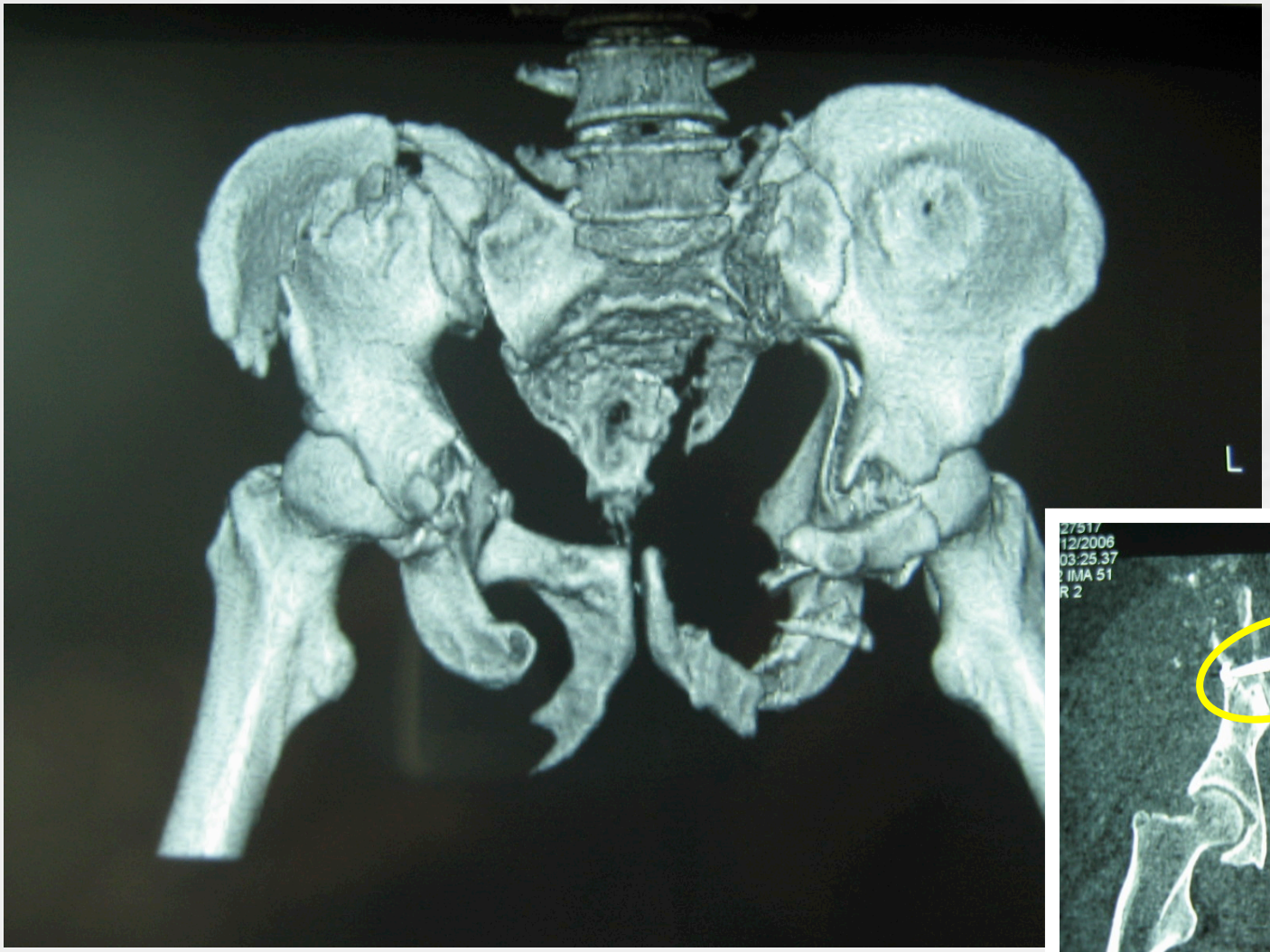
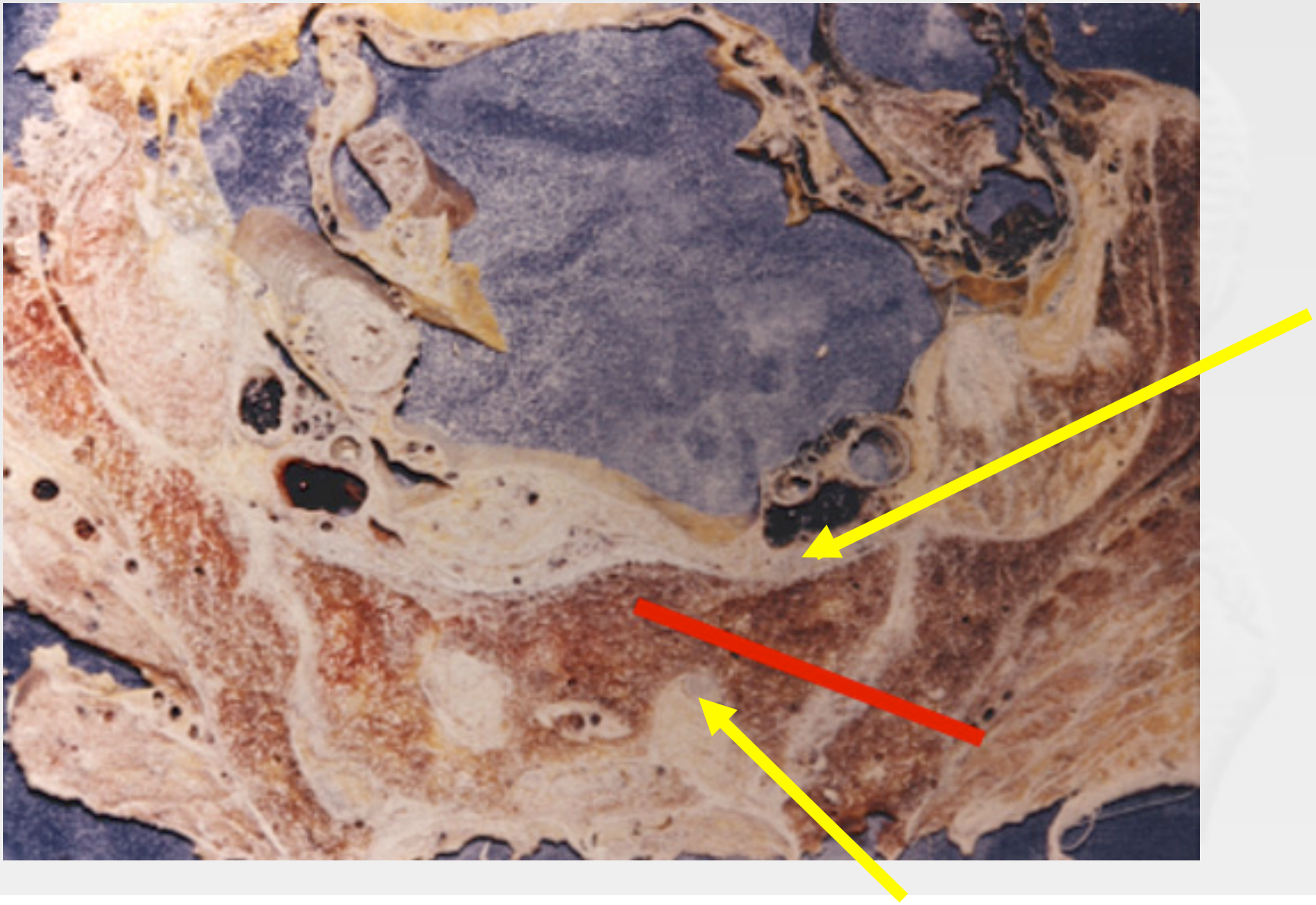
leçon & simulation de la chirurgie orthopédique percutanée

