

3D imaging and preop. planning in pelvic and acetabular fractures

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Learning is a continuous process...



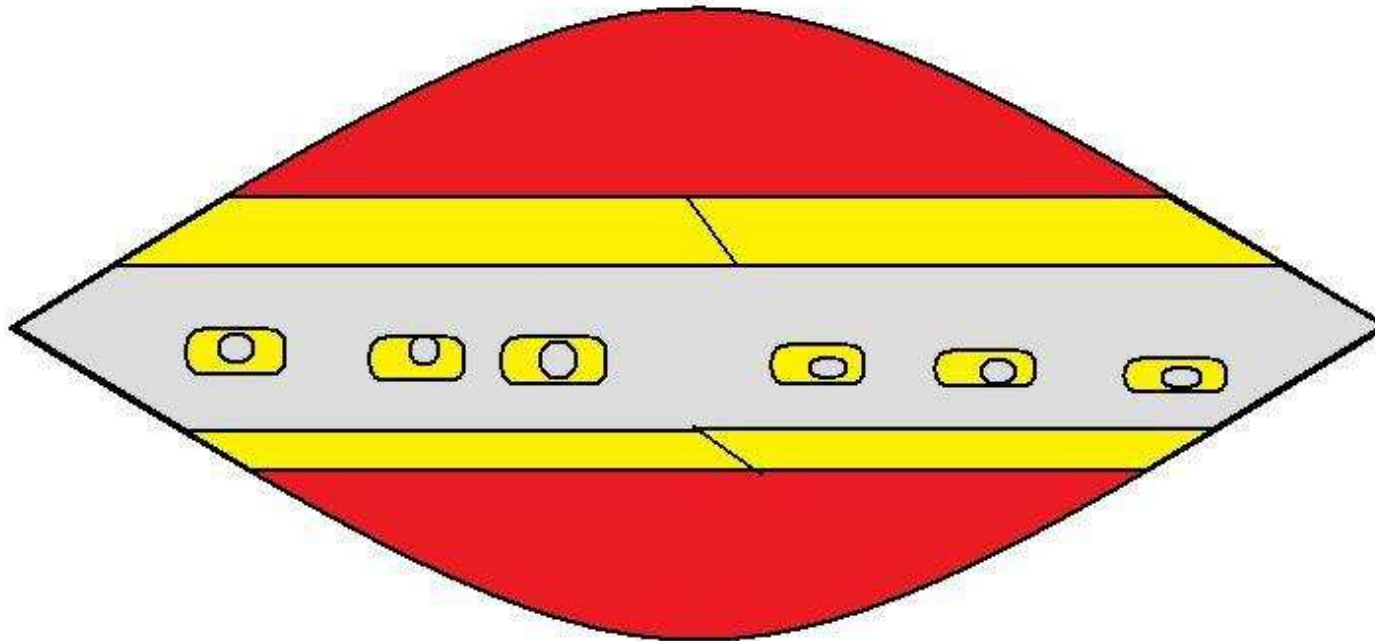
Planning is essential....



**Plan is the most important thing
(I heard it somewhere but, I don't know
where)**

In our kind of surgery, plan is known

Internal fixation



No battle plan survives contact with the enemy

(Helmuth von Moltke the Elder)

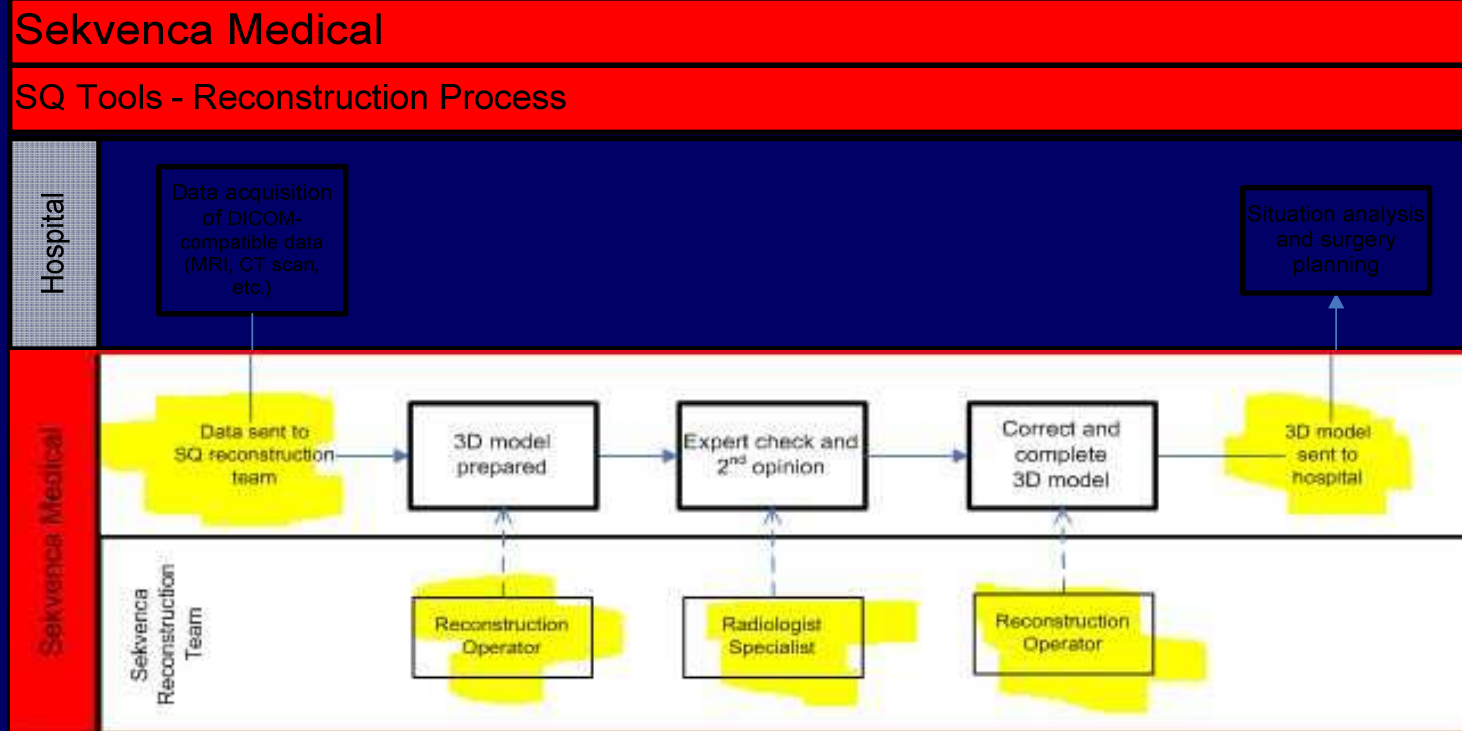


New idea: SQ pelvis tool

- integration (surgeon, radiologist, sculpturer, computer engineer)
- 3D Diagnostics & Surgery Planning
- real patient data
- regular computers
- performing of complete virtual operation
- for a wide range of surgical procedures

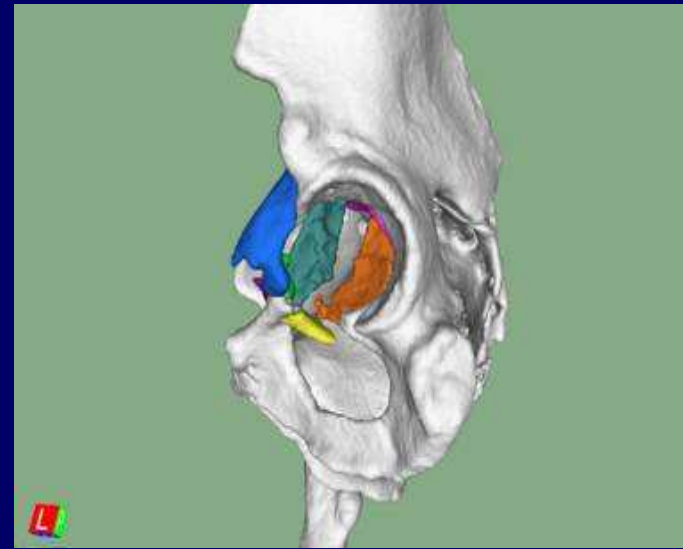
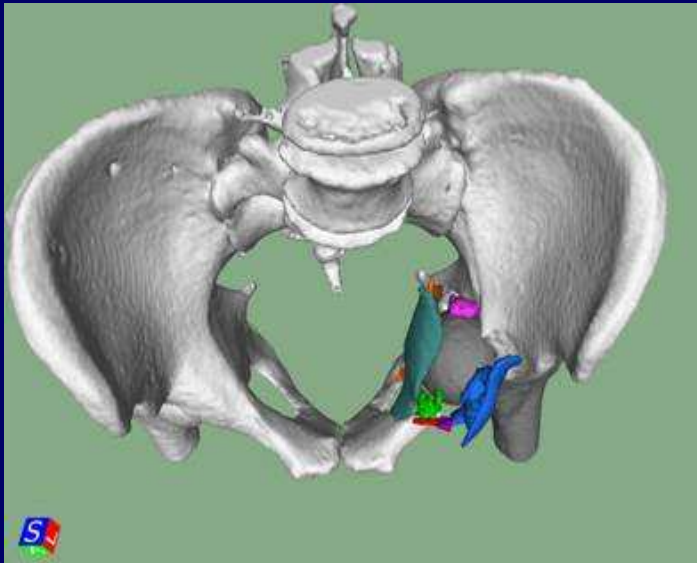
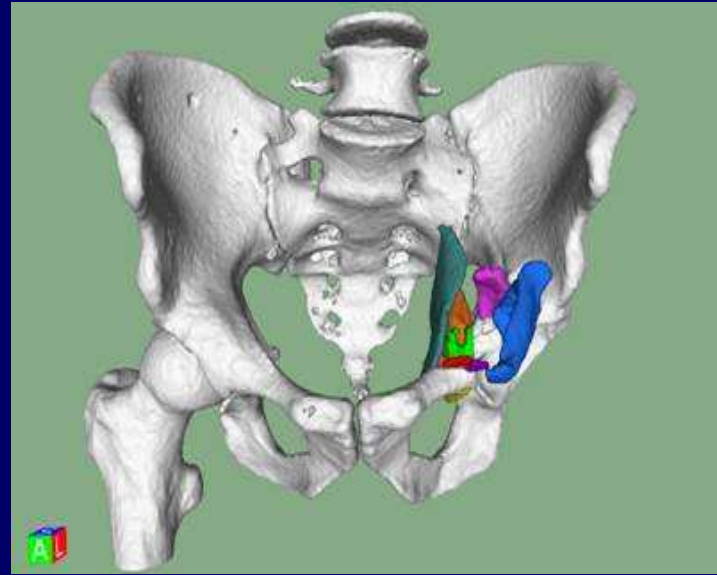
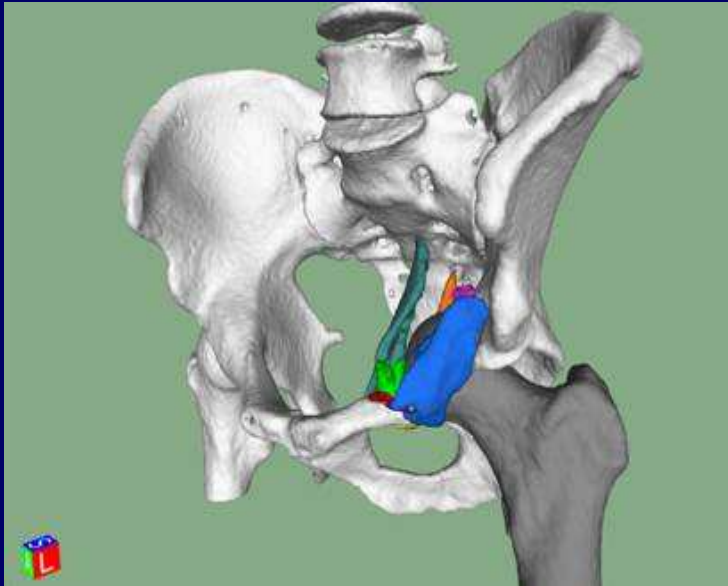


