

# KOELIS

## *Augmented Surgery*

# Company Background

- **Medtech** company, inc. Oct 2006 in Grenoble, France
- **History**
  - 5 years R&D at Grenoble University (TIMC lab) France
  - Scientific & Clinical Partners (France, USA)
- **Domain: Computer-Assisted Urology**
  - Imaging                      - Planning
  - Modeling                    - Guiding
  - Navigation                 - Robotics
- **Team**
  - 5 people (2 managers, 2 R&D engineers, 1 app. engineer)

# Our Focus: Urology – Prostate Cancer

- FACTS

- PCa incidence  $\nearrow$ , younger patients, smaller tumors
- 2D echoguided biopsy is not accurate
- New modalities contribute to diagnosis & prognosis

→ **Patients request accuracy and quality**

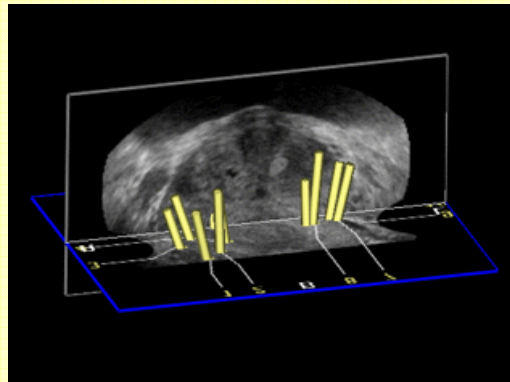
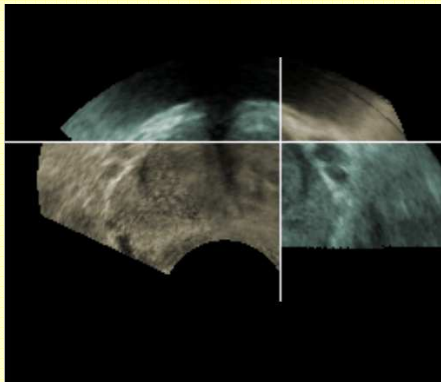
- VISION

- For the first time **3D ultrasound**, image fusion and automatic **organ tracking** are combined to increase **prostate biopsy** precision and improve **focal therapy** outcomes for all patients.

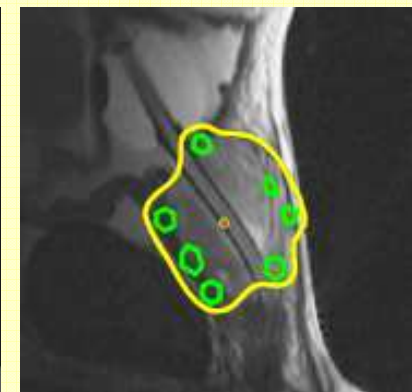
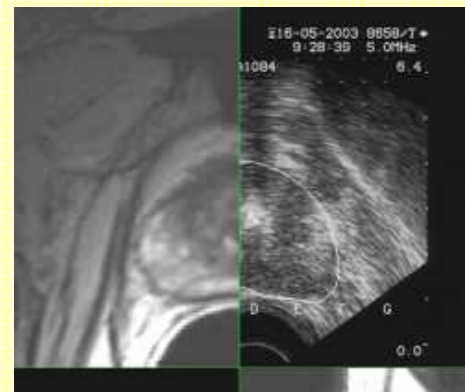
# TECHNOLOGY

