



# Opportunity Thailand

Medical Devices-Driving Growth through innovation



## Key Research Projects

### Faculty of Engineering Chulalongkorn University

3.30-5.00 P.M. 15 February 2017

Jupiter 8-10 Challenger hall IMPACT Muang Thong Thani

**CHULA ENGINEERING**  
Foundation toward Innovation

Dr. Supot Tiarawut  
Director of Industrial Liaison Program



# R&D Medical Technology

- ❖ Medical Material Design & Fabrication Process
  - ✓ Metals (non-degradable)
  - ✓ Biopolymer (degradable & non-degradable)
- ❖ Medical Electronic & Sensor
- ❖ Medical Robotics
- ❖ Medical Software & Management system
- ❖ Medical Instrumentation & Rehabilitation devices



# Aging Society, Health and Well being Team

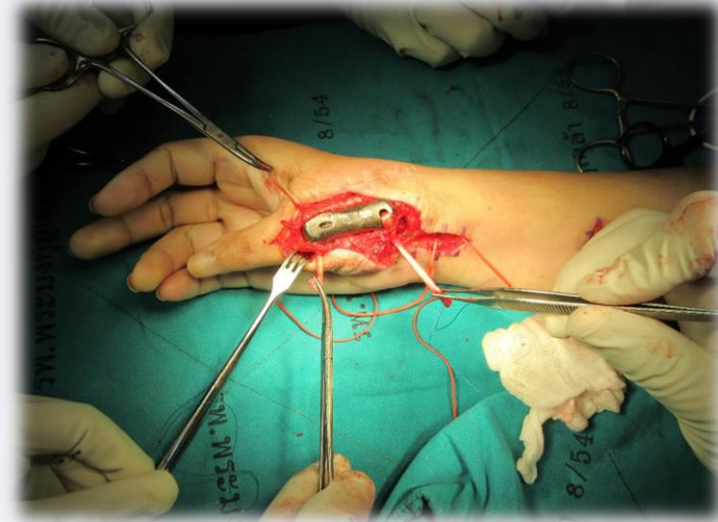




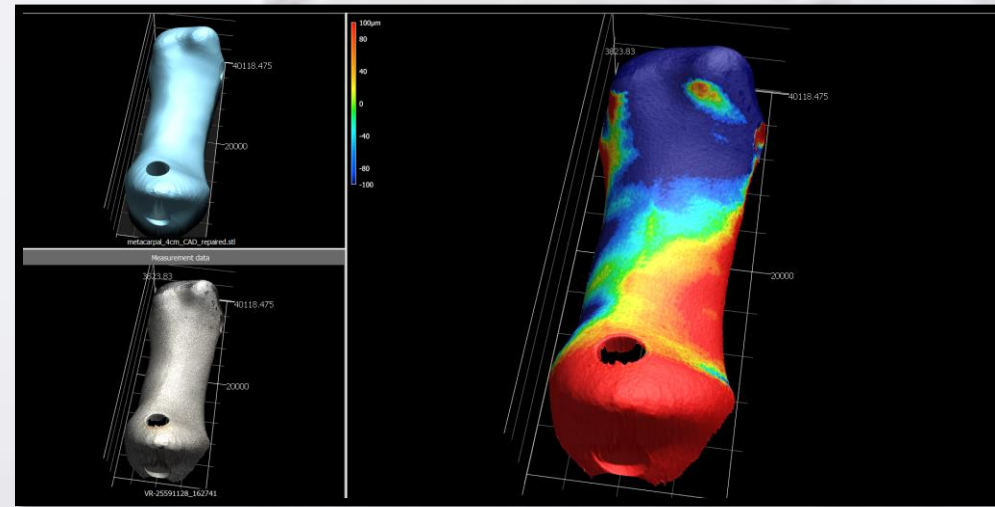


# Custom-made Titanium Bone Replacement

## Case: metacarpal bone

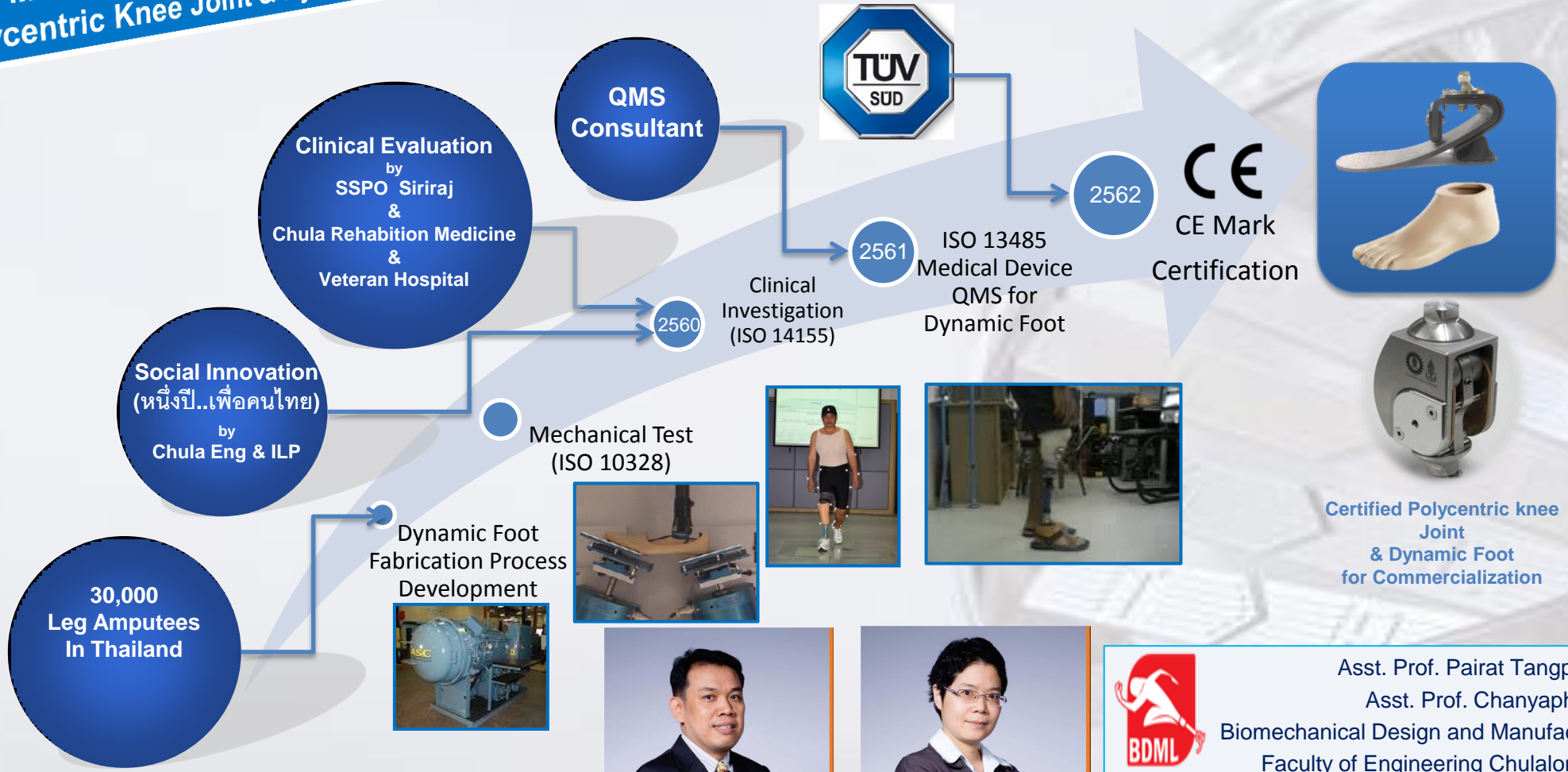



Using 3D printing technology, titanium bone replacement is created from CT Scan of a patient. The titanium bone is a direct drop in with great accuracy which allows the organ and biomechanic to be 100% functional again.





