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Clinical Article

Functional recovery of neurological deficit among patients with Orbital Fracture due to Craniofacial Traumas.

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Abstract

Background: With recent development in imaging and bone fixation technology, the orbital fracture is now considered an emerging reconstruction technique for the fixation of even the most severe injuries. This study aims to explore the success rate of functional recovery through different orbital approaches in orbital fractures and reconstruction in patients having craniofacial injuries with clinical and neurological deficits.

Methodology: This observational study was conducted from 2016 to 2018, at the Department of Neurosurgery, Liaquat University of Medical & Health Sciences (LUMHS). A total number of 30 patients were enrolled through consecutive sampling. The patients with any clinical and neurological deficit were included in this study, while the patients with craniofacial fractures with comorbidities were excluded. The evaluation of clinical and neurological deficits in the admitted patients was noted pre-operatively and re-assessment of the same deficit postoperatively was done during the tenure of 1-6 months. All orbital floor fractures were approached via a sub-ciliary or transconjunctival incision with a supraciliary approach used for all supra orbital injuries. The reconstruction of the fracture was done within 5 to 10 days of admission.

Results: A total of 30 patients underwent surgery for the repair of an orbital floor fracture. The mean age observed was 32.09 ± 10.36 years. The patient age range was 20-50 years. Among the patients 22(73.3.0%) were male and 8(26.7%) patients were female. The improvement of symptoms observed after surgical intervention includes sub-ciliary approach that resides the recovery of diplopia (95%), paraesthesia (75%), enophthalmos (100%) and vertical Dystopia (100%). On the other hand, trans-conjuctival approach resides in the recovery of diplopia (95%), paraesthesia (100%), enophthalmos (100%) and vertical Dystopia (100%).

Conclusion: It is concluded that the surgical treatment of orbital fracture shows promising results in the recovery of neurological deficit among patients with crani-o-facial injuries. Moreover, the trans-conjuctival approach holds much promising results in the improvement of infra-orbital para-aesthesia (100%) as compared to the sub-ciliary approach (75%).

Keywords

Orbit, Reconstruction, Diplopia, Orbital Fractures, Craniofacial Traumas.

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Introduction

Orbital fractures are common and challenging fixation technology and deserve special consideration. Besides surgical or observational management, defect in vision with irregular globe position may result[1]. Most of the orbital fractures occur in males, usually in their second decade of life hood[1,2], usually orbital fractures are differentiated on the basis of locations that includes roof alone, orbital roof with other wall and orbital fractures sparing the roof[1]. In adults, motor vehicle accidents and assaults are common, however in young and pediatric patients, the fall and sports related injuries are more common[1-4].

Orbital fractures commonly referred as a 'blowout' fractures, besides most of the fractures involves the maxillofacial injuries[5]. Midfacial trauma with complexity are usually considered as orbital fractures[4]. Most of the surgeons described the orbital fracture according to the location with facial extension, besides number of classification available for surgeon communication, guidelines for surgical management including indication, timing and standard guidelines for research[5,6]. Orbital fractures are handled by specialist with distinct surgical approaches, based on the trauma and its characteristics[4]. Computer tomography is gold standard imagining after clinical and plain radiographic evaluation with different views that provide different locations. These views and locations include axial view; medial wall, Sagittal view; orbital floor, soft tissue entrapment, coronal view and soft tissues entrapment[5].

Orbital fracture are usually associated with ocular injuries that are present in up to 29% of patients, with defect in blindness (0-7%-10%) and traumatic optic neuropathy (3%) in isolated orbital fracture[7,8]. Sometimes orbital fracture is associated with lethal bradicardia, vomiting, syncope and even systole due to entrapment of muscle and this can leads to oculo-cardiac reflex[9]. So, any suspect of entrapment warrants surgical intervention within 48 hours besides 2 week window could be considered elsewhere[5]. The surgical approach that depends upon type, surgeon experiences and available equipment include Sub- Ciliary, Sub-tarsal and trans-conjuctival incisions. It is suggested that these surgical approached are used with Supra Cillary approach[5-10]. Sub-ciliary approach have highest complication rate with approximately 12.9% of cases as compare to others surgical approaches[10].

Different surgical approaches contain different complications rate as described above, although these kinds of the exploration to check the validity of the different surgical approach and it succession has not been done in our setup. Since different geographical presets may cause different response and complication related to different surgical techniques. Therefore, this prospective study is initiated to evaluate the success rate of functional recovery and reconstructing using different orbital surgical approaches in orbital fractures, in individuals with craniofacial injuries, having clinical and neurological deficits.