# 3D Image fusion

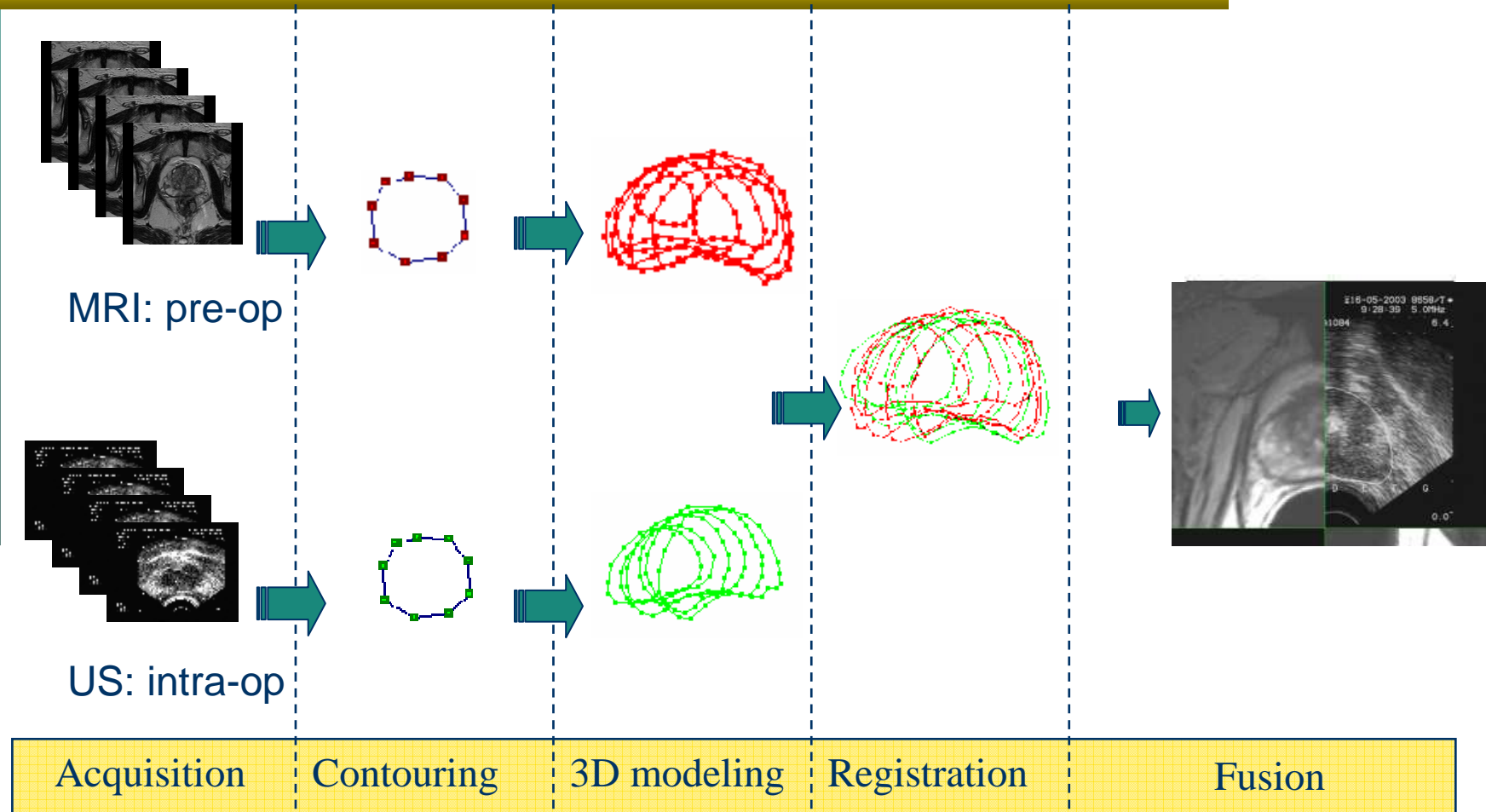
## Prostate 3D US



## Prostate IRM/US

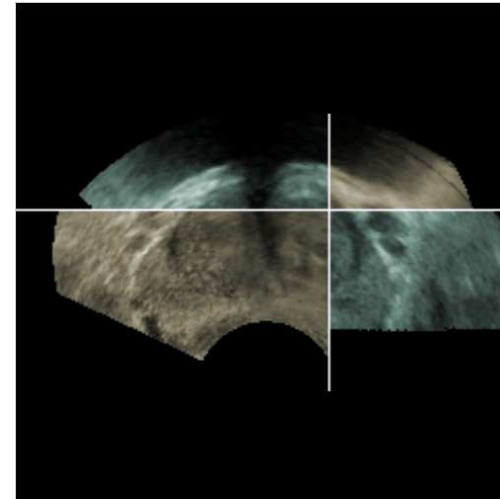
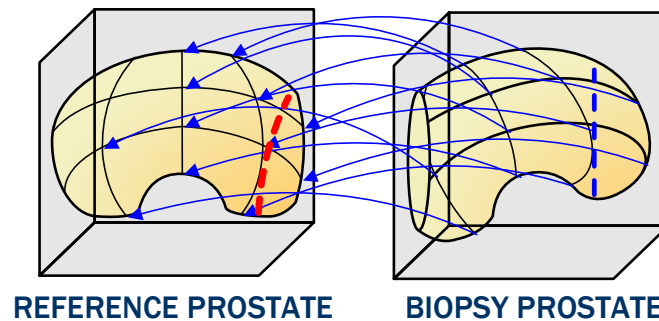


