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EXPLORING AUTOTHROMBOCYTE MASS AS A REGENERATIVE SUPPLEMENT IN THE MANAGEMENT OF ZYGOMATIC BONE FRACTURES

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Abstract: This study aimed to improve the healing of zygomatic bone fractures by using local injections of platelet-rich autoplasma (autothrombocytic mass) as a regenerative support. A total of 200 patients (153 men and 47 women) treated at the Bukhara Regional Multidisciplinary Medical Center (BRMMC) were included. Each patient received five targeted injections of platelet-rich autoplasma directly into the fracture line. Clinical assessment showed that this method provided several benefits, such as reduced pain and soft tissue swelling, faster bone repair, and fewer post-traumatic inflammatory complications. These findings suggest that incorporating platelet-rich autoplasma into the treatment of zygomatic bone fractures is an effective approach that enhances bone regeneration, controls inflammation, and lowers the risk of secondary infections.

Keywords: zygomatic bone, platelet-rich autoplasma, fracture, regeneration, autothrombocytic mass

Introduction

Zygomatic bone fractures are among the most frequent injuries of the midface and play a critical role in maintaining facial contour, orbital integrity, and masticatory function. The zygomatic bone, with its complex anatomy—including the zygomatic arch, lateral orbital rim, and zygomaticomaxillary buttress—is particularly susceptible to trauma due to its prominent position on the facial skeleton. Epidemiological studies indicate that zygomatic fractures account for approximately 20–30% of all facial fractures, consistently ranking among the most common maxillofacial injuries worldwide. Young adult males, particularly those aged 20–40 years, are most often affected, reflecting the higher incidence of interpersonal violence, sports injuries, and road traffic accidents in this population.

The pattern and severity of zygomatic fractures vary depending on the mechanism of injury. High-energy impacts, such as those from vehicle collisions, typically result in comminuted fractures with displacement of multiple zygomatic buttresses, whereas low- to moderate-energy trauma, such as falls or sports injuries, often causes isolated arch or lateral orbital rim fractures. Clinical presentation frequently includes facial asymmetry, periorbital ecchymosis, trismus, infraorbital nerve paresthesia, and diplopia in cases of orbital involvement. The complex anatomical relationships of the zygomatic bone with the orbit, maxilla, and temporal region pose challenges in both diagnosis and treatment, as improper reduction can result in persistent facial deformity, functional impairment, and sensory disturbances.

Recent epidemiological data demonstrate that zygomatic fractures commonly occur in combination with other midfacial injuries, including maxillary, nasal, and orbital fractures. Retrospective studies in Europe and Asia have highlighted an increased proportion of midface fractures associated with soft-tissue injuries and traumatic tooth loss, particularly during periods of restricted mobility, such as the COVID-19 pandemic. These findings underscore the multifactorial nature of midface trauma and the need for comprehensive evaluation and management.

The management of zygomatic fractures typically involves anatomical reduction and rigid fixation to restore facial symmetry, orbital volume, and masticatory function. Standard treatment approaches include open reduction and internal fixation (ORIF) using titanium miniplates along the zygomaticomaxillary buttress and arch. Despite advances in surgical techniques, the risk of postoperative complications—including infection, malunion, and prolonged soft-tissue edema—remains significant. These complications are influenced by the zygomatic bone's intricate vascular supply, its articulation with multiple craniofacial structures, and the presence of conditionally pathogenic oral and nasal microflora.

Innovative regenerative approaches have emerged to enhance fracture healing and reduce postoperative morbidity. Among these, autologous platelet-rich plasma (PRP), also referred to as autothrombocytic mass, has gained attention due to its high concentration of growth factors, including platelet-derived growth factor (PDGF), transforming growth factor-beta (TGF-β), vascular endothelial growth factor (VEGF), and insulin-like growth factor-1 (IGF-1). These bioactive molecules stimulate osteoblast proliferation, collagen synthesis, angiogenesis, and microvascular perfusion. PRP's fibrin scaffold also supports osteoconduction and stem cell migration, while modulation of inflammatory cytokines aids in reducing edema and pain. Clinical studies in mandibular and midface fractures have shown that local PRP application can accelerate bone consolidation, improve soft-tissue healing, and decrease the incidence of postoperative inflammatory complications.