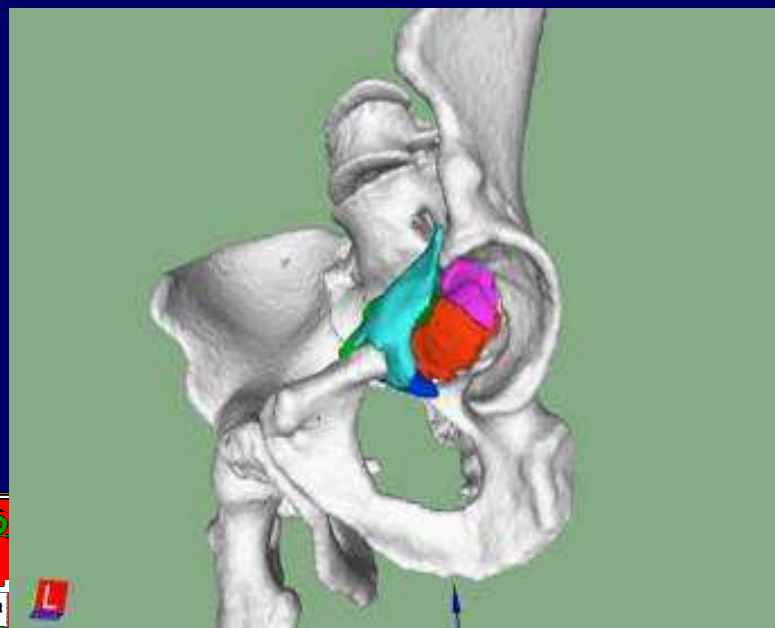
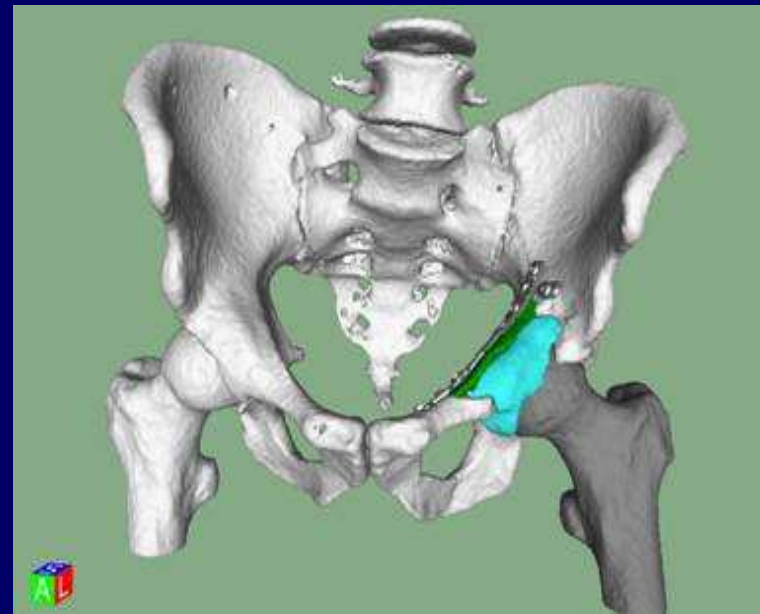
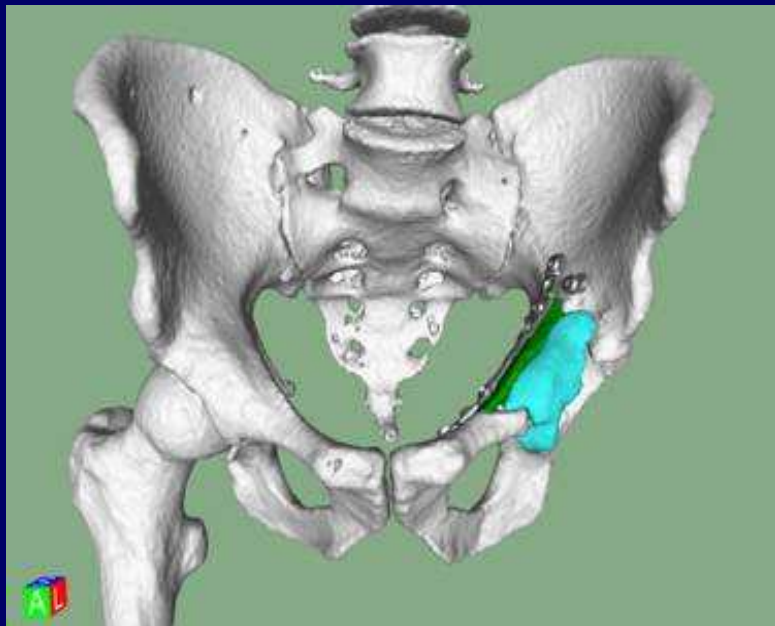
Protocol



Male, 62 y, bicycle fall



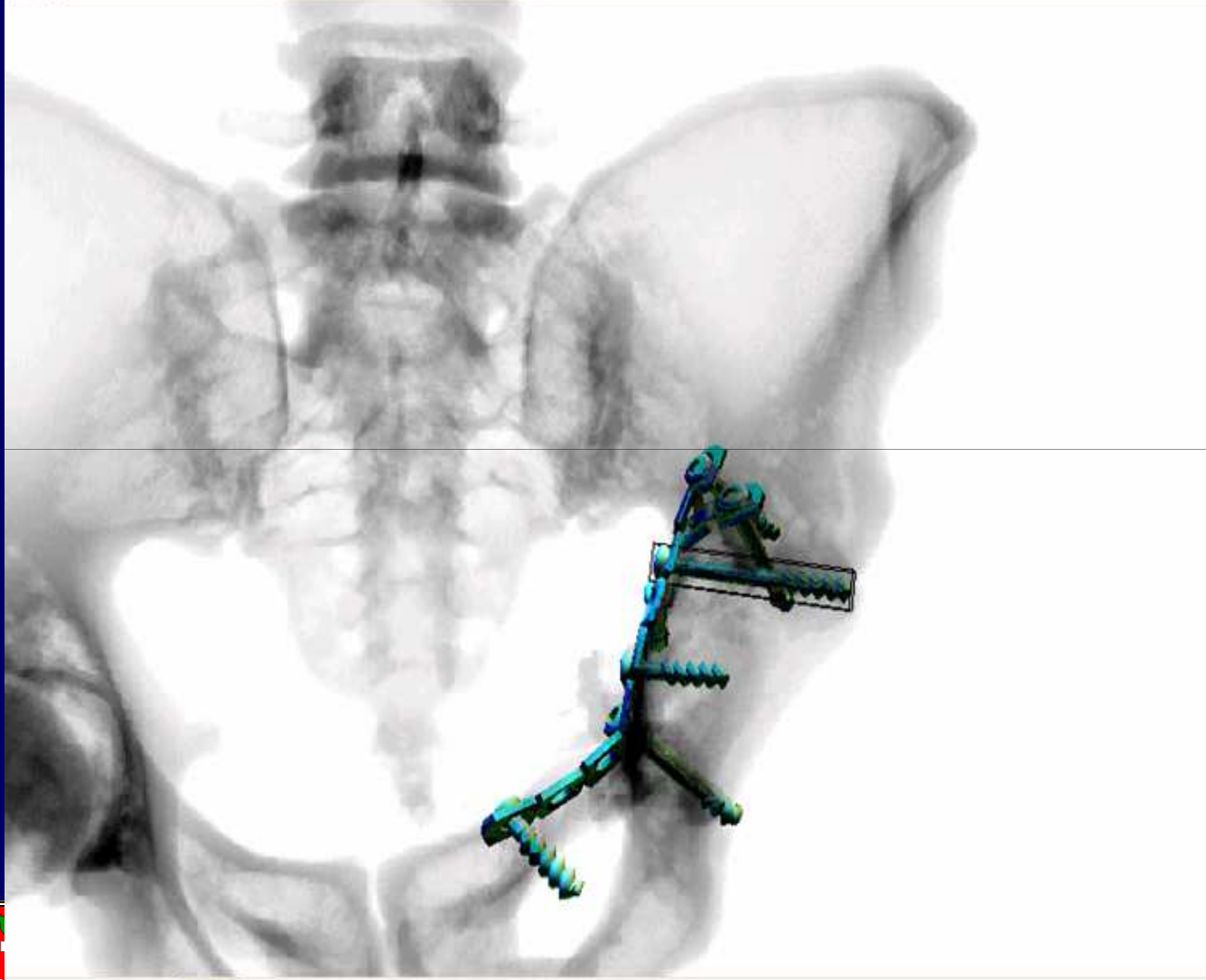




Pelvis



X-Ray



Assets

- Name / Info
- Accessories
 - Fixation Plate
 - Fixation Plate_2
 - Fixation Plate_3
 - Fixation Plate_4
 - Fixation Plate_5
 - Screw

Assets Sequence |

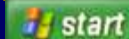
Properties

Name	Screw_6
Visible	<input checked="" type="checkbox"/>
Opacity	100.0
Color	
Intersection Test	<input checked="" type="checkbox"/>
Transform	x y z
Translation	201.9 160.3 120.1
Rotation	0.0 16.1 -162.6
Scale	1.0 1.0 1.0
Insertion	100.0
Screw Type	(user defined)
Length	42.7
Thread Length	17.0
Shank Diameter	4.0
Major Diameter	6.0
Minor Diameter	3.0
Hole Diameter	0.0
Pitch	3.0

Report | CT/MRI | 3D | X-Ray

Histogram | Tool | Properties

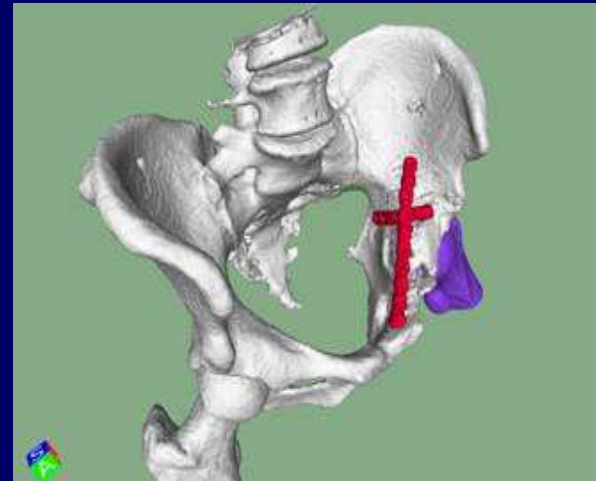
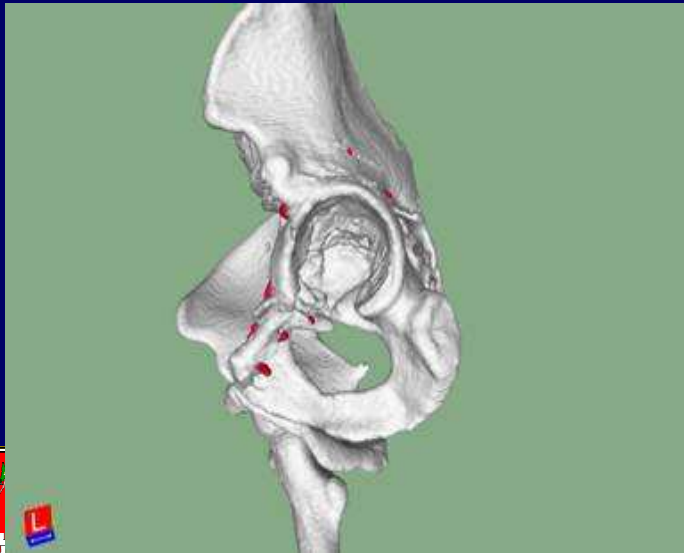
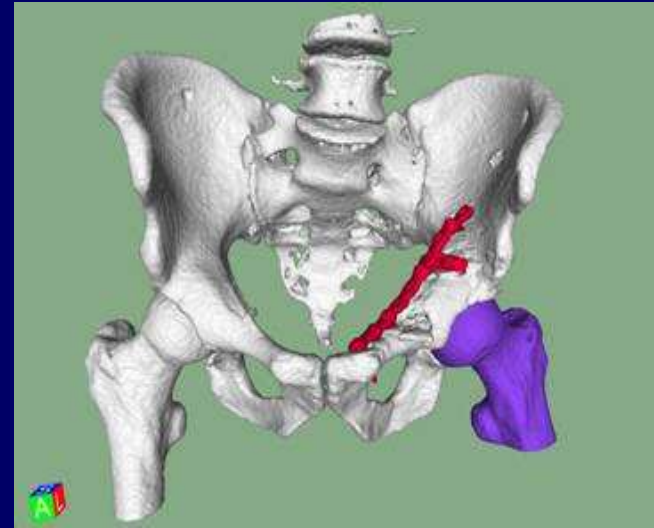
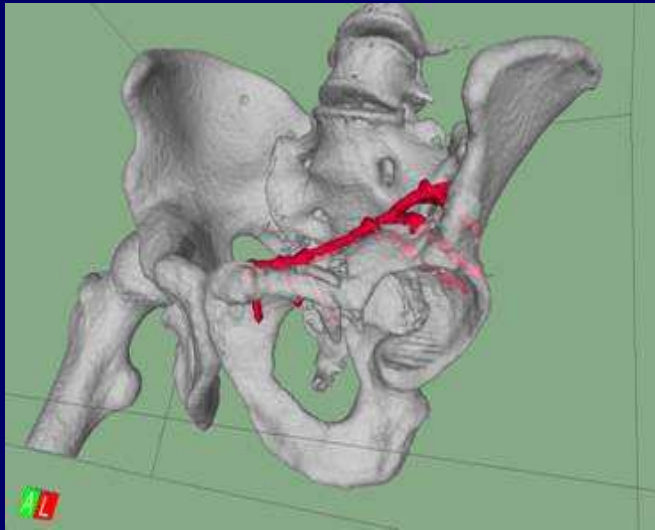
Ready

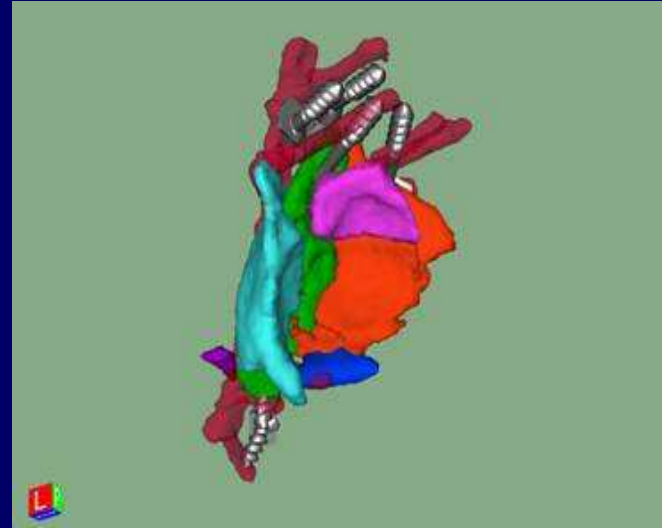
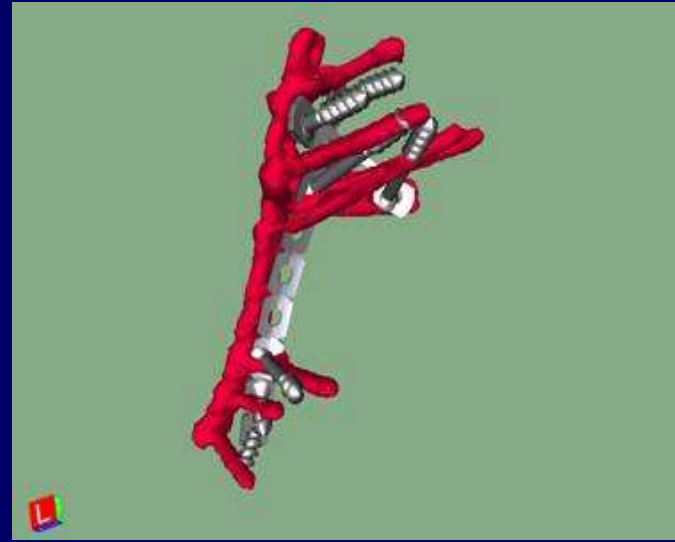
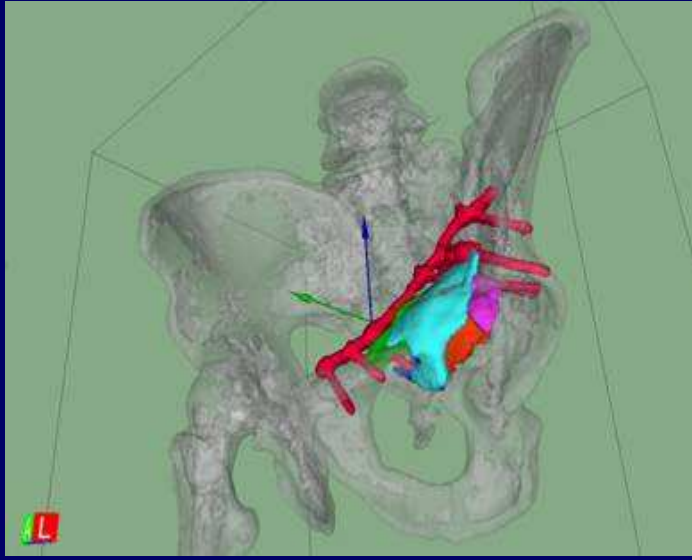


Sestavljena kožuh.sq...