# Method 1- Point-Based Registration



## Method 2 - Iconic Registration

- Prostate Tracking/Morphing with intraop. 3D ultrasound



**Baumann et al., MICCAI 2007**

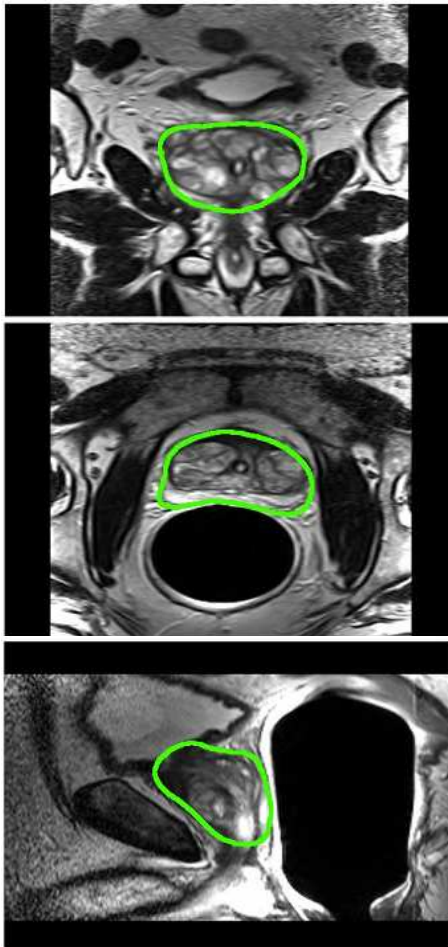
Towards 3D Ultrasound Image Based Soft Tissue Tracking: a Transrectal Ultrasound Prostate Image Alignment System

**Baumann et al., MICCAI 2009**

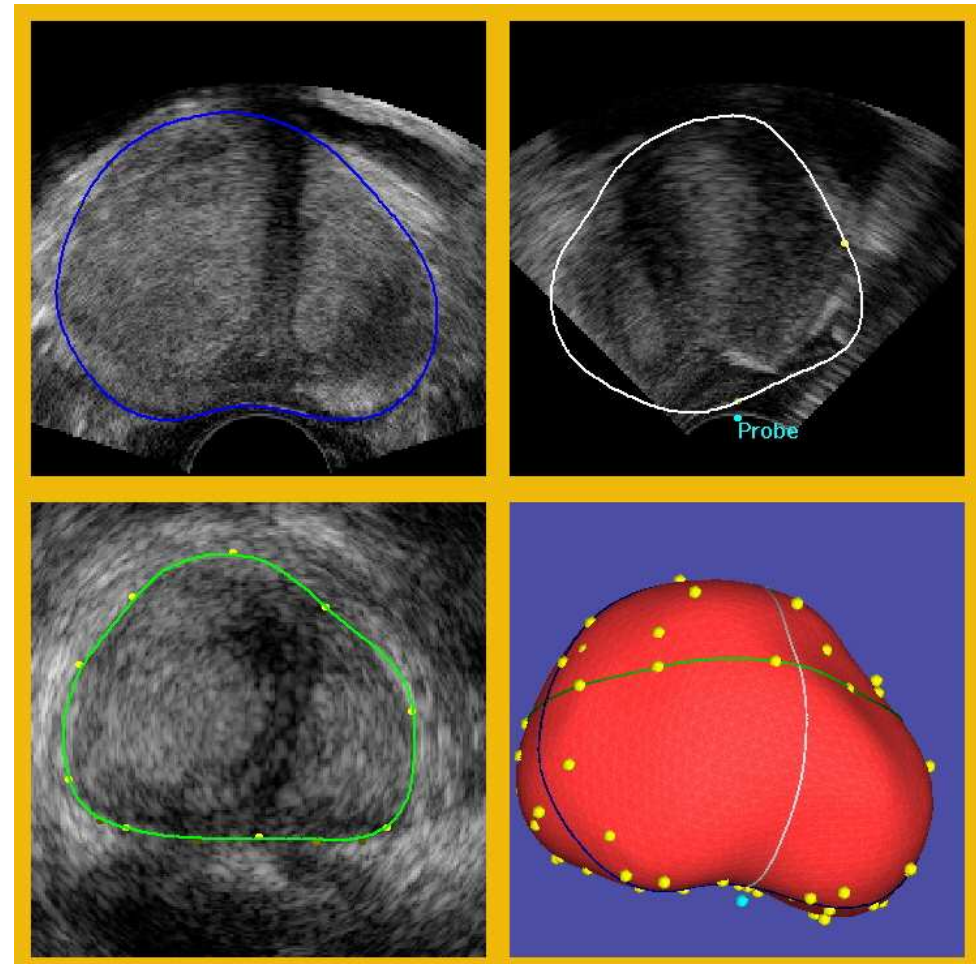
Prostate Biopsy Assistance System with Gland Deformation Estimation for Enhanced Precision