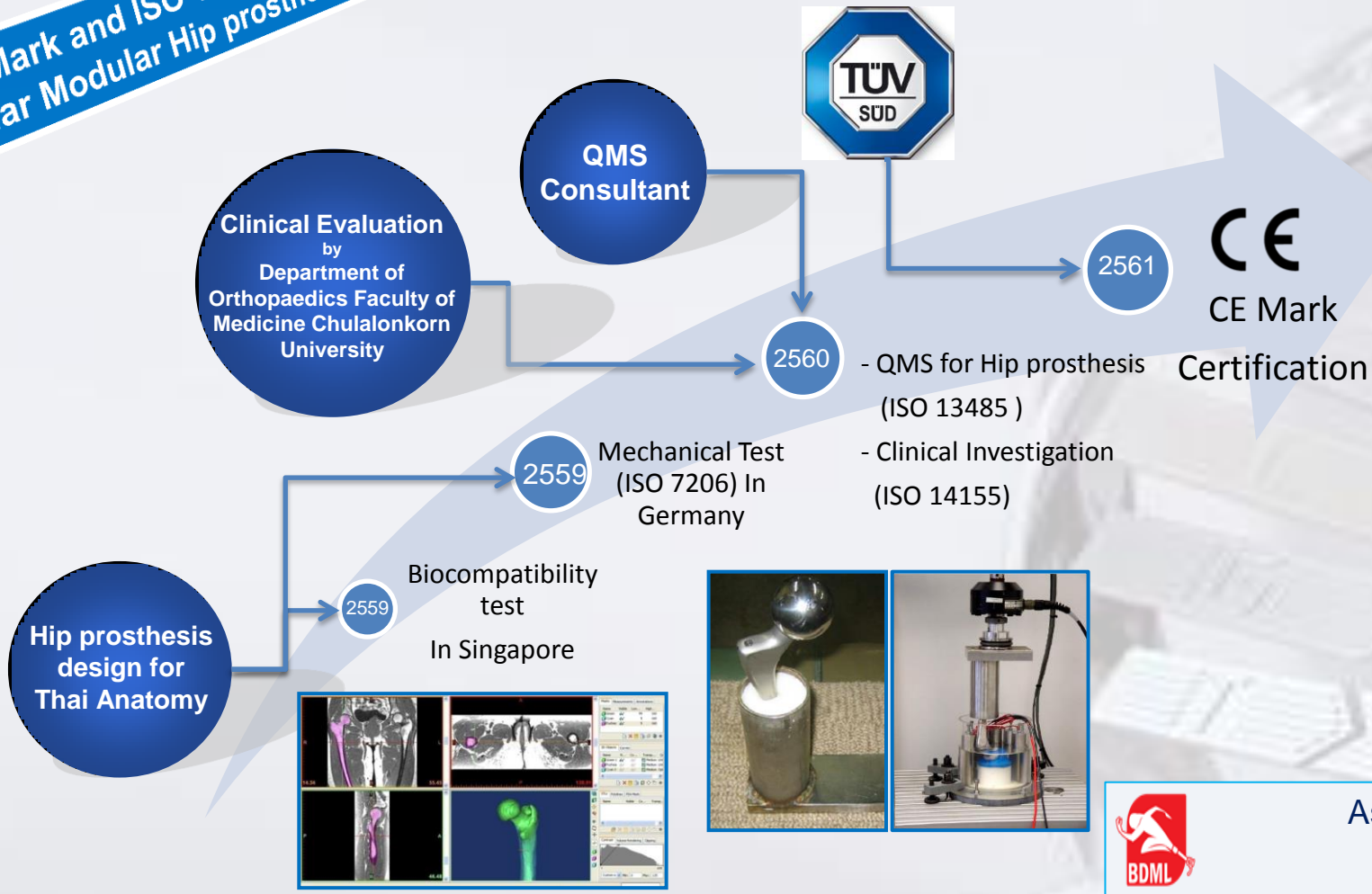
# CE Mark and ISO 13485 Approval for Polycentric Knee Joint & Dynamic Foot



 Asst. Prof. Pairat Tangpornprasert, Ph.D.  
Asst. Prof. Chanyaphan Virulsri, Ph.D.  
Biomechanical Design and Manufacturing Laboratory  
Faculty of Engineering Chulalongkorn University



**CE Mark and ISO 13485 Approval for  
Unipolar Modular Hip prosthesis for Thais**



**Certified Hip Prosthesis for Commercialization**



Assistant Professor  
**Pairat Tangpornprasert**



Assistant Professor  
**Chanyaphan Virulsri**



**Asst. Prof. Pairat Tangpornprasert, Ph.D.**  
**Asst. Prof. Chanyaphan Virulsri, Ph.D.**  
**Biomechanical Design and Manufacturing laboratory**  
**Faculty of Engineering Chulalongkorn University**



# Microneedles and Microtubes

**Assistant professor Werayut Srituravanich, PhD,  
Electro mechanic and nano technology laboratory  
Mechanical Engineering Chulalongkorn University**