13:40







International study

10 centers (Croatia, Germany, Hungary,
Izrael, Poland, Slovenia)

26 operated cases

Preoperative planning in pelvic and acetabular
surgery: The value of advanced computerised
planning modules

Matej Cimerman*, Anze Kristan

Injury, Int. J. Care Injured (2007) 38, 442–449



ELSEVIER



3D Tools possibilities

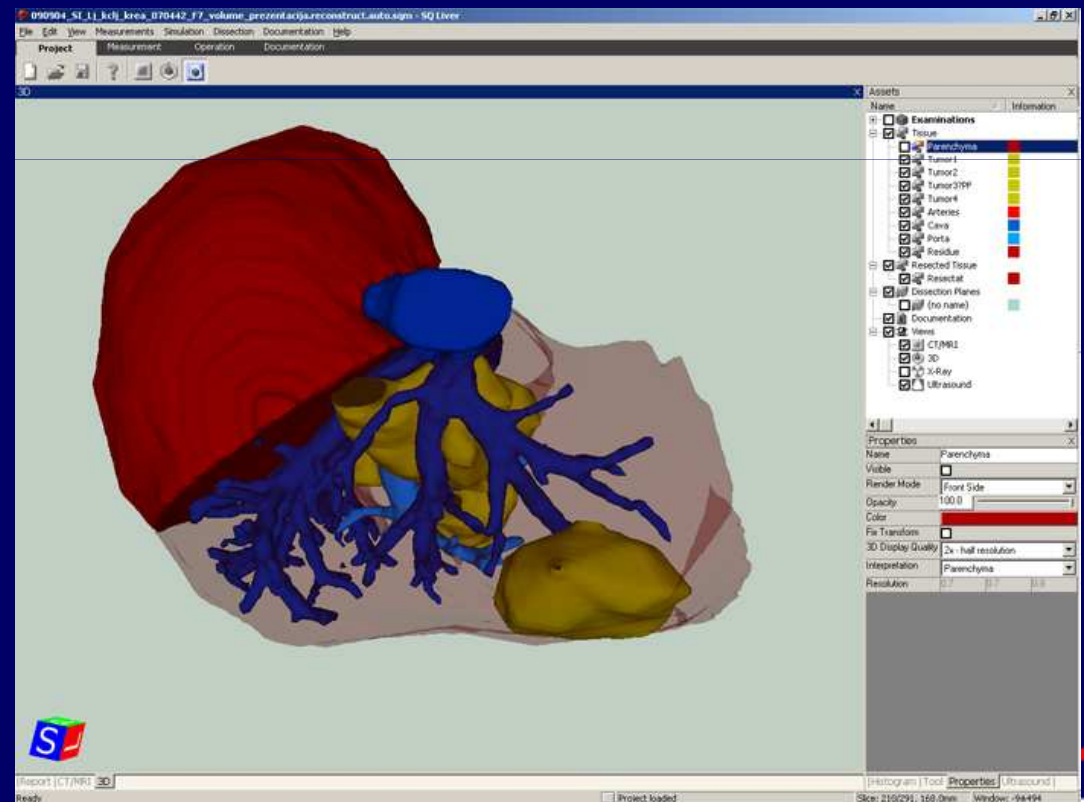
Currently proposed 3D Tools:

pelvis

shoulder

knee

liver



Did we succeed ?

1. CT data are transferred into the program
2. Segmentation and rendering process
3. Virtual operation in regular computer



EBS pelvis – a new project

All steps can be do by a surgeon

User friendly

Aplications: “what surgeon really needs”