# Morphological Segmentation

- On MRI

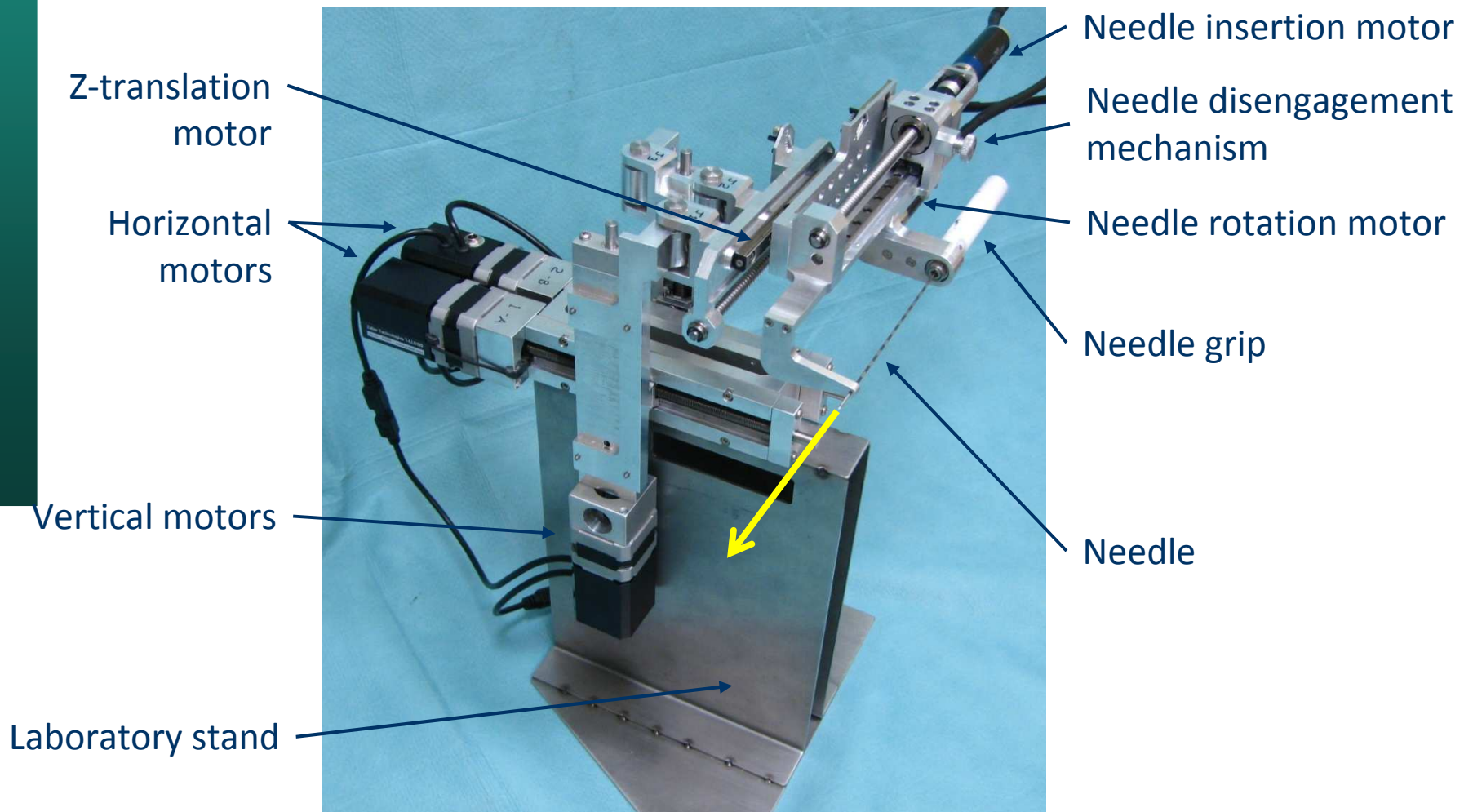


## On 3D TRUS



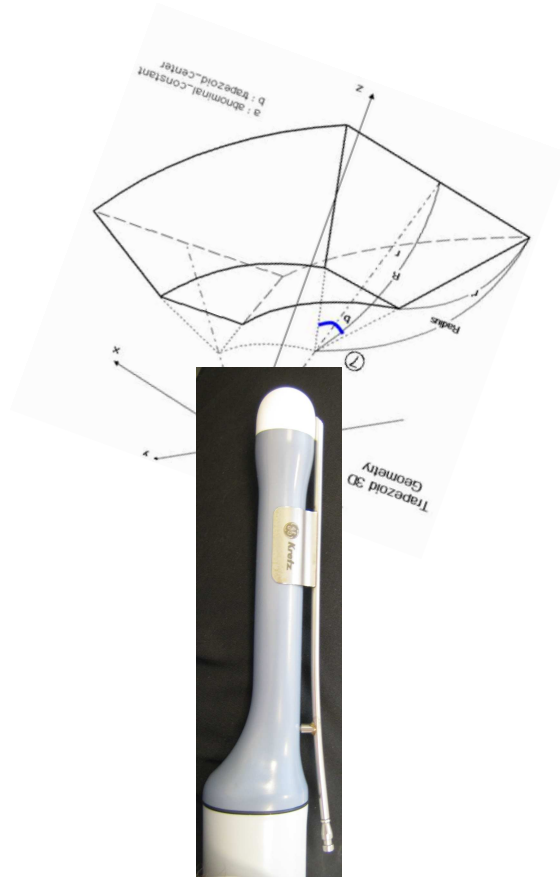


# Research Projects - Robotics



# PRODUCT

# UROSTATION




3D TRUS PROBE





3D TRUS SCANNER

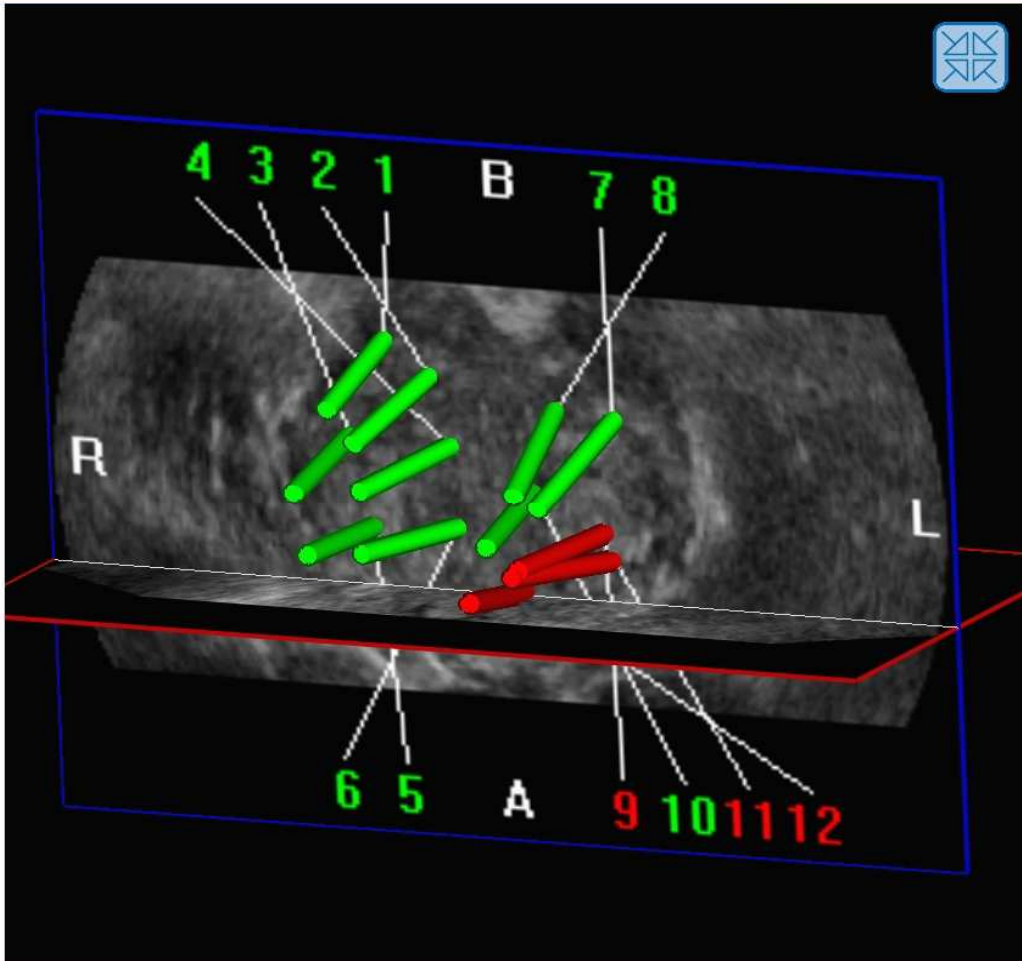


# 3D Targeted Prostate Biopsy


KOELIS

BIOPSIES REVIEW

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Axial Image Selection  

−

+

Coronal Image Selection  