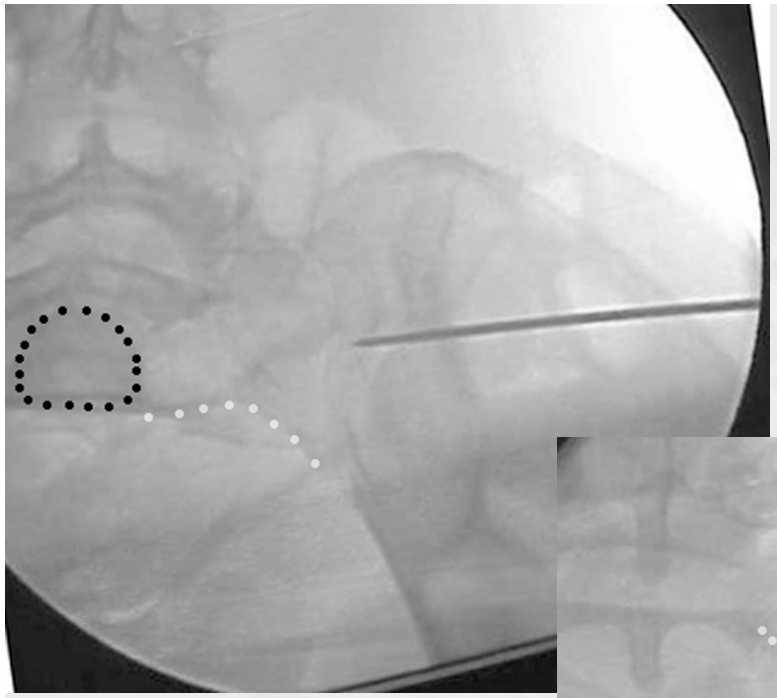
Pr J. Tonetti
chirurgie orthopédique
CHU de Grenoble

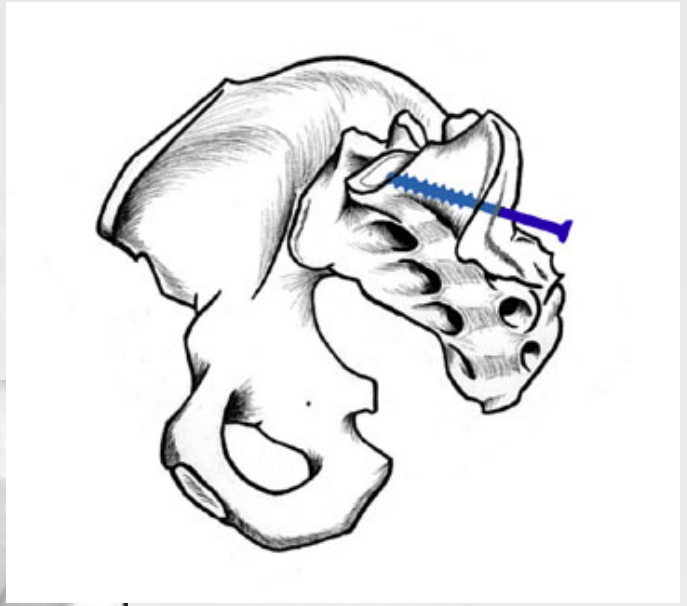
l'application
fracture de l'anneau pelvien

