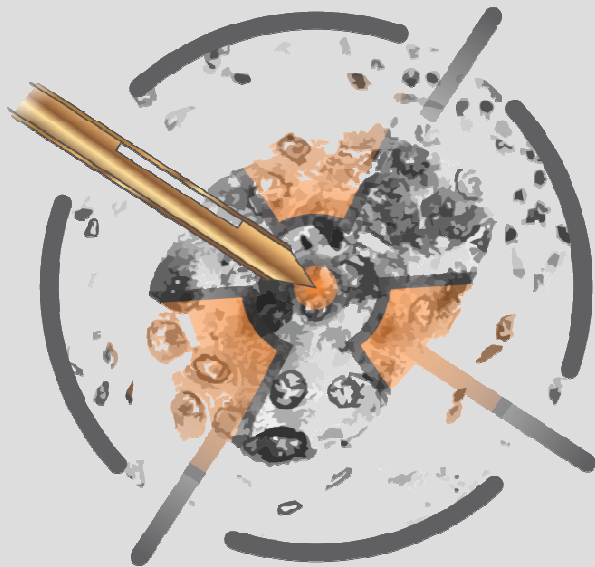


# “PRO INVENT” RESEARCH CONFERENCE–24.03.2016

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## A multi-purpose needle insertion device for the diagnosis and treatment of cancer – ACCURATE



Project code : PN-II-RU-TE- 2014-4-0992

Contract number: 59 /2015

Duration: 2015-2017

<http://www.cester.utcluj.ro/accurate/index.html>

# Implementation team

<b>Name</b>	<b>Position</b>
Calin VAIDA	Project leader
Doina PISLA	Senior Researcher
Nicolae PLITEA	Senior Researcher
Florin GRAUR	Medical Expert
Bogdan GHERMAN	Post-doc
Paul TUCAN	PhD student
Iosif BIRLESCU	PhD student
Marius HUTA	PhD student

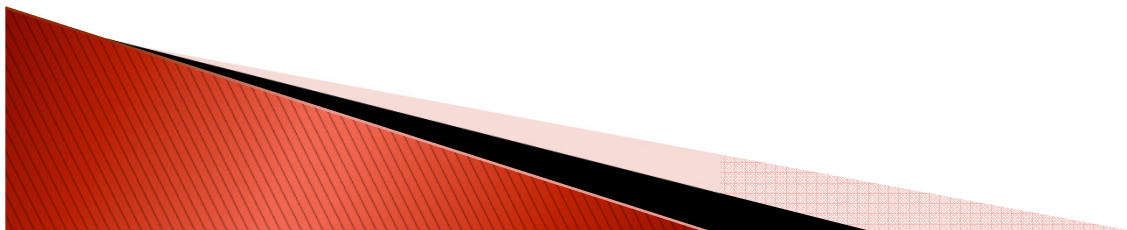


# Motivation



Cancer, considered the disease of the XXI century, is an open problem in which every progress means a step forward in the fight between life and death. The fight against cancer has two main components strongly interconnected: **diagnosis** and **treatment**. **An early, accurate diagnosis** can provide the means for **local targeted treatment** of the tumors with excellent life expectancy. Thus, the proper diagnosis and staging of cancer are the first steps towards a positive prognosis for a cancer patient.

A reasonable conclusion for **the enhancement of cancer treatment** would be **to perform accurate early diagnosis to identify potential malignant tumors in early stages** and **to perform local targeted treatment to destroy the tumors in both curative and palliative approaches**, this idea representing the aim of the ACCURATE project.

