



Tecnologie medicali

Ricerca ed innovazione a Genova

[My personal view on Genova's climate for medical technology research and innovation]

Leonardo De Mattos

Head of Biomedical Robotics Lab
Department of Advanced Robotics

Biomedical Robotics Laboratory

World-class R&D in robotic systems for precision medicine

- Human-centered robotic technologies
- Direct impact on health and well-being of people
- Intelligent interfaces & mechanisms
 - Diagnosis & Surgery
 - Assistive communications
 - General healthcare
 - Biomanipulations

ASSISTIVE SYSTEMS FOR AUGMENTED CONTROL

novel technologies to augment **capabilities**
and **performance** beyond humanly possible



BRL team



Clinical Partners

- Ospedale San Martino, Genova
- Istituto Gianna Gaslini, Genova
- Ospedale Niguarda, Milano
- Fondazione Sanità e Ricerca, Roma



**OSPEDALE POLICLINICO
SAN MARTINO**



Genova

A great place for medical technology research and development

ENT microsurgery



ISTITUTO ITALIANO
DI TECNOLOGIA

Fetal surgery

Tumor detection

Pediatric neurosurgery

Pediatric catheterization



Prof. Giorgio Peretti, Prof. Francesco Mora,
Prof. Luca Guastini

Prof. Armando Cama, Prof. Dario Paladini
Dr. M. Ravegnani

The best part of my work...



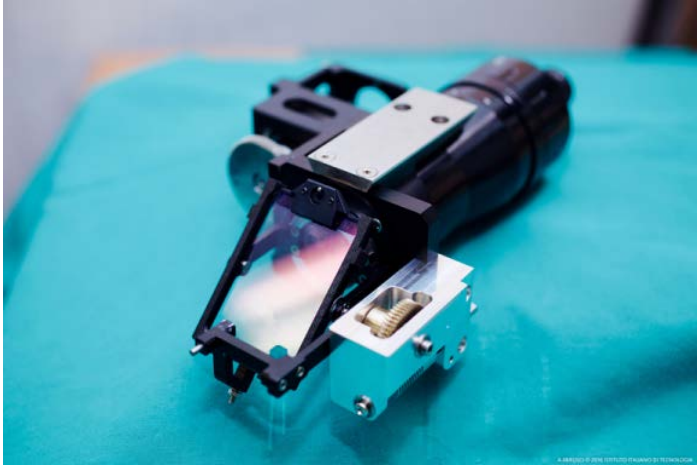
Transoral Laser Microsurgery (today)



- Micrometric precision
- Long operating distance

CALM Surgical System

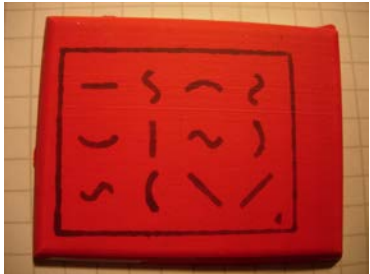
Computer-Assisted Laser Microsurgery



- ✓ Robotic Laser Micromanipulator
- ✓ Negligible impact on surgical workflow
- ✓ Tablet-based laser control
- ✓ Add-on system for available lasers & microscopes

Comparative Trials – Sample Results

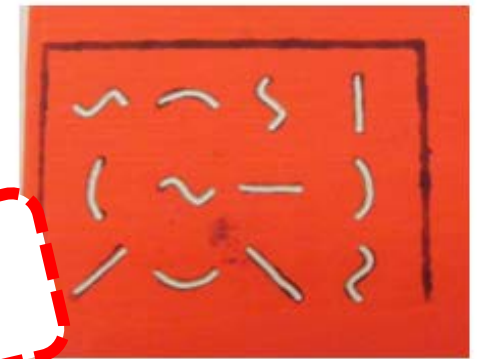
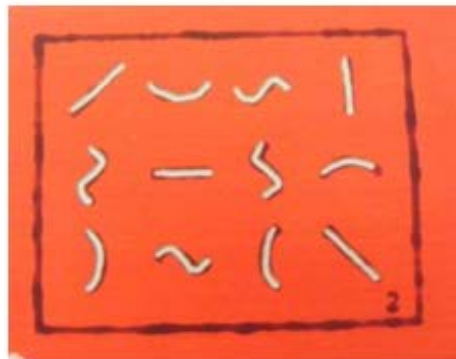
Precision Targets