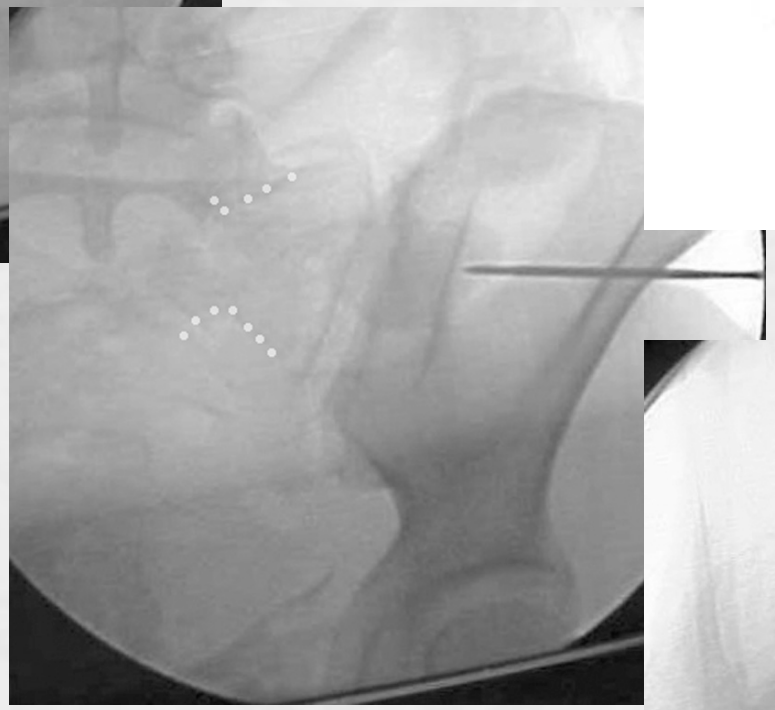


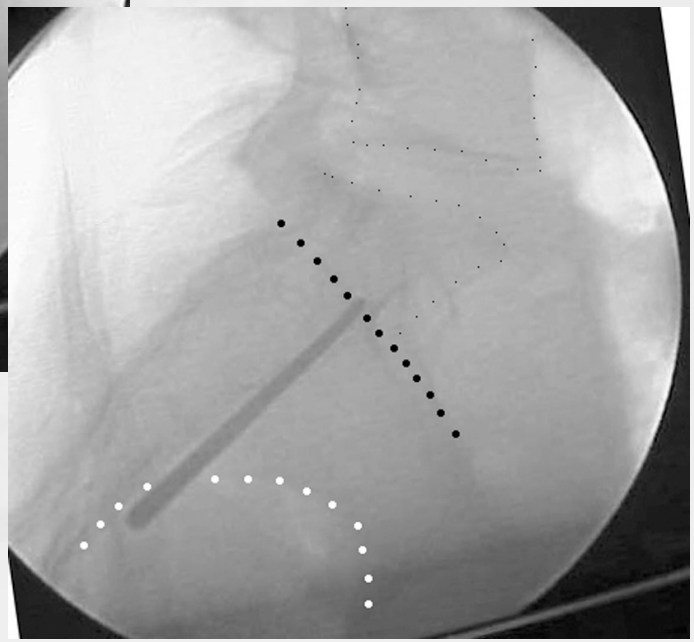
l'application



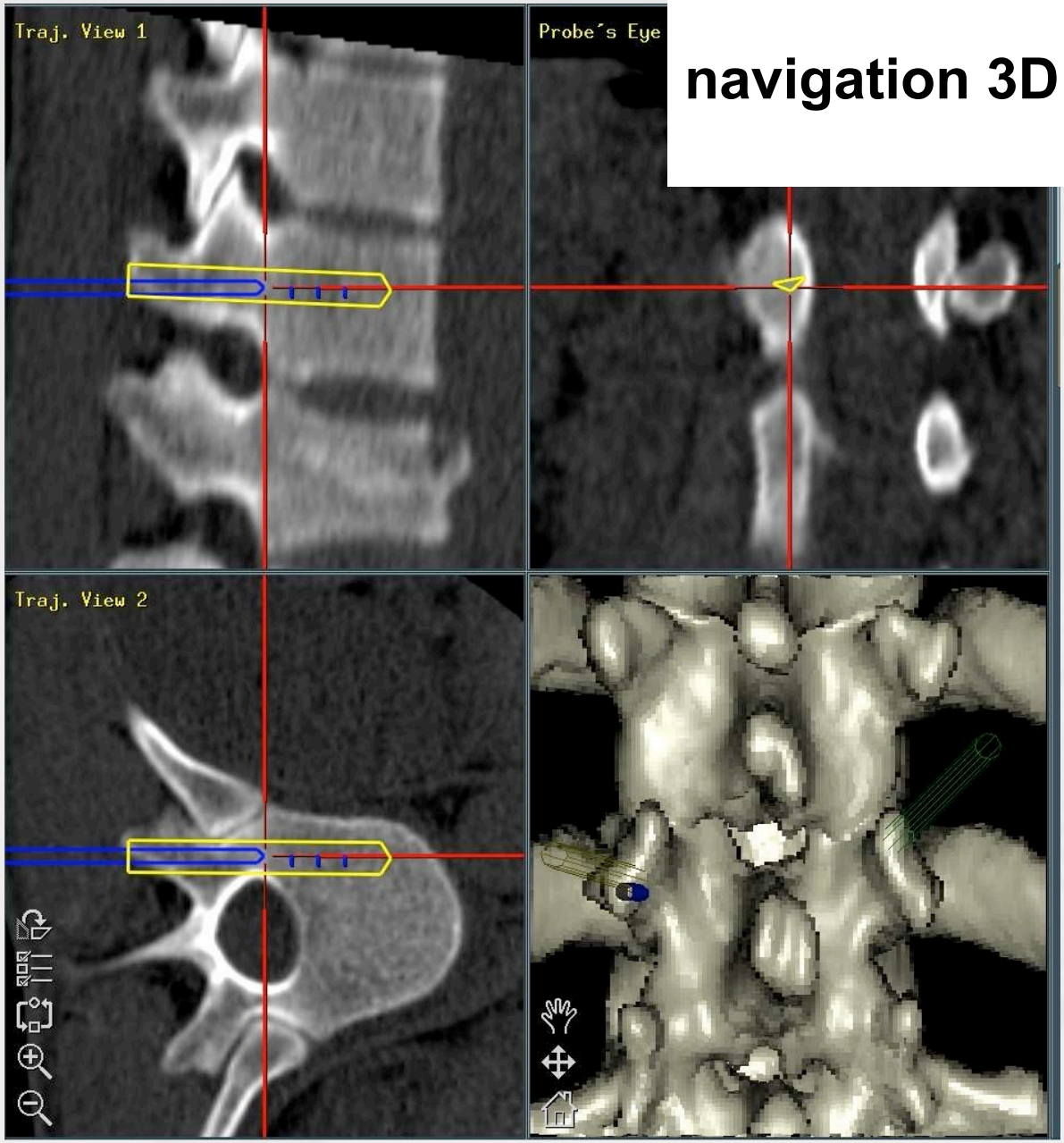








planification
navigation 3D sur scanner pré-op
1995



IGOS 1 1996
IGOS 2 1998

VOEU 2000

- **IGOS 1 & 2 (projet européen HC1026HC) 1996-2000**
  Image Guided Orthopaedic Surgery

- **VOEU 2000-2002**
  Virtual Orthopédique Européan University
  leçon illustrée (HTML) puis simulateur 3D (VRML)

- **TELEOS (TCAN / ANR) 2004-2008**
  Technology Enhanced Learning for Orthopaedic Surgery

  TIMC-IMAG équipe GMCAO
  LIG / CLIPS-IMAG équipe ARCADE et équipe Multicom
  Lab Sciences de l'Education
  Laboratoire Interdisciplinaire de Psychologie