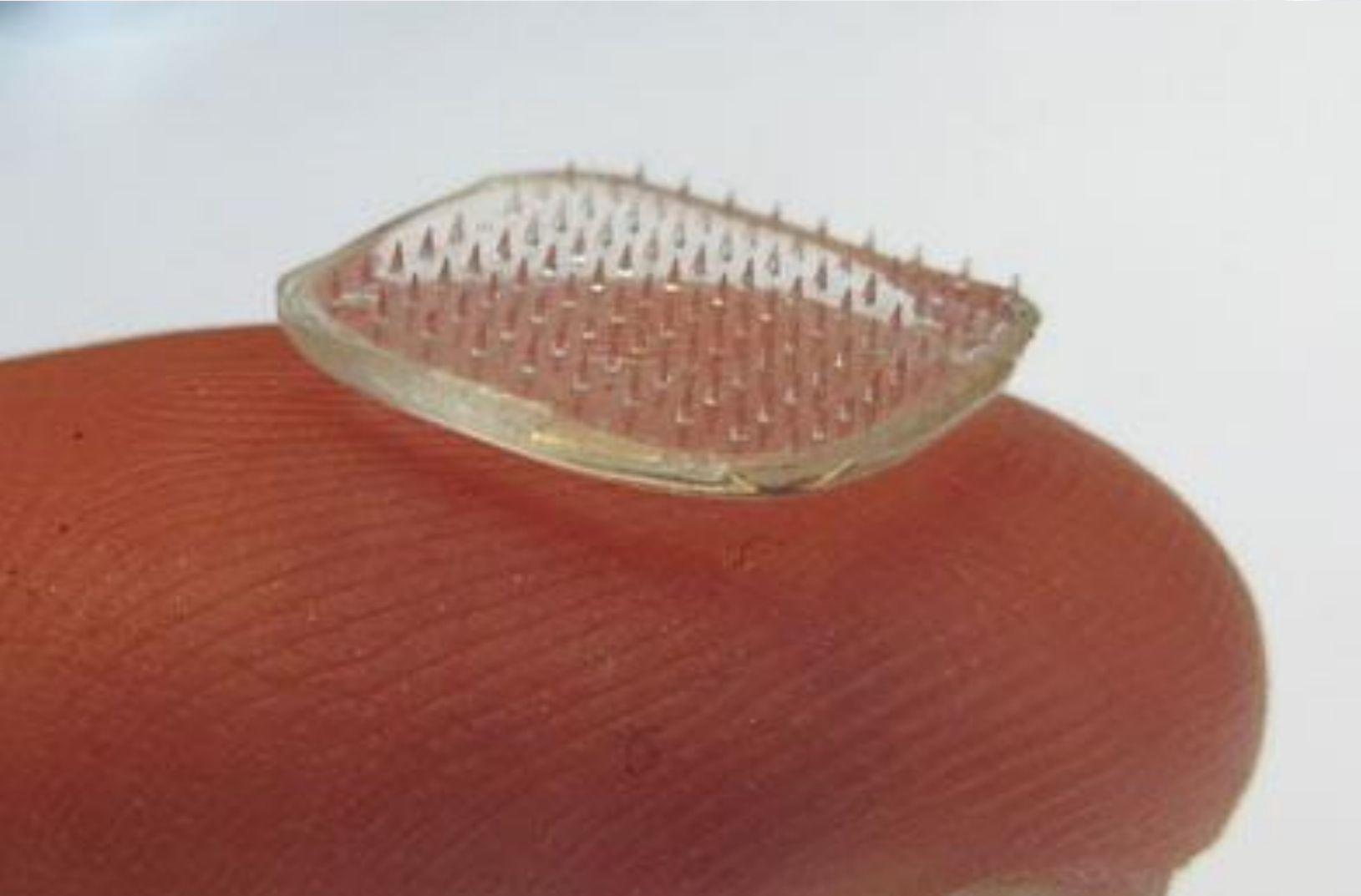
# Microneedles



Current hypodermic needles

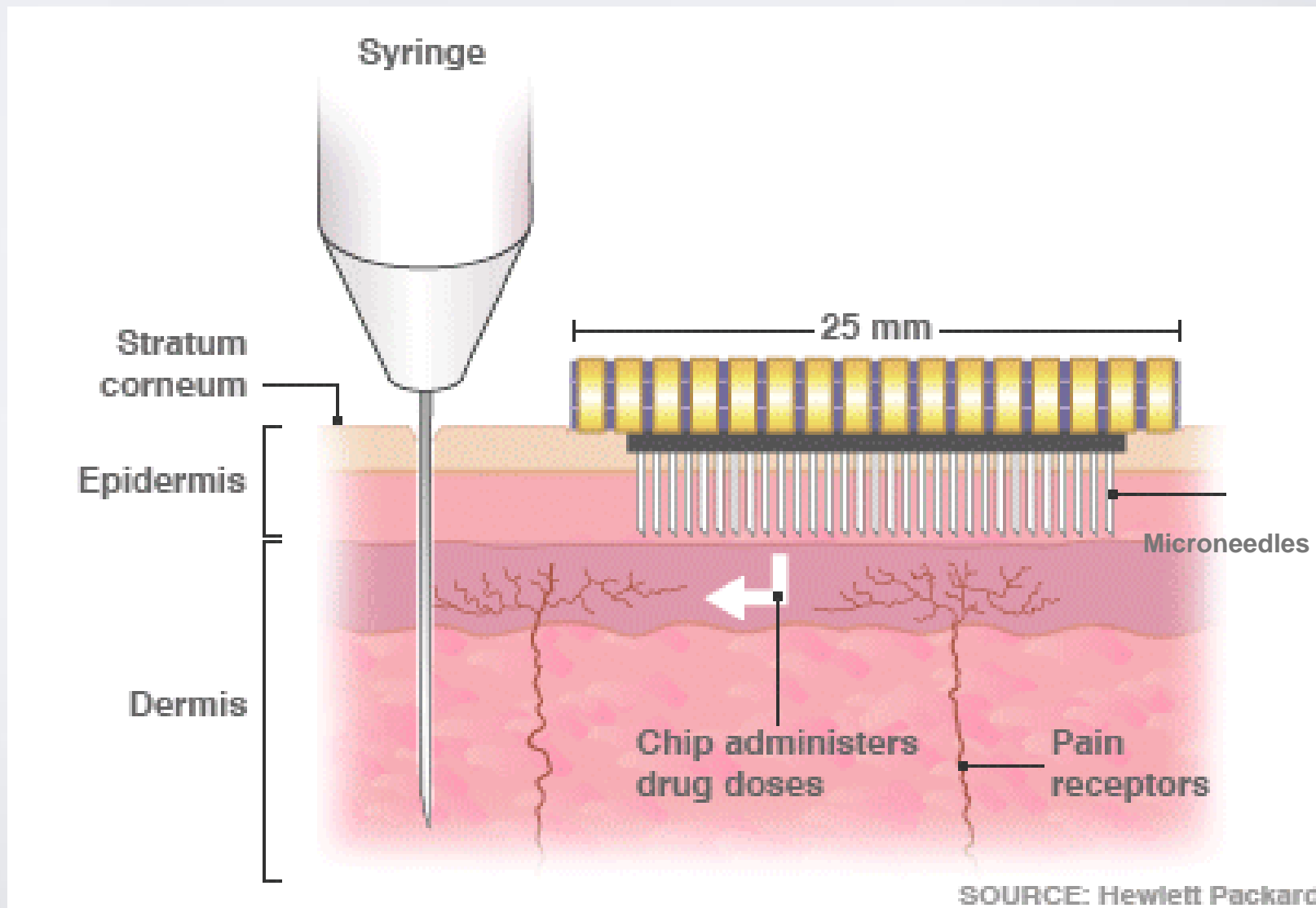


# Microneedles



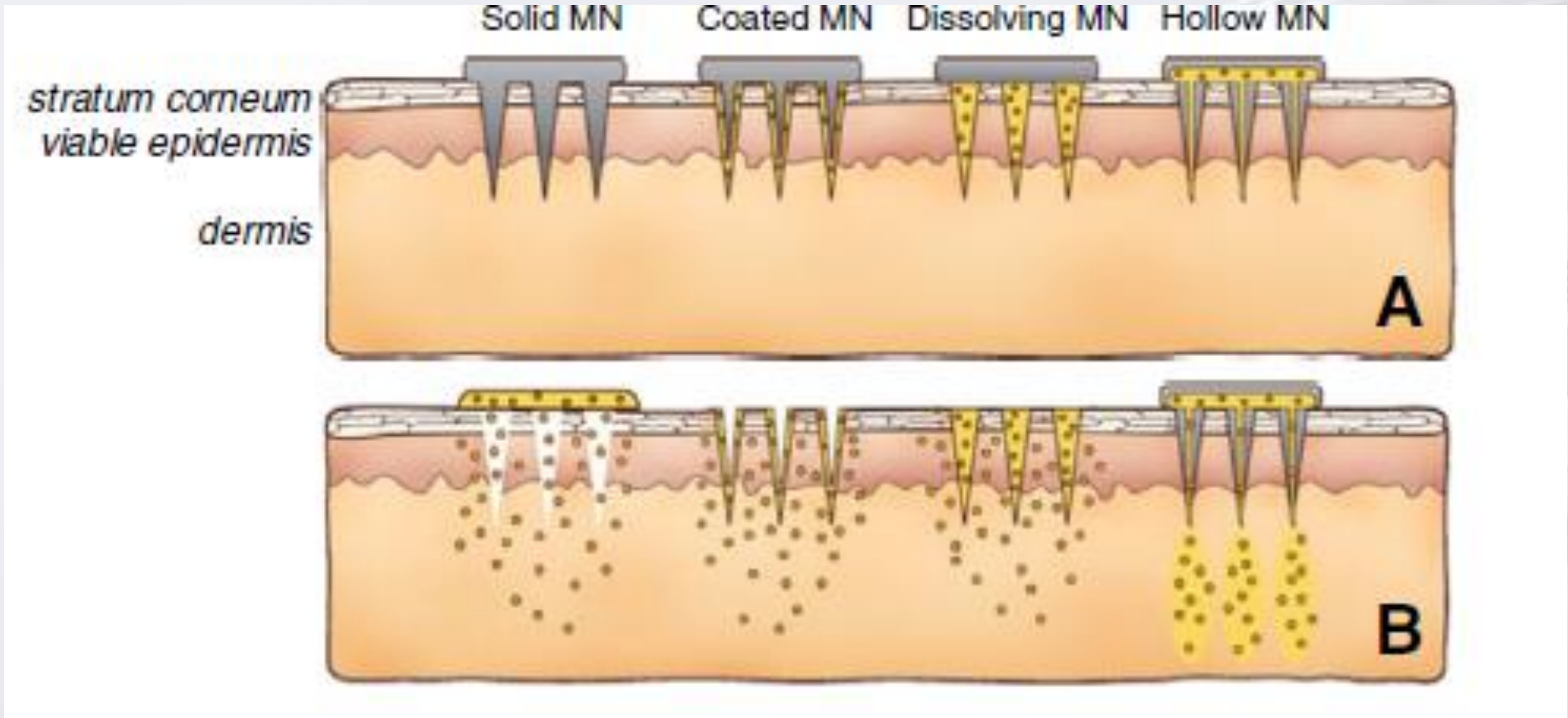


# Microneedles



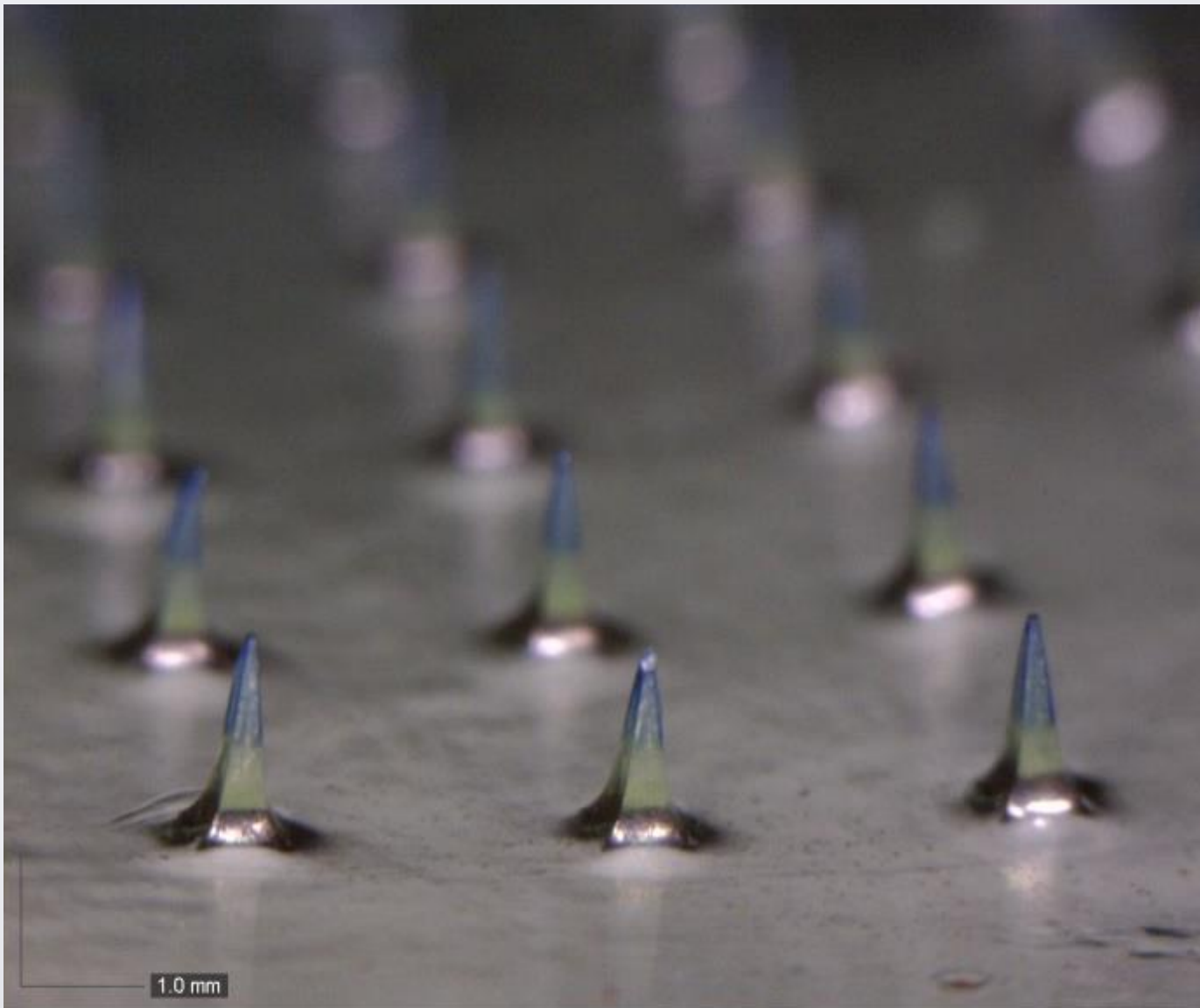