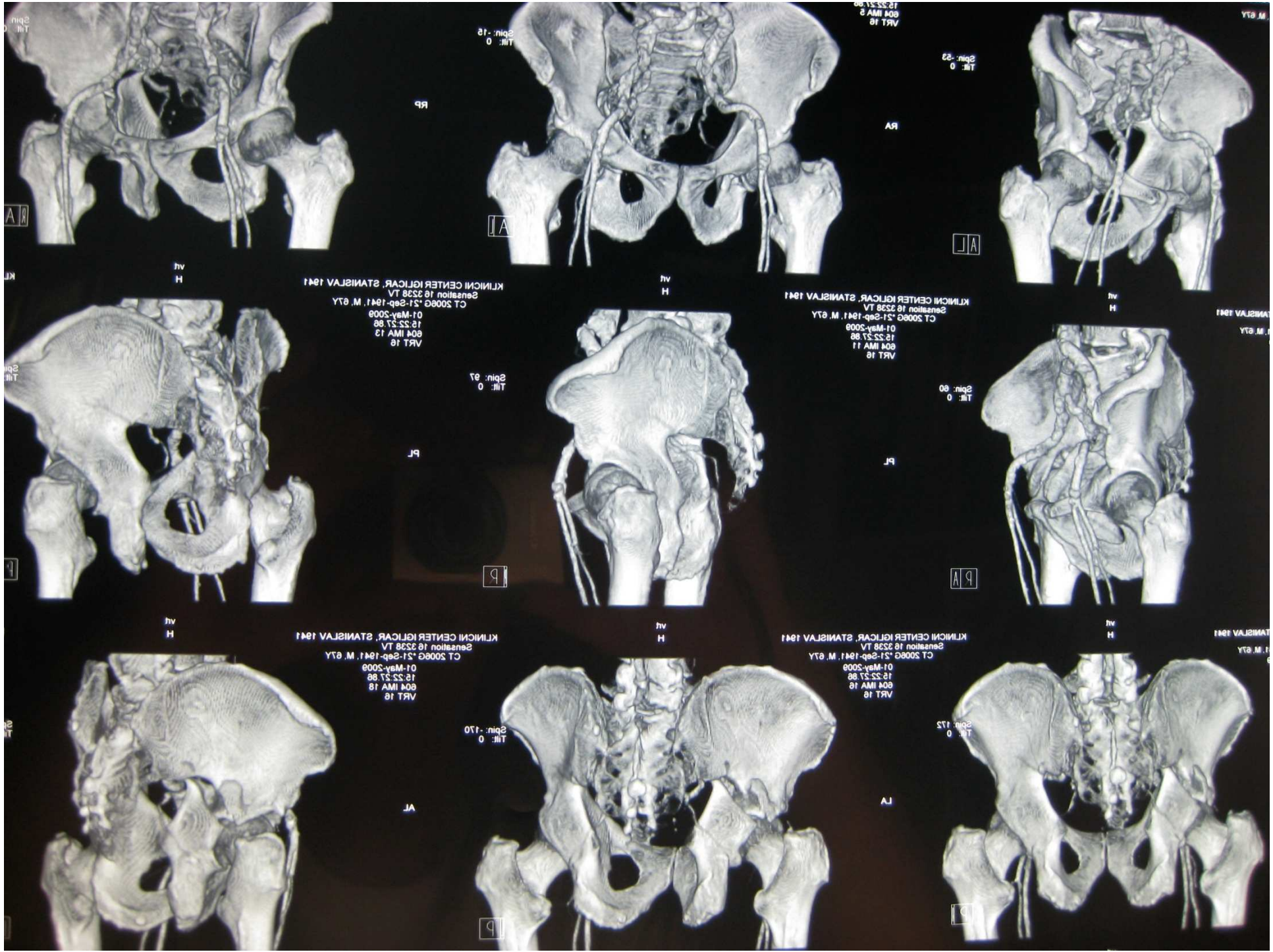
Education modules

Future: Upgrade possibilities



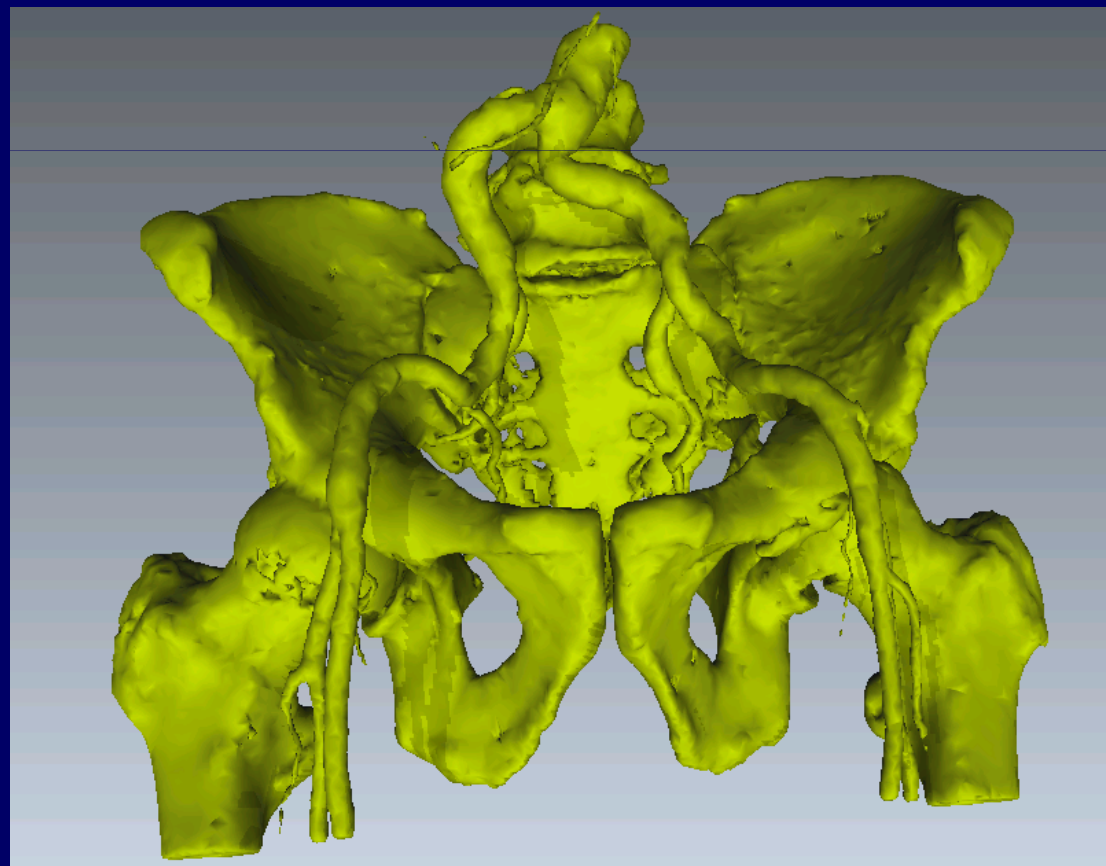
Male, 64 y., hit by car





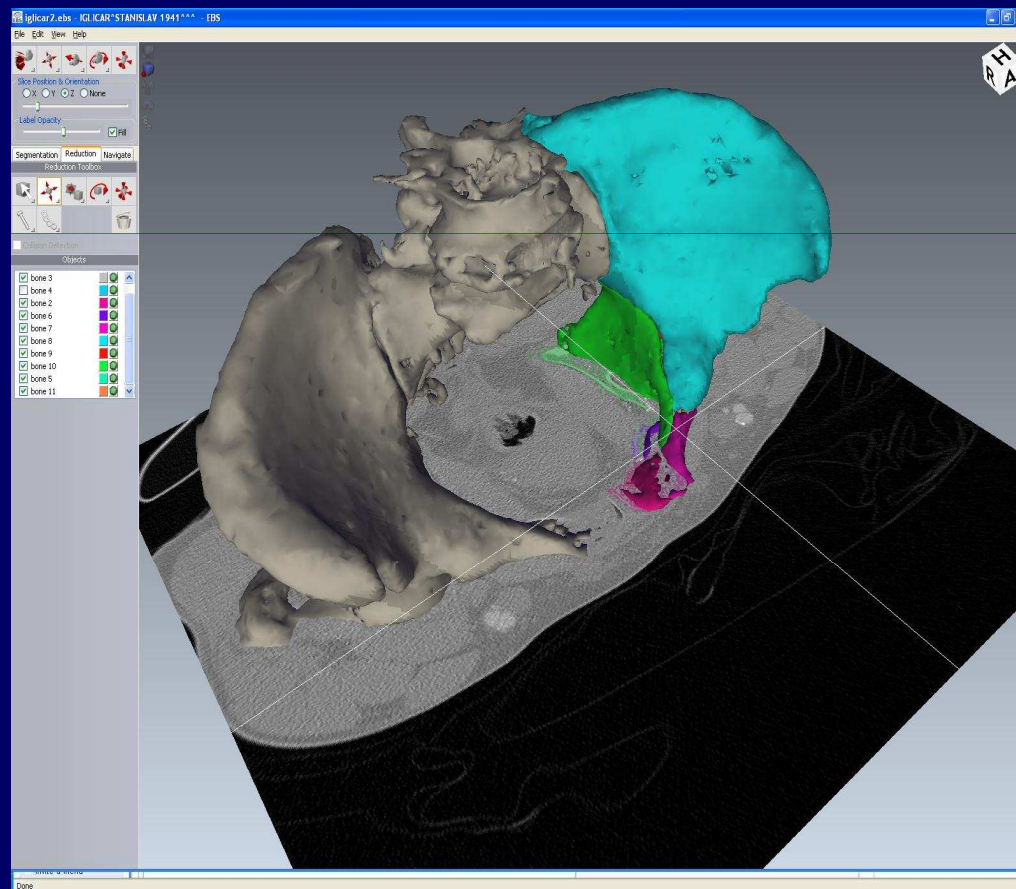
Step 1

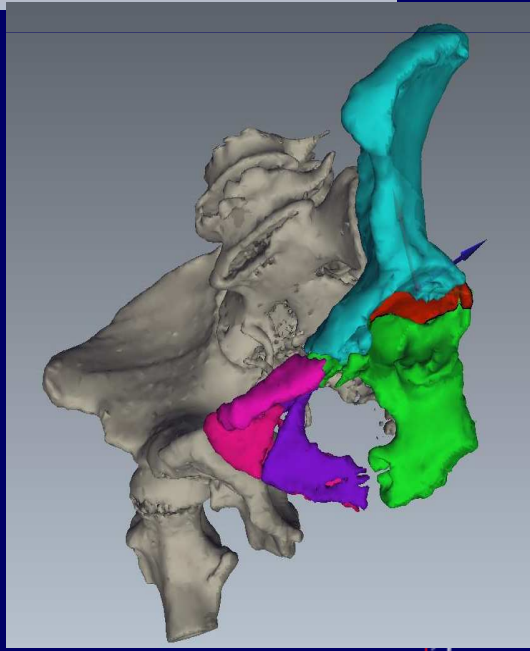
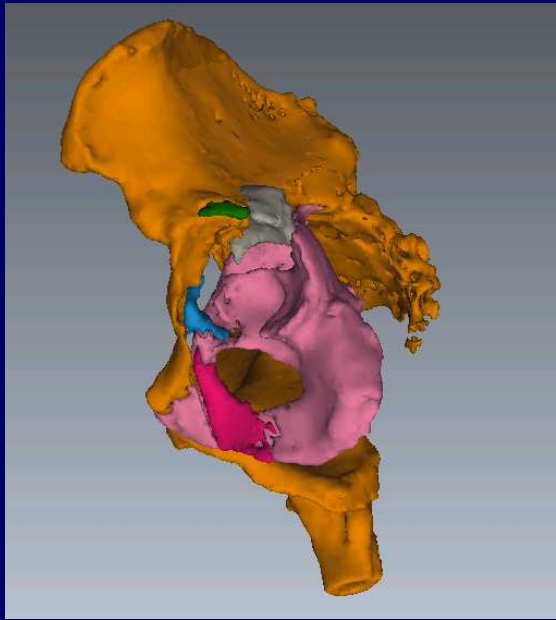
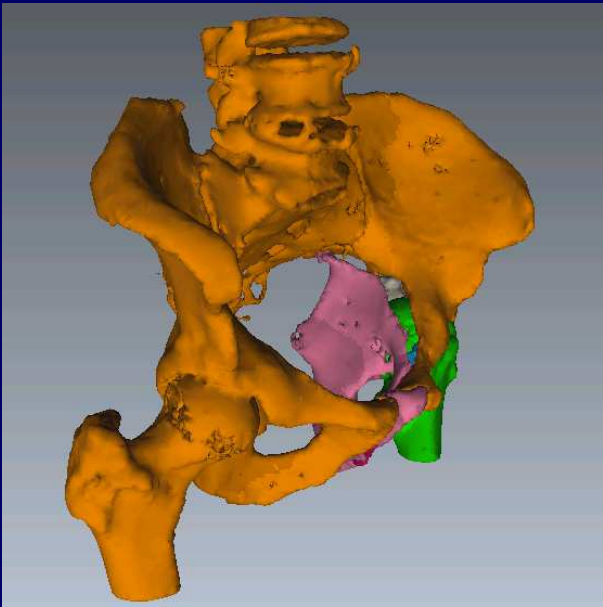
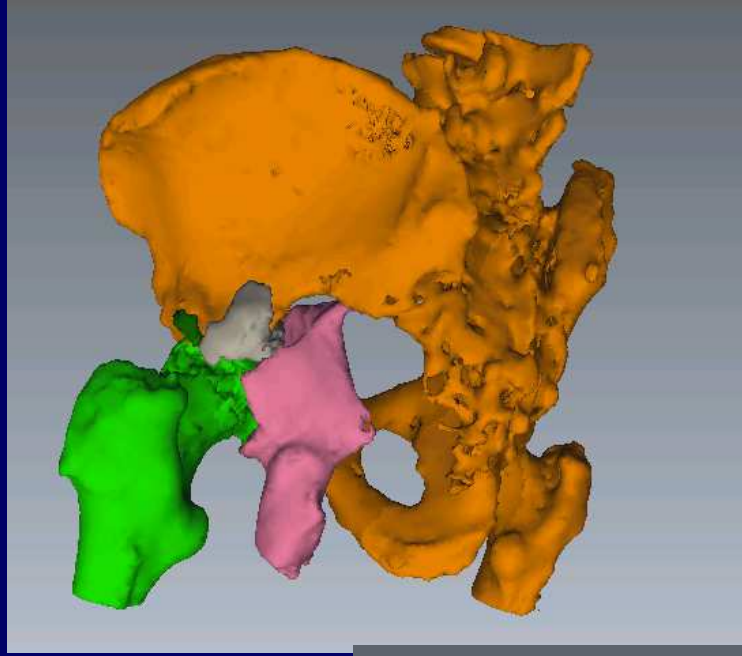
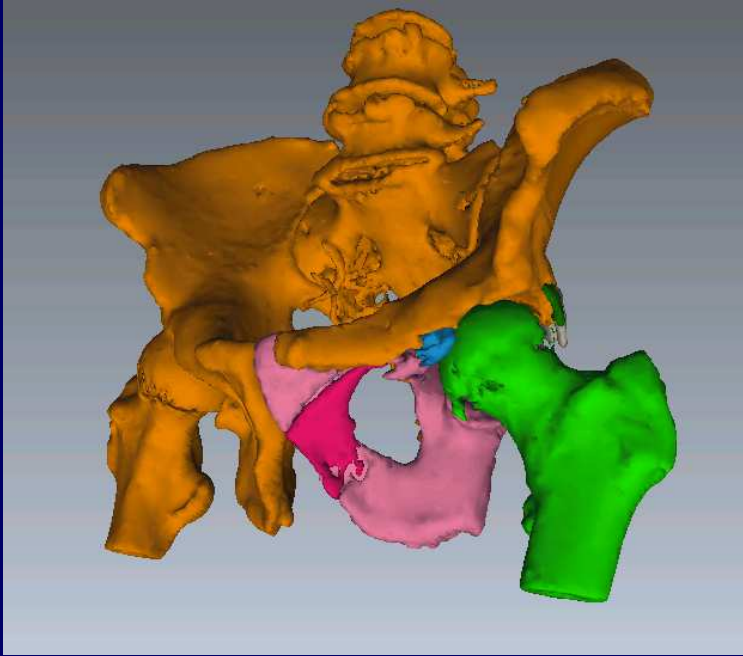
Importing of CT data into the programme
and making a 3D model



Step 2

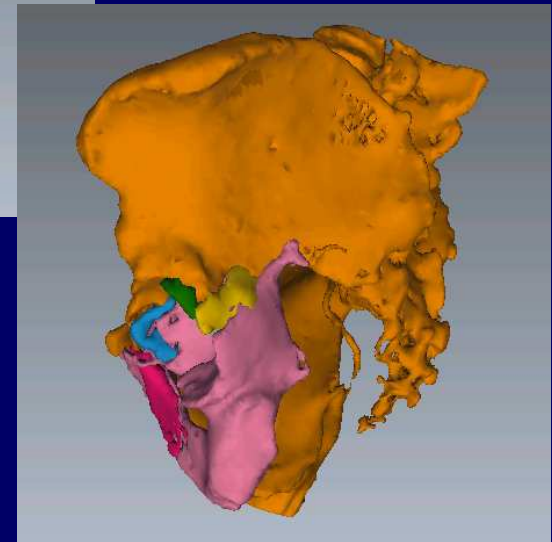
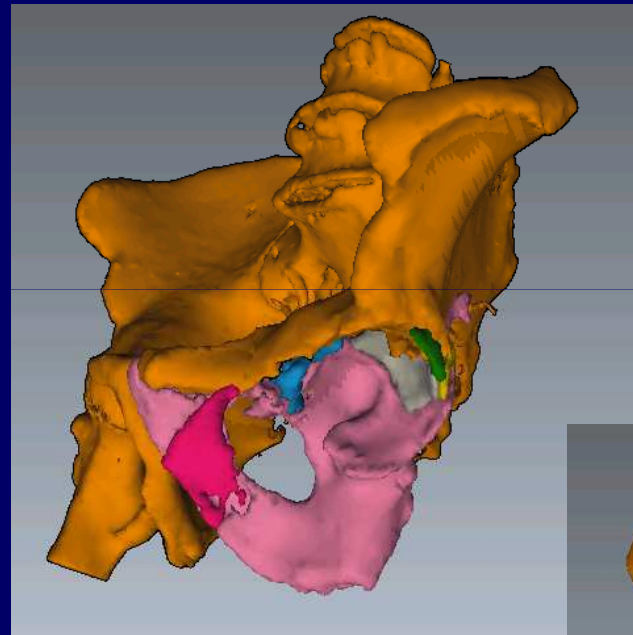
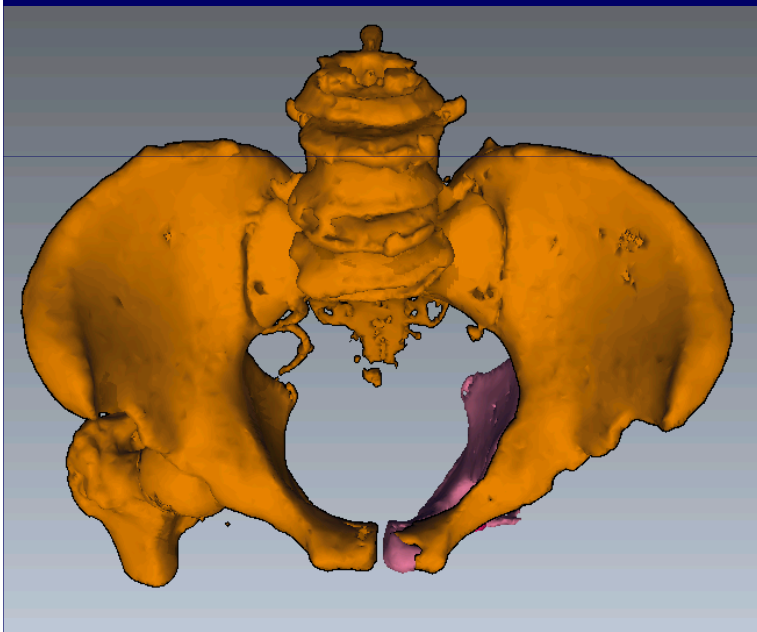
Segmentation (made by a surgeon)





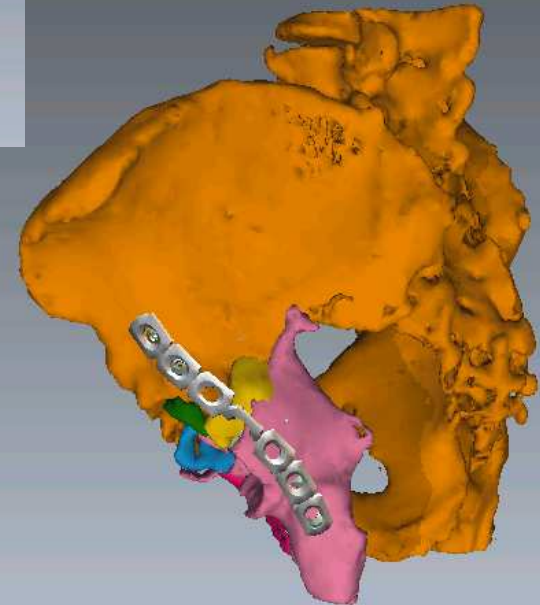
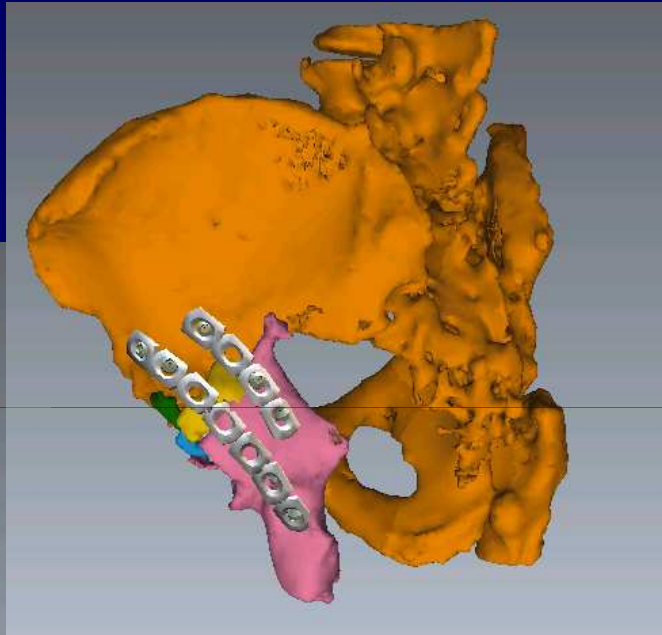
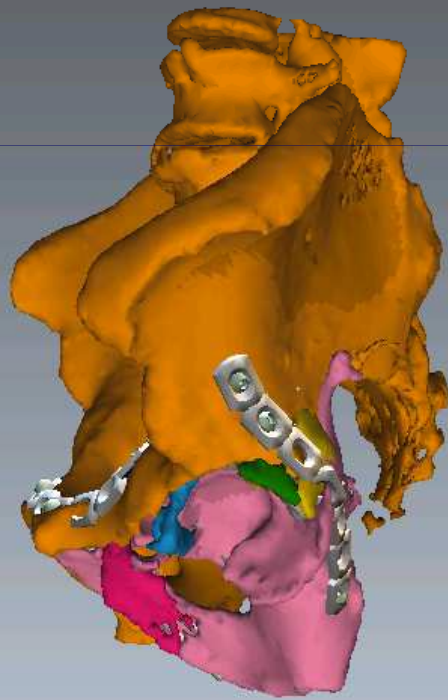
Step 3

