

WCMISST 2014 Abstract submission

Innovation in spine surgery

WCMISST14-1179

"Invisible" pedicle screws of Carbon Fiber Technology

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Preferred presentation method: Oral presentation

Declare any conflict of interest: No, none of the authors listed have any conflict of interest

Background: Carbon Fibers-PEEK implants are in orthopedic use for over a decade, including spinal cages. Additionally, intramedullary nails and plates for long bone trauma and pathologies, made out of continuous Carbon Fibers Reinforced PEEK (CFR-PEEK), are being used worldwide.

Recently, CFR-PEEK pedicle screw system has been introduced (CarboFix Orthopedics). It is composed of continuous longitudinal carbon fibers, embedded in PEEK.

CFR-PEEK is radiolucent. It does not create artifacts in MRI & CT, which makes it advantageous for use in spinal fixation procedures, where imaging is important intra-op, as well as for routine follow-up.

Additionally, in case of oncological patients, this composite material, allows precise radiation therapy planning, and produces no backscattering during radiation therapy at the involved segment.

The CFR-PEEK pedicle screw system, which include also rods, has a mono-axial or poly-axial screw design. Its components are marked using embedded radiopaque tantalum markers for X-ray visualization.

According to accepted standards for spinal implants, biomechanical tests, including 4-point bending, fatigue and static torsion testing, demonstrated that the CFR-PEEK pedicle screw system is at least as strong as common titanium pedicle screw systems.

Methods: Three patients were treated using this novel pedicle screw system. Two patients had oncological lesion at the surgery site, and the third had spinal stenosis. The procedures were performed according to common pedicle screw surgical technique. Patients were followed-up using CT & MRI imaging. The two oncological patients were radiated post procedure.

Results: The procedures did not differ from metal implants procedures. Post-operative unobstructed imaging clearly demonstrated underlying pathology or anatomic structure with no image artefacts in CT & MRI.

For patients with spinal metastatic disease, radiation therapy could be locally applied with good pre-radiation CT planning, and no backscattering at the involved levels.

Follow-up of the patients was performed during 4 months with satisfactory results and no complications.

Conclusions: This pedicle screw system has the same biomechanical properties as metal implants. The advantage of artifact-free view of the bone and neural structures, and no backscattering in radio-therapy, opens a new area in spinal surgery.

In this presentation our experience using the CFR-PEEK pedicle screw system, as well as patients outcome and follow-up will be presented.

Disclosure of Interest: None Declared