

Reconstruction of Zygomatico-Orbital Post Gunshot Defect: Case Report

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Abstract

Reconstruction of zygomatico-orbital complex remains as one of the troublesome and topical problems at steady posttraumatic deformations and fresh traumas of the mentioned region. The case of post gunshot zygomatico-orbital complex defect reconstruction with titanium mesh and autologous bone graft in combination with platelet rich plasma (PRP) is presented.

Keywords: Foreign bodies; Zygomatico-orbital complex; Titanium mesh; PRP; Gunshot injury

Abbreviations: CT: Computerized Tomography; PRP: Platelet Rich Plasma

Introduction

Management of delayed orbitozygomatic fractures with enophthalmos is a frequent challenge in oral and maxillofacial surgery [1]. Reconstruction of the craniofacial skeleton is extremely challenging even to the most experienced surgeon. Some of the critical factors that contribute to the complexity include anatomy, presence of vital structures adjacent to the affected part, uniqueness of each defect and chances of infection [2]. Craniofacial defects also have complex anatomical shapes that are hard to achieve intraoperatively by carving harvested bone from the donor site [2]. Obtaining acceptable results is still difficult in delayed cases because of the loss of bony landmarks and presence of scar tissue [4]. Even in experienced hands, good and satisfactory esthetic results are only found in 77% of cases [3]. Computer-aided individually shape-adapted fabricated titanium mesh for the mirroring-reconstruction is a promising method for the correction of post-traumatic defects [4]. Also, custom implants for the reconstruction of craniofacial defects have gained importance due to better performance over their generic counterparts [2]. However, it requires technical equipment that are not available in many clinics. We present a case of post gunshot zygomatico-orbital complex defect reconstruction with hand-adapted titanium mesh and autologous bone graft in combination with PRP.

Case Report

A 56-year-old male patient was admitted to ENT and Maxillofacial Surgery department with a complaint of left side face deformation. He gave a history of gunshot injury of head left side 8 years ago. He noted that after the injury he underwent surgical treatment of wounds with enucleation of the affected left eye under general anesthesia. On examination the patient was conscious and well oriented. His vital signs were normal. Face asymmetry was observed due to deformation of the left zygomatico-orbital region and scars of the periorbital region (Figure 1a and 1b). On CT scan examination left maxillary sinus was not traced. Instead of sinus and zygoma the conglomerate of hard and soft tissues were observed. The mandible coronoid process was fractured. Also multiple foreign bodies (bullets) were found in affected region (Figure 2).

Reconstruction with titanium mesh with autograft in combination with PRP was planning for this patient. At first, CT scan measuring of the right side landmarks and anatomy was done and then manually adapting of titanium mesh to the zygomatico-orbital zone defect was performed. Natural phantom skull was used for the mesh adaptation and reshaping (Figure 3a and 3b).

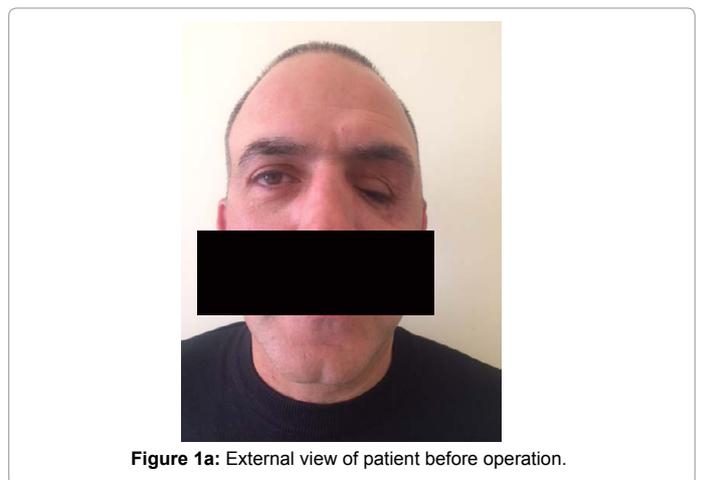


Figure 1a: External view of patient before operation.