Methodology

An observational study was conducted at Department of Neurosurgery, Liaquat University of Medical & Health Sciences (LUMHS), Pakistan. The duration of the study was from 2016 to 2018. A total of 30 patients with clinical and neurological deficit of either sex and with age between 20-50 years, who underwent orbital fractures with craniofacial trauma, were enrolled in this study through consecutive sampling. The patients with craniofacial fractures with co morbidities, were kept under exclusion criteria. Evaluation of clinical and neurological deficits in admitted patients was noted pre-operatively and re-assessment of same deficit post-operatively was done during the tenure of 1-6 months. Moreover, all the surgical procedures in this study were performed by senior surgeons.

All orbital floor fractures were approached via a subciliary or transconjunctival incision with supra ciliary approach used for all supra orbital injuries. Furthermore, the Reconstruction of fracture was done within 5 to 10 days, after the patients were admitted. Prolapsed orbital contents were elevated back to the orbit.

All the collected data was stored electronically and later analyzed by using SPSS version 20. Descriptive statistics were further applied to calculate mean and standard deviation. Frequency distribution and percentages were calculated for qualitative variables including gender and craniofacial trauma.

Results

This study includes 30 patients which underwent surgery for repair of an orbital floor fractures with a mean age of 32.09 ± 10.36 years. The patients enrolled in the study have age range between 20-50 years. 22 (73.3.0%) patients were male and 8(26.7%) patients were female among the patients included in this study (Table 1).

Table 1: Demographic data of the subjects enrolled in the study.

Baseline Characteristics		n(%)
Gender	Male	22(73.3)
	Female	08(26.7)
Mode of injury	RTA	20(66.7)
	Fall	07(23.3)
	Assault	03(10.0)

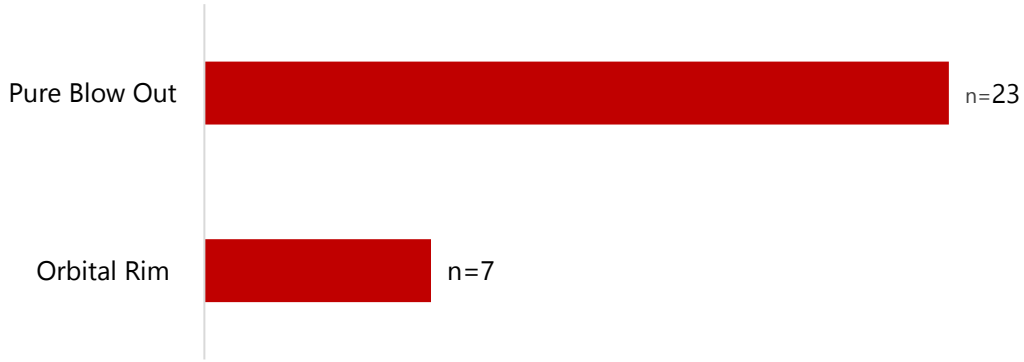

Figure 1: Type of Fractures demonstrated in the study

Results of the study further suggest that according to type of fracture demonstrated, twenty-three orbital fractures were pure blow out fracture, whereas seven were orbital rim fracture.

Most of the patients enrolled in the study were found with neurological disturbance that include; diplopia (100%), infra-orbital nerve paranesthesia (66%), enophthalmos (16%) and vertical dystopia (23%) (Table 2).

Table 2: Pre-operative Clinical presentation of Neurological disturbance.

Clinical Presentation		Percentage
Neurological disturbance	Diplopia	100
	Infra orbital nerve paranesthesia	66
	Enophthalmos	16
	Vertical Dystopia	23

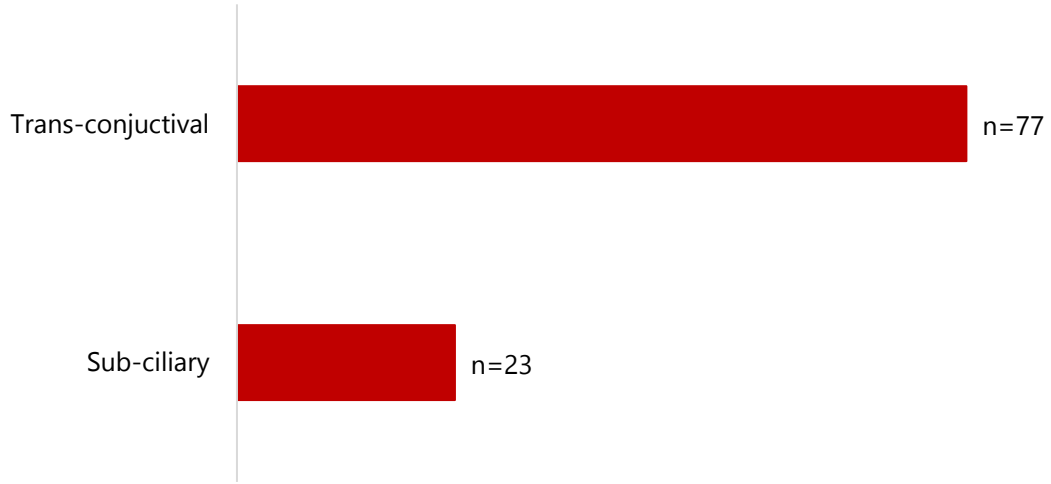

Figure 2: Surgical Approaches used in the study.