  UJF & UPMF GRENOBLE

corpus - Mozilla

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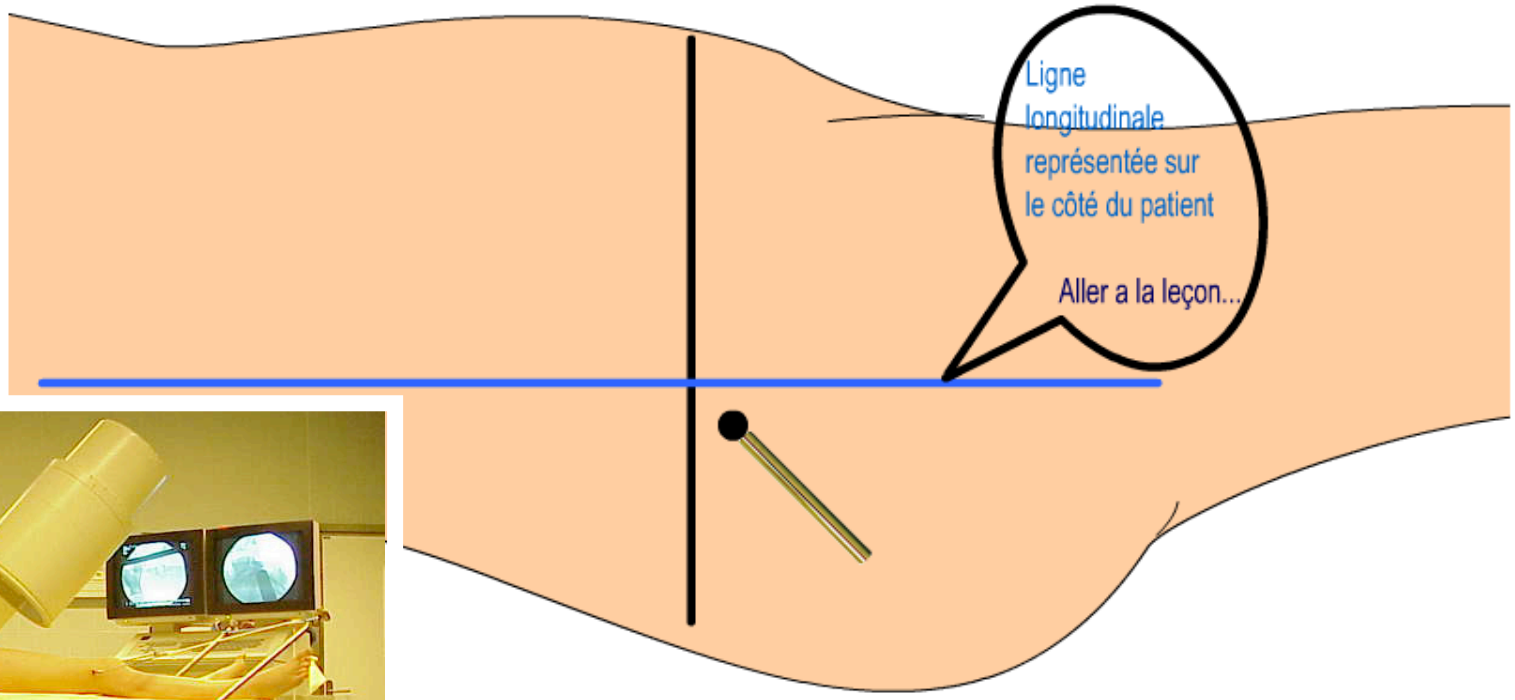
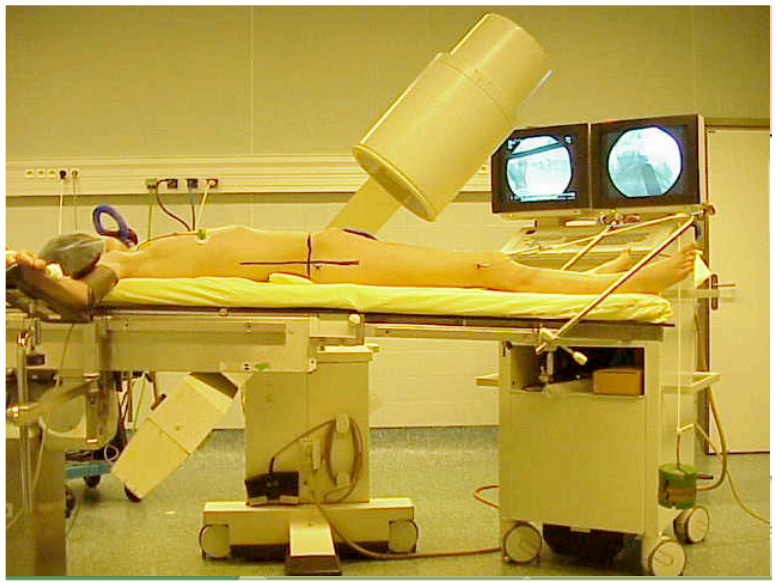
- Résumé
- Plan
- Index
- Glossaire
- Bibliographie
- Liens
- Indication chirurgicale
- Réduction à foyer fermé
- Protocole fluoroscopique
- Protocole assité par ordinateur
- Suites post-opératoires
- Exercice
- KawaTree © 1998 H. Inisan

Explication

Le Vissage Sacro-Iliaque

Virtual Orthopaedic European University





Valider Leçon

Video Recommencer

Zoom

vissage7 corpus - Mozilla Bureau FR 18:54

corpus - Mozilla

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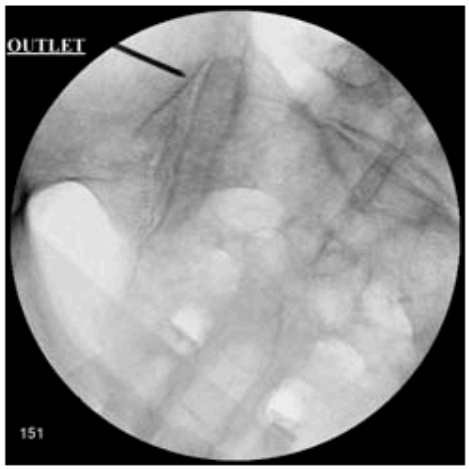
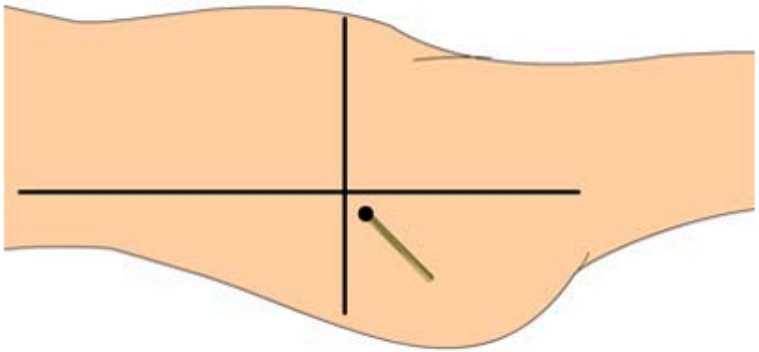
Le Vissage Sacro-Iliaque

Voici la trajectoire que vous avez choisie sur les contrôles Inlet et Outlet.

Si vous avancez la broche, restera t-elle intra-osseuse ? Oui : cliquez sur "Valider" Non : cliquez sur "Recommencer"





Recommencer Leçon

Valider Video

Done

démarrer Microsoft PowerPoint... SIMULATEUR vissage7 corpus - Mozilla Bureau FR 19:00

Le Vissage Sacro-Iliaque

Désolé !!!

La trajectoire traverse le canal sacré. Vous risquez une lésion des racines de la Queue de Cheval et de la racine S1 en particulier.

Recommencer Leçon FIN

Vissage sacro-iliaque / Suites post-op&eacuteratoires

Contrôles paracliniques

Radiographie du bassin de face.

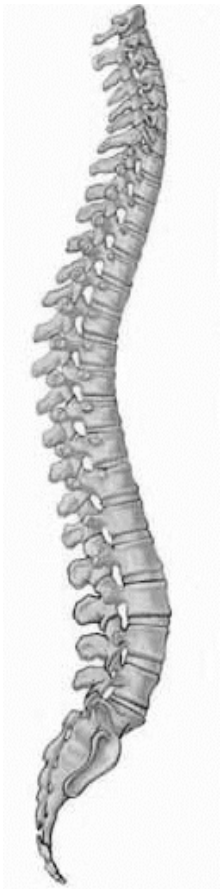
La radiographie simple est répétée à 5 jours, à 45 jours, à 3mois et à 6 mois.

Tomodensitométrie avec reconstruction 2D

-1 reconstruction dans l'axe de la vis parallèle au plateau sacré
-1 reconstruction dans l'axe de la vis perpendiculaire au plateau sacré
-1 reconstruction perpendiculaire à l'axe de la vis passant par la zone la plus étroite de l'aileron sacré.