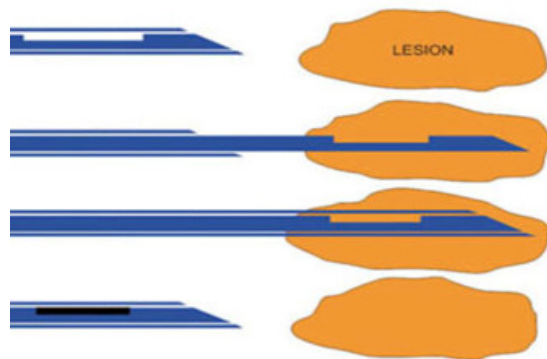


# Objectives

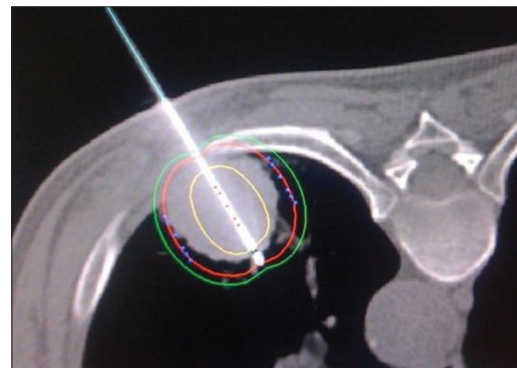


## Main Objective

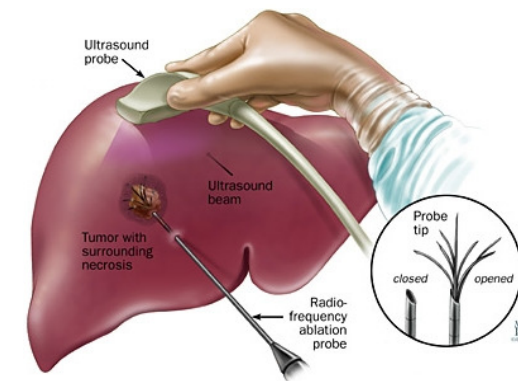
Development of a family of needle placement devices able to perform **highly accurate needle guidance with force feedback** in three **oncologic procedures**: biopsies, brachytherapy and radiofrequency ablation.



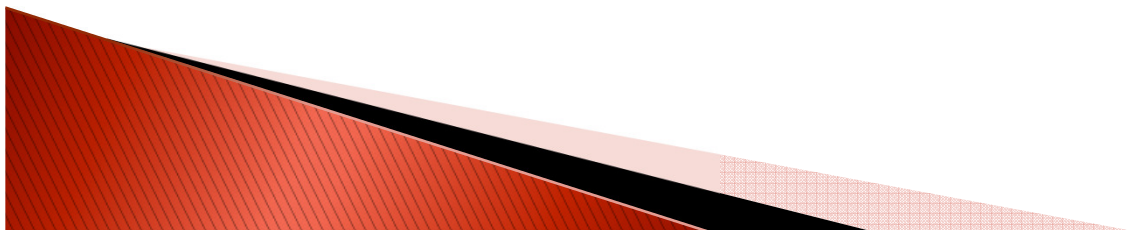
Core needle biopsy



Brachytherapy



Radiofrequency ablation

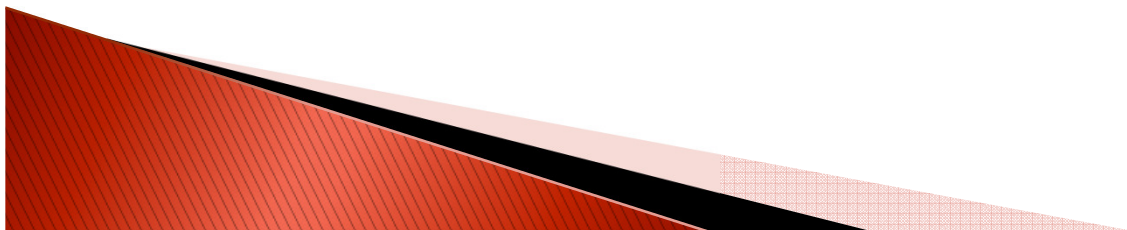


# Objectives



## Specific Objectives

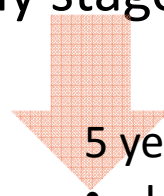
- (O1) Modular development of a **family of innovative needle placement devices** electrically actuated able to perform highly accurate needle guidance.
- (O2) Development of a **control system, actuation solution and user interface** for the family of needle guiding modules including the particular requirements for each procedure and continuous force feedback.
- (O3) Design, simulation and development of the ACCURATE **experimental model**.
- (O4) **Validation** of the functional experimental model in a testing stage.
- (O5) Research team visibility increase on national and European level and its integration in **international research programs and scientific collaborations**.



# Case study: Prostate Biopsy and its role in Prostate Cancer



- ▶ Most widely spread type of cancer
- ▶ 2<sup>nd</sup> deadliest type of cancer
- ▶ WHY?
  - Inaccurate diagnosis with high percentages of false negative results in early stages



5 years survival rates by stage of diagnosis:

- Local – nearly 100%
- Regional – nearly 100%
- Distant – 28%

- ▶ HOW TO INCREASE SURVIVAL RATE?