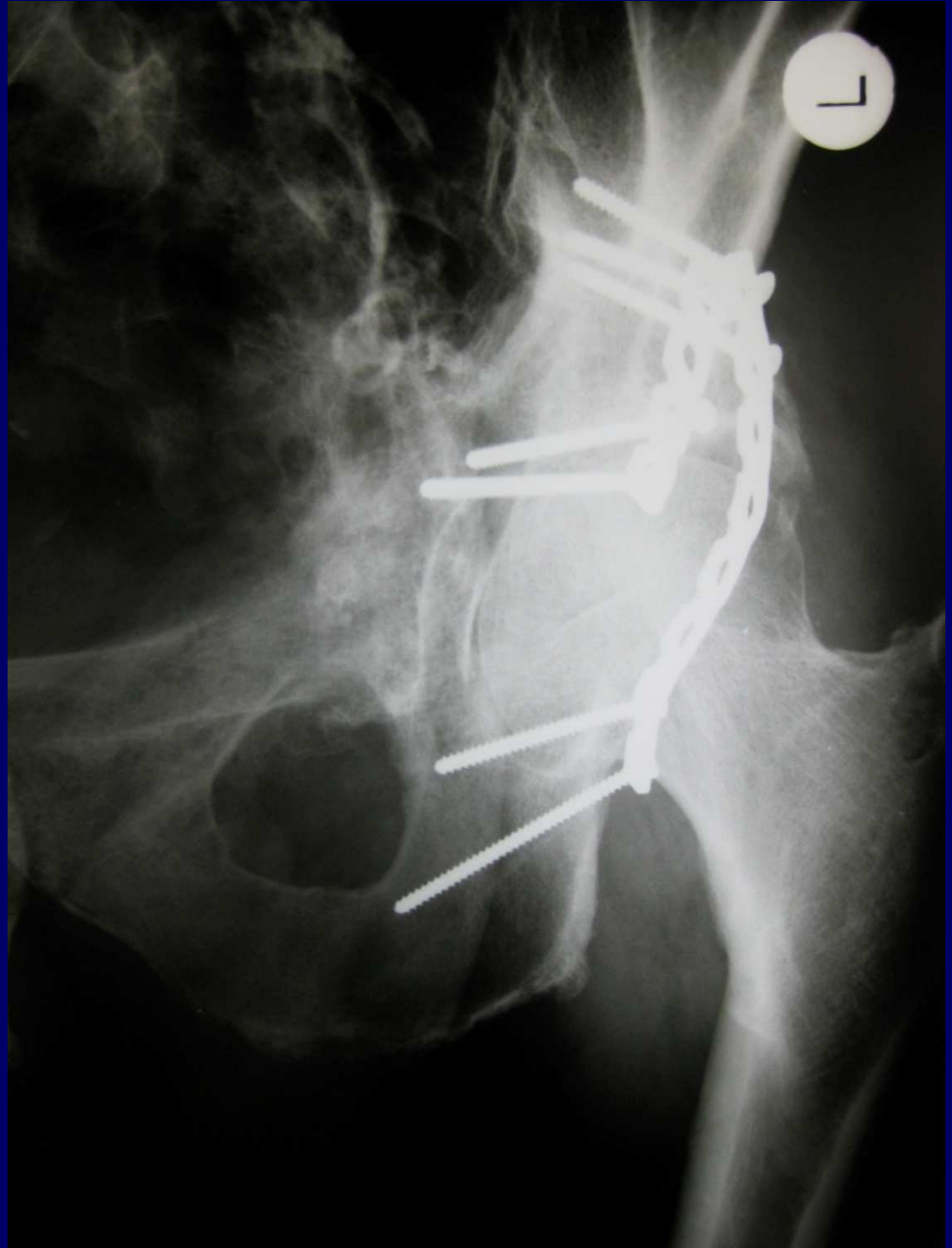
Reduction



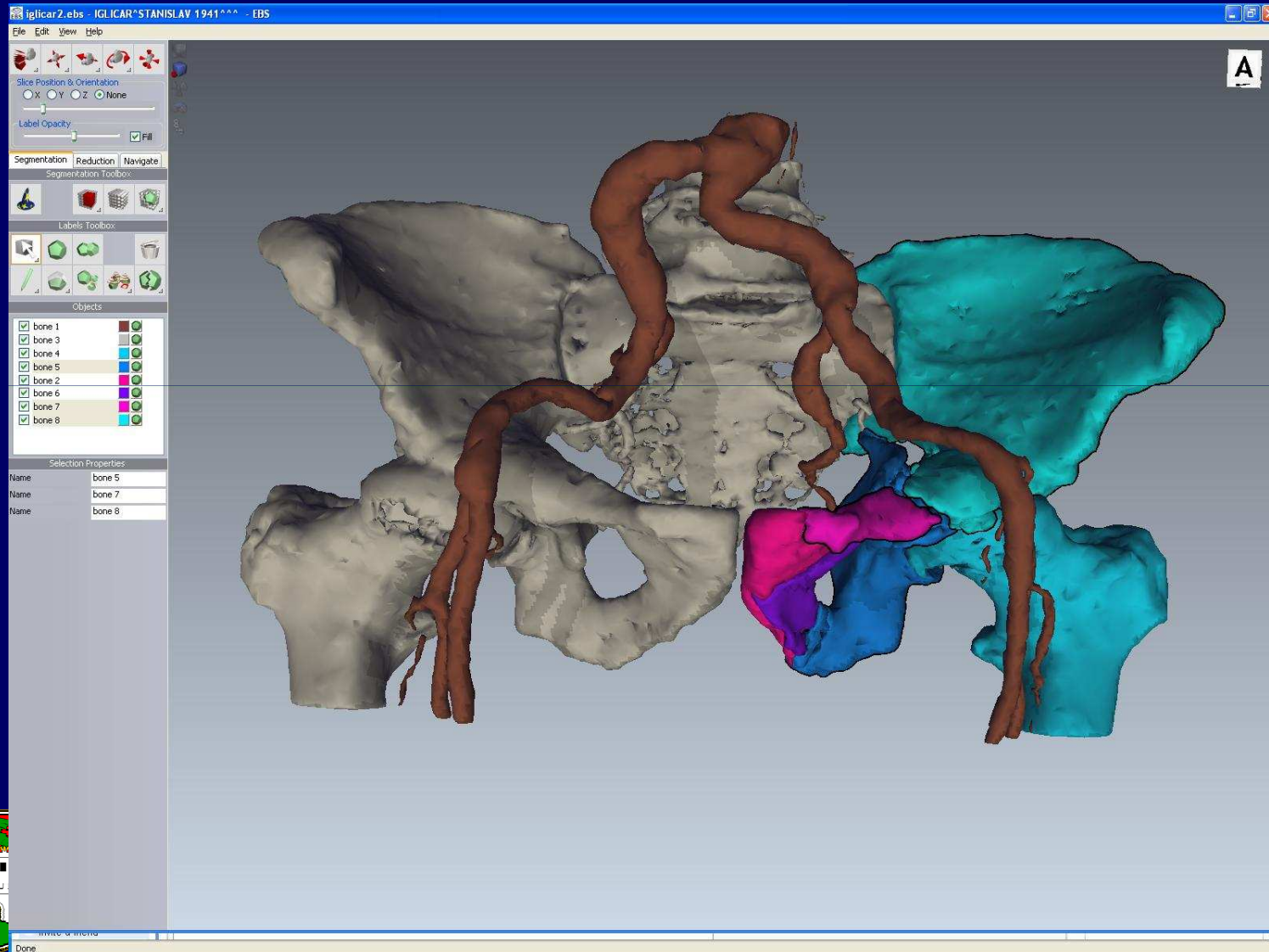
Step 4

Fixation

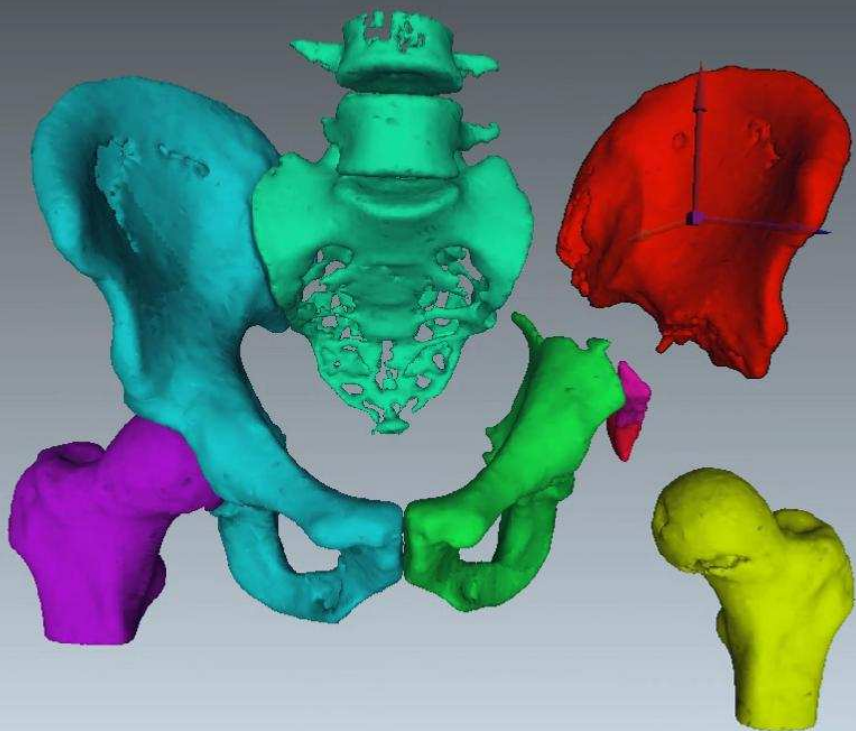




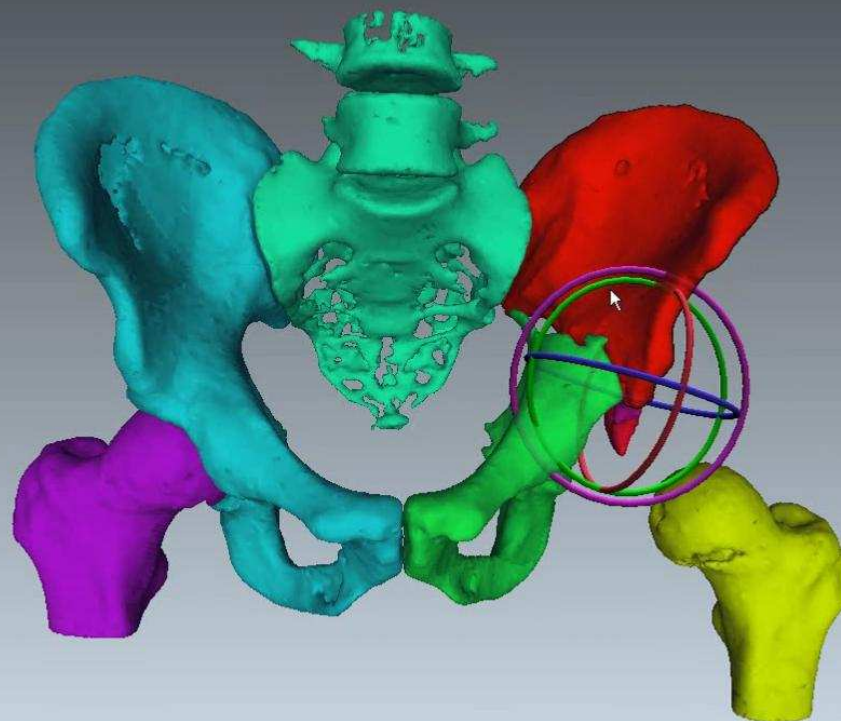
Applications



R A



R A



EBS Quick Tutorial.wmv - Predvajalnik VLC

Odpri Zvok Slika Predvajanje Seznam predvajanja Orodja Pomoč

tutoria21.ebs - EBS

File Edit View Help

CAD Display

Projection: All

Lock Display Scale To 1:1

Segmentation Reduction Navigate

Reduction Toolbox

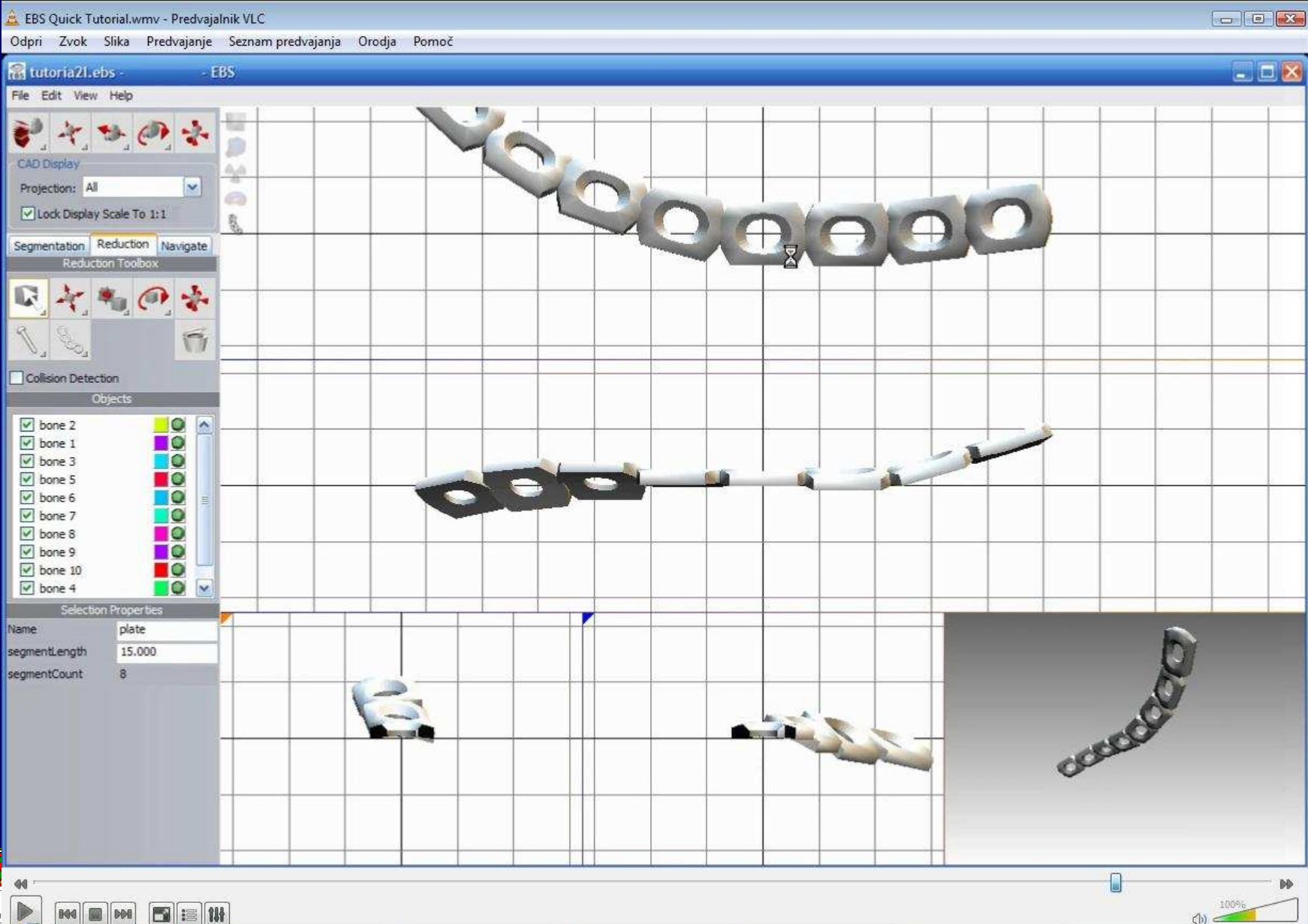