VOEU vrml

ExerciceVOEU



Modélisation de la connaissance pour la conception d'un EIAH en Chirurgie Orthopédique (TELEOS)

Projet TCAN ~ CNRS

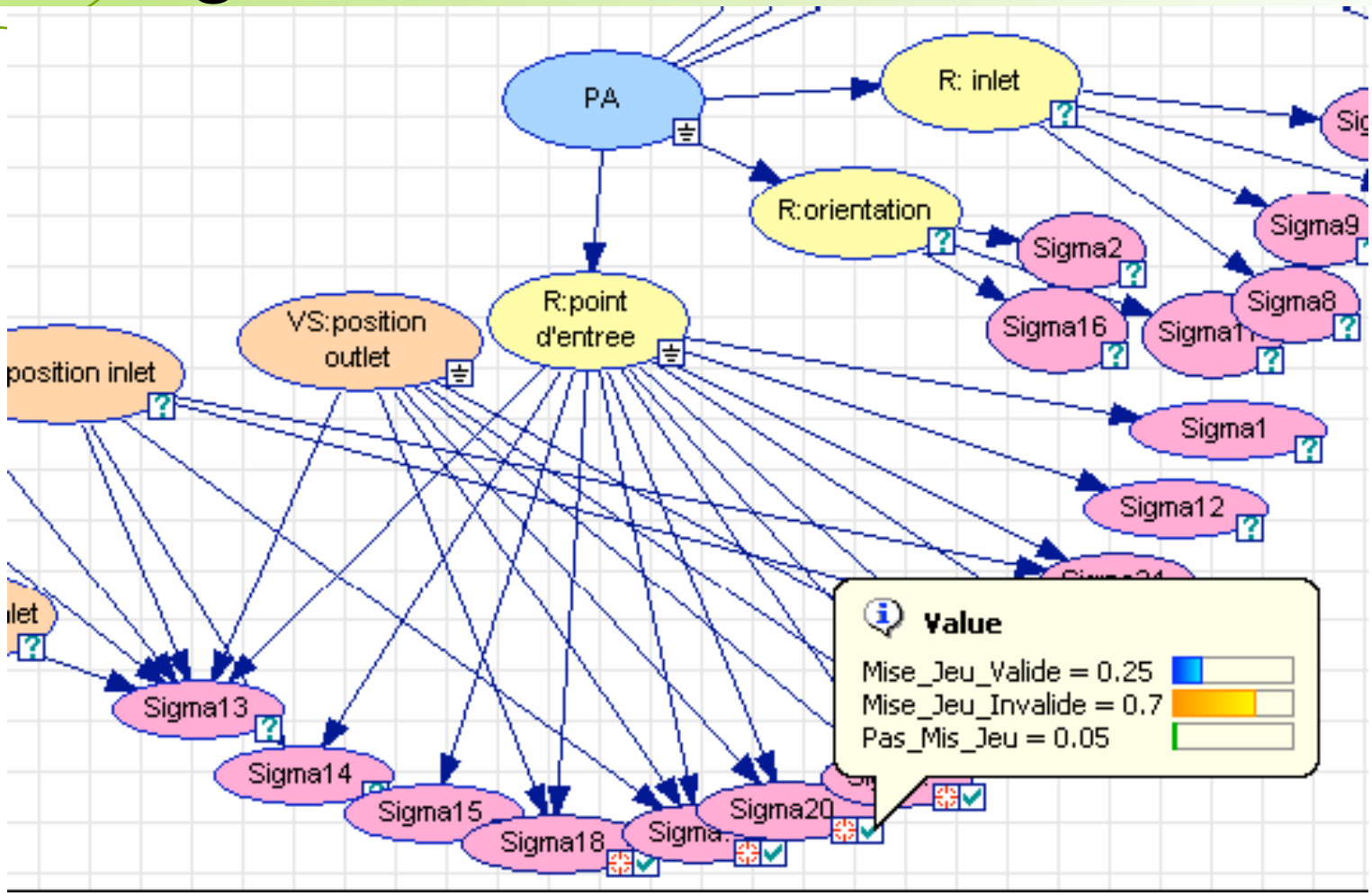
22 septembre 2004

méthode

- Analyse de l'activité opératoire
  - Expert et formateur
  - Prescription et réalité
- Modélisation de connaissances
  - Liens entre connaissances, problèmes, systèmes de représentation
  - Déclaratif, empirique, gestuel
- Conception d'environnements de formation
  - Représentation informatique du réseau de connaissances
  - Diagnostic et production de feedback pour la formation

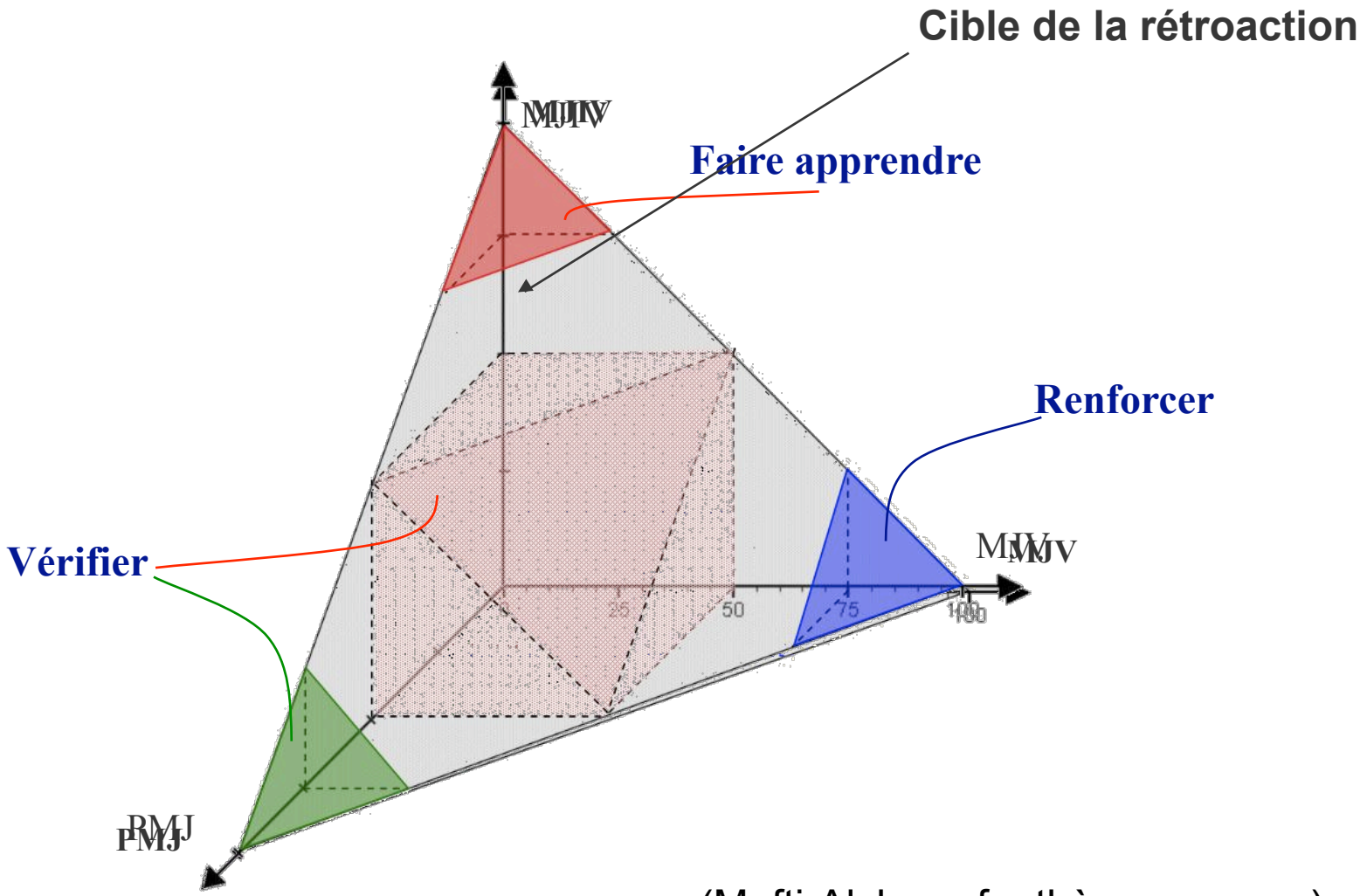
TELEOS : Technology Enhanced Learning for Orthopaedic Surgery

Diagnostic



(Vu Minh, post doc CNRS 2005/2006)

Prise de décision didactique



(Mufti-Alchawafa, thèse en cours)

Q1 : besoin des chirurgiens ?

