Orbital Observation Chart: Significant in Orbital Fractures or Not?

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Purpose: The study was conducted to assess the efficacy of orbital chart in detecting postoperative complications of orbital fractures.
Materials and Methods: A retrospective study was conducted in the Department of OMFS, SDM College of Dental Sciences, Dharwad from January 2011 to December 2016. It included all the patients with orbital fractures who underwent surgical intervention for reduction of the fracture in the study. We recorded data for the type of fracture, type of intervention, and orbital and ocular changes. Orbital changes measured and charted for 5 parameters which were: pain, proptosis, visual acuity, size of the pupil, and pupillary reaction to direct light reflex.
Results: Two hundred thirty-six patients with orbital fractures underwent surgical intervention during these 5 years. The prevailing type of fracture for which they required orbital intervention remains zygomatic complex fractures (69%). The treatment protocol depended on the pattern and displacement of fracture and age of the patient. Pain was the most common symptom among these parameters (15.7%).
Conclusion: Orbital chart monitoring represents a straightforward and effective method to detect any complications after surgical management of orbital fractures.

Key Words: Orbital chart, orbital fracture, postoperative management, retrobulbar hemorrhage

(*J Craniofac Surg* 2019;30: 2088–2090)

Incidence of orbital fractures ranges between 10% and 25% among all facial fractures and is primarily associated with zygomatic complex fracture, naso-orbito-ethmoid fracture, Le Fort fractures, frontal bone fractures, among others.[1] One of the most dreaded complications of orbital fractures is acute retrobulbar haemorrhage which most commonly occurs following malar, middle third or ocular trauma.[2] The incidence of this complication immediately after the injury is relatively rare and more frequently occurs post reduction of malar fractures, orbital floor repair, and or orbital surgery.[3–6] The onset of retrobulbar hemorrhage is most commonly seen on immediate postoperative period, but can also be seen till the fifth postoperative day.[7] Although the incidence of retrobulbar hemorrhage followed by visual loss is 0.3%,[2] to avoid this complication our unit has been using an orbital observation chart since 1999. Hayter and Sugar initially described the chart in 1991[7] and it is an easy and effective method of monitoring orbital complications after the management of orbital fractures.

Therefore, the aim of our study was not only to highlight this chart, which Hayter and Sugar[7] have already described, but also to assess its practical implication on the patient's and how it helped to manage and prevent the occurrence of retrobulbar hemorrhage.

MATERIAL AND METHODS

During 5 years from January 2011 to December 2016, 236 cases of patients who underwent surgical intervention for orbital fractures and periorbital fractures (orbital rim) were recorded. Clinical and radiographic features confirmed the diagnosis of orbital and periorbital fractures. Data were collected from medical history and clinical examination. It included all patients who underwent surgical intervention in the midface region where it involved retraction and manipulation of the orbital unit in the study. We excluded patients who were advised conservative management of an orbital unit from the study. The records were reviewed for the pattern of fracture, type of treatment, and details in the orbital chart (Fig. 1). Because of the retrospective nature of this study, it was granted an exemption by the SDM University Institutional Review Board.

Two symptoms, orbital pain and visual acuity, and 3 signs, proptosis, size of the pupil, and direct light reflex, were the parameters that assessed the orbital changes in the chart. Orbital pain which was aggravated by eyeball movement was recorded as per patient's detail.[7] Visual acuity which decreases with retrobulbar hemorrhage were assessed as normal, reduced or absent. On examination, proptosis, which may appear rapidly in such cases, was recorded as present or absent. The direct light reflex, which is lost in retrobulbar hemorrhage, was assessed as reacting, slowly reacting, or not reacting. A dilating pupil may indicate retrobulbar hemorrhage and the diameter of the pupils, estimated in millimeters, was recorded.[7] Pain was never considered as a sole parameter to reach a conclusion of retrobulbar hemorrhage. If a patient complained of pain, he was asked to do eyeball movements and other signs and symptoms like proptosis, visual acuity, light reflexes were also checked.