Collision Detection

Objects

- bone 2
- bone 1
- bone 3
- bone 5
- bone 6
- bone 7
- bone 8
- bone 9
- bone 10
- bone 4

Selection Properties

Name	plate
segment.Length	15.000
segment.Count	8





Slice Position & Orientation
 X Y Z None

Label Opacity
[Slider]
 Fill

Cutaway
 Lock Cut Direction

Segmentation Reduction Navigate

Reduction Toolbox



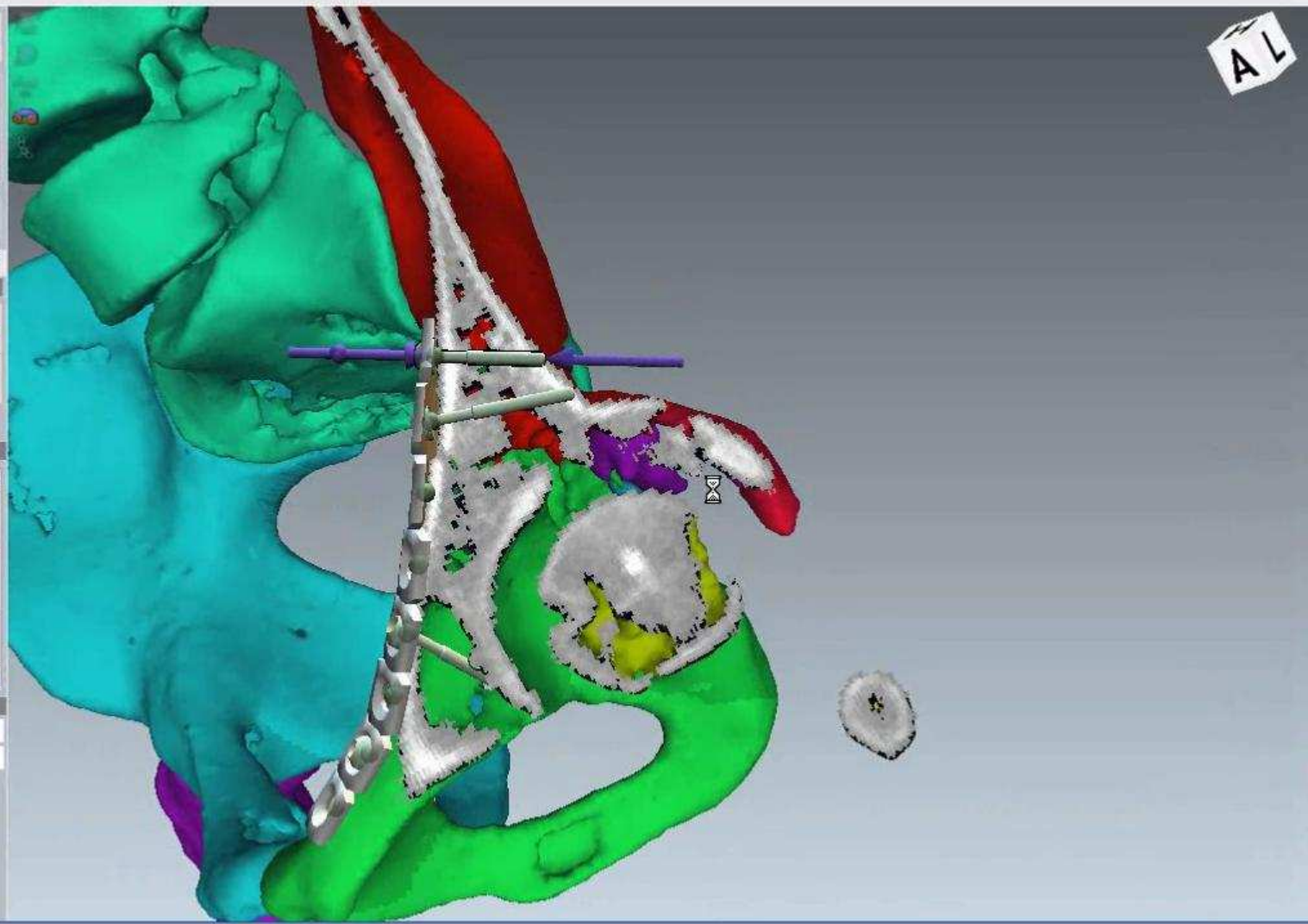
Collision Detection

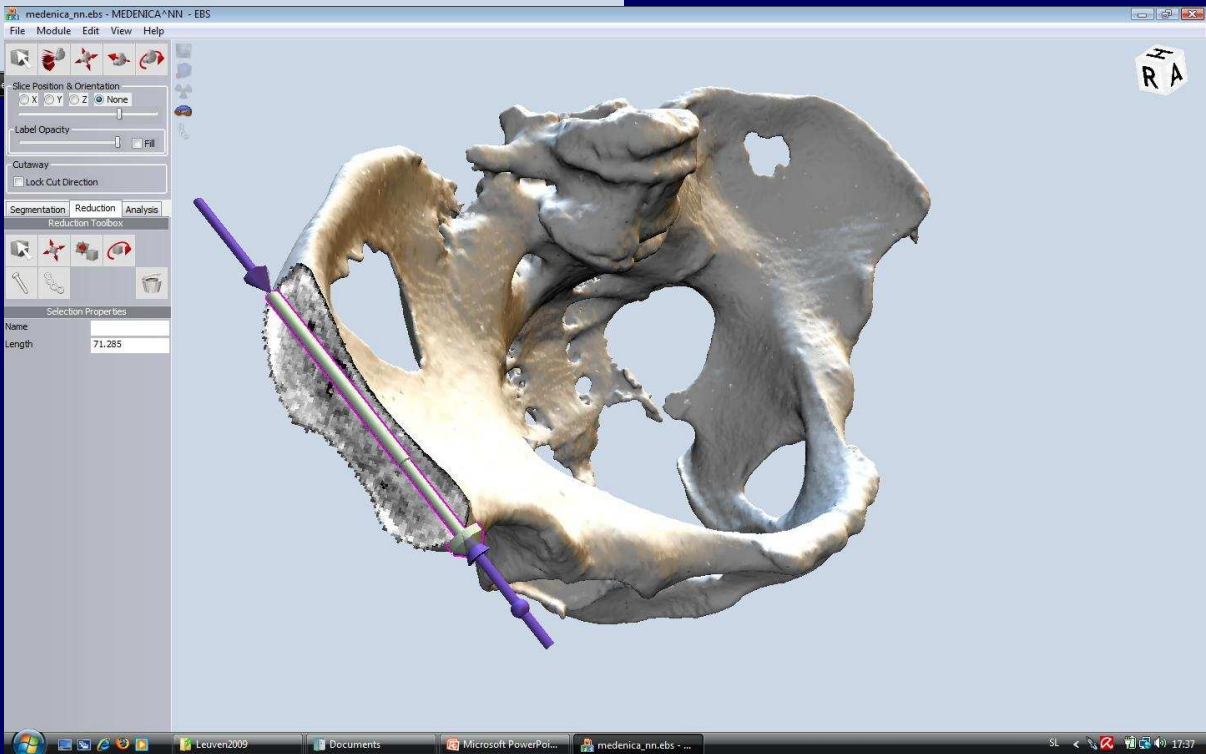
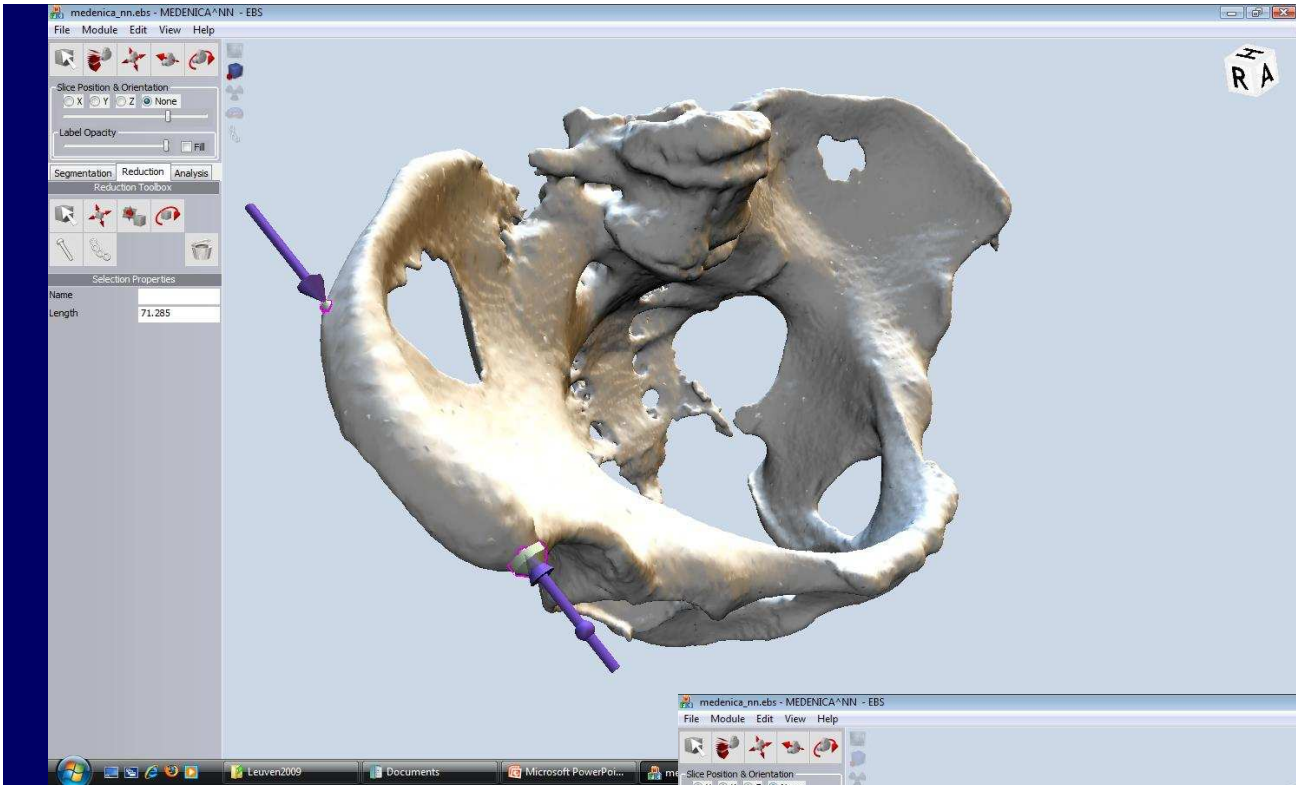
Objects

