

Near-scarless surgery on its way thanks to novel laser technique

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Researchers at U of T and the Hospital for Sick Children (SickKids) have developed a novel laser technique that could allow surgeons to cut tissue with more precision than ever before, significantly reducing recovery times and scarring after surgery.

“Healing times depend on the wound size,” said University Professor Dwayne Miller of chemistry and physics and the Institute for Optical Sciences. “All surgeries today lead to scar tissue with loss of some function. We knew the new laser approach, based on selectively energizing water in biological tissue faster than ever before, would be the most gentle means of cutting tissue.”

Miller, co-principal investigator of a new study published online in *PLoS ONE*, and his colleagues at SickKids compared a new surgical laser called Picosecond IR Laser (PIRL) with conventional surgical lasers and traditional surgical tools, such as scalpels. They found that using the PIRL in mice resulted in minimal scarring; in fact, the scars that resulted from this technique were half the width of those produced by traditional methods. The wounds also appeared to heal faster with PIRL [surgery](#).

“We were hoping to cut at speeds comparable to mechanical tools such as a scalpel. We never dreamed we could cut with far less damage than the surgical gold standard,” Miller said. “We can really now do surgery at the level of a single cell without inflicting damage past one cell line, the fundamental limit to surgery — like the atom for chemistry and biology.”

Lasers are known for their precision; however, they have been limited in their use as a surgical tool because in many cases, the laser is more damaging to surrounding tissues than cutting with traditional surgical tools.

“One of the major stumbling blocks in using lasers for surgery is the collateral damage that is usually caused by thermal and shock waves to the area,” said Professor Benjamin Alman of surgery and head of the Division of Orthopaedic Surgery at SickKids, co-principal investigator of the study. “Traditional lasers tend to burn the tissue but PIRL superheats the cutting area quicker. It vaporizes the tissue, resulting in less destruction to the cells.

“Achieving minimal scarring is beneficial to patients, especially in cases where scarring can be particularly debilitating,” said Alman. “By reducing healing time, this new surgical method could also result in increased patient comfort and lower risk of secondary infections due to surgery.”

Researchers say this new technique looks promising and clinical trials in adult patients could take place as early as next year.

“Imagine healing time reduced from months without complete recovery of function to healing times of days with complete recovery,” said Miller. “Imagine removing the least amount of cancerous tissue and being able to trace in good tissue from cancerous [tissue](#) ... the ability of surgeons to cut without ever damaging nerves. It is early days but just maybe we have the ultimate tool for surgeons to put you back together fully whole again.”

Provided by University of Toronto

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