We made observations at 15-minute intervals for the first 2 postoperative hours, 30-minute intervals in the next 2 hours, and then hourly until further instructions given by the surgeon. The protocol for the frequency of check was followed as per the key article of Hayter and Sugar.[7] The resident who assisted the operating surgeon in the surgery maintained the orbital chart.

Even after stopping the orbital observation chart, ocular function and changes were kept under monitor until the patient was discharged.

RESULTS

A total of 236 cases who underwent surgical intervention for orbital and periorbital fractures were recorded during this 5-year tenure.

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Received March 1, 2019.
Accepted for publication August 18, 2019.
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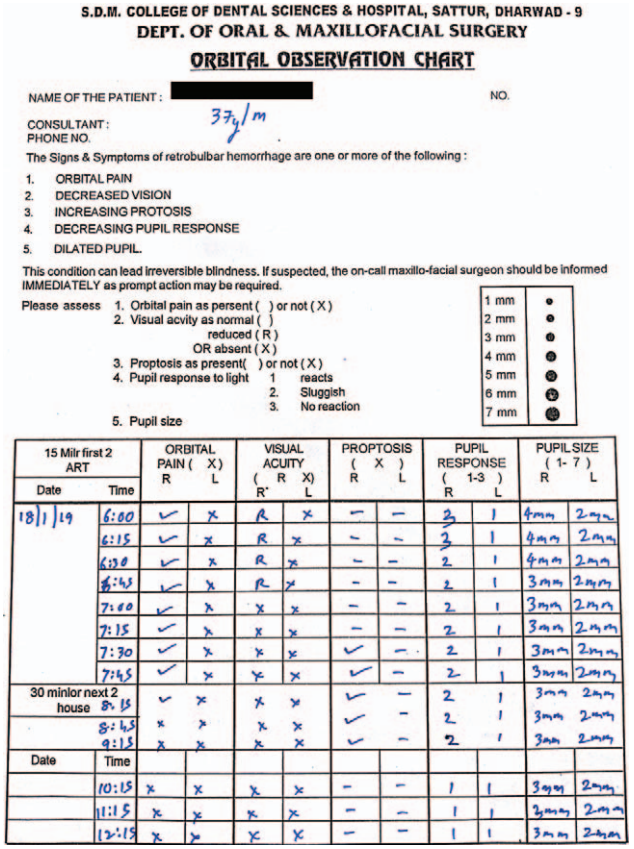
The authors report no conflicts of interest.
Supplemental digital contents are available for this article. Direct URL citations appear in the printed text and are provided in the HTML and PDF versions of this article on the journal's Web site (www.jcraniofacialsurgery.com).

ISSN: 1049-2275
DOI: 10.1097/SCS.0000000000005981



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DEPT. OF ORAL & MAXILLOFACIAL SURGERY

ORBITAL OBSERVATION CHART

NAME OF THE PATIENT : [redacted] NO.

CONSULTANT : PHONE NO.

37y/m

The Signs & Symptoms of retrobulbar hemorrhage are one or more of the following :

1. ORBITAL PAIN
2. DECREASED VISION
3. INCREASING PROTOSIS
4. DECREASING PUPIL RESPONSE
5. DILATED PUPIL.

This condition can lead irreversible blindness. If suspected, the on-call maxillo-facial surgeon should be informed IMMEDIATELY as prompt action may be required.