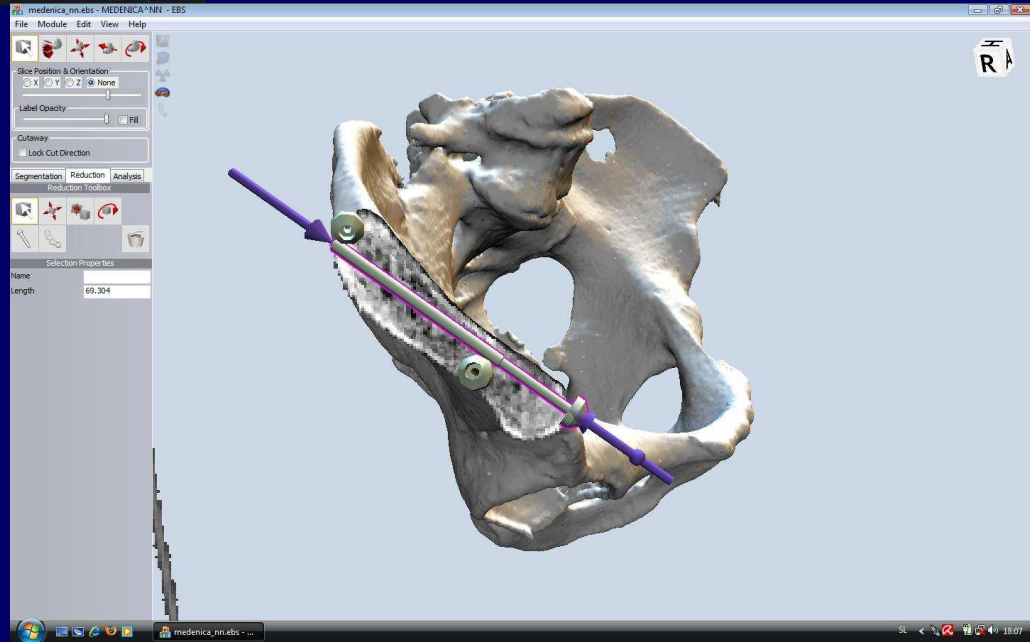
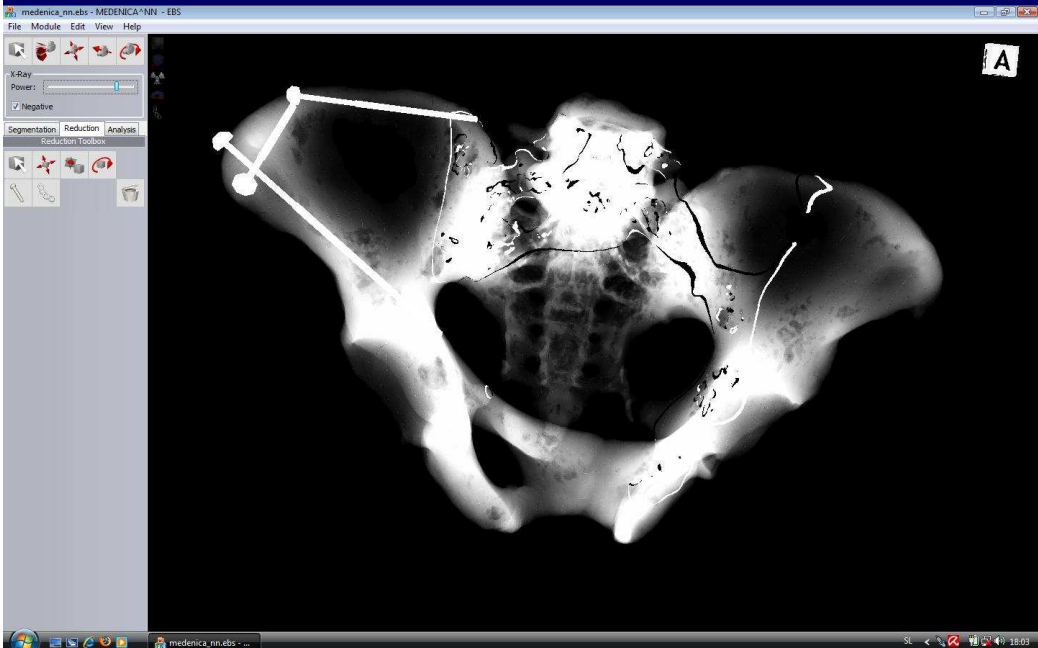
- bone 2
- bone 1
- bone 3
- bone 5
- bone 6
- bone 7
- bone 8
- bone 9
- bone 10
- bone 4

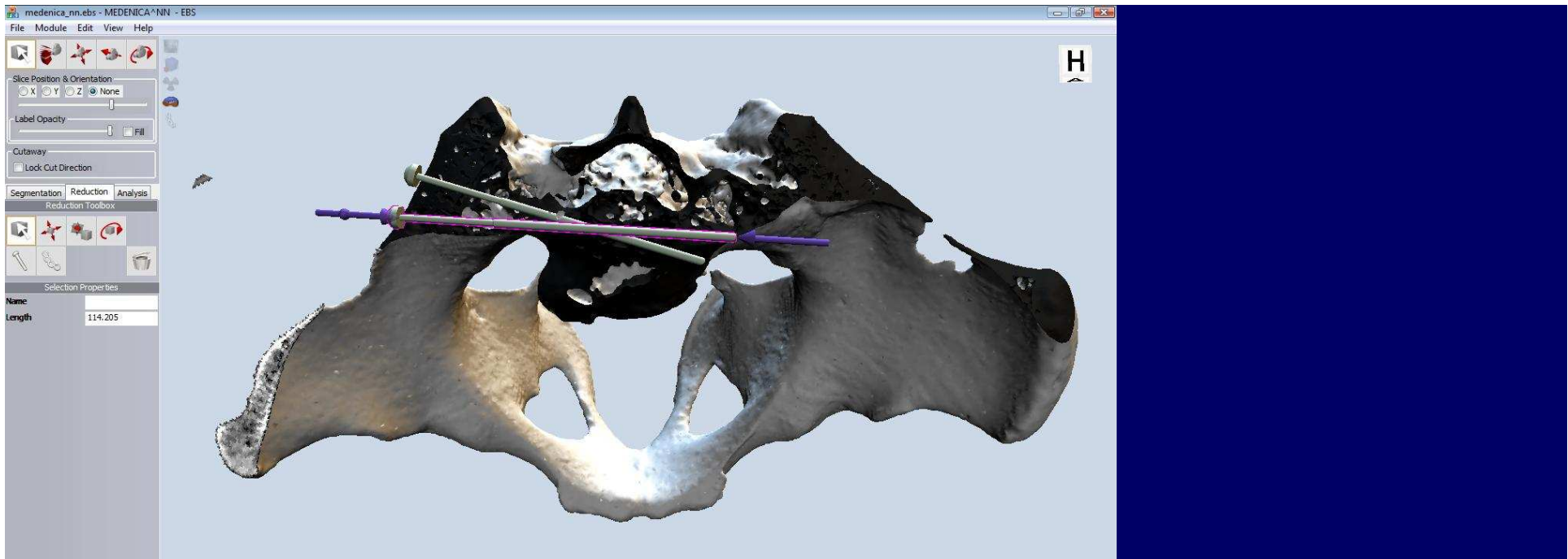
Selection Properties

Name screw
Length 23.025









Slice Position & Orientation
 X Y Z None

Label Opacity
[Slider]
 Fill

Segmentation Reduction Navigate

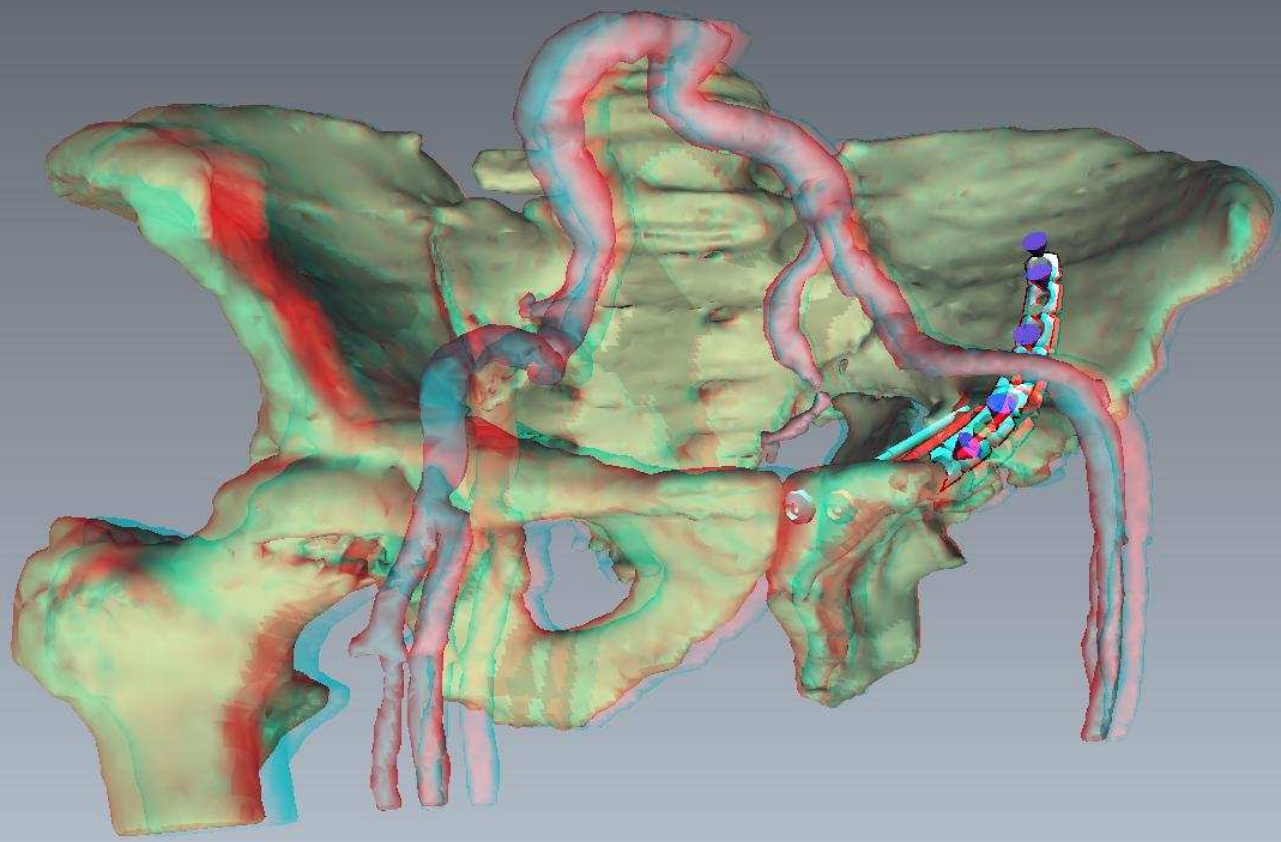
Reduction Toolbox

Collision Detection

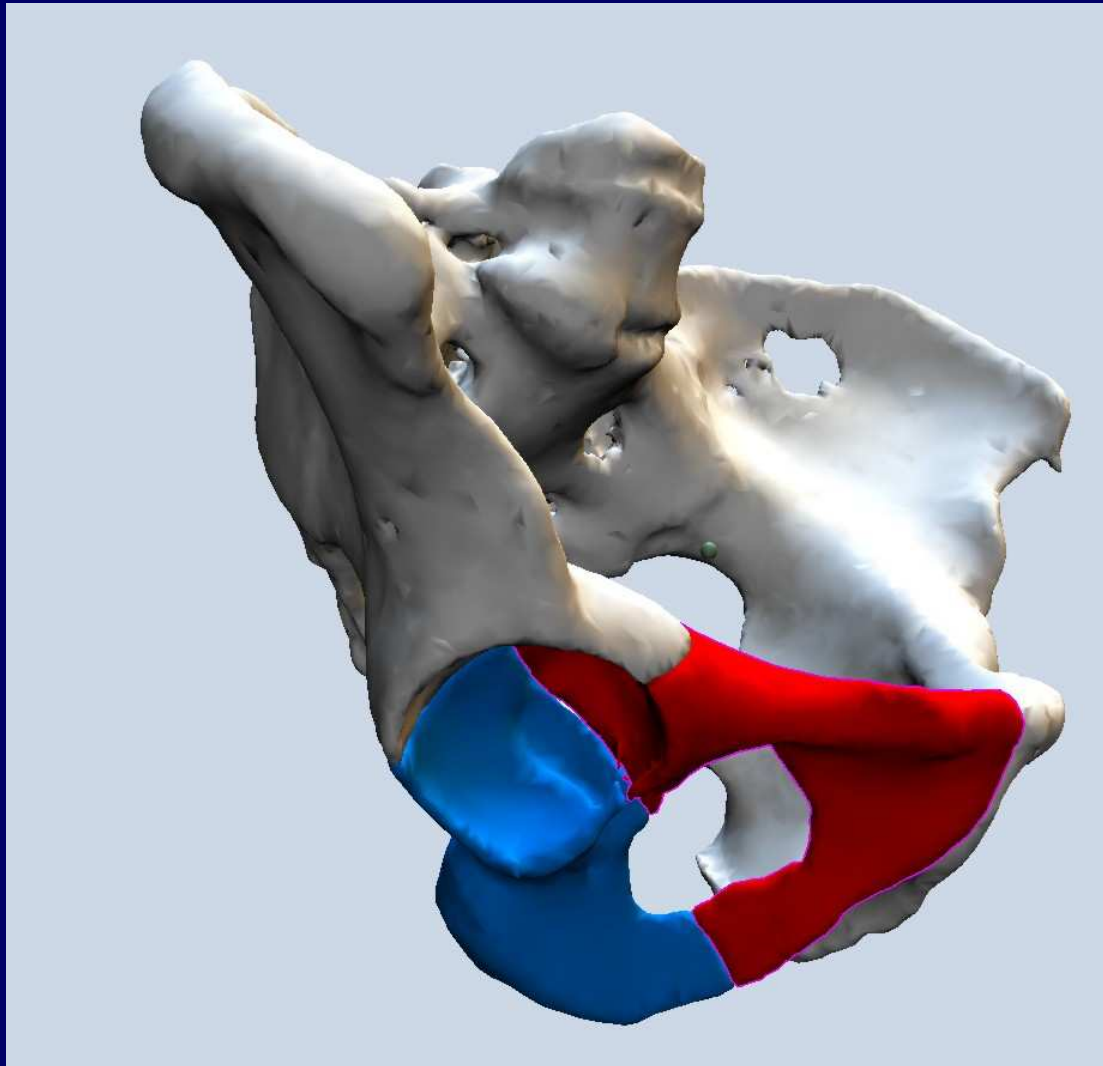
- Objects
- bone 2
 - bone 3
 - bone 1
 - bone 4
 - bone 5
 - plate
 - screw