# Types of Microneedles

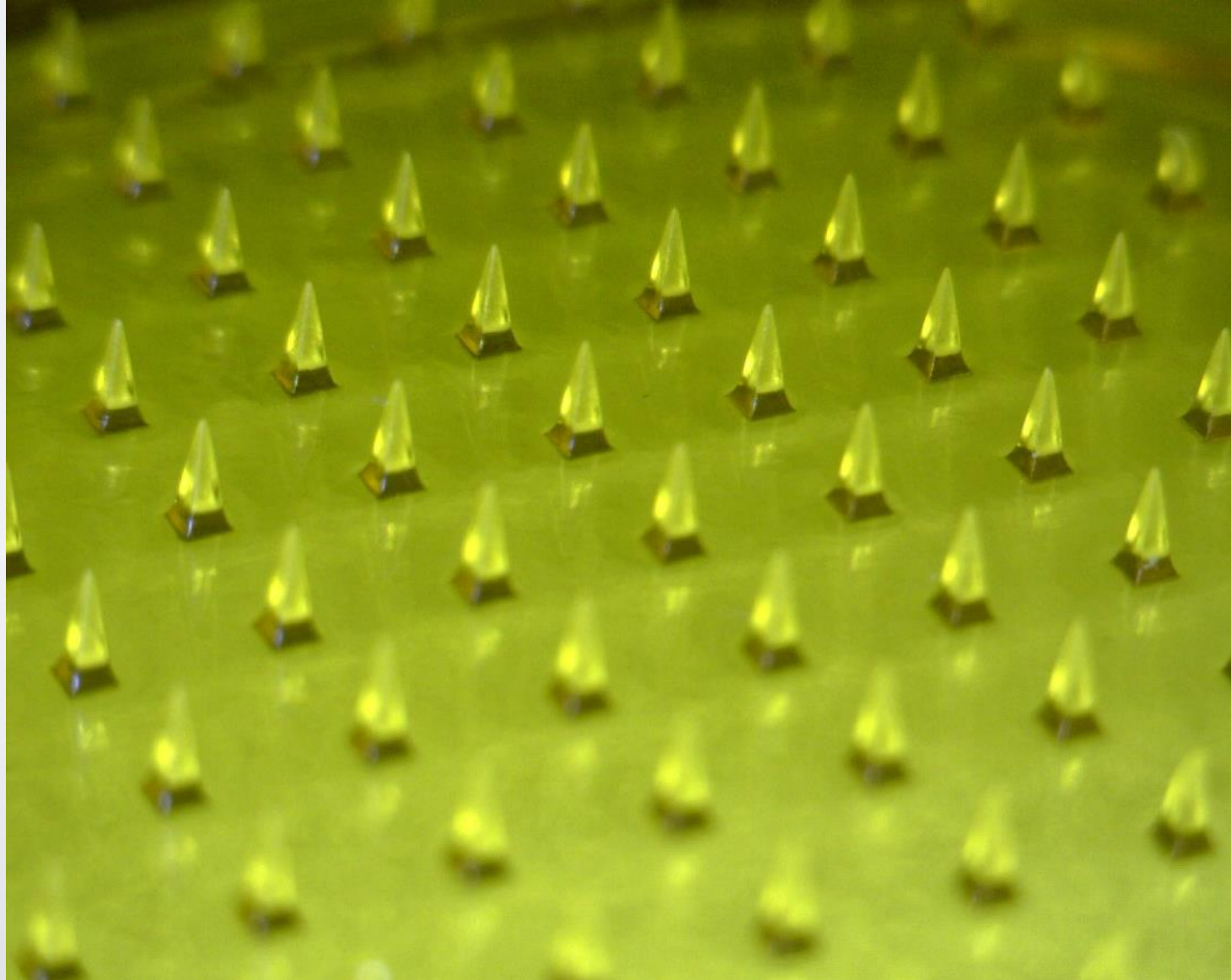




# Silk Microneedles

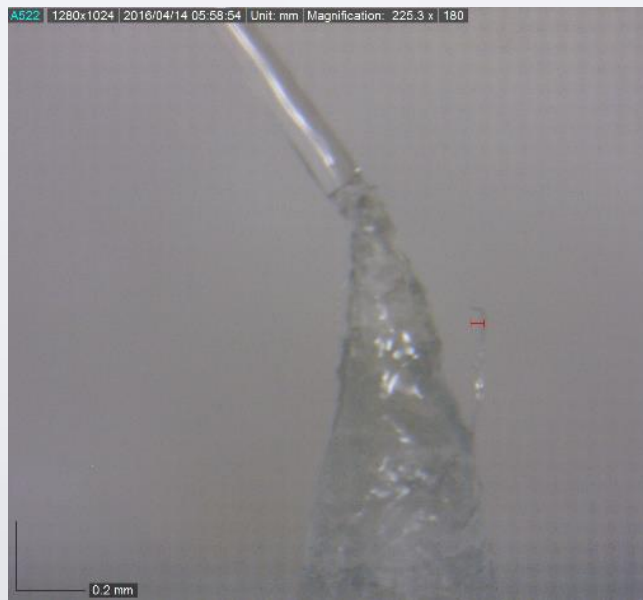


# Sugar Microneedles



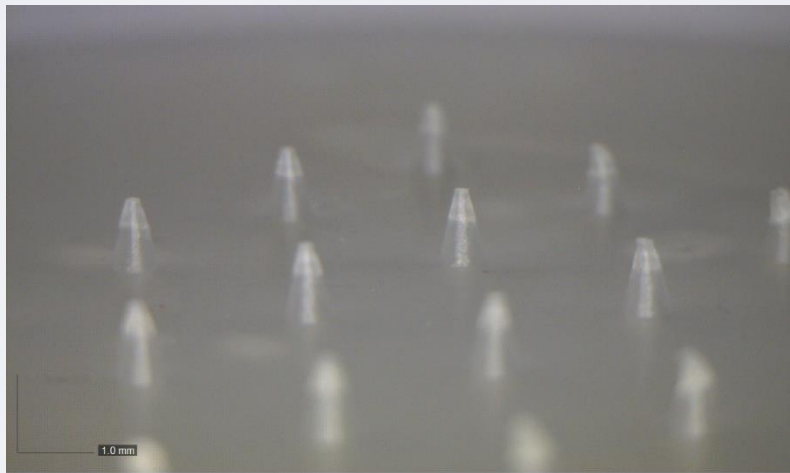


# Hollow Microneedles

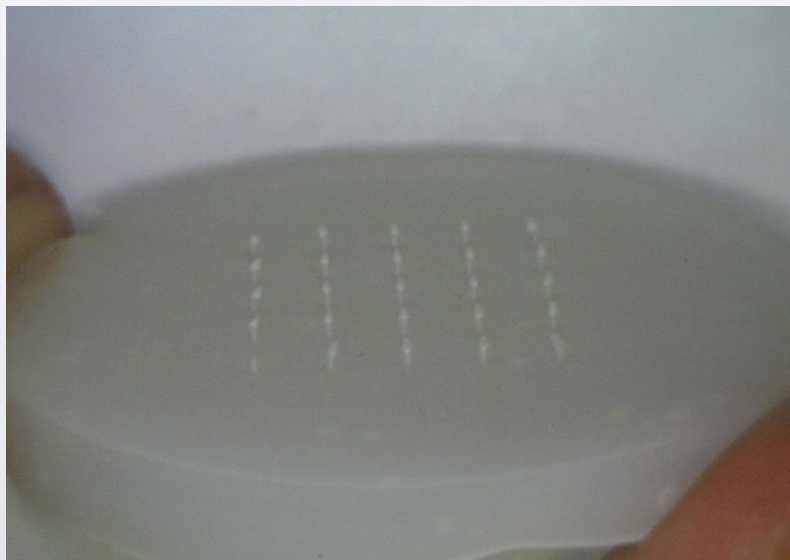




# Microneedle Patch



Nara Factory Ltd.