Please assess 1. Orbital pain as persent ( ) or not (X)
2. Visual acvity as normal ( ) reduced (R) OR absent (X)
3. Proptosis as present( ) or not (X)
4. Pupil response to light 1 reacts 2. Sluggish 3. No reaction
5. Pupil size

1 mm
2 mm
3 mm
4 mm
5 mm
6 mm
7 mm

15 Mlr first 2 ART		ORBITAL PAIN (X)		VISUAL ACUITY (R X)		PROPTOSIS (X)		PUPIL RESPONSE (1-3)		PUPIL SIZE (1- 7)	
Date	Time	R	L	R	L	R	L	R	L	R	L
18/1/19	6:00	✓	x	R	x	–	–	3	1	4mm	2mm
	6:15	✓	x	R	x	–	–	3	1	4mm	2mm
	6:30	✓	x	R	x	–	–	2	1	4mm	2mm
	6:45	✓	x	R	x	–	–	2	1	3mm	2mm
	7:00	✓	x	x	x	–	–	2	1	3mm	2mm
	7:15	✓	x	x	x	–	–	2	1	3mm	2mm
	7:30	✓	x	x	x	✓	–	2	1	3mm	2mm
	7:45	✓	x	x	x	✓	–	2	1	3mm	2mm
30 minlor next 2 house	8:15	✓	x	x	x	✓	–	2	1	3mm	2mm
	8:45	x	x	x	x	✓	–	2	1	3mm	2mm
	9:15	x	x	x	x	✓	–	2	1	3mm	2mm
Date	Time										
	10:15	x	x	x	x	–	–	1	1	3mm	2mm
	11:15	x	x	x	x	–	–	1	1	3mm	2mm
	12:15	x	x	x	x	–	–	1	1	3mm	2mm

FIGURE 1. Orbital chart format.

The mean age of occurrence of fractures was 25 years and the common most fracture pattern that was associated with orbital fracture was a zygomatic complex fracture (69%), followed by Lefort (16.9%), isolated orbit, naso-orbital ethmoid and frontal bone fractures (4.7%), respectively (see Supplemental Digital Content, Graph 1, http://links.lww.com/SCS/A935). The orbital chart had contained 5 parameters among which pain was the most typical symptom of the patient (15.7%) followed by reduced visual acuity (4.2%) (see Supplemental Digital Content, Graph 2, http://links.lww.com/SCS/A935). Three percent patients had a pupillary size which was larger than normal (see Supplemental Digital Content, Graph 3, http://links.lww.com/SCS/A935), 2.1% patients exhibited the sign of proptosis, 3.8% patients had nonreactive pupil, and 16.5% patients had slowly reacting pupils (Supplemental Digital Content, Graph 4, http://links.lww.com/SCS/A935). The surgical intervention in all the cases comprised open reduction and internal fixation with only 5% of patients requiring orbital reconstruction with autogenous grafts or titanium mesh. Three patients postoperatively showed signs and symptoms of retrobulbar hemorrhage that is severe pain, proptosis, and sluggish or unreactive pupils. These 3 features are the most sensitive and specific for detecting retrobulbar hemorrhage.

These 3 patients were managed by following medical treatment protocol of retrobulbar hemorrhage and none of them had postoperative vision loss.

DISCUSSION

Blindness owing to retrobulbar hemorrhage occurs because of ischemia of the anterior optic nerve head following the occlusion of the short posterior ciliary arteries.[7] Hemorrhage may be caused by intraconal bleeding from short posterior ciliary arteries,[8] extraconal from perforating branches of the infra-orbital arteries,[9] or subperiosteal from the infraorbital arteries.[10] Early diagnosis of retrobulbar hemorrhage is important because serious complication of blindness can only be prevented if prompt medical or surgical intervention is undertaken.[9] The 5 cardinal signs and symptoms as described by Rowe[8] helps to detect the early ocular changes which are pain, visual acuity, proptosis, direct light reflex, and size of the pupil. In 1971, Nicholson and Guzak[11] first recommended monitoring of visual acuity, pupillary response and fundus appearance for orbital floor fractures; following this Putterman in 1975 and Heinze and Hueston[9,12] in 1978 also recommended observation of pain, proptosis, and visual loss following blepharoplasty for reduction of malar fractures. Although literature was present regarding the importance of orbital changes observation following orbital fractures, no organized schematic format was present to record these data unless Hayter and Sugar in 1991[7] proposed the orbital chart. Hayter and Sugar[7] in his article explains the technique of recording orbital changes in a chart taking into account the cardinal signs and symptoms of retrobulbar hemorrhage as described by Rowe.[8] After this, no literature review has been recorded regarding the efficiency of this chart. The limitation of Hayter and Sugar's article was that he did not describe his experience about the efficiency of this chart on patients.