−

+

Image Orientation Selection  

A
S
C

### Histologic Analyze Results

Nb Pos. Biop.	3 / 12
Total Tumor Size	15.0 / 42.0
Gleason max	8


**Grade** T2A

▲
Biopsy 1
▼

Length	0
Tumor Size	0
Gleason	-
PCI	NO
PNI	NO
ASAP	NO
PIN	NO

**GLOSSARY**  
 PCI: Prostate Capsular Infraction  
 PNI: Peri-nervous Invasion  
 ASAP: Atypical Small Acinar Proliferation  
 PIN: Prostatic Intra-epithelial Neoplasia

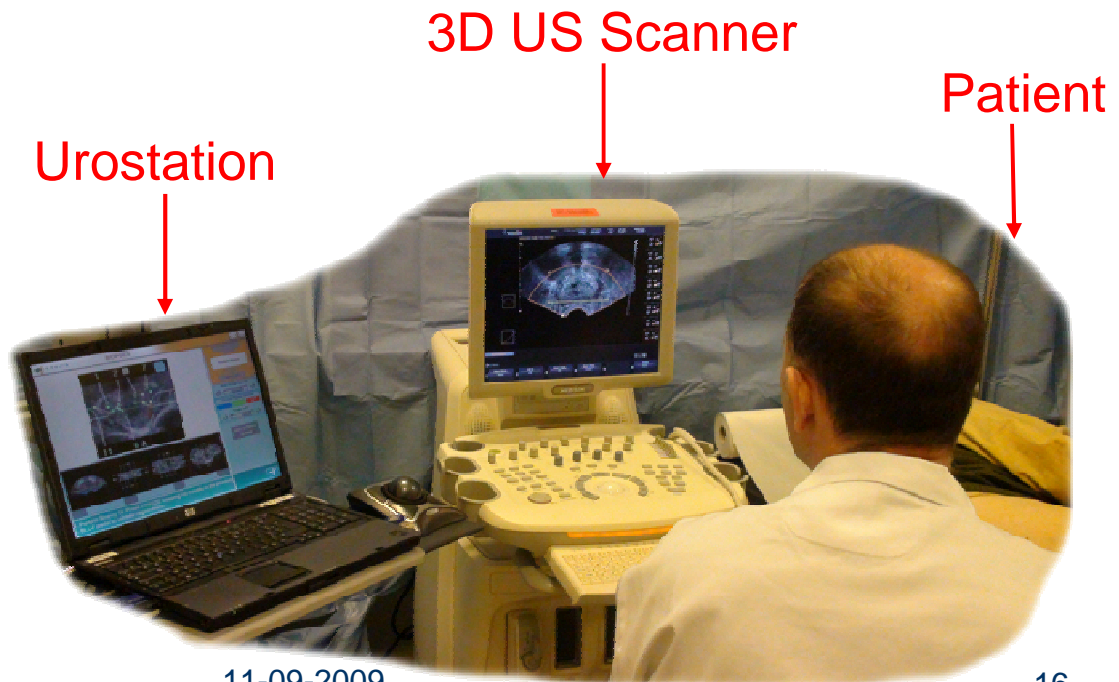
- Entry histologic results on the right panel.  
 - BLUE pedal to validate registrations.



Koelis Prostate Biopsy 1.0

# Clinical Validation

- Pitié Salpêtrière Hospital, Paris
  - +100 Patients enrol.
  - Live targeting
  - Improved distribution
  - 3D recording



**Mozer et al., Journal of Ultrasound in Medicine 2009**

Mapping of Transrectal Ultrasound Prostate Biopsies: Quality Control and Learning Curve Assessment by Image Processing