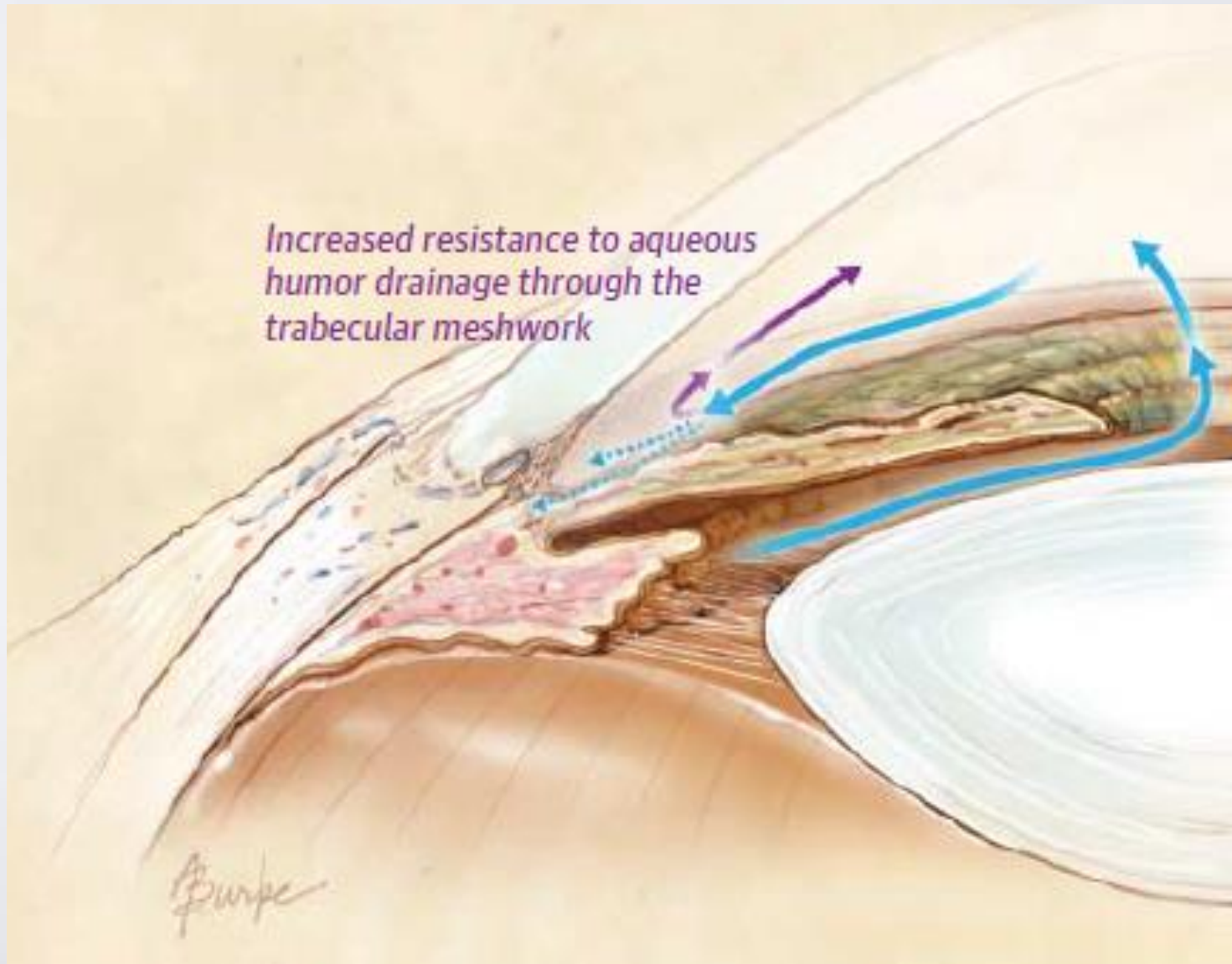




# Microtubes for glaucoma



# Introduction





# Introduction

## Glaucoma Symptom

**NORMAL VISION**



**ADVANCED GLAUCOMA**



**EARLY GLAUCOMA**



**EXTREME GLAUCOMA**



© Sea View Optometric, Long Beach, CA