Among the 236 cases who underwent surgical intervention, the most typical symptom was pain (15.7%) and the common most sign was a sluggish pupillary reaction to direct light reflex (16.5%). This sign and symptom were similar to the study by Cheon in 2013 wherein initial signs of pain, reduced visual acuity, and sluggish pupillary reaction helped to diagnose provisionally retrobulbar hemorrhage, which was then confirmed with a computed tomography (CT) scan and then surgical intervention was done.[13]

Of these patients, 3 of them showed initial signs and symptoms of retrobulbar hemorrhage that is severe pain, proptosis, and sluggish or non-reactive pupillary action within the first 24 hours of surgical intervention. Medical management was instantly started which comprised an initial mega dose of steroids (3/4th mg of dexamethasone per kg body weight as an initial loading dose followed by 1/3rd mg maintenance dose per kg body weight every 4 hours over the next 24 hours)[14] and intravenous mannitol was also given.[15] Medical treatment only successfully managed all 3 cases. The goal of medical management is not to control retrobulbar hemorrhage but to reduce intraocular pressure, intra-orbital edema, circulatory spasm, and cell necrosis.[7] Similar medical treatments for management were also taken by Han et al, 2008[16] and also by Wood in 1989.[17] If symptoms would have not subsided; surgical alternatives would have been considered that is to go for decompression by exploring either through the previous surgical incision or a lateral canthotomy. Besides this 3% patient's had an only unreactive pupil to direct light response and larger than normal pupil size but this was mostly because of premacular hemorrhage and retinal edema along with choroidal rupture pre-operatively owing to the sustained trauma.

The incidence of retrobulbar hemorrhage following midface trauma is <1%, and it is even more reduced in the postoperative scenario, but blindness following retrobulbar hemorrhage in midface trauma has as high an incidence of 48%.[18] In our study, it was difficult to record any case of retrobulbar hemorrhage as our sample size was just little <250 but we feel this precautionary system had potential benefits which prevented 3 of our patients from going into a retrobulbar hemorrhage, followed by maybe blindness. This chart aided us to identify initial symptoms of increased intraocular pressure and manage them by medical treatment alone or else these could have led not only to retrobulbar hemorrhage but other complications like a superior orbital fissure and orbital apex

syndrome. We the authors feel that if this simple, easy-to-record, and a cost-effective procedure is installed in all maxillofacial centers, it can prevent potential morbidities of patients, as studies have also shown that if the retrobulbar hemorrhage is identified within 2 hours of its occurrence, the prognosis is better.[18]

CONCLUSION

Although with CT scans and other imaging technologies diagnosis of retrobulbar hemorrhage has become easy, but this simple and easy charting system could help us identify early signs and symptoms; thus, prompt management could be started unless other imaging tools confirm the diagnosis. Nursing staff and residents have also found the chart easy to understand and to record data, so when the surgeon receives this completed chart it aids him/her to assess the progress of orbital sign and symptoms after surgery. The limitations of this study are: we have not performed a surgical intervention, so we cannot comment on the results after surgery in cases of retrobulbar hemorrhage and secondly as the detection is completely based on signs and symptoms, we may need additional investigations before providing a final diagnosis of retrobulbar hemorrhage and proceeding for surgery. We would like to conclude by stating that morbidity like blindness massively affects a person's physical, mental, and social efficacy, so it will be prudent to avoid this complication even for a single patient.

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