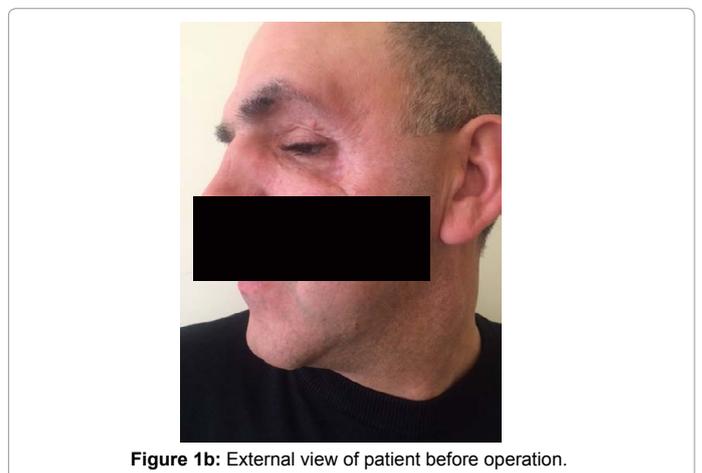


Figure 1b: External view of patient before operation.

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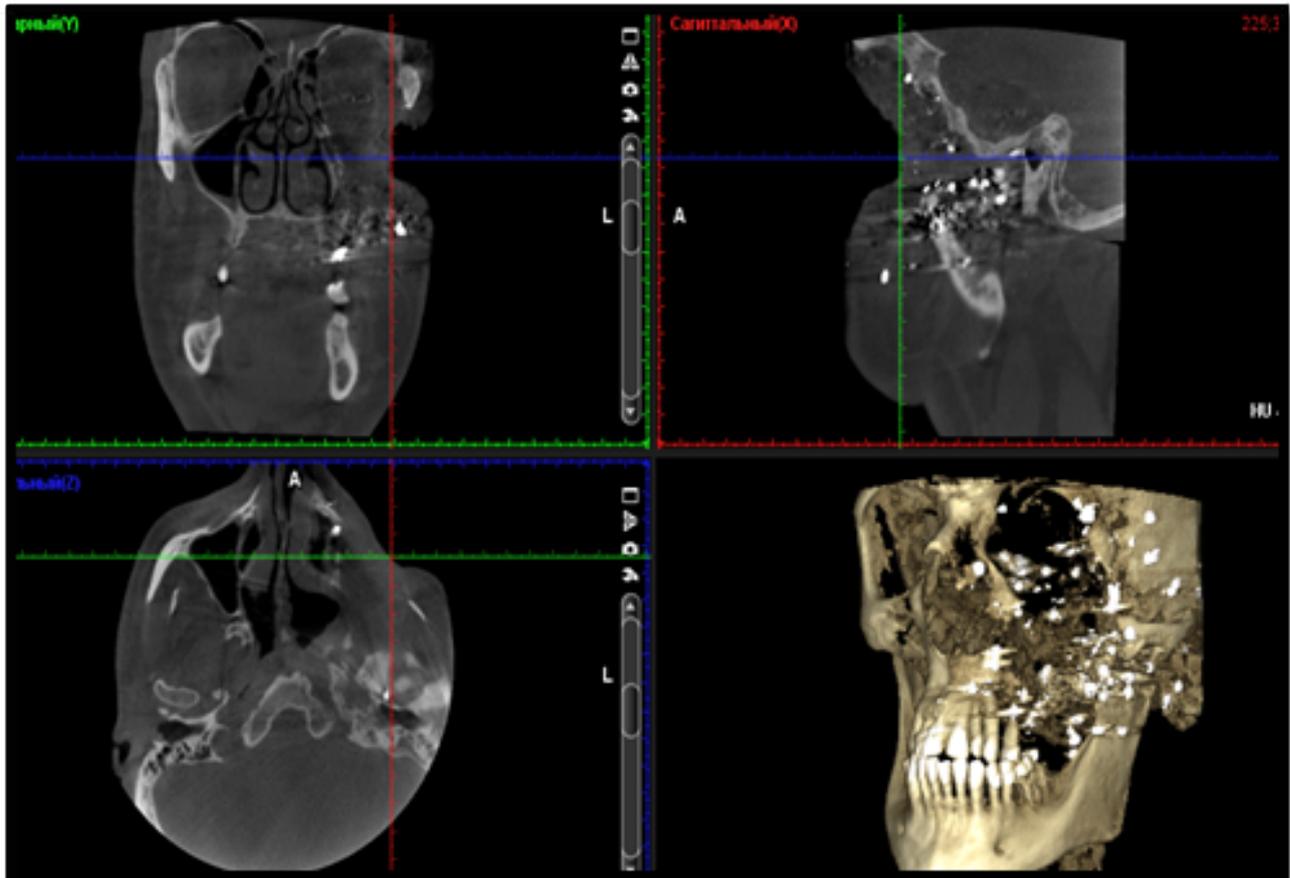