Traditional Laser Micromanipulator



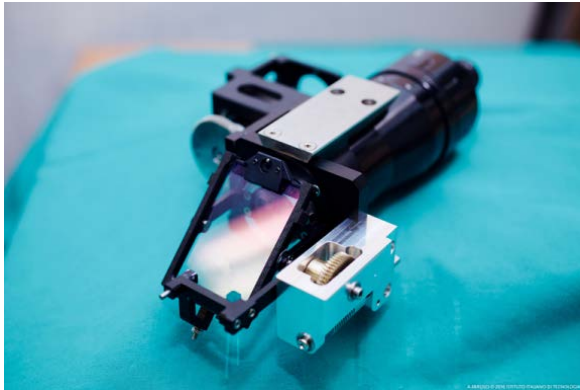
Computer-Assisted Laser Micromanipulator



**CLEARLY
SUPERIOR**

CALM user trials

- 57 international expert surgeons
- Realistic Transoral Laser Microsurgery (TLM) setup
- Currently under certifications for clinical trials



Deshpande et al., "Design and Usability Study of a Next Generation Computer-Assisted System for Transoral Laser Microsurgery," OTO-Open, Feb 2018

Endoscopic Robot-Assisted Laser Microsurgery



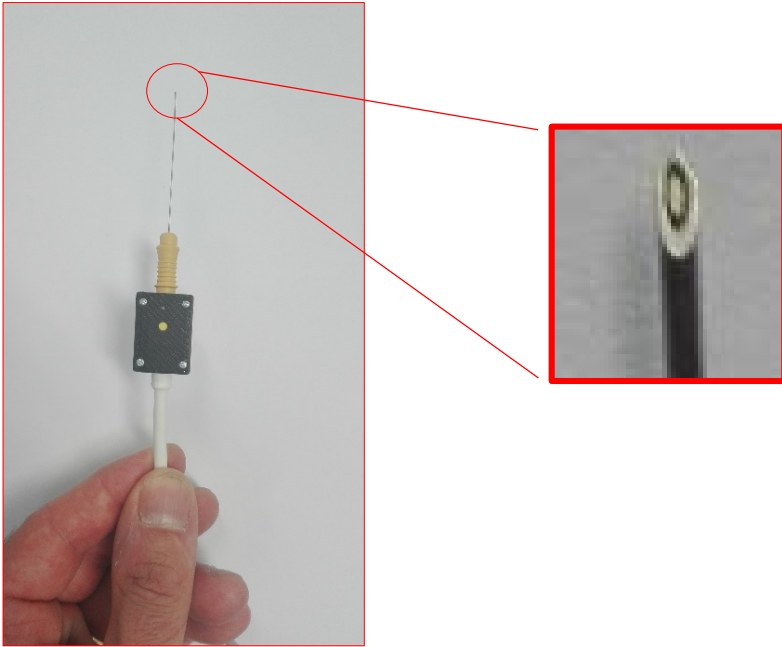


