Laser light

Essentially, the use of laser light allows the deposition of a precise amount of energy to a defined area at the tip of a fiber. The energy transmitted by the laser fiber is absorbed by tissues surrounding the tip and converted into heat. At temperatures between 55°C and 95°C, photocoagulation occurs, leading to rapid, irreversible tissue damage. Early on, the technique gained traction in the treatment of hepatic tumors and varicose veins, but the inability to monitor tissue damage and to protect eloquent structures initially hampered its use in neurosurgery.

With the introduction of magnetic resonance thermography, which harnesses the temperature dependence of the proton resonance frequency to generate an accurate real-time map of tissue temperature, the treatment of deep-seated lesions in critical areas became feasible.

Since the early 1980s, CO(2), neodymium-doped yttrium aluminum garnet (Nd:YAG), and other laser prototypes have been widely used in neurosurgery as an intraoperative aid along with the cavitron ultrasonic surgical aspirator (CUSA), bipolar forceps, and micro dissection.

Technological advancements have expanded their use and improved technical application. Originally applied to brain tumors to confer destructive oncolysis, lasers have been used over the last decades to incise, fenestrate, and repair tissues and now are being used for cerebrovascular bypass techniques.

Such applications include: laser scalpel for spinal cord tumors and lipomas, fenestration of arachnoid cysts, cerebrovascular bypass with the ELANA device, Laser interstitial thermotherapy for brain tumors, laser tissue soldering for dural repair, and percutaneous laser disc decompression [1)].

YAG laser

see Thulium laser.

see CO2 laser.

1)

Lin LM, Sciubba DM, Jallo GI. Neurosurgical applications of laser technology. Surg Technol Int. 2009 Apr;18:63-9. Review. PubMed PMID: 19579190.