BLINDNESS FOLLOWING TRAUMA OF MIDFACIAL FRACTURES: A RETROSPECTIVE STUDY.

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ABSTRACT

Introduction: The incidence of blindness following craniofacial injuries, chiefly in orbito-frontal, orbito-naso-ethmoidal, zygomatico-orbital and Le Fort II and III fractures ranges from 1-5%. Hence in the present study we aim to conduct a retrospective study investigating the blindness following trauma of midfacial fractures.

Material and methods: We conducted a 5 year institutional retrospective study among 150 subjects. 88 fractures were related to the zygomatic complex, 4 were pure blow out, 11 were related to the orbito-naso-ethmoidal complex, 17 were Le Fort II and III type and 8 were located exclusively to the orbit. The causes and mechanism of injury that led to blindness were also investigated.

Results: A total of 12 patients were blinded as a result of the injuries, while in 2 patients the blindness was bilateral. Regarding the mechanism in 10 patients blindness was due to injury to the orbital globe, in one case due to intraorbital hematoma and in one case due to neurotmesis of the optic nerve. In 11 patients blindness was immediate post-traumatic and in one case it was progressive due to development of an intraorbital hematoma.

Conclusions: We can conclude that Midfacial trauma may cause blindness. The rupture of the orbital globe is the chief cause of blindness.

Keywords: Midfacial fracture, Maxillofacial trauma, Blindness.

I. INTRODUCTION

In Patients with a fracture of the middle third of the face have an increased probability of eye injury with initial or subsequent blindness [1-3]. In the orbit the strong bony walls which enclose the eyeball, as well as the muscle cone of the extraocular muscles, protect, facilitate and restrict the unwarranted mobility of the orbital globe. Also, the long and short posterior ciliary arteries enter the eye around the optic nerve and lie unprotected in the muscle cone, so may be more susceptible to injury than the optic nerve and produce anterior ischemic neuropathy, which is a mechanism of visual loss [2,4]. Also, the fat muscle mass of the orbit protects the eyeball from a sudden impact or compression leading to a possible blindness which is an uncommon, but predictable complication of facial trauma. The intracranial part of the optic nerve is gradually connected to the bone, so the nerve is immovable and take bleed by a thin capillary net, which can easily devastated under compression as a result of

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the increased pressure to the optic foramen after trans-ethmoidal fracture. The intra-orbital part of the optic nerve which is approximately 50 mm from the optical cruciate ligament up to the retina has a helical course, thus having a high resistance to pressure, dislocation and generally indirect injuries [5,6]. Fractures that cause blindness originate mainly only from the orbit or from more extensive fractures, such as orbito-frontal, orbito-naso-ethmoidal, zygomatico-orbital and many time Le Fort III fractures [3,7,8]. Hence in the present study we aim to conduct a retrospective study investigating the blindness following trauma of midfacial fractures.

II. MATERIALS AND METHODS

We conducted a 5 year institutional retrospective study among 150 subjects. 88 fractures were related to the zygomatic complex, 4 were pure blow out, 11 were related to the orbito-naso-ethmoidal complex, 17 were Le Fort II and III type and 8 were located exclusively to the orbit. In patients whose posttraumatic blindness was reported, the causes and the mechanism of trauma that led to the blindness were investigated and detailed medical history, plain X-rays and CT scan were taken.

III. RESULTS

We observed that the most frequent type of injury that cause blindness was Zygomatico-orbital bone fractures followed by Le Fort III-type fractures, although postoperative blindness did not occur in our patients. In a total of 150 patients, 12 patients sustained blindness due to trauma. In 2 out of these patients the blindness was bilateral. Concerning the mechanism of blindness, eight patients were due to complete globe perforation and rupture, 1 case was due to globe rupture and optic nerve compression, 1 case was due to retrobulbar hematoma, one case was due to intraorbital hematoma and vitreo-retinal hemorrhage and one case was due to optic nerve laceration and neurotmesis. In eleven patients the blindness was immediate post-traumatic and in only one case the progress was delayed due to gradual dilatation of retrobulbar hematoma. In almost all patients, blindness occurred at the time of trauma and the most common cause was orbital globe rupture, while the vision of the patients didn’t recover after treatment. Table 1