μRALP surgical system

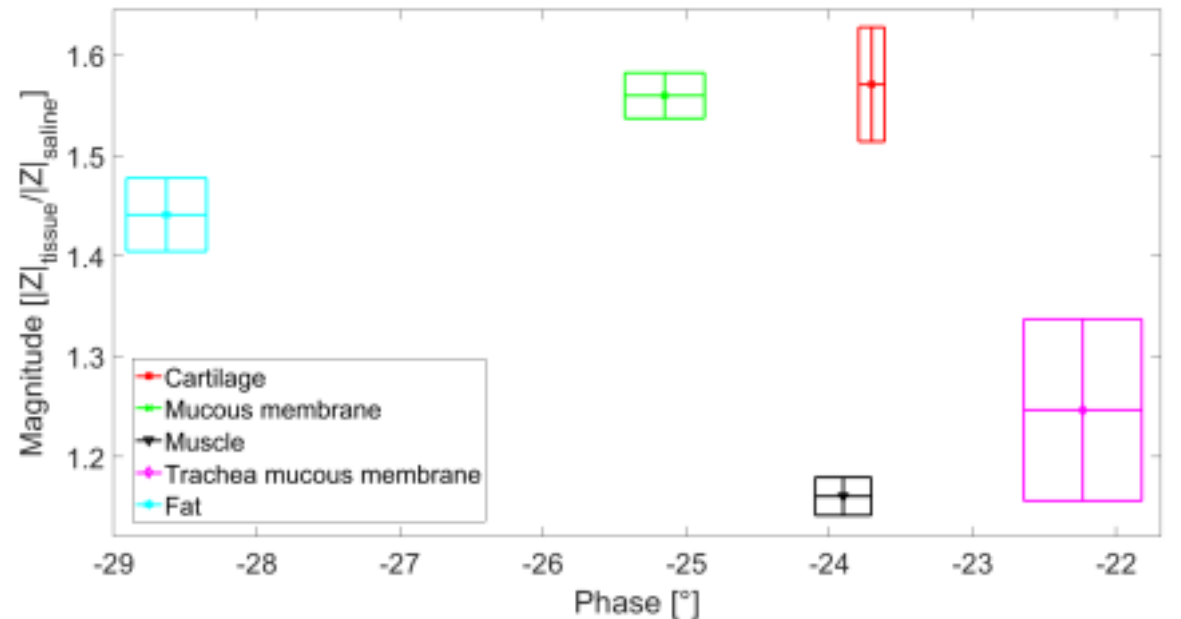
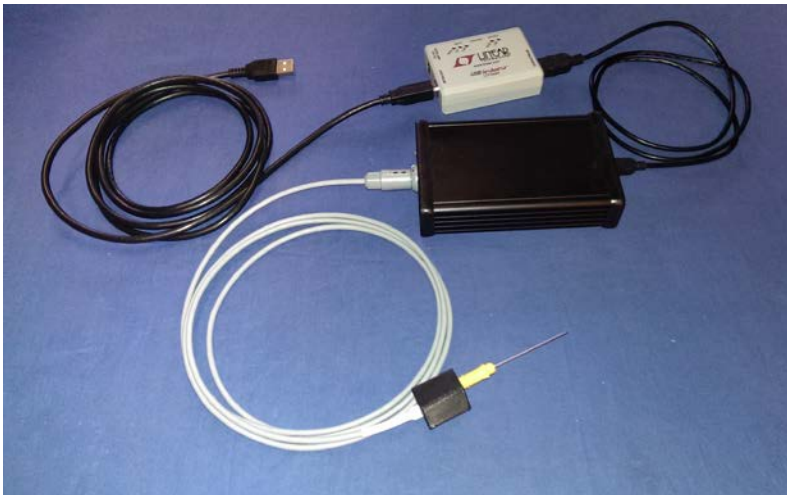
**Micro-Technologies and Systems for
Robot-Assisted Laser Phonomicrosurgery**



Smart Probe



- Needle-based bioimpedance sensor
 - Tissue classification
 - Cancer detection
- Certified for clinical trials
- Waiting ethical committee approval



Smart systems for PIVC

Peripheral Intravenous Catheterization



- Often more than 3 attempts in pediatric patients
- Can lead to serious issues (e.g. extravasation injuries)

