Non-invasive Registration Strategies for Submillimeter Navigation Accuracy in the Lateral Skull Base

Daniel Schneider, Jan Hermann, Kate A. Gerber, Juan Anso, Marco Caversaccio, Stefan Weber, Lukas Anschuetz
I have nothing to disclose.

No, within the last 12 months I have not had any type of financial arrangement or affiliation with commercial interests related to the content of this continuing education activity that requires disclosure.
Optical camera: Cambar B1, Axios3D, Germany, tracking accuracy 0.05±0.025mm

Custom made patient marker and pointer

Fiducial screws: 8mm, Medartis, Switzerland

Tablet: iPad Pro, Apple Computer, USA

Software development
Optical camera  Cambar B1, Axios3D, Germany, tracking accuracy 0.05±0.025mm

Fiducial screws  8mm, Medartis, Switzerland

Software development

Accuray 0.2 +/- 0.1 mm

Tablet  iPad Pro, Apple Computer, USA

Custom made patient marker and pointer
Problem: SCREWS

• Implantation before surgery
• CT scan with screws
Problem: SCREWS

- Implantation before surgery
- CT scan with screws

→ Development of non-invasive registration strategies
Innovation Study

- 14 novel registration strategies
- 36 registration attempts per strategy in temporal bones
- Target registration errors measured at 10 anatomical targets
Non-invasive Registration Strategies

- Paired-point matching
- Surface matching
- Suitable anatomy
- Tracking technology
TRE Paired-point Matching
TRE Surface Matching

Max = 2.3

TRE (mm)

SM50(MAS)  SM50(EAC)  SM50(ME)  SM100(MAS,EAC)  SM100(MAS,ME)  SM100(EAC,ME)  SM150(MAS,EAC,ME)

96.9%  81.4%  95%  98.9%  100%  99.7%  100%
Accuracy Considerations

- Number of points acquired
- Distance to target
Conclusions

• Highly accurate non-invasive registration methods
• Applicable
• Advantaging
  – Increase efficiency (no screws, use diagnostic CT scan)
  – Reduce invasiveness
  – Improve patient safety

→ Extension of applicability
Thank you!
lukas.anschuetz@insel.ch