#1096 - Clinical Study / Free Papers

The Use Of Augmented Reality Technology In The Treatment Of Severe Intraarticular Fractures Of Distal Tibia

Trauma / Foot & Ankle Trauma / Surgical Treatment

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Background
The level of wound complications and quality of reductions in distal tibia fractures remain an issue despite advances in soft-tissue management (staged treatment) and reduction techniques. Correct placement of surgical incision(-s) centered directly over the fracture line is important tool to minimize additional insult to vulnerable soft tissues in the region. Augmented reality (AR) technology allows the placement of holographic image of the fractured bone "within" the leg of the patient, and in this way promotes correct planning of surgical approach(-es) and fixation.
Objectives
To prove the efficacy of AR-technology in the pre-operative planning and surgical treatment of patients with complex distal tibia fractures.
Study Design & Methods
In this randomized prospective study we included 24 patients with complex distal tibia fractures (43C according to AO/OTA classification), treated in our institution from January to September 2017. Standard treatment (10 patients) consisted in initial application of external fixator (delta-frame) with subsequent definitive fracture reduction and fixation after resolution of soft-tissue swelling (av. 10.6 days after the injury). Planning of definitive fixation was performed according to CT-data, obtained after ExFix application. The CT-data of 14 patients were additionally analyzed with the help of Microsoft Hololens (AR-group). The holographic model of given fracture was initially analyzed more thoroughly with the use of the device and then placed "within" the limb of the patient for definitive planning and marking the surgical approach(-es) immediately in operating room. Parts of external fixator served as reference points for correct placement of holographic bone model within the leg.
Results
The general length of definitive surgery comprised 118 min in the main group and 124 min in the AR-group due to the time, required to place the holographic model in the leg and definitive marking the surgical approach(-es) (it took initially around 10-15 min). There were any intraoperative complications in both groups. One superficial wound infection occurred in AR-group and two in standard group (non-significant). The quality of reduction was accessed according to Ovadia and Beals criteria and was slightly better in AR-group (78.6% vs. 70% of good reductions, non-significant).
Conclusions
This is a preliminary report and the efficacy of the AR-technology use was not confirmed statistically. At the same time we didn’t noticed any adverse effects. AR-technology allowed

us for better assessment of fracture morphology (that lead to slightly better reduction quality) and improved planning of surgical approaches with respect to soft-tissue condition. Potentially this technology will lead to the measurable decrease of additional surgical damage to soft-tissues in the fracture site.