The surgical approach used in the study is supra-ciliary approach that include sub-ciliary or trans-conjunctival incision (Figure 2).

Moreover, after the surgical intervention was applied to the patients, a one to six-month follow-ups was conducted that shows the improvement symptoms of that existed pre-operative approaches. The improvement of symptoms observed after surgical interventions are shown in table 3. The sub-ciliary approach resides the recovery of diplopia up to 95%, paranesthesia up to 75%, while recovery of enophthalmos and vertical Dystopia was observed 100%. On the other hand, trans-conjunctival approach.

Table 3: Functional Neurological Recovery follow-up after surgical approach.

Surgical approach	Post-operative Symptoms improvement	n(%)
Sub-ciliary Approach (n=23)	Diplopia	22(95)
	Infra orbital nerve paranesthesia	12(75)
	Enophthalmos	3(100)
	Vertical Dystopia	6(100)
Trans-conjunctival Approach (n=7)	Diplopia	6(95)
	Infra orbital nerve paranesthesia	4(100)
	Enophthalmos	2(100)
	Vertical Dystopia	1(100)

n=total number of cases

Discussion

Orbital fractures are common and challenging to conduct. Most of the orbital fractures occur in males in their second decade of life hood[1, 2]. In adults, motor vehicle accidents and assaults are common, however in pediatric patients fall and sports-related injuries are more common[4]. Most of the fractures involves the maxillofacial injuries[5]. Majority of patients with craniofacial trauma had different levels of injuries to the orbit and its contents[11]. Mostly the fracture that involves Le fort II, III and naso-orbital-o-ethmoid bone are the one that usually hinders the provision of the vision[5,12]. Moreover, the incidence and chances of loss of vision after trauma is 7-10% that are also reported in the study literature[7,8]. One of the hypothesis

suggested regarding the pathogenesis of blowout fracture is the bone-conducting theory. This suggest that the force that is not enough powerful for fracture, can propagate along the bone, in order to fracture the weaker orbital floor[5]. One of the leading cause for orbital fracture in most of the countries is traffic accidents. Complications in these types of fractures are usually related to the oculoplastic surgeons and the globe[5]. Therefore, it is said that the management of the orbital fractures, be it optimal or complex is directly dependent on the evaluation that is conducted I the initial stages and the correct assessment of injury, along with the initiation if the suggested therapy or surgical approaches[13].

In this study the patients who underwent orbital fractures were went under surgical intervention due to neurological deficit. The neurological deficits were seems to be improved after approaching the surgical intervention. Two approaches; sub ciliary and trans-conjunctival were used and both shows promising results with recovery of diplopia (95%), enophthalmos (100%) and vertical dystopia (100%) but improvement of infra-orbital para-aesthesia (100%) seems to be more indulge with trans conjunctival approach as compare to sub-ciliary (75%). These results are similar to the results that found in literature, besides the validity of Trans conjunctival approach should be confirmed by conducting larger trial with larger sample size[10-12,14]. A study conducted by Kreidl KO and his colleagues suggest that up to 29% patients with orbital fractures are associated with the ocular injuries[7]. Furthermore, a number of studies have been shown to support the fact that orbital fractures are associated with blindness in patients up to 0.7 to 10% [8,15].

Results of this study shows that patients with orbital fractures, using the sub-ciliary approach resides the recovery of diplopia up to 95%, paranesthesia up to 75%, while recovery of enophthalmos and vertical Dystopia was observed 100%. On the other hand, trans-conjunctival approach suggests the recovery of diplopia up to 95%, while this approach resides the recovery of paranesthesia, enophthalmos and vertical Dystopia to almost 100%. Studies suggest that several patients with orbital fractures using different surgical approaches are at lower risk of developing any enophthalmos, diplopia or ocular dysfunction[16].

Our results displayed a few drawbacks in this study that includes; the weaker projection with amalgamation of recall bias, unequal group distribution, insignificant sample size and loss of follow-ups. For future consideration, the data of this study should be interpreted as a basic stone to the big foundation. Moreover, further consideration should be given to conduct case-control and cohort trials to fulfill the perquisite of temporal sequence.

Conclusion

It is concluded that the surgical treatment of orbital fracture used by patients enrolled in this study, shows promising results in the recovery of neurological deficit among patients with crani-o-facial injuries. Beside this the trans-conjunctival approach holds much promising results in the improvement of infra-orbital para-aesthesia (100%) as compare to sub-cilary approach (75%) in the patients with neurological deficits. For future consideration, the data of this study should be interpreted as a basic stone to the big foundation in order to conduct case-control and cohort trials to fulfill the perquisite of temporal sequence.

Conflicts of Interest

The authors have declared that no competing interests exist.

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