**New approach, targeted biopsies,  
with near 1 mm accuracy**

# Techniques in Transperineal Prostate Biopsies

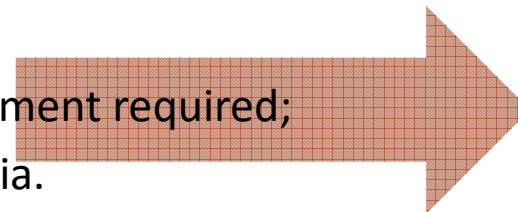


A review article "*Transperineal biopsy of the prostate – is this the future?*<sup>1</sup>" published in Nature, points out the advantages of a currently underused technique:

- ▶ improves the cancer detection rate;
- ▶ reduces the false negative results;
- ▶ improves the sampling of the anteroapical (the apex of the prostate) region
- ▶ eliminates the sepsis risk (which appears due to the perforation of the intestine) especially for the high risk patients with diabetes.

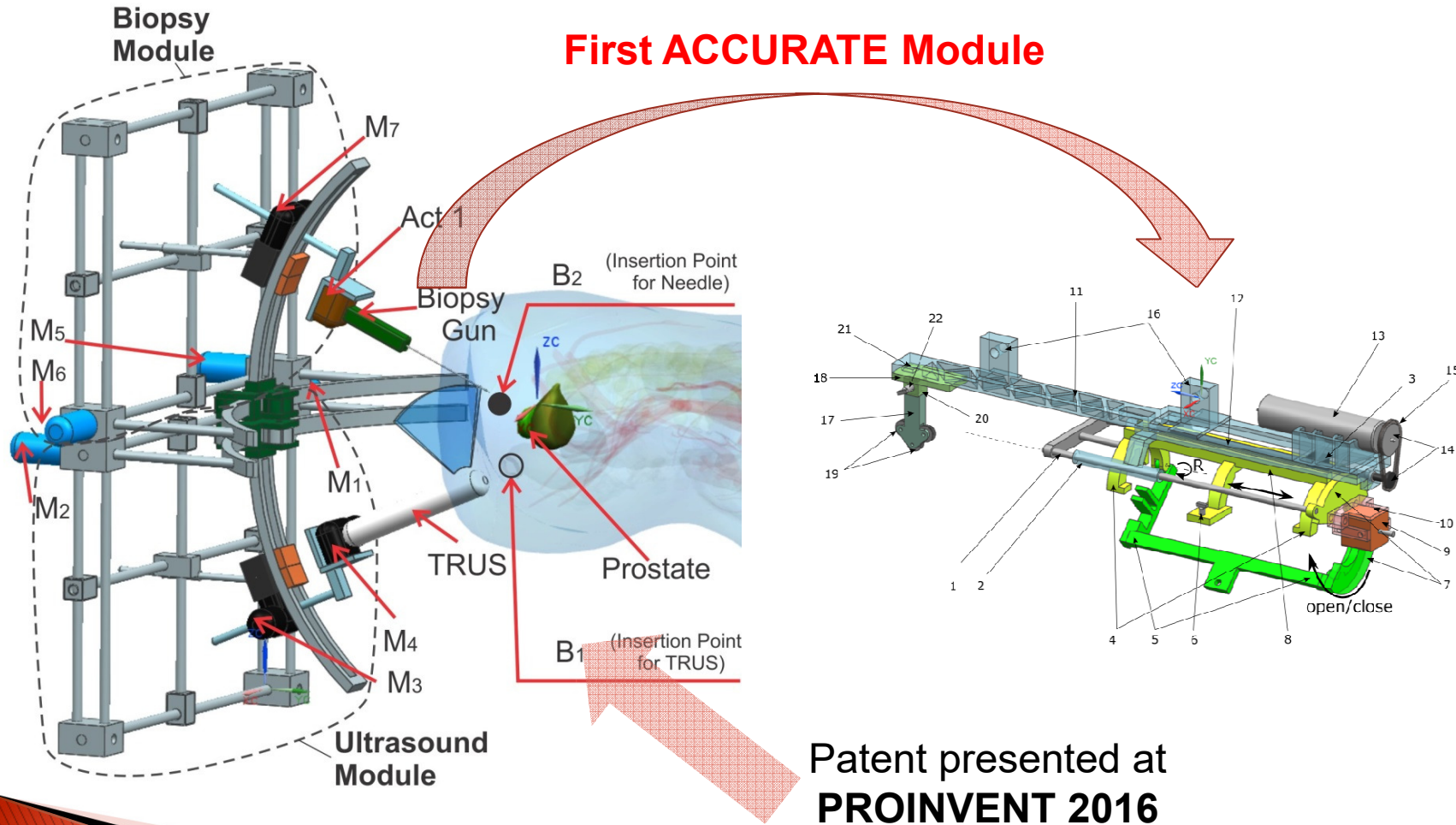
WHY its UNDERUSAGE?