5 billion
catheterizations per year worldwide

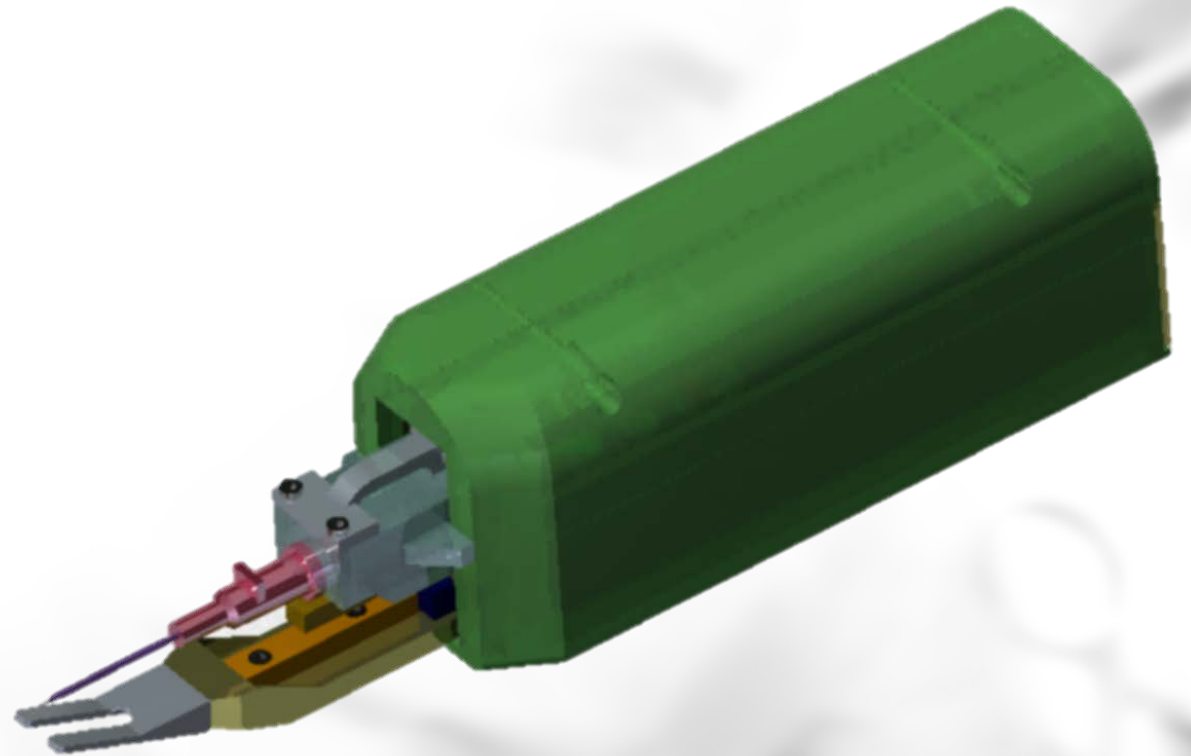


CathBot

A hand-held robotic device for PIVC

1. Automatically stops the needle insertion
 2. Inserts the catheter
 3. Retracts the needle
- all with a simple push forward

“A perfect catheterization each time, every time”



CathBot

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 2. Inserts the catheter
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- all with a simple push forward

“A perfect catheterization each time, every time”

Phantom vein diameter: 2 mm



Cheng et al., “A new venous entry detection method based on electrical bio-impedance sensing,” Annals of Biomedical Engineering, April 2018

Cheng, Z., Davies, B., Caldwell, D., Mattos, L., “A hand-held robot for precise and safe PIVC,” (under review) IEEE Robotics and Automation Letters (RA-L)

Results

- Baby arm trainer
- Naïve subjects

Conventional
12%

zero first stick accuracy



CathBot

86%

success rate

100% first stick accuracy

ENCOURAGING YOUNG SURGEONS AND ENGINEERS



21-22 March 2019

Genoa, Italy



9th CRAS

Joint Workshop on Computer/Robot Assisted Surgery

www.cras-eu.org



ISTITUTO ITALIANO
DI TECNOLOGIA

Thank you!

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