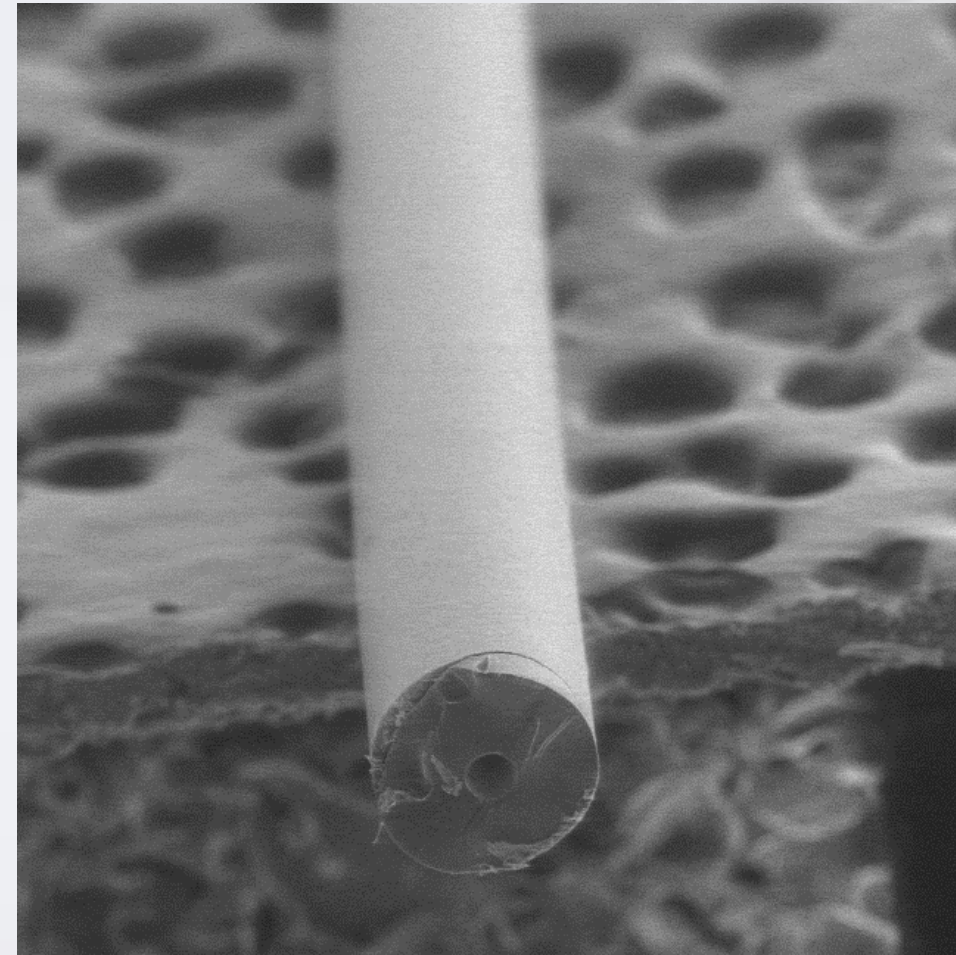
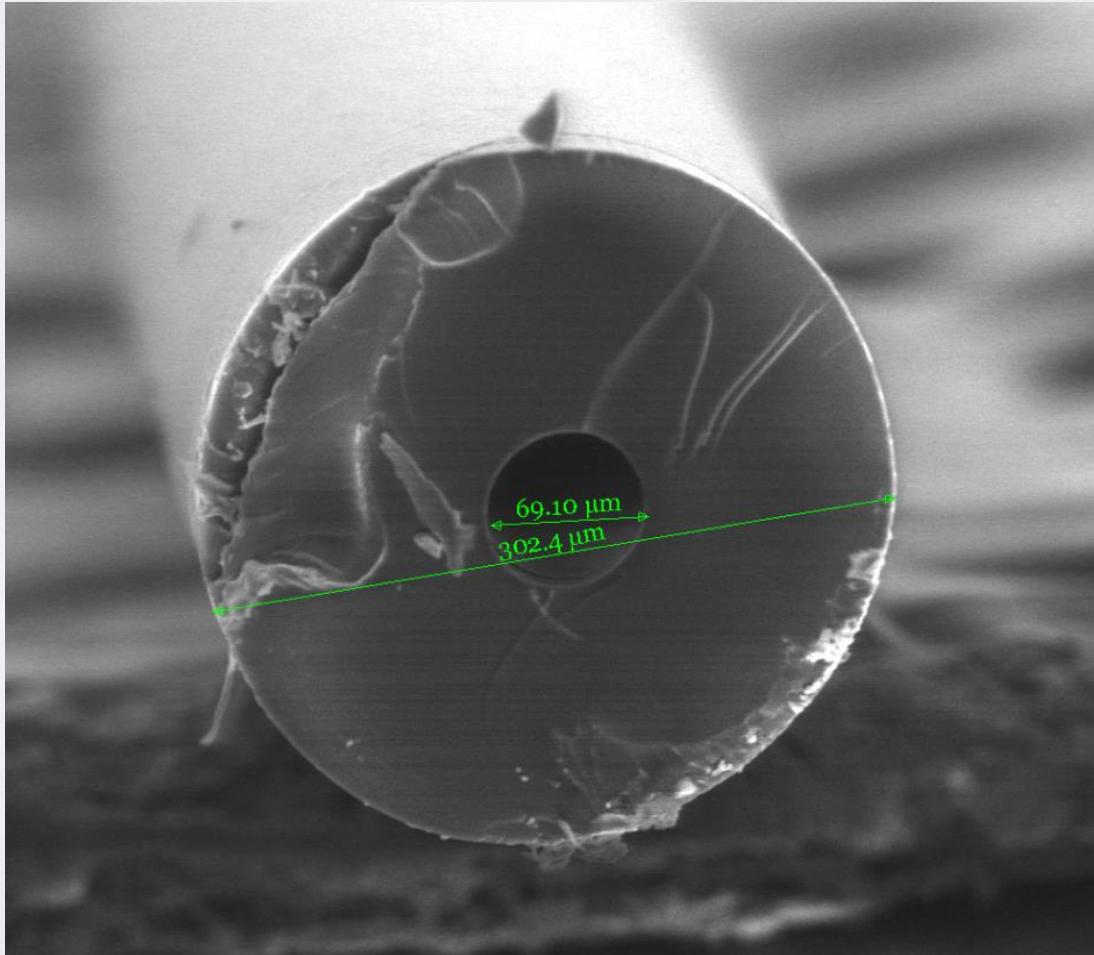


# Fabrication of Microtube





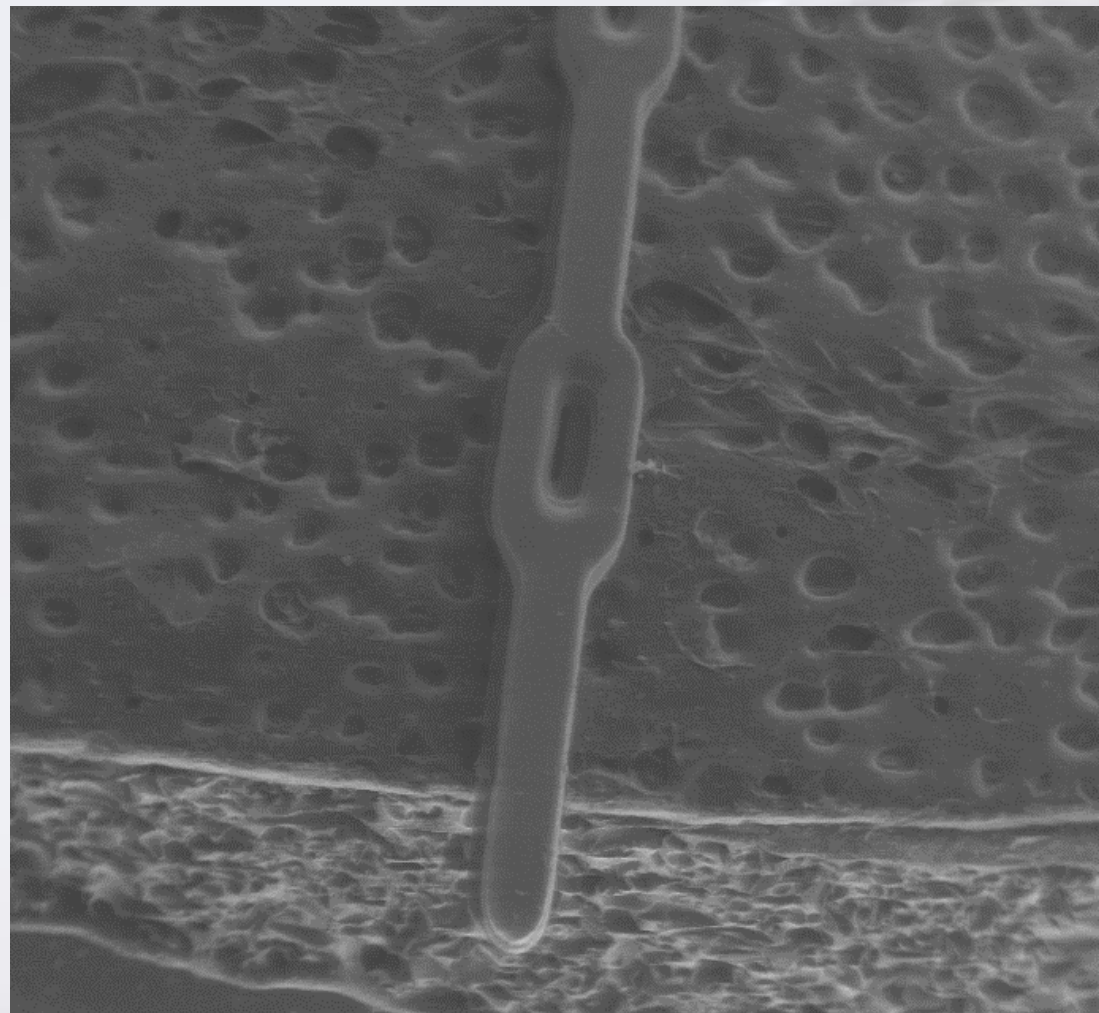
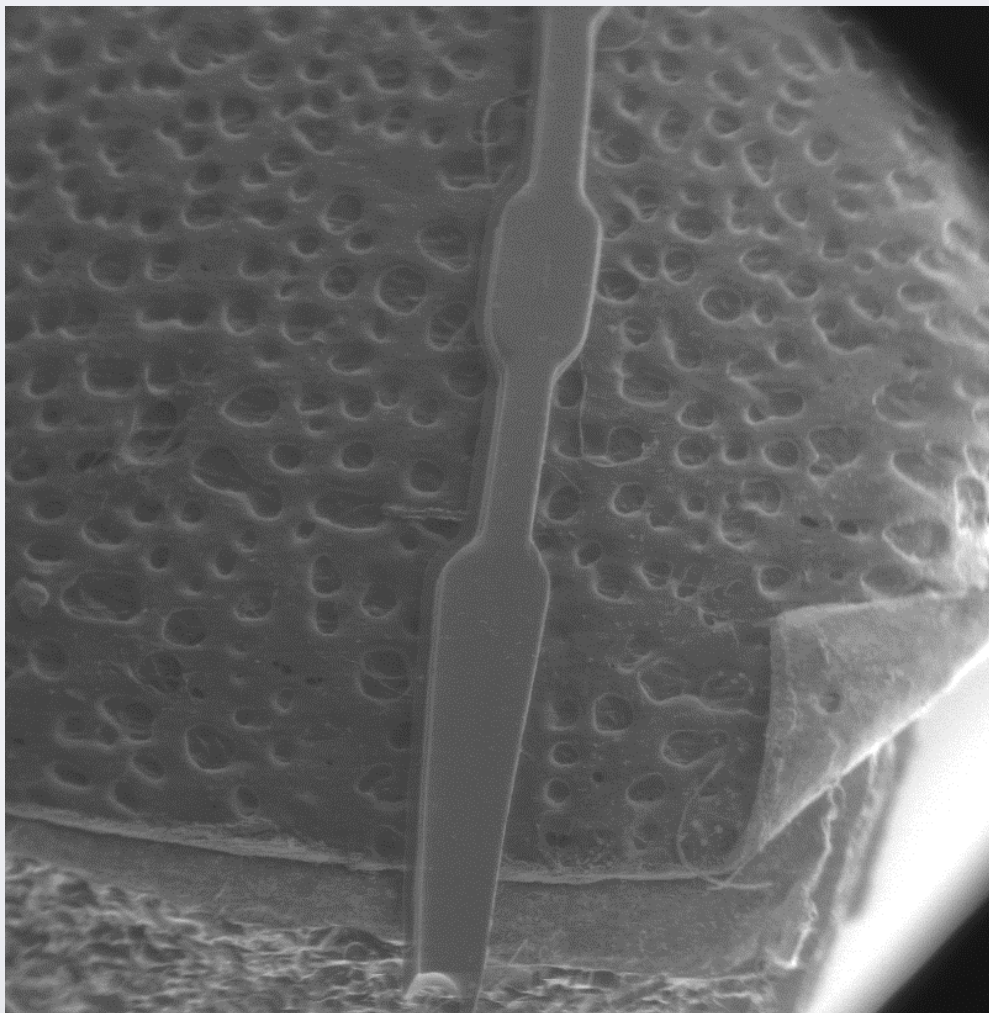
# Fabrication of Microtube