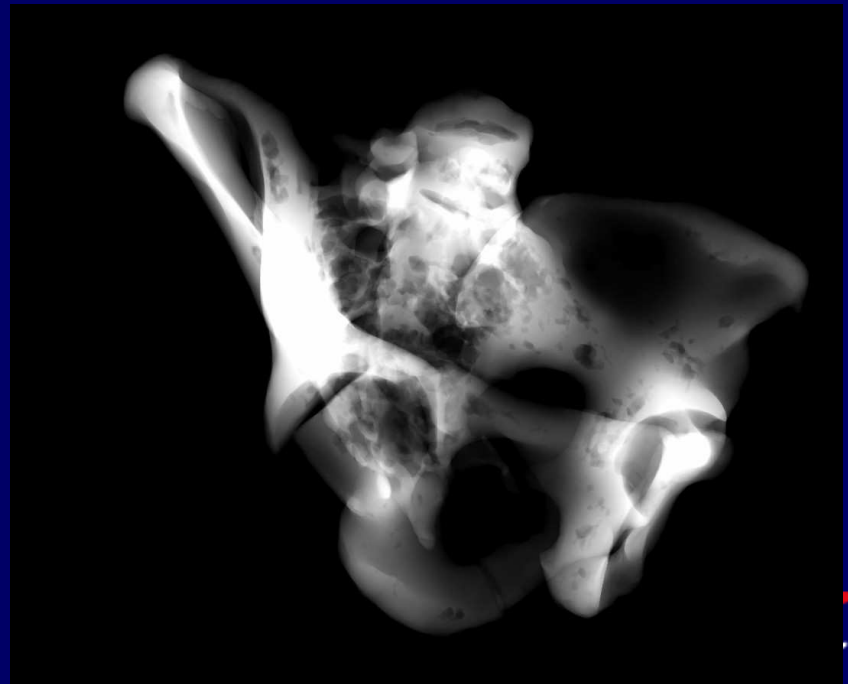
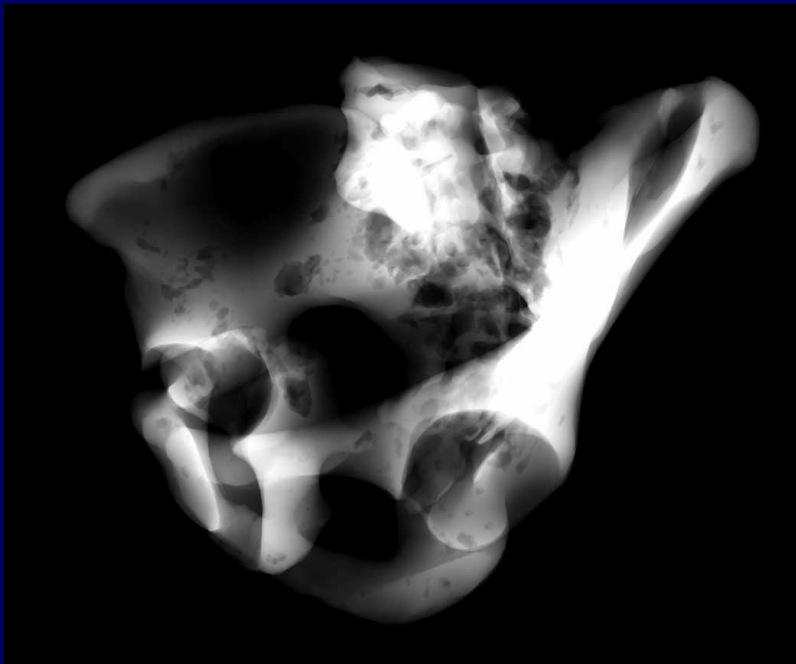
Selection Properties

Name	plate
segmentLength	12.000
segmentCount	9



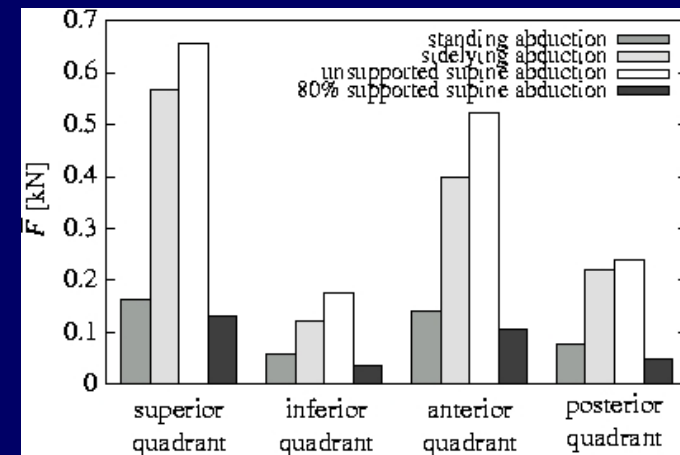
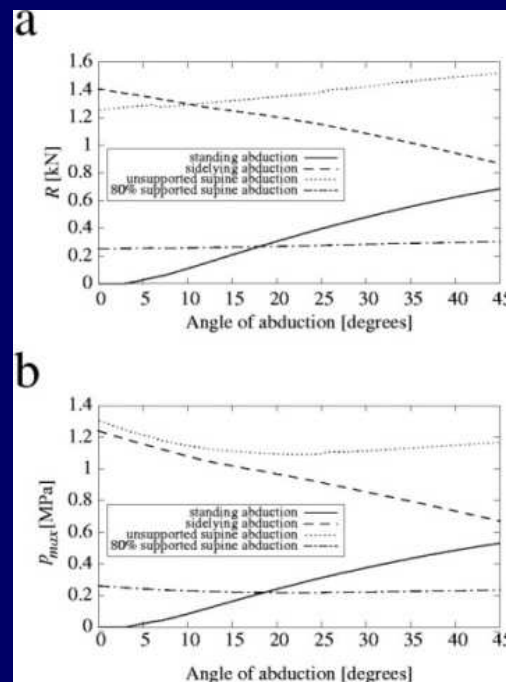
Education





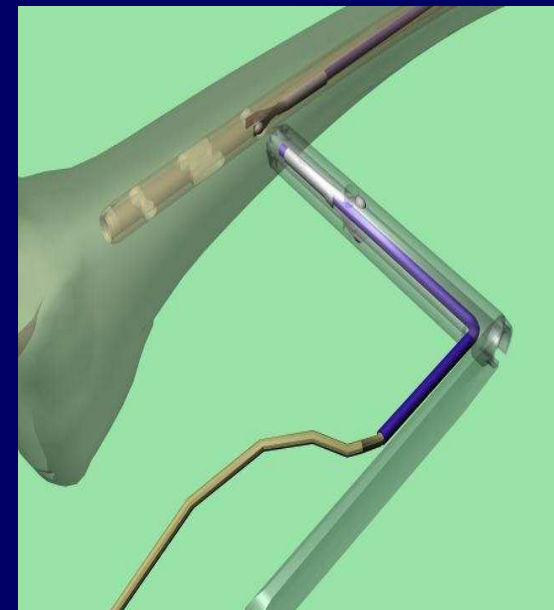
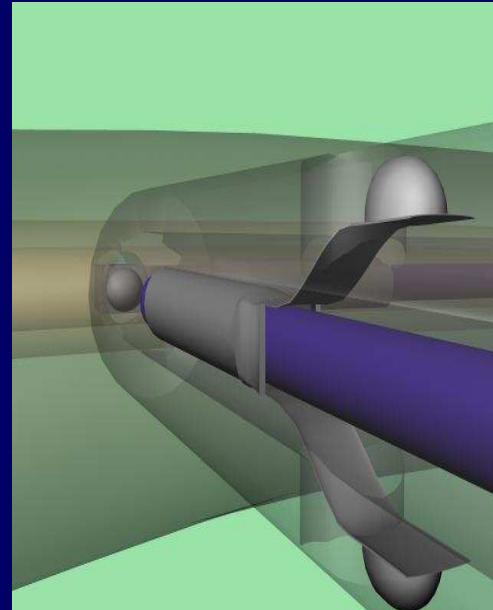
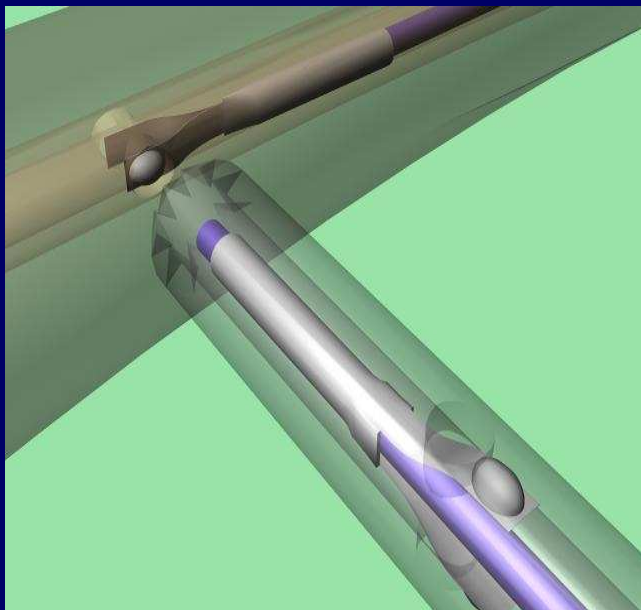
Future and development

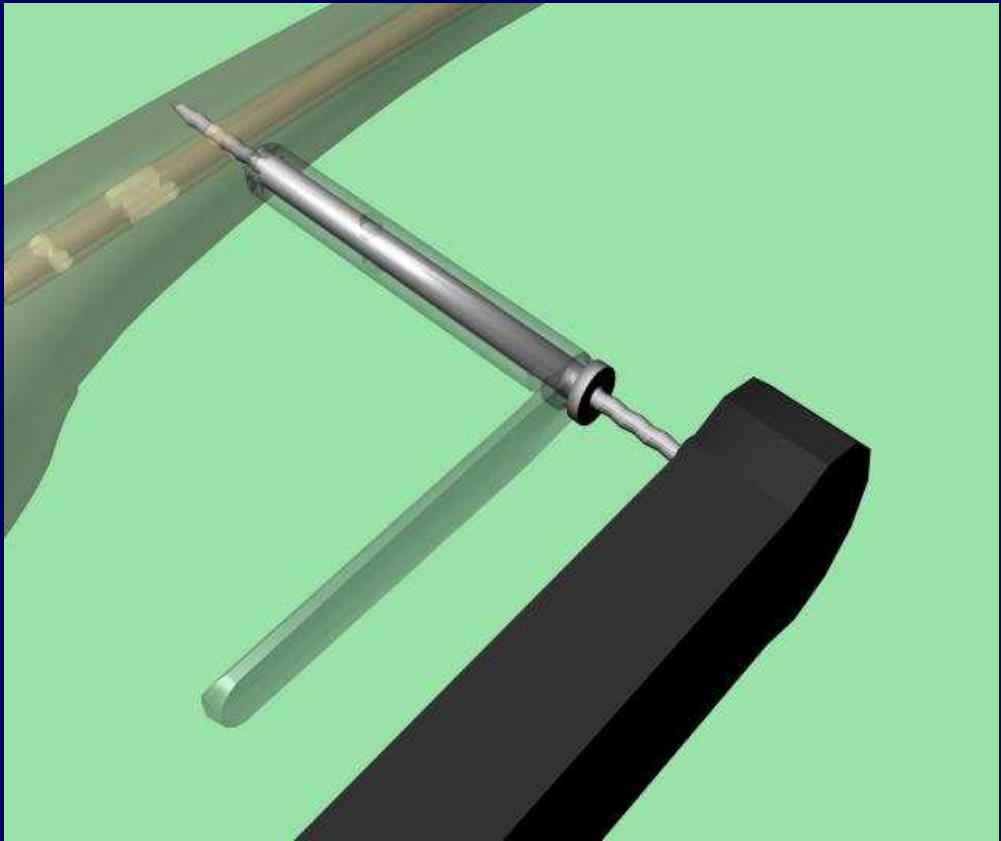
Incorporate biomechanical data for acetabular loading (Kristan A, Cimerman M, IEE 2007)



Future and development

Incorporation of navigation systems with microsensors: interlocking and reduction, guiding with "flying sensors" (8 SIS screws already placed in Ljubljana, SLO 6 in Udine, I)







conclusions

- EBS procedure: much better understanding of the fractures
- lesser approach
- more precise reduction
- better fixation
- less "surprise surgery"
- teaching tool
- research tool
- connection with biomechanical data and navigation is possible





NEW SOFTWARE application for PREOPERATIVE PLANNING AND TRAINING for BONE SURGERY



Allows EXPORT TO STL, COLLADA FORMATS

Allows REDUCTION/RECONSTRUCTION planning

Allows STEREO IMAGE

USEFULL EDUCATIONAL TOOL for the preoperative planning and operative
procedures in orthopedic, maksilofacial and trauma surgery



All interested, contact us at

info@ekliptik.si, tel: +386 1 4776 631, fax: +386 1 4776 632



Thank you for your attention