- ▶ longer procedural times;
- ▶ the slightly more expensive equipment required;
- ▶ the need of high-grade anaesthesia.



Higher costs!!!

# PBS-BOT – A new patented robotic system for single port transperineal prostate biopsy

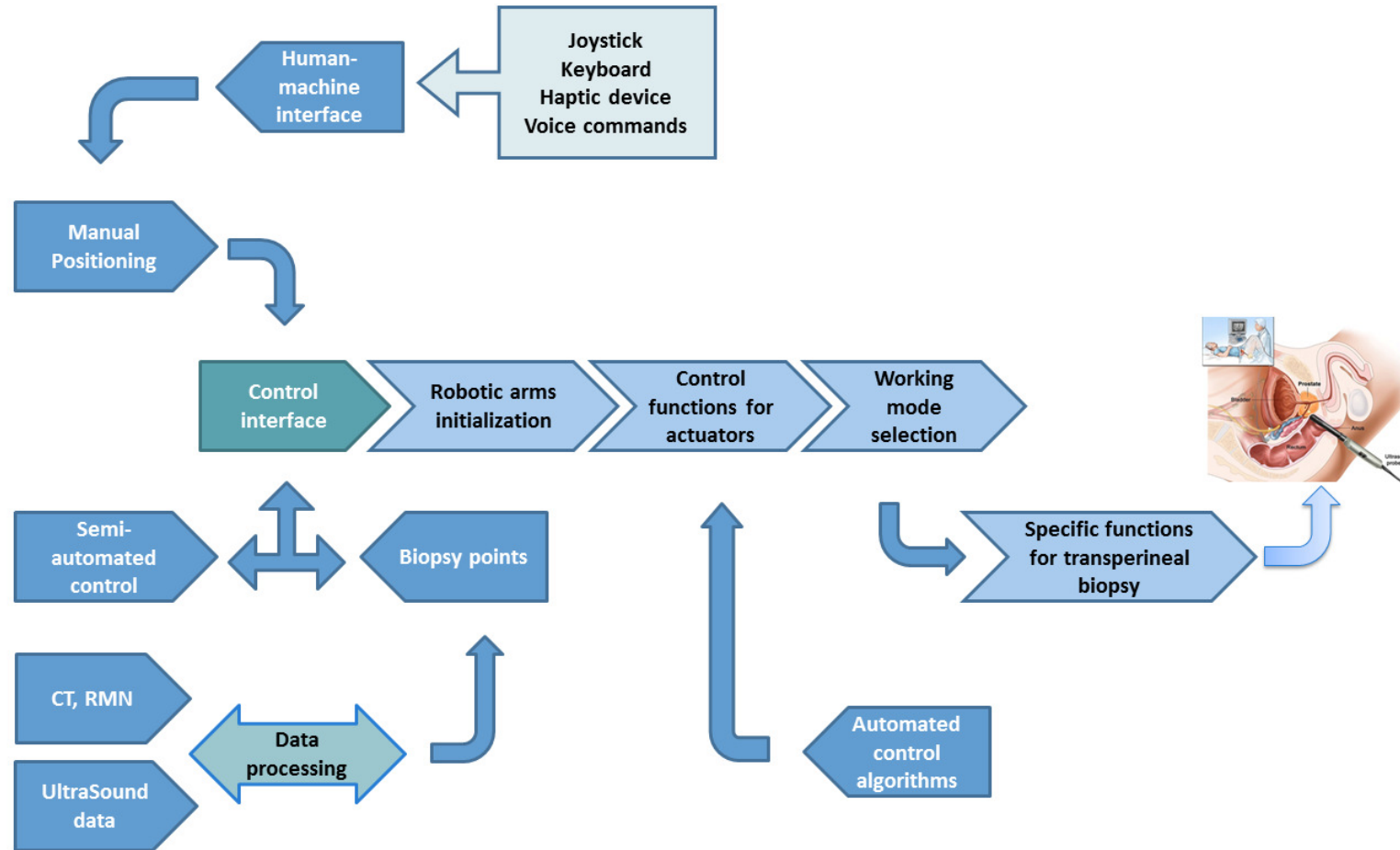