OD : 300  $\mu\text{m}$ , ID : 70  $\mu\text{m}$

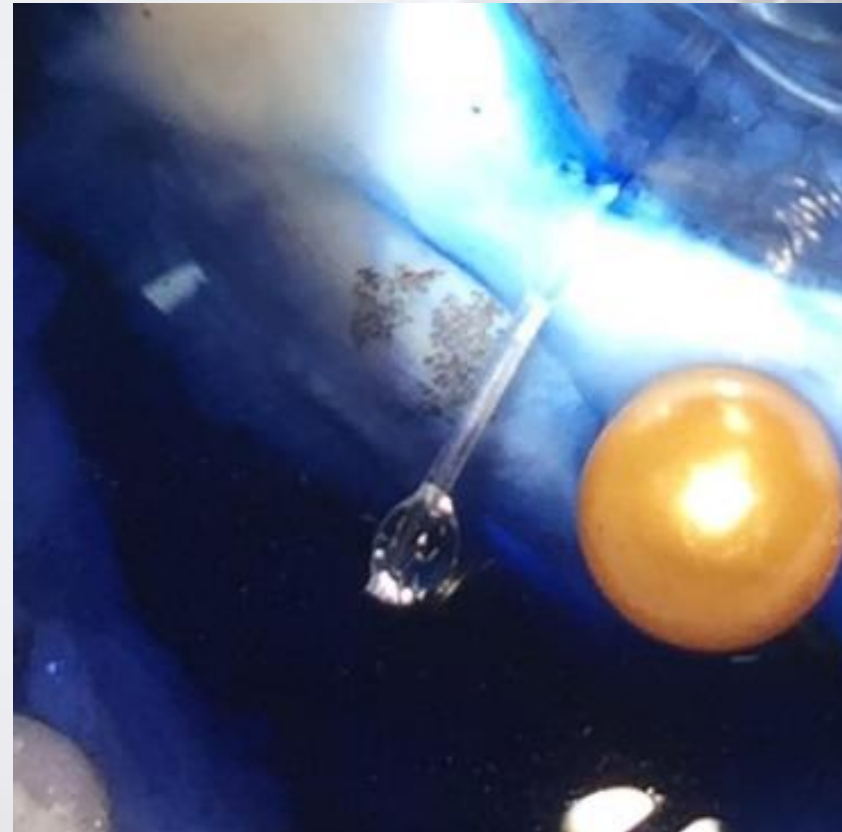
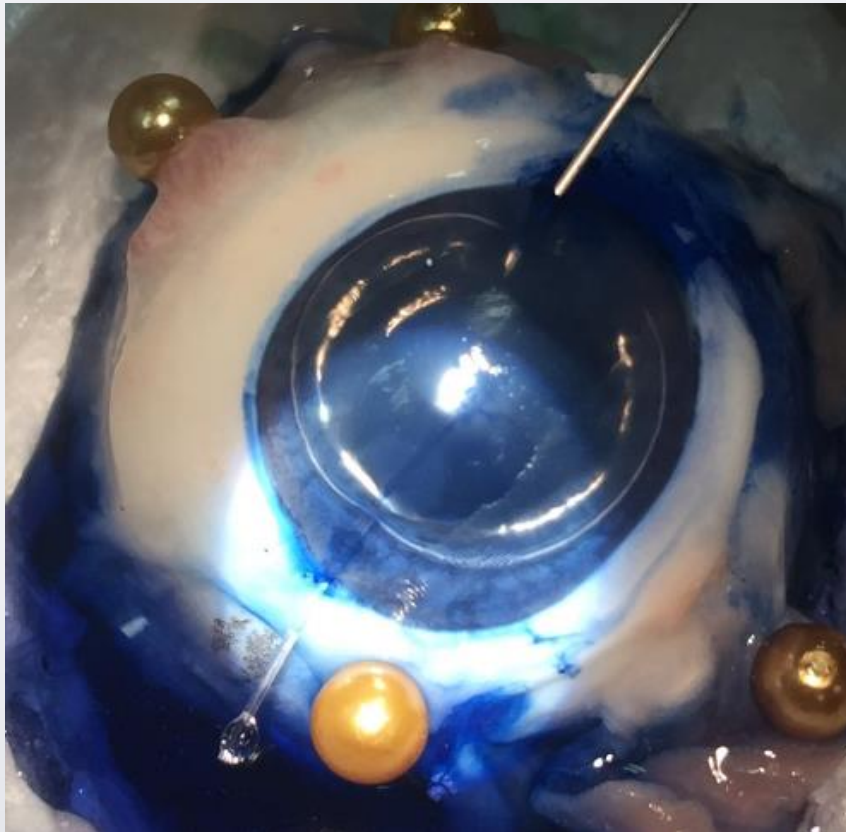


# Fabrication of Microtube with Fin





# Dead pig eye experiment





# CUREs: Chulalongkorn University Rehabilitation Robotic Exoskeleton System for Strokes





# Exoskeleton system

- *Upper-limb*
- *Lower-limb*
- *Wrist*
- *Hand*

# End-effector system



Upper-limb



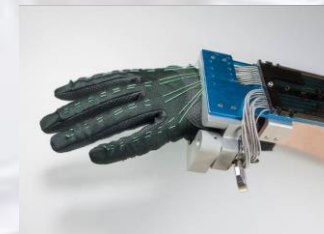
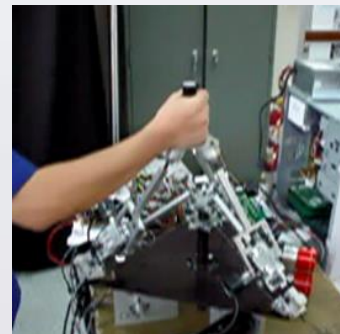
Wrist



