Complex Craniofacial Fracture

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- Fracture Patterns in Craniofacial Gunshot Wounds: A Seven-Year Experience

A complex craniofacial fracture refers to a fracture involving multiple bones and structures in the skull and face. These fractures are often the result of significant trauma, such as high-impact accidents, falls, or physical assaults. The complexity arises from the involvement of various cranial and facial bones, which may include the skull base, facial bones, and the structures surrounding the eyes, nose, and mouth.

Common components of a complex craniofacial fracture may include fractures of the skull bones (such as the frontal, parietal, and temporal bones), facial bones (such as the zygoma, maxilla, and mandible), and associated structures like the orbits (eye sockets), nasal bones, and the base of the skull.

The management of complex craniofacial fractures often requires a multidisciplinary approach involving neurosurgeons, oral and maxillofacial surgeons, ophthalmologists, and other specialists. Treatment strategies may include surgical intervention to realign and stabilize the fractured bones, address soft tissue injuries, and ensure proper healing and functional restoration.

The diagnosis and treatment plan for complex craniofacial fractures typically involve detailed imaging studies, such as CT scans or MRI, to assess the extent and location of the fractures and to guide the appropriate course of action. The ultimate goal is to restore both the structural and functional integrity of the craniofacial region.

Classification

Classifying complex craniofacial fractures involves considering various factors, such as the specific bones involved, the pattern of the fractures, and associated soft tissue injuries. There isn't a universally standardized classification system specifically for complex craniofacial fractures, but the following classification may provide a general framework for understanding and communicating the complexity of these fractures:

Le Fort Classification for Facial Fractures:

Le Fort I, II, and III fractures are commonly used to describe the involvement of the midface in complex craniofacial fractures. Each type represents a specific pattern of fracture extending across

the facial skeleton. Skull Base Involvement:

Classifying fractures based on whether they involve the skull base is crucial. Skull base fractures can be anterior, middle, or posterior fossa fractures, and the extent of involvement may contribute to the complexity. Involvement of Multiple Facial Bones:

Classifying fractures based on the number and type of facial bones involved. For example, a fracture involving the zygomaticomaxillary complex, mandible, and orbital walls would be considered more complex. Soft Tissue Injuries:

Consideration of soft tissue injuries, such as lacerations, contusions, or injuries to the facial muscles and skin, adds to the complexity of the fracture. Orbital Fracture Patterns:

Specific patterns of orbital fractures, such as blowout fractures or fractures involving multiple orbital walls, contribute to the complexity and may impact eye function. Associated Injuries:

Considering injuries to adjacent structures, such as the optic nerve, major blood vessels, or nerves, can further categorize the complexity of the fracture. Panfacial Fractures:

The term “panfacial fracture” is sometimes used to describe fractures that involve all parts of the face, including the upper, middle, and lower thirds. This term emphasizes the comprehensive nature of the injury. It's important to note that the classification of complex craniofacial fractures may vary among healthcare professionals and institutions. Additionally, the treatment approach will depend on the specific details of the fracture, and a multidisciplinary team of specialists is often involved in managing these complex cases.

Treatment

case-control study reports the institutional preliminary experience of using intraoperative CT scans in the surgical management of complex cranio-facial fractures. The results in terms of accuracy of bony reconstruction and neurological or surgical complications have been analyzed in 12 consecutive patients treated with (6 cases) or without (6 cases) i-CT. Comparative analysis demonstrated a greater accuracy of reconstruction in patients treated with the assistance of i-CT. Intraoperative CT is a useful tool with a promising role in a multidisciplinary surgical approach to complex cranio-facial surgery [1)].

Case series

A retrospective review was conducted of 33 consecutive patients with complex fractures of the anterior cranial fossa and facial skeleton, who required elective surgery for craniofacial reconstruction. Patients who required emergency surgery for intracranial clots or penetrating wounds were excluded. In all cases, all or almost all the anterior skull-base was injured with compound fractures of the frontal sinus, the orbital roofs, the lamina cribrosa, and the planum sphenoidale. In all cases, the prioritization of treatment was carefully discussed, and surgical timing and strategy were agreed.

Results: There was one dead. Olfactory injuries were always found intraoperatively. There were no mucoceles, CSF-leak recurrences, cranial infections, or neurological worsening. The functional and

neurological results were highly satisfactory.

The one-stage surgical treatment of complex craniofacial fractures has numerous advantages, including the possibility of reducing facial fractures without the risk of CSF leaks. It also eliminates the need for repeated procedures in fragile patients, and the need to dismantle the facial reconstruction if the skull base repair is performed later. The main issue is the surgical timing, considering that the maxillofacial surgeon usually favors early facial repair, whereas the neurosurgeon generally prefers delayed manipulation of the contused frontal lobes. A timeframe of 10-14 days after trauma may be a good compromise for safe procedures with excellent neurological and functional outcomes [2)].

Case report from HGUA

Multiple comminuted left craniofacial fractures.

Skull fractures: left parietal, temporal, and frontal bones, with herniation of brain parenchyma through them. Soft tissue hematoma in the left facial region with scalp involvement in the temporal and parietal regions. Fractures of the left zygomaticomaxillary complex: zygomatic arch, anterior and posterior walls of the maxillary sinus, frontal sinus fracture and hematosinus. Also associated with subcutaneous emphysema adjacent to the fractures.

Sphenoid bone fracture with involvement of both sinus walls, noting a fracture line in the clivus extending to the carotid canal.

Longitudinal and oblique fracture of the left petrous part, extending to the anterior wall of the external auditory canal (CAE)

The left orbital wall fracture is associated with inferior and lateral displacement of intraorbital contents, with herniation of extraconal fat into the maxillary sinus and slight displacement of the inferior rectus, without thickening of the same.

Zygomaticomaxillary complex fractures: Fractures of the left zygomaticomaxillary complex with inferolateral displacement: zygomatic arch, anterior and posterior walls of the maxillary sinus, with involvement of the frontal sinus and hematosinus.

Skull base fractures affecting the body, walls of the sinuses, and greater wing of the left sphenoid bone, noting a fracture line in the clivus extending to the carotid canal.

Longitudinal fracture line affecting the petrous part with probable incudomalleolar subluxation and hemotympanum, continuing with a fracture line of the greater wing of the sphenoid bone.

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Certo F, Altieri R, Crimi S, Gurrera G, Cammarata G, Visocchi M, Bianchi A, Barbagallo GMV. Image-Guided Surgery in Complex Skull Base and Facial Fractures: Initial Experience on the Role of Intra-Operative Computer Tomography. Acta Neurochir Suppl. 2023;135:61-67. doi: 10.1007/978-3-031-36084-8_11. PMID: 38153450.
2)

Talamonti G, Fragale M, Carassi E, Meccariello G, Pozza A, Canzi G. Surgical Treatment of Complex Craniofacial Fractures. World Neurosurg. 2023 Dec 27:S1878-8750(23)01854-5. doi: 10.1016/j.wneu.2023.12.121. Epub ahead of print. PMID: 38157985.