Patent presented at  
**PROINVENT 2016**

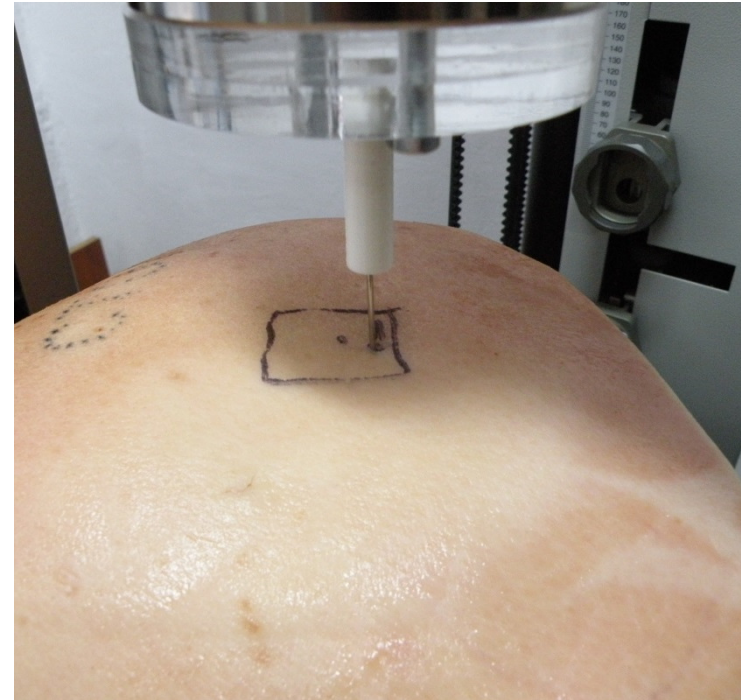
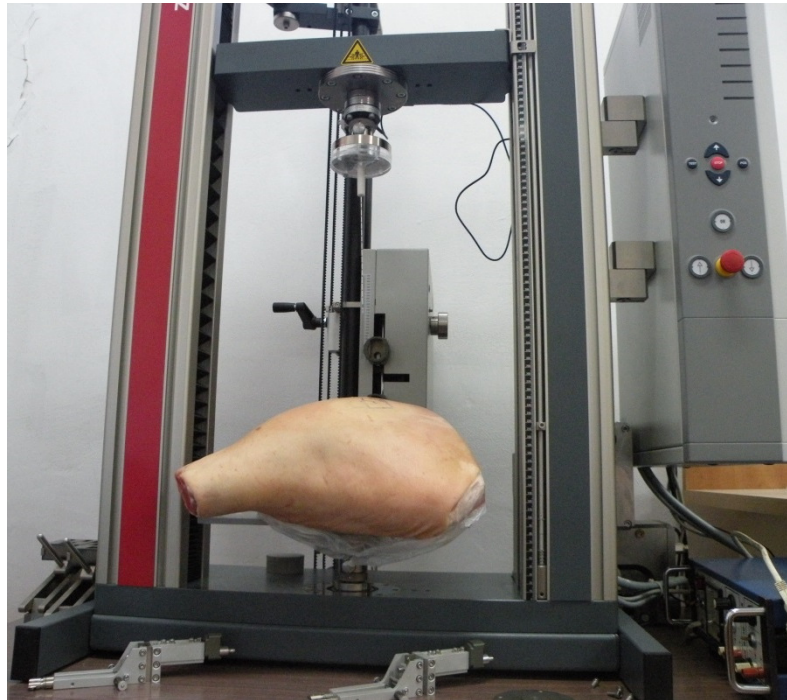
C. Vaida, D. Pislă, P. Tucan, N. Plitea, B. Gherman: Parallel robot for transperineal prostate biopsy. Patent pending: 00761/26.10.2015



