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Medical laser update

A whole new generation of laser instruments, combined with fiberoptics, makes the surgeon's job much easier.

The sixth annual meeting of the American Society for Laser Medicine and Surgery May 24-26 in Boston presented an impressive display of the revolution in medical treatment which has occurred since Theodore Maiman, a scientist at Hughes Aircraft, created the first working laser in 1960.

Initially used by opthalmologists for certain eye problems, the first ruby lasers have given way to a whole generation of new instruments which, combined with the development of fiberoptic technology, have enabled physicians to access and treat lesions previously untreatable, and to reduce the complications of traditional surgical procedures.

Lasers are now used extensively in opthalmology, gynecology, dermatology, pulmonary surgery, and ear, nose, and throat surgery. Their use is now expanding into the digestive tract, nervous system, urinary system, and even the cardiovascular system.

Because of the ability to focus energy precisely, and both cut and coagulate, the laser has primarily been used as a substitute for the scalpel and cautery in surgery. In these applications, the laser has demonstrated its ability to reduce operative and post-operative bleeding from such major procedures as mastectomy. In addition, patients undergoing laser surgery suffer less post-operative pain and spend less time in hospital.

In September 1985, a new hospital with centralized laser-beam supply systems was opened in Omiya City, 20 miles north of Tokyo. At present, beams of three different types of lasers can be supplied to two operating rooms and six outpatient treatment rooms by optical fibers up to 300 feet in length. In each room is a terminal which can input the doctor's orders into the central computer—laser type, power output, patient appointments, etc. In addition to the three central lasers, Nd-YAG (Neodynium-Yttrium-Aluminum-Garnet), Argon, and Argon-Dye, there are mobile Nd-YAG, CO_2, He-Ne (Helium-Neon), and semiconductor laser units installed at the hospital. In the near future, gold-vapor and excimer laser units will be added. As of Novermber 1985, 40 major surgical operations were performed using the laser system.

One of the most rapidly growing areas in laser medicine is photodynamic diagnosis and therapy. This new development is based on the fact that tumors, and certain other lesions, selectively accumulate chemicals, such as hematoporphyrin derivative (HPD), which is a breakdown product of hemoglobin, the pigment of red blood cells.

Diagnosis is based on the fact that HPD, and other similar chemicals, are optically active, and will fluoresce when illuminated with light of certain wavelengths. This causes tumors in such areas as the bronchial tree to light up when they are illuminated, enabling doctors to identify tumor tissue otherwise indistinguishable from normal tissue.

In photodynamic therapy, tissue containing these dye substances selectively absorbs laser light and undergoes necrosis, or tissue death, while adjacent normal tissue is spared. A variation on this effect is under study in the treatment of arteriosclerotic plaques in arteries. Laser wavelengths which are preferentially absorbed by the yellow plaques are used to destroy the plaque while avoiding damage to the normal blood vessel wall.

Like other forms of radiant energy, lasers exhibit a destructive effect at high intensity and a stimulating effect at low intensity. Since 1971, scientists at the Postgraduate Medical School of Budapest, Hungary, have studied the effect of low-intensity laser irradiation on non-healing and poorly healing skin ulcers. Treatment by laser has resulted in healing of 80% of previously non-healing skin ulcers, including post radiation therapy ulcers.

Another use of low intensity laser irradiation, reported on in Boston, is for relief of pain in rheumatoid arthritis and other musculoskeletal conditions. In one study, in California, 72 subjects with rheumatoid arthritis received treatment with a low-powered Helium Neon laser, or a placebo treatment. There was a highly significant decrease in pain and increase in activity in the treatment group, compared to the control group.

Another study on inflammatory diseases of the mouth, such as gingivitis and periodontitis showed a relatively rapid regression of inflammation, with lessening of secretion, swelling, and hemorrhage, following application of low-power laser energy from a Helium Neon laser. In addition, there was suppression of bacteria and enhanced regeneration of tissue.

While the laser, like any other medical treatment, is not a cure-all, it does represent a quantum leap forward in medical diagnosis and treatment.