgery [22].

Endoscopic decompression at other times is an alternative method that alleviates pressure in the canal. It is considered to have advantages such low morbidity, retention of a sense of smell, a shorter recovery time as compared to surgical procedure, no

surgical scar and does not interfere with children's growth [18, 8]. However, there is no evidence to support that there is significant improvement in patients after the procedure.

In our study most at the time of discharge, 35 patients who had received craniotomy and endoscopic nerve decompression still had no light perception. This was proof that the surgeries had little effect on the optic nerve injuries. The other patients had gained some degree of visual acuity. Some could perceive light and others could perceive movement. This may have been as a result that their injuries were probably superficial and as such, their bodies had helped their optic nerves to regenerate to a certain degree. This was however, no conclusive information to determine that the surgeries were in any way useful to the patients.

CONCLUSION:

The decompression of the optic canal by surgery or endoscopy served to alleviate some of the symptoms of the optic nerve injury. Swelling of the nerve reduced and in cases eliminated. A level or two of improved visual acuity was reported. However, there is no proof that they in any way help in the restoration of the vision in patients. This can be supported by cases of spontaneous visual recovery in patients who have never received any treatment.

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