

The CUNY Center for Advanced Technology In Photonics Applications (CUNY CAT)
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Tissue Welding With Near Infrared Laser

Laser tissue welding is a novel technique for wound closure, which has potential application in almost all surgical specialties. It is rapidly getting transformed from the laboratory to clinical practice. The advantages of laser tissue welding are:

- Leaves little or no scar
- Enables rapid wound healing and reduced surgical time
- Is not susceptible to any foreign body reaction, no granuloma or granulation tissue deposition
- Non-lithogenic (no foreign material is left after closure)
- Forms immediate water tight seal
- No "solder" or dye required

Near infrared tunable solid-state lasers operating in the 1200 to 1500 nm wavelength range have been used for welding *ex vivo* artery, skin and ocular tissues. The laser emission band used is one where the water in the tissue is strongly absorbing. Studies of tissue welding in animal skin and internal tissues have been made to determine the effect of wavelength, absorption by water, average power, pulse duration, penetration depth, and tissue optical characteristics on the efficacy of the fusion process.

The efficacy of the welding was evaluated by tensile strength measurements using a digital force gauge, histology, scanning electron micrograph (SEM), fluorescence and Raman spectroscopy. Figure 1 shows a scanning electron micrograph of a specimen of welded porcine arterial tissue. The quality of the weld is so extraordinary that under a 480X SEM magnification, little difference is observed between the welded region (shown by arrows) and the normal region. The weld is full thickness over the full length with little damage to the tissue. In addition the weld exhibited good tensile strength. Figure 2 shows an end on section of the same tissue type with the welded region shown by arrows.

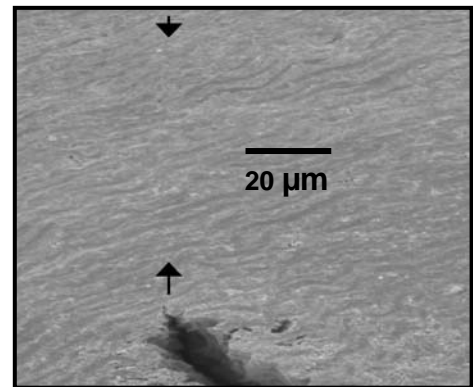


Figure 1

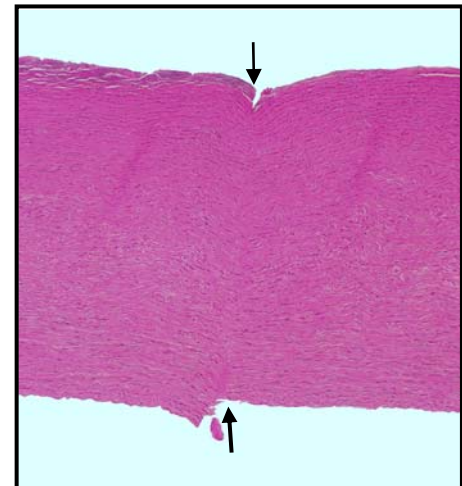


Figure 2

This technology opportunity sheet describes continuing efforts in this area. Several patents may have been issued or are pending and which may be available for licensing.