Figure 2: CT of the head before operation.



Figure 3: Titanium mesh adaptation: (a) adaptation on the phantom skull, (b) finally suited mesh.



Figure 4: Incised skin and subcutaneous tissue.

Operation was done under general anesthesia. Paranasal and infraorbital transcutaneous surgical approach was performed, due to the presence of a scar being from the previous intervention (Figure 4). Skin and subcutaneous tissues were incised and existing underlying tissues were revised. Some foreign bodies were removed. The inferior orbital rim remnants periosteum was incised and raised so wide access to orbital floor was obtained. Also incised and raised periosteum of lateral wall of the piriform aperture, part of the zygomatic arch and lateral orbit wall. Titanium mesh was adapted to the defect area and fixed with titanium screws to bearing bones (Figure 5). There was a space between mesh and underlying tissues approximately 1.5 cm in depth. Iliac crest graft was harvested, milled in the grinder and mixed with PRP (Figure 6a and 6b). The insulin syringe was used for defect grafting through the mesh pores (Figure 7). Titanium mesh surface was

covered by PRP membrane (Figure 8). The wound was suturing and a rubber ribbon drain was inserted. Upper blepharoplasty was performing for best esthetic results (Figure 9). The patient was prescribed routine antibiotics. The drain was removed on the second postoperative day (Figure 10). Sutures were removed on the tenth postoperative day.

After 8 month follow-up examination the patient was satisfied with his facial esthetic results. Face symmetry was as possible recovered (Figure 11). On CT scan examination the shapes of lower orbital rim and zygoma contours were restored (Figure 12).

Discussion

Gunshot injuries of the craniomaxillofacial region are a challenge to the trauma and reconstructive surgeon. Multiple critical structures

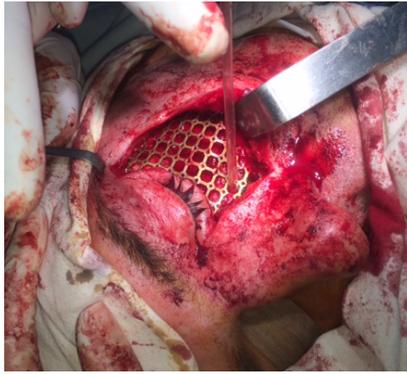


Figure 5: Titanium mesh adaptation and fixation.



Figure 6: (a) Iliac crest bone harvesting, (b) milled bone mixed with PRP.

