Microsurgery, Microneedles, and Drug Delivery

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Microsurgical Tools

• Focused Ion Beam Machining

Surgical Tools

• Ultrasound transducers for cutting
• Piezoresistors for control and setup of gradients
• Thin films for cutting
  – Can be nm in thickness
  • Less than cell size
  – No blunt tip

Drug Delivery Rates

Graph showing drug delivery rates over length of therapy, indicating different methods and their effectiveness in various care settings.
Microneedles

- Microneedles allow collection and dispensing of microsamples
- Large array required to dispense and collect necessary volumes
- Packaging the primary limitation

LIGA Microneedles

Planar Microneedle Array

Photomicrograph of a 20×20 array of solid microneedles resting on a human finger to give a sense of its small size.
Planar Needle Array

An SEM image of a portion of an array showing sharp and uniform needles
Typically polysilicon
Can be atomically sharp if made using self occluding mask

Reservoirs for Drug Delivery

Caps for Drug Release

Implantable Controlled Capsule

- Holes open to allow drug to diffuse out
- Modified version incorporates piston