Lower-limb



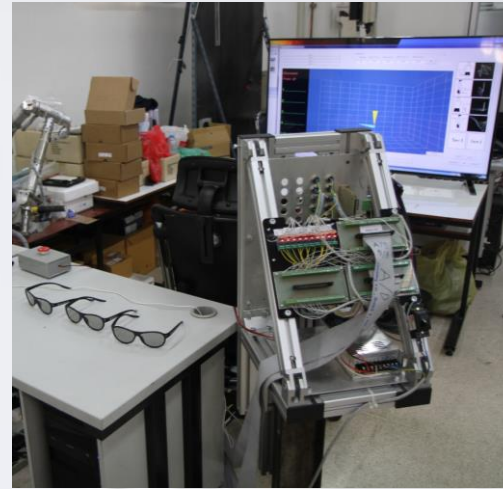
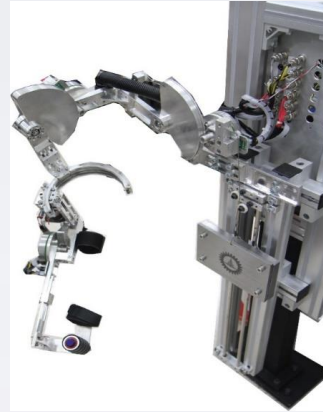
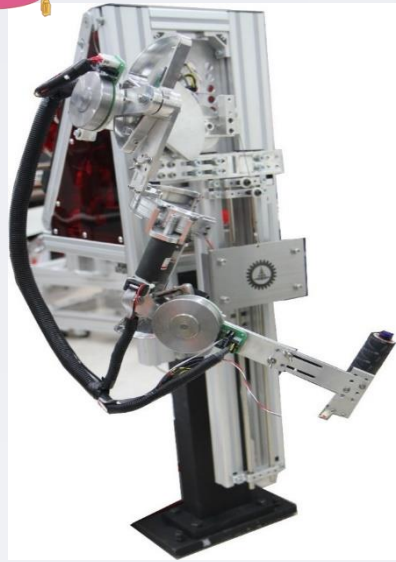
End-effector



Hand



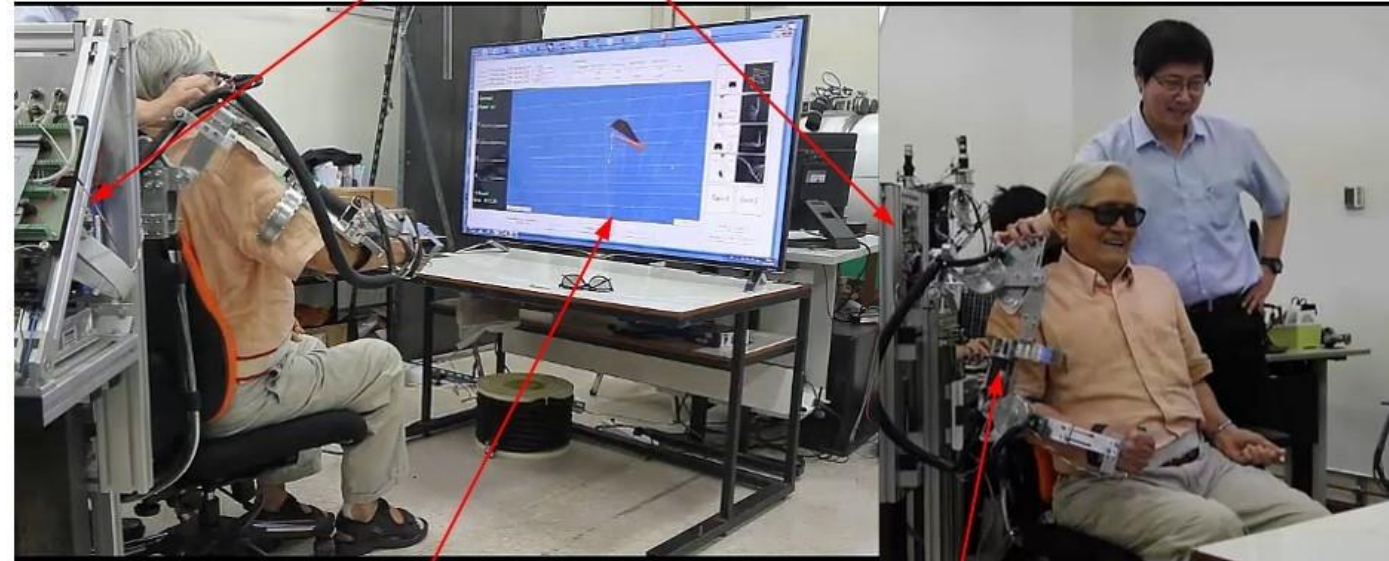
# Different types of rehabilitation robots







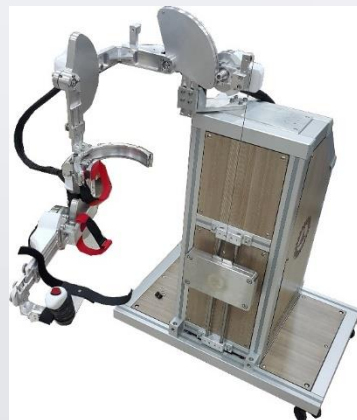
# Components



Controller unit

Exoskeleton Arm

A Large monitor is used for providing information to a patient during operation or exercise. A patient can realize his performance by viewing how close he can follow the pre-specified path. The information about operation time, force induced in the each axis can also be observed.





# Medical Technology: degradable materia



**Silk Proteins**  
**Collagen/Gelatin**

**Hyaluronate**  
**Hydroxypapatite**  
**Chitosan**

**Biomaterials**

- Gel
- Sponge
- Film
- Micro-nano particles
- Electrospun fiber

**Fabrication**

**Physical- Chemical- Mechanical Tests**

2 mm/sec  
5-0 prolene suture

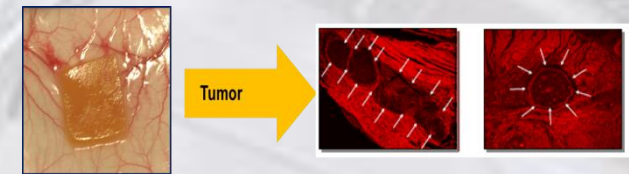
SDS-PAGE

**Biological test (ISO 10993)**

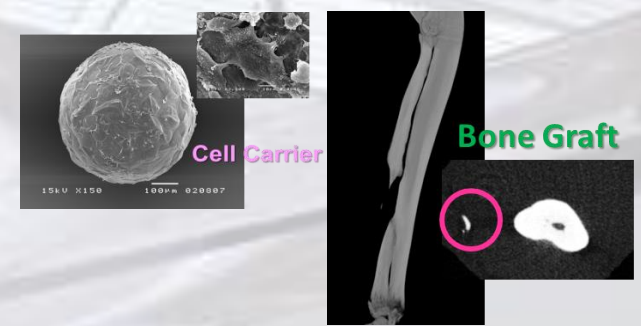
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## Application Test

*Advance Drug Delivery System*



*Tissue Engineering & Cell Therapy*





# Industrial Liaison Program CHULA ENGINEERING

Foundation toward Innovation



**Seminars & Workshops**  
Data Science      Health  
Environment      Energy  
Etc...



**Facilities**  
Laboratory & Library



**Connect to CUE expertises**  
Collaborative Researches  
Engineering Services  
Knowledge database



## Our members





# Challenges for Medical Technology Development in Thailand



- **No regulation on medical devices standard**
- **No testing service center for biocompatibility standard (i.e. standard ISO10993)**
- **Need to import medical-grade raw materials**
- **Collaboration between users (doctors), inventors and producers starting from lab prototype phase, clinical trial phase and industrial prototype phase.**
- **Users' reluctance to use domestic products.**



# Thank You

**Contact ILP:**

- **ILP Office :** **Room 708, Centennial Memorial Building, Faculty of Engineering, CU**
- **Phone:** **02-218-6414**
- **Email:** **[cu.eng.ilp@gmail.com](mailto:cu.eng.ilp@gmail.com)**
- **Website:** **[ilp.eng.chula.ac.th](http://ilp.eng.chula.ac.th)**