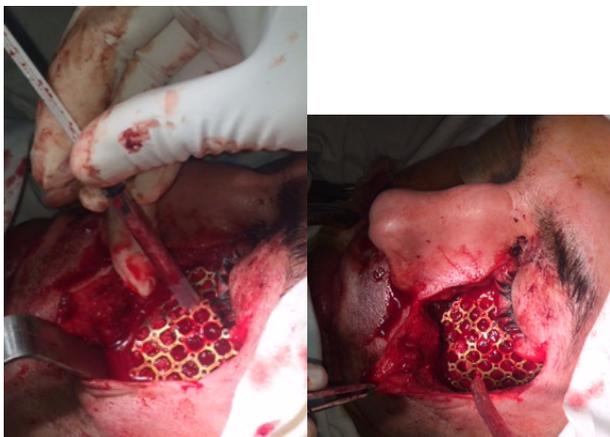


Figure 7: Bone grafting into subimplant space: (a) via syringe, (b) finally grafted space.



Figure 8: Titanium mesh, covered by PRP membrane.



Figure 9: Upper lid blepharoplasty.



Figure 10: The patient on the second post-op day.

are in close proximity; therefore damage can occur to a combination of organ systems [5]. Additionally, soft and hard tissue damage can be extensive, often requiring multiple interventions with limited functional and cosmetic results [5]. And, among them, orbito-zygomatic fractures represent a type of maxillofacial injury that happens very often due to the prominent position that the zygomatic bone occupies in the facial skeleton [6-8]. The case of post gunshot zygomatico-orbital complex defect with eye enucleation is presented. Damage of maxillary sinus and eye was occurred, and functional disorders were observed as a result. 25-28 teeth were missed and limitation of mouth opening was



Figure 11: External view of patient after 8 month follow-up.