<table>
<thead>
<tr>
<th>Gender</th>
<th>Age</th>
<th>Traumatic cause</th>
<th>Type and site of fracture</th>
<th>Mechanism of blindness</th>
<th>Location of blindness</th>
<th>Time of onset of blindness</th>
</tr>
</thead>
<tbody>
<tr>
<td>male</td>
<td>24</td>
<td>Self-gunfire</td>
<td>Comminuted fracture of facial skull</td>
<td>Globe rupture</td>
<td>L</td>
<td>Immediate</td>
</tr>
<tr>
<td>Female</td>
<td>25</td>
<td>Car accident</td>
<td>Frontal + Zygomatico-orbital orbital bone</td>
<td>Globe rupture</td>
<td>L</td>
<td>Immediate</td>
</tr>
<tr>
<td>Female</td>
<td>30</td>
<td>Car accident</td>
<td>LeFort III + Orbito-ethmoidal bone</td>
<td>Globe rupture</td>
<td>Bilateral</td>
<td>Immediate</td>
</tr>
<tr>
<td>Male</td>
<td>30</td>
<td>Car accident</td>
<td>LeFort III (Comminuted) + Optic nerve compression</td>
<td>Globe perforation</td>
<td>Bilateral</td>
<td>Immediate</td>
</tr>
<tr>
<td>Male</td>
<td>35</td>
<td>Car accident</td>
<td>Zygomatico-orbital bone + Sphenoidal bone</td>
<td>Retrobulbar hematoma</td>
<td>R</td>
<td>Immediate</td>
</tr>
<tr>
<td>Male</td>
<td>46</td>
<td>Beating</td>
<td>Frontal + Zygomatico-orbital</td>
<td>Globe perforation</td>
<td>R</td>
<td>Immediate</td>
</tr>
<tr>
<td>Male</td>
<td>24</td>
<td>Car accident</td>
<td>Naso-orbito-ethmoidal + Zygomatic + Blowout bone</td>
<td>Intra orbit hematoma + Vitreoretinal Hemorrhage</td>
<td>L</td>
<td>Indirect</td>
</tr>
<tr>
<td>Female</td>
<td>62</td>
<td>Car accident</td>
<td>Zygomatico-orbital bone</td>
<td>Globe rupture</td>
<td>R</td>
<td>Immediate</td>
</tr>
<tr>
<td>Male</td>
<td>27</td>
<td>Car accident</td>
<td>Frontal + Orbito-ethmoidal bone</td>
<td>Globe perforation</td>
<td>L</td>
<td>Immediate</td>
</tr>
</tbody>
</table>
A trauma of the eyeball may cause to blindness rendering to the number of fractured bony walls of the orbit [6,7]. So, after an orbital floor fracture and secondary orbital cellulitis can cause transient or permanent complete blindness [8]. Damage to the optic nerve itself is the most common cause of blindness following traumatic fracture. Direct optic nerve damage can happen from the segments of the fractured orbit or even foreign bodies [1-5]. When the fracture line passes through the optic canal and foramen, the nerve fibers are crushed and splited [1,4,9]. Indirect damage of the optic nerve can occur by decrease of the orbital volume or by increased pressure to the intraorbital content due to retrobulbar hematoma, edema or hemorrhage of the optic nerve into the optic canal, while can rarely occur after fractures of frontal bone and post-operatively during their fixation [1-10]. In these patients, optic nerve compression will follow, which leads to its’ ischemia [5]. In dissimilarity, patients with comminuted orbital fractures carry the risk that the subsequent movement of the globe can also cause movement of the intraorbital segment of the optic nerve, while the intrabony segment by its turn can lead to strangulation, blood supply discontinuation and upcoming blindness [4].

The diagnostic inspection of patients with midfacial trauma starts with plain x-rays in conjunction with computed tomography, which should include the area of the optic foramen in order not only to get detailed information concerning the type and size of the fractures, but also the potential injury of the optic nerve. Consequently, important information are given for the evaluation of the soft tissue in the area and the extent of the hematoma possibly developed due to trauma [1]. Ultra-sound of the orbit and 3D-CT can also give important in- formations [1-6]. Regarding the prognosis a detailed medical history should be included, which will also give information about the exact time of visual loss [7,8].

Regarding the mechanism of blindness, direct trauma to the orbital globe corresponds to 1% of blindness, while retrobulbar hematoma is rare and the rate is ranging around 0.3 % [10]. The high rate of blindness that is reported in our study is maybe due to the fact that most of our patients were victims of car accidents and almost all of our patients were not wearing safety belts or protective helmets.

Nonetheless, when the retrobulbar hemorrhage becomes evident immediately after the trauma, massage to the globe can be applied in order to decrease the intrabulbar pressure and restrict the hematoma [2]. The head of the patient should be elevates and anxiolytic medication is given in order to reduce arterial pressure [8,10]. For drainage of hematoma, if there are soft tissue trauma to the area and the orbital diaphragm is dissected, then can be accomplished through the soft tissue lacerations. Differently it can be achieved with a small incision sideways to the eyelid over or under from the inner canthus or after a canthotomy of lateral palpebral ligament [2]. Instant decompression of the optic nerve is indicated in cases of retrobulbar hemorrhage (which possibly can lead to the strangulation of the nerve) and drainage of the hematoma in conjunction with the immediate fixation of the fractured bony segments must be completed, while has even better results in patients with gradual visual loss and should be done as soon as possible [6,9]. In distinction, other clinicians believe that the surgical de- compression of the optic nerve can be achieved even 7 days after trauma [5], whereas in traumatic optic neuropathy observation seems to be enough [9].

V. CONCLUSION

The valuation of intrabony course of optic nerve inside the optic canal with the use of computed tomography is important. Additionally, the trans-ethmoidal approach for nerve decompression remains the method of choice compared to the trans- frontal approach. Nonetheless, the appropriate treatment modality for patients suffering blindness secondary to blunt head trauma continues to be debated.