- individuelle : formation à une intervention peu pratiquée
- institutionnelle : homogénéisation des pratiques sur le territoire européen
- certification du chirurgien en vue d'une autorisation à pratiquer cette intervention

➔ qualité et précision du simulateur
➔ efficacité : cohorte comparatives de chirurgiens

medline : Orthopedic Surgery Simulator
20 résultats dont la moitié pour arthroscopie

1: Blyth P, Stott NS, Anderson IA.
A simulation-based training system for hip fracture fixation for use within the hospital environment. Injury. 2007 Oct;38(10):1197-203.

2: Cannon WD, Eckhoff DG, Garrett WE Jr, Hunter RE, Sweeney HJ.
Report of a group developing a virtual reality simulator for **arthroscopic** surgery of the knee joint. Clin Orthop Relat Res. 2006 Jan;442:21-9.

3: Blyth P, Anderson IA, Stott NS.
Virtual reality simulators in orthopedic surgery: what do the surgeons think? J Surg Res. 2006 Mar;131(1):133-9;

4: Frey M, Riener R, Burgkart R, Pröll T.
[Initial results with the Munich knee simulator] Biomed Tech (Berl). 2002;47 Suppl 1 Pt 2:704-7.

5: Pedowitz RA, Esch J, Snyder S.
Evaluation of a virtual reality simulator for **arthroscopy** skills development. Arthroscopy. 2002 Jul-Aug;18(6):E29.

6: Mabrey JD, Gillogly SD, Kasser JR, Sweeney HJ, Zarins B, Mevis H, Garrett WE Jr, Poss R, Cannon WD.
Virtual reality simulation of **arthroscopy** of the knee. Arthroscopy. 2002 Jul-Aug;18(6):E28.

7: Tsai MD, Hsieh MS, Jou SB.
Virtual reality orthopedic surgery simulator. Comput Biol Med. 2001 Sep;31(5):333-51.

8: Poss R, Mabrey JD, Gillogly SD, Kasser JR, Sweeney HJ, Zarins B, Garrett WE Jr, Cannon WD.
Development of a virtual reality **arthroscopic** knee simulator. J Bone Joint Surg Am. 2000 Oct;82-A(10):1495-9.

9: Mabrey JD, Cannon WD, Gillogly SD, Kasser JR, Sweeney HJ, Zarins B, Mevis H, Garrett WE, Poss R.
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Blyth P, **Anderson IA**, **Stott NS**.

Virtual reality simulators in orthopedic surgery: what do the surgeons think?

J Surg Res. 2006 Mar;131(1):133-9

Department of Surgery, University of Auckland, Grafton, Auckland, New Zealand.

BACKGROUND: There is increasing pressure to develop virtual reality surgical simulation that can be used in surgical training. However, little is known of the attitudes of the surgical community toward such simulation, and which aspects of simulation are most important. MATERIALS AND METHODS: A postal survey on attitudes to surgical simulation was sent to all New Zealand orthopedic surgeons and advanced trainees. This comprised of 44 questions in 10 sections, using either a visual analogue scale (0 to 10) or free text box replies. Results were analyzed for two sub-groups; surgeons qualified before 1990 and those qualified in or after 1990 or still in training. RESULTS: Of the 208 possible responses, 142 were received, a response rate of 68%. Only four respondents had tried a surgical based simulator. Earlier qualified surgeons were more likely to agree that simulation was an effective way to practice surgical procedures, median score 7.7 versus 5.6 (P = 0.03). Both groups thought the most important task for simulation was practicing angulation/spatial orientation (median score 8.4/10), while a realistic view of the operation was the most important requirement (median score 9/10). Both groups were unconvinced that simulation would impact on their practice in the next 5 years, with this statement being scored lower by later qualified surgeons, median score 2.4 versus 4.1 (P = 0.04). CONCLUSIONS: Orthopedic surgeons in New Zealand are supportive of surgical simulation but do not expect simulation to have an impact in the near future. Intriguingly, later qualified surgeons and trainees are more skeptical than their earlier qualified colleagues.

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nses,

a realistic view of the operation was the most important requirement

aplications cliniques cibles

applications avec "gymnastique" 3D

arthroscopie épaule, genou, hanche

correspondance image Rx 2D et 3D per-op

➔vidéochirurgie

➔fluorochirurgie

= chirurgie percutanée

Q2 : qualité du volume 3D

- images 3D format DICOM
- construction automatisées du volume 3D
- dépendance du fournisseur d'image

- segmentation de l'os (seuillage + manuel)