# Conceptual control scheme



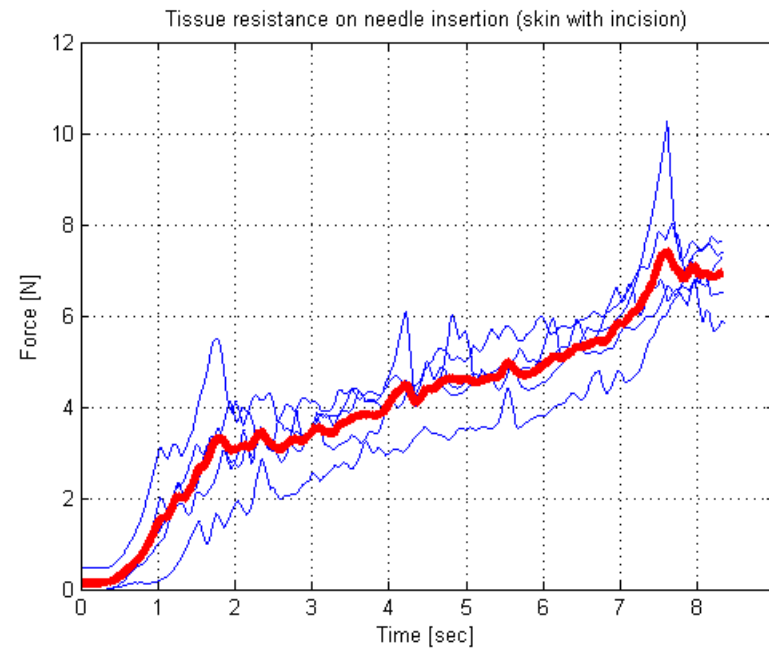
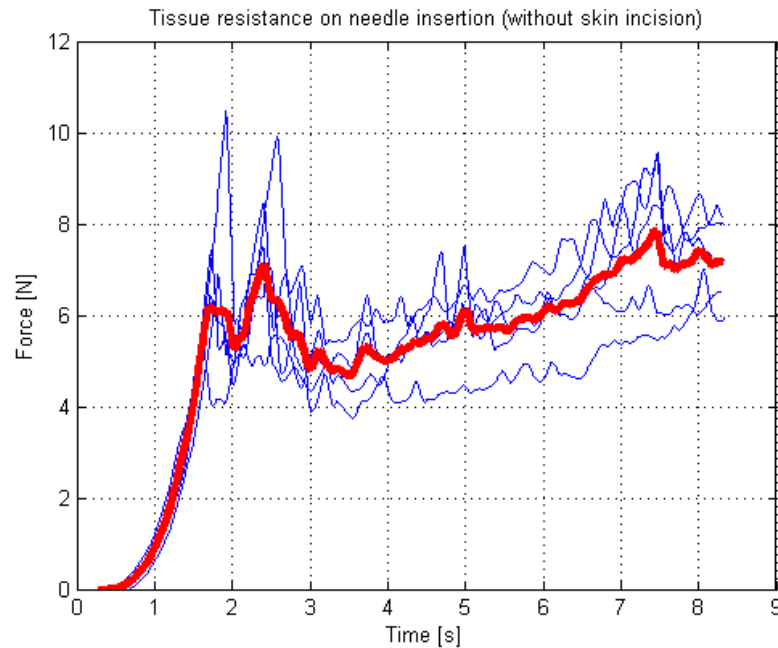
# Experimental needle force determination - Setup



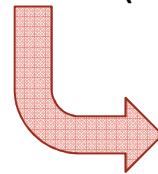
**Tissue resistance on needle insertion experimental setup.  
Overview on the left; close view on right.**



# Experimental needle force determination - Results



Reported tissue resistance for needle insertion using ex vivo animal tissue without skin incision (on the left) and **with skin incision** (on the right).



**Validation** of the medical variation of the transperineal procedure the **European Institute of Oncology**, Italy

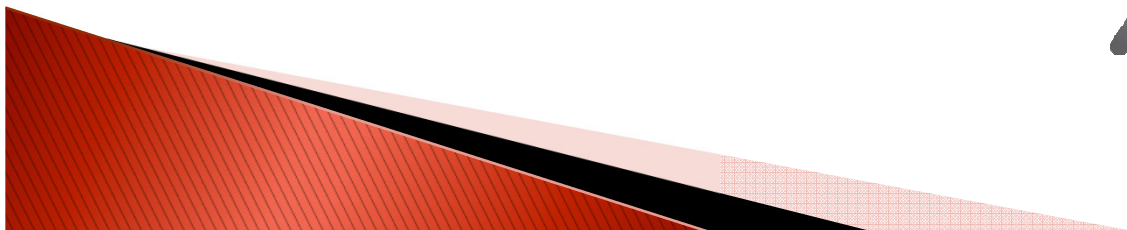
# Publications



**4 research papers** under review

**1 review chapter** on Cancer therapy submitted for publication

**1 research paper** accepted for publication in the International Journal of Production Research



# *Questions*



**Thank you for your attention!!!**