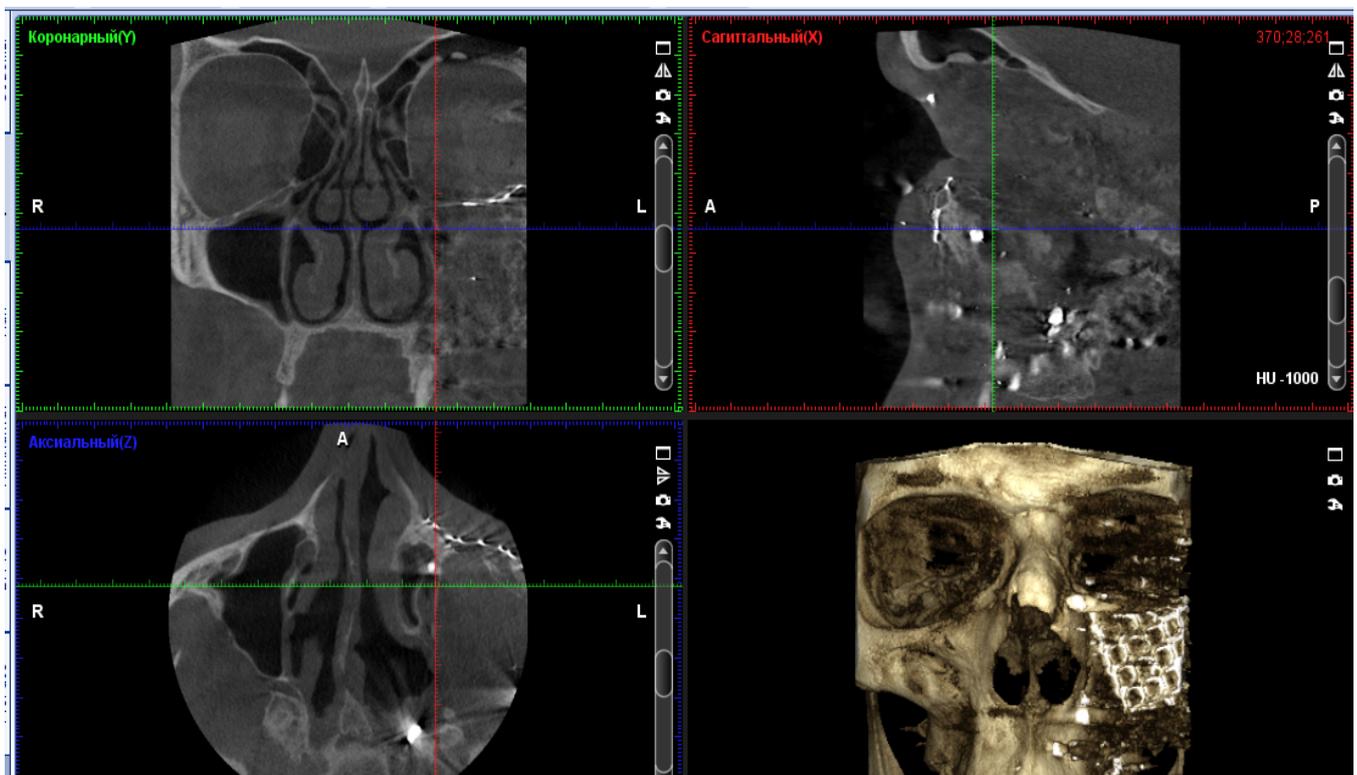


Figure 12: CT of the head after 8 month post-op.

2.5 cm. Reconstruction of zygomatico-orbital complex was planning for this patient.

Reconstruction of the craniofacial skeleton is extremely challenging even to the most experienced surgeon. Craniofacial defects also have complex of anatomical shapes that is hard to achieve intraoperatively by carving harvested bone from the donor site [2].

Computer-aided individually shape-adapted fabricated titanium mesh for the mirroring-reconstruction of the orbit is a promising method for the correction of post-traumatic enophthalmos [4,9]. CAD/CAM implants is the preferred method for the reconstruction of maxillofacial defects [1,10]. 3D printed models have been used as a template to presurgically adapt a titanium mesh or plate to precisely fit

the defects of the orbital wall a procedure that helps to reduce surgical time [10,11]. However, these technologies are expensive. Therefore, their use must be critically evaluated with regard to accuracy, informative value, cost and benefits in terms of improved diagnosis and better surgery [12].

In the absence of technical possibilities for 3D printed models, as an additional choice digital CT measuring and titanium mesh adapting are useful tools for pre-surgical planning.

Titanium can be contoured to fit virtually any internal defects because of its significant tensile strength and malleability. These characteristics determine titanium to be well established as an implant material in orbital and adjacent craniofacial skeleton reconstruction [13].

Although the risk of implant exposure exists, individual digital planning procedures, rapid prototyping, digital locating templates, and titanium implants are still effective methods for reconstructing traumatic zygomatico-orbital defects [14]. So, in our case we decide to reconstruct outer bone contours with designed titanium mesh, which was finally adopted intraoperatively. Most of the landmarks for proper positioning were lost, leaving the parts of lateral orbital wall, zygomatic arch, naso-ethmoid junction and lateral wall of piriform aperture as the only reliable landmark in secondary revisions.

Underlying tissues defect we filled with iliac crest autograft, since autologous bone remains gold standard for defects grafting. We have mixed it with PRP, so that the bone particles stick together and better maintain the shape of the defect. PRP is a new approach to tissue regeneration and it is becoming a valuable adjunct to promote healing in many procedures in dental and oral surgery, especially in aging patients [15]. The use of PRP in surgical practice could have beneficial outcomes, reducing bleeding and enhancing soft tissue healing and bone regeneration. Titanium mesh was covered by PRP membrane, as the use of PRP at injury sites might be able to promote wound healing and the regeneration of soft tissues [16].

Conclusion

The described case shows that reconstruction of delayed zygomatico-orbital complex gunshot fractures with bone defects can be performed with hand adapted titanium mesh with good esthetic results. Additional augmentation by autologous milled bone in combination with PRP was applied for correction of residual bone defects. The demonstrated method can be regarded as a treatment option for midface defects reconstruction.

Conflict of interests

Authors have no conflict of interests to declare.

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