

The Present and Future of Micromachining in Industrial Production of Surgical Tools M.J. Tolkoff

ACT Medical, Newton Massachusetts

ABSTRACT

Surgery is the removal of obstructions and replacement or realignment of structures allowing the body to heal itself. What can micromachining add to this practice? Devices smaller than achieved before which are good for detecting problems, removing obstructions so biological repair can commence, and creating structures (scaffolds) for speeding repair. With the advent of micromachining industry can begin to create devices which are similar in size to the cells themselves. This will allow the creation of devices which mimic biology, for example needles as small as a mosquito's, valves the size of tiny blood vessels, or structures which allow cells to grow creating new functioning tissue.

Micromachining's promise allows the engineer to take into account the cells' "view" of devices. Devices can now be made as small as a red blood cells (8μ) and with passages of 50μ , critical for healthy cell growth. In pores larger than this cells can't bridge the space for transport of nutrition, oxygen, carbon dioxide, etc. In smaller pores cells clog the passageways and get quickly trapped.

The mechanical design engineer can use micromachining to:

- See things: diffraction gratings, lenses, optical elements
- Filter things: segregate cells, move drugs and nutrients without moving the cells
- Do work: move/remove tissue, make tiny surgical tools, make tiny nozzles for water jet cutting
- Support things: make scaffolds for cells, stent open body passages
- Make surfaces biologically friendly: textured surfaces, surfaces filled with materials friendly to the cells
- Make better tools: sharper cutting edges, tiny mechanisms, valves, controls

These and other possible micromachined devices will be discussed.