

CT-Guided Osteosynthesis in Instable Pelvic Fractures

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Recent improvements in mortality due to high-energy trauma can be attributed to the progress made in modern critical care medicine including early fracture stabilization.

Most of the complications of classical stabilization techniques are related to the surgical exposure itself, rather than to the initial injury. It therefore seems reasonable to consider less invasive

treatment options. The most frequent percutaneous application is the transiliosacral screw fixation using only fluoroscopy guidance. Given the anatomical complexity of the pelvic structures, this surgical procedure remains a challenging task.

An 18-year-old woman was presented at the CT unit for a whole-body scan after having experienced a severe car acci-

dent. The CT scan revealed – beside a right sided lung contusion – an instable fracture of the pelvic bone involving the superior ramus of the pubic bone and the wing of the sacral bone on the left side (Figs. 2A-B). On day 5 after the trauma the patient was referred to the interventional radiology unit for CT-guided osteosynthesis.



1 CT-guided osteosynthesis in instable pelvic fractures

Procedure

The procedure was performed under general anaesthesia in cooperation with trauma surgeons (Figs. 1A-C). The patient was placed in a strict lateral position using a vacuum mattress with the fractured pelvis pointing to the

top. A planning CT was performed to identify the most appropriate position for the screw. Using a Siemens SOMATOM Definition AS+ CT scanner and the new Siemens Interventional Suite for 3D-guided interventions, planning procedures have been dramatically

improved. Additionally, a 78 cm large bore allows convenient work within the gantry. The innovative table-side control module "i-Control" enables operating all table and scanner movements from inside the scan room (Fig. 1B, arrow), improving the workflow as well on such complex procedures. For this patient, the correct positioning of the screw was planned on axial images. Furthermore, path planning and calculation of the screw length were performed on the automatically obtained 3D images using the needle oriented views. A combination of CT Fluoroscopy with the new i-Fluoroscopy mode and a sequential approach with 3D i-Sequence mode was used to securely drive a wire through the iliac bone and the sacral wing into the first sacral vertebral body. Especially the 3D i-Sequence mode with instant display of the wire in an axial, coronal and sagittal view (MPR) permitted excellent visualization and increased the interventional radiologist's confidence not to harm, e.g. the neuro-foramen, or to protrude outside the first sacral vertebral body. This enables a safe placement of the screw even in complex anatomy (Fig. 3).

With the guide wire in place, the screw could be advanced into the target area to provide compression on the fractured sacral wing (Fig. 3). Then, the guide wire was withdrawn. Before the patient was removed from the CT-table, a control scan was conducted and MPR as well as VRT were reconstructed (Fig. 4).

Comments

With the availability of the new 3D-guided Interventional Suite, we have chosen the approach of CT-guided osteosynthesis. In comparison to classic surgical techniques of internal fixation, the new interventional procedure brings advantages for both patients and the hospital. Less complications, due to less extensive soft tissue damage associated with long bed rest, reduce the likelihood for pneumonia, deep vein thrombosis etc., facilitate a faster recovery of the patient and finally an earlier discharge.



2 CT scan revealed an instable fracture of the pelvic bone involving the superior ramus of the pubic bone and the wing of the sacral bone on the left side (Fig. 2A). VRT supports surgical planning planning (Fig. 2B).



3 With the 3D approach, the placement of the screw into the target area can be perfectly monitored using a guide wire.



4 Using CT guided interventions, the screw can be placed in the target area without providing compression of the fractured sacral wing.