Given the anatomical complexity and functional importance of the zygomatic bone, integrating platelet-rich autoplasma into the management of zygomatic fractures may provide a biologically supported method to enhance bone regeneration, control inflammation, and optimize clinical outcomes. This study aims to evaluate the clinical effectiveness of local PRP application in zygomatic bone fracture treatment and to assess its role in improving postoperative healing and reducing complications.

Purpose of the study: To evaluate the clinical effectiveness of autologous platelet-rich plasma (PRP) as a regenerative adjunct in the treatment of zygomatic bone fractures, with a focus on enhancing bone healing, reducing soft-tissue edema, preventing inflammatory complications, and improving overall postoperative outcomes..

Material and method: This prospective clinical study was conducted at the Bukhara Regional Multidisciplinary Medical Center from 2021 to 2024 and included 200 patients (157 males and 43 females), aged 18–60 years, diagnosed with unilateral or bilateral zygomatic bone fractures involving the zygomatic arch, lateral orbital rim, and zygomaticomaxillary buttress.

All patients underwent standard management for zygomatic fractures, including open reduction and internal fixation (ORIF) with titanium miniplates under strict aseptic conditions, systemic antibiotic therapy, anti-inflammatory medications, and physiotherapeutic rehabilitation. In the experimental group, patients additionally received local injections of autologous PRP along the fracture line to promote bone regeneration and soft-tissue healing.

PRP was prepared from 10 ml of venous blood using a double-spin centrifugation protocol with acid citrate dextrose (ACD-A) as an anticoagulant. The first centrifugation at 1,600 rpm for 10 minutes separated the plasma, followed by a second centrifugation at 3,500 rpm for 10 minutes to concentrate platelets. The PRP fraction, containing four to six times the baseline platelet concentration, was activated with 10% calcium chloride. Activated PRP (2–3 ml per session) was injected locally along the fracture line under sterile conditions at 2–3 day intervals for a total of five sessions.

Clinical evaluation included assessment of pain intensity using the Visual Analogue Scale (VAS, 0–10), measurement of soft-tissue edema, radiological monitoring of bone callus formation using digital panoramic radiographs and CBCT imaging, determination of time to

bone consolidation, and observation for inflammatory or infectious complications. Statistical analysis was performed using SPSS 26.0, with continuous variables expressed as mean ± SD and intergroup comparisons made using Student's t-test and χ^2-test ($p < 0.05$).

Results: Patients receiving PRP for zygomatic fractures demonstrated faster recovery and fewer complications than those receiving standard treatment alone. More than 90% of patients reported significant pain relief within 48–72 hours after the first PRP injection. Soft-tissue swelling decreased substantially after the second or third session, improving local circulation and accelerating tissue repair. Radiographic evaluation revealed initial bone callus formation by days 21–24 in the PRP group, compared with days 30–35 in the control group, reducing the overall healing period by 10–14 days. The incidence of post-traumatic infection or inflammatory complications decreased from 12% to 3%, with no adverse immune or allergic reactions.

The therapeutic benefits of PRP are attributed to its high concentration of platelet-derived growth factors (PDGF, TGF-β, VEGF, IGF-1), which stimulate osteoblast proliferation, collagen synthesis, angiogenesis, and microvascular perfusion. Its fibrin scaffold facilitates stem cell migration and osteoconduction, while modulation of inflammatory cytokines reduces edema and pain. PRP-derived exosomes may also contribute to enhanced tissue regeneration.

Conclusion**:** Incorporating autologous PRP into the management of zygomatic bone fractures accelerates bone healing, reduces postoperative edema and inflammation, minimizes complications, and improves overall patient outcomes. PRP represents a safe and effective regenerative adjunct in maxillofacial trauma care.

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