Synthetic Bone Graft, Spinal Fusion & PET-CT

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Synthetic bone grafts, made of ceramic materials, can promote the healing process of bone tissue. The objective was to test a new synthetic bone graft. The aim was to study outcome of interbody spinal fusion surgery by PET-CT evaluation.

Synthetic bone graft used for spinal fusion in adult minipigs – osteoblast activity evaluated with PET-CT
Left: High resolution CT Right: ^{18}F-PET

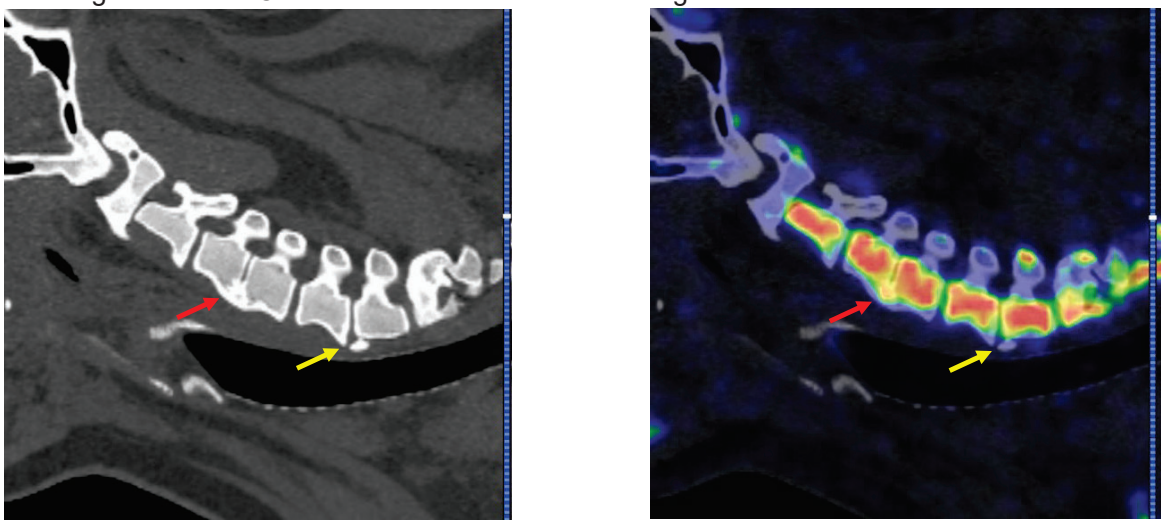

Figure 1. Red arrow: C3/C4, high ^{18}F-uptake indicating ongoing bone remodelling/healing = synthetic bone graft. Yellow arrow: C5/C6, low ^{18}F-uptake, indicating low activity = control.

Method: Non-instrumented cervical spinal fusion surgery was performed in six adult mini-pigs. Each animal had two ventral slots, implant-vs-sham. The new hydroxyapatite synthetic bone graft contained calcium pyrophosphate (Ca-PP) and α-tricalcium phosphate/monetite. After 14.5 months, animals were sedated, a radioactive tracer was injected. Euthanasia was performed 1h post injection, PET scan and quantitative analysis was performed post-mortem. ^{18}F-NaF accumulates in bone tissue by binding to apatite and is considered a marker of osteoblast activity. Data was reported as mean ± SD.

Results: Mean bodyweight was 62±5.6 kg. Mean tissue activity at implant-vs-sham was SUV_{mean}= 11.4±5 vs 10.7±4, respectively (n.s.). Implant sites were higher on PET in 3 pigs, and lower in 3.

Conclusion: Use of ^{18}F-NaF and PET-CT allows objective quantification of osteoblast activity, which can be used to assess the efficacy of synthetic bone grafts.

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