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RESEARCH

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Laser surgery: cutting the costs

Laser surgery is a versatile way of shrinking or removing tumours without the trauma and risk of conventional surgery. Unfortunately it is also very expensive and so not an option for too many people. That state of affairs could be about to change, however, thanks to the work of a team at Ben Gurion University of the Negev in Israel, which has been developing a system that can deliver laser surgery "without the laser".

Laser surgery uses beams of high-intensity light to shrink or vaporize cancer cells by heating them up. It is a minimally invasive technique – the laser beam is applied to the tumour through a fibre-optic cable, which can be inserted into the body. As such it's a good option for people who have small tumours or are too weak to undergo open surgery.

Because of the reliance on large, powerful lasers, though, the treatment is currently prohibitively expensive. The lasers in question are typically of the neodymium:yttrium-aluminum-garnet (Nd:YAG) kind. "Today, laser fibre-optic surgery is only available to affluent medical centres," said Ben Gurion physicist Jeffrey Gordon. "[Our system] would be a universally affordable alternative."

This is possible because Gordon's team has found a way to generate light beams of sufficient power using a cheap and widely available commercial xenon discharge lamp (like those used in movie projectors). In these lamps, very intense white light is generated from electronic transitions in the plasma, formed by sending a large current through a glass tube filled with xenon gas.

The team has designed a series of mirrors to collect the light from the lamp and focus it into an optical fibre so that it can be used to ablate tissue. Unlike laser light, light from the lamp is incoherent and polychromatic, but if anything this is an advantage: "A broadband light source simultaneously produces a range of optical wavelengths and hence heating penetration depths," explained Gordon.

Gordon and his co-workers have just published results from the first tests of the system on live animals. They performed lamp surgery on the livers and kidneys of healthy rats and showed that it is just as effective at removing tissue as conventional laser surgery. "The virtues of lamp surgery relative to hot-wire techniques, RF ablation and cryoablation should be the same as those for laser surgery compared to the same methods," stated the team in the *Journal of Biomedical Optics* (**11** 050509).

Hot-wire, RF ablation and cryoablation techniques are also minimally invasive tumour-killing treatments. They are growing in popularity and are considerably cheaper than laser surgery. Gordon feels that lamp surgery has the edge over RF ablation and cryoablation, however. "Light-based methods enjoy the virtues of requiring no high-amperage electrical lines or cryogenic fluid channels to be inserted in the body, superior surgical efficacy, less damage to healthy tissue and greater safety in insertion and removal," he told *medicalphysicsweb*.

The next step towards getting lamp surgery into hospitals is to conduct trials on real tumours in larger animals. There's also a need to modify the system so that it's more surgeon-friendly.

The researchers are currently collaborating with an industrial partner, Ray Medical Private (Singapore), to develop lamp surgery as a commercial product. "I would hope that we can tackle these issues within two to three years," said Gordon.

About the author

Michelle Jeandron is science and technology reporter on *medicalphysicsweb*.