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Maxillofacial Trauma Treatment**

**ABSTRACTS**

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## Oral Presentation

### USE OF $\beta$ -Ti-Zr-Nb ALLOY WITH MODIFIED ELASTICITY MODULUS IN TREATMENT OF PATIENTS WITH TRAUMATIC FACIAL BONES FRACTURES

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#### **Aim**

To study the biomechanical properties of the "fixator-bone" system after open reduction and internal fixation with miniplates from a modified  $\beta$ -Ti-Zr-Nb alloy in patients with traumatic fractures of the facial bones.

#### **Methods**

Clinical and instrumental studies included analysis of the immediate and long-term results of the osteosynthesis with  $\beta$ -Ti-Zr-Nb miniplates compared to the traditional titanium miniplates in patients with facial bones fractures, estimation of radiological data, intraoperative measurement of torques when fixing screws were installed, electron microscopy of titanium plates and fixators from  $\beta$ -Ti-Zr-Nb alloy, removed in remote terms after operation, computer simulation of the stress and strain state using the finite element (FE) method.

#### **Results**

The installation of plates from modified  $\beta$ -Ti-Zr-Nb alloy with a low elasticity modulus in fractures of the facial bones provided reliable fixation stability and reduced the stress shielding effect. The value of torque in the installation of screws from this alloy consisted 10-50 Ncm with no significant differences with titanium screws. It determined the sufficient initial stability of the fixation system in most of the patients. The results obtained were in accordance with FE simulation. The potential risks of system failure were associated with a posttraumatic decrease in the bone "quality" in the area of the surgical intervention.

#### **Conclusions**

Low modulus of elasticity, high value of the reversible deformation, high fatigue strength, low magnetic susceptibility and high level of X-ray contrast determine the clinical benefits of the  $\beta$ -Ti-Zr-Nb miniplates usage in patients with facial bone fractures.