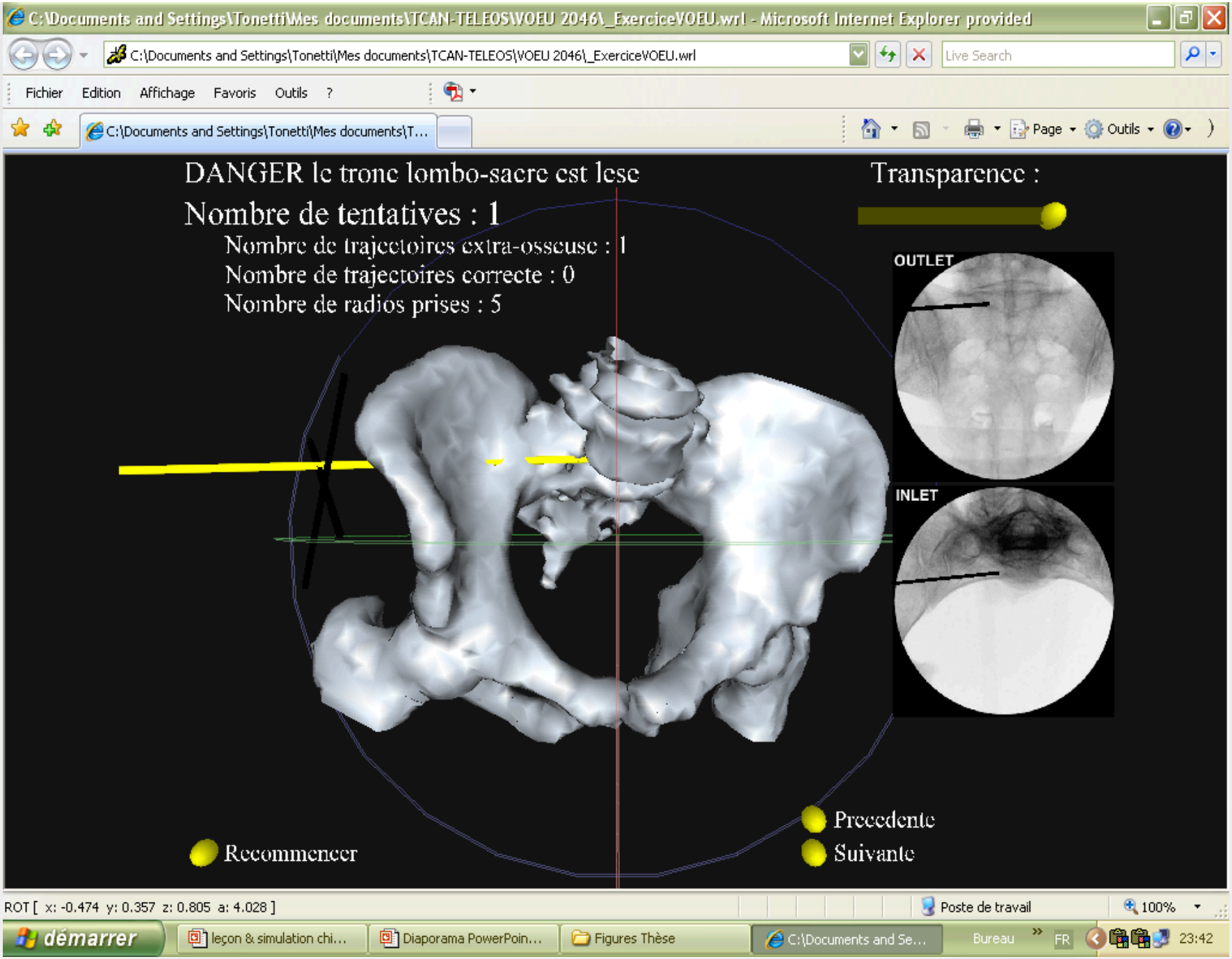
Q3 :
mise en correspondance 2D-3D

génération des images 2D à partir du 3D

ou bien matching 2D 3D sur des essais de projections empiriques

ou bien repères implantés

➔ remise en cause de la précision du simulateur et abandon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C:\Documents and Settings\Tonetti\Mes documents\TCAN-TELEOS\VOEU 2046_ExerciceVOEU.wrl
Live Search
Fichier Edition Affichage Favoris Outils ?
C:\Documents and Settings\Tonetti\Mes documents\T...
Page Outils
DANGER le tronc lombo-sacre est lese
Nombre de tentatives : 1
Nombre de trajectoires extra-osseuse : 1
Nombre de trajectoires correcte : 0
Nombre de radios prises : 5
Transparence :
OUTLET
INLET
Precedente
Suivante
Recommencer
ROT [x: -0.474 y: 0.357 z: 0.805 a: 4.028]
Poste de travail
100%
démarrer
leçon & simulation chi...
Diaporama PowerPoin...
Figures Thèse
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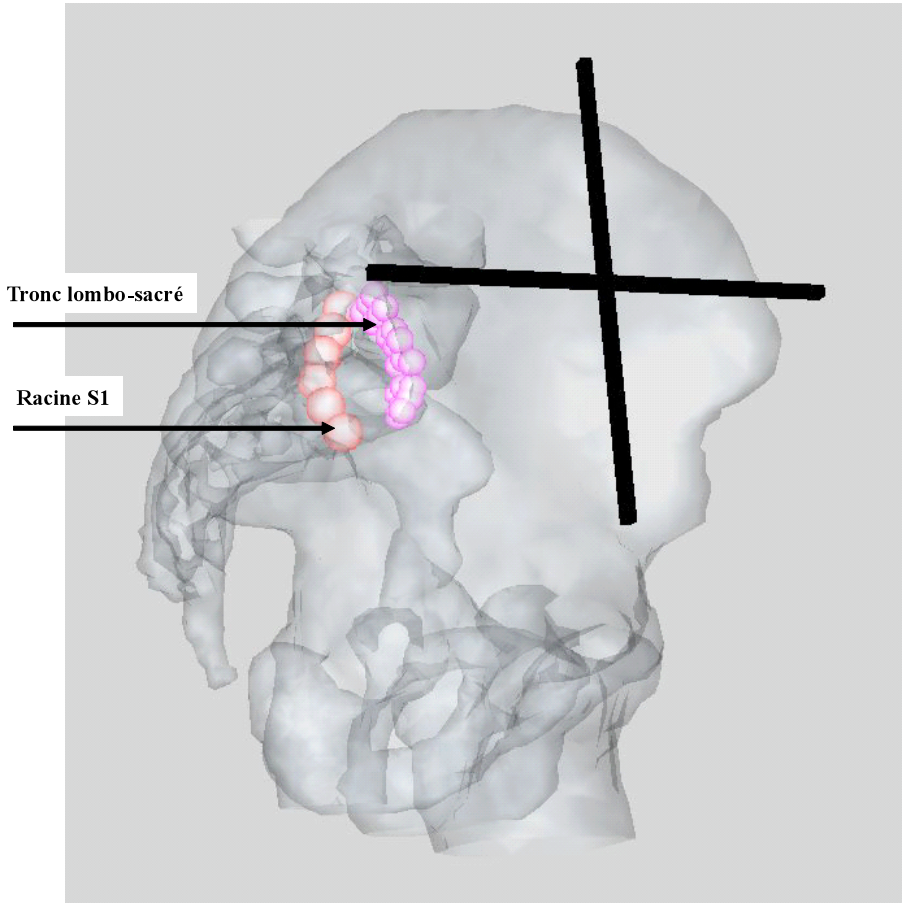
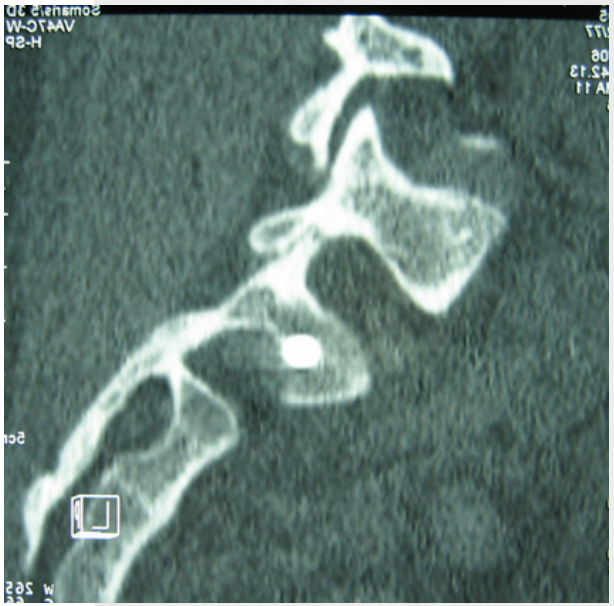
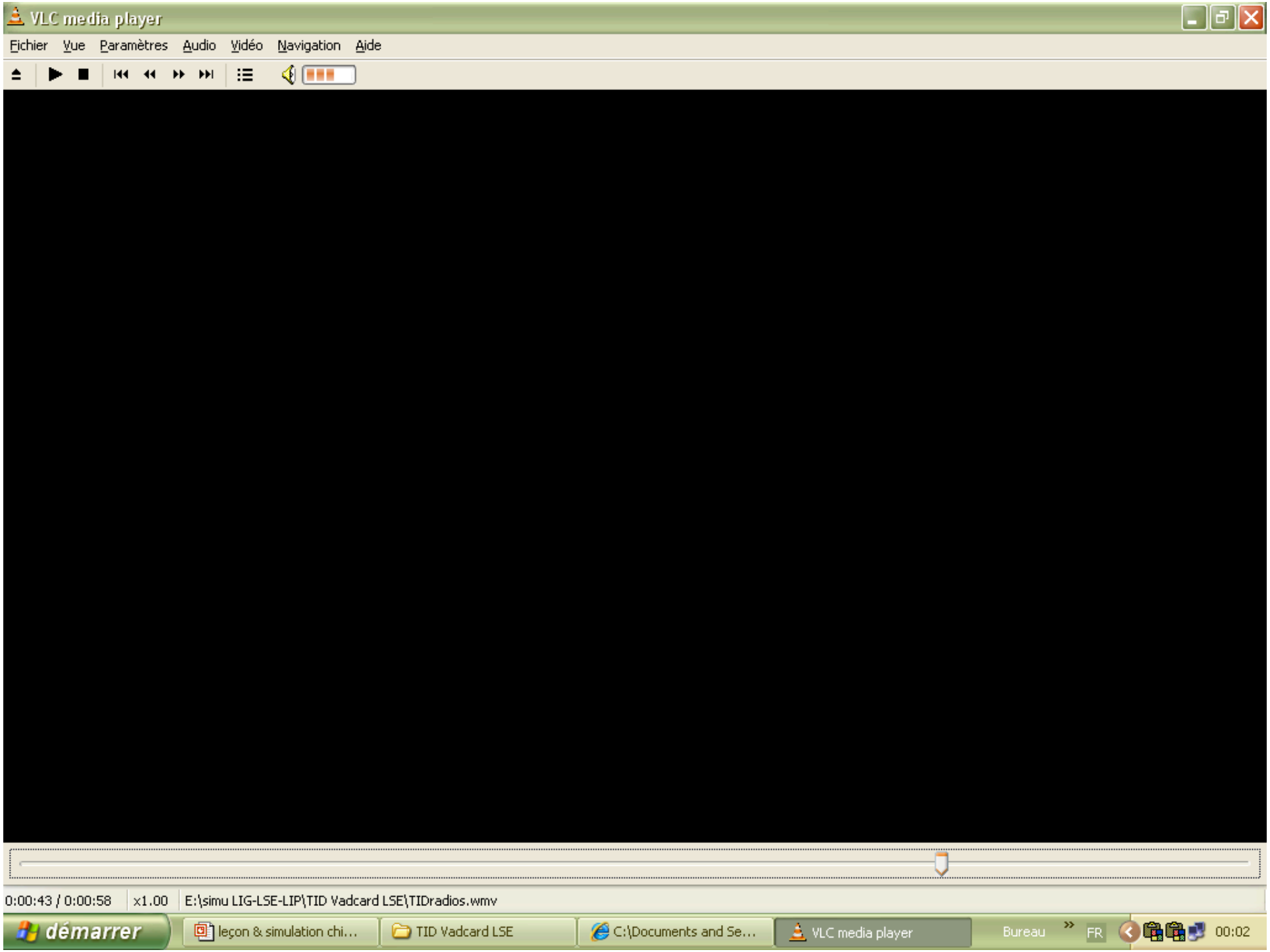
Q4 : comment extraire les zones sémantiques repérées

afin de générer des traces et donc le retour didactique





passage au format JAVA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Q5 : développement de l'interface physique

TraumaVision
Melerit Medical AB

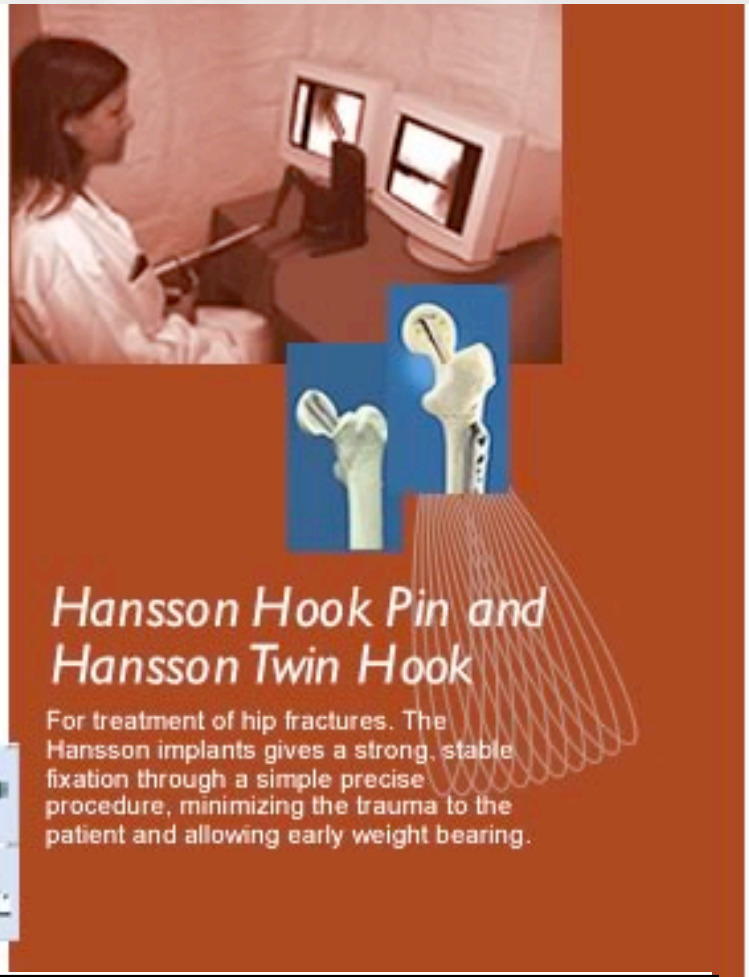
The future surgeon is given the opportunity to practice several orthopedic procedures

- Hansson Hook Pin (transcervical fractures)
- Hansson Twin Hook (trochanteric fractures)
- Distal locking of femoral nails (femoral fractures)

Download PDF product sheet here

In the future, TraumaVision will incorporate additional procedures such as:

- Hansson Screw (transcervical fractures)
- Hansson Compression Hip Screw (trochanteric fractures)



Femoral nailing

The distal locking of femoral nails is one of the most difficult parts in femoral trauma surgery. With Melerit TraumaVision, this procedure can now be practiced in a safe and realistic manner minimizing the potential risk of the secondary fraction caused by to many drillholes.

PelvicVision ➡ PhacoVision ➡

Poignée avec retour haptique. Pas pour toutes les applications

Q6 : Financement du outil pédagogique pour tous ?

- **sociétés savantes**
- gouvernement européen
- sociétés commerciales distributrices d'implant

conclusions : les problèmes

- cibles
  - chirurgiens
  - applications
- techniques aigus
  - construction 3D
  - matching de plusieurs modalités
- extraction des infos sémantiques
- interface haptique
- financement et responsabilité