THE USE OF THE CO₂ LASER IN NEUROSURGERY

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We started the studies on developing a practical model of the carbon dioxide laser surgical unit in 1969 and produced the Medilaser-S, Model MEL-442, and MEL-444. The former was officially approved by the Japanese Ministry of Health and Welfare in 1980 as the first CO₂ laser surgical unit in Japan. And the latter was also officially approved in 1982. The volume and the weight of Model MEL-444 was reduced by 30% respectively compared to the former model. The control system of this device was computerized and the infrared contact coagulator was built in to cover the insufficient capability of the CO₂ laser.

We performed 143 cases of brain tumor laser surgery using these models by the end of 1982. The CO₂ laser can be applied to both benign and malignant brain tumors. But the best indication is meningioma of the skull base, posterior fossa and ventricles. The CO₂ laser is useful for the bloodless removal of the hard and hemorrhagic tumors. The width of thermal coagulation made by the CO₂ laser is very thin, about 50 microns in neural tissue. Therefore, it is safely applicable to the tissue in the vicinity of the vital organs. On the contrary, the Nd-YAG laser produces thick thermal coagulation about 5 mm. Thus, the hemostatic capability of the Nd-YAG laser is stronger than the CO₂ laser. But it is dangerous to apply the Nd-YAG laser to the tissue in the vicinity of such vital organs as the optic nerve, brain stem, basilar artery, etc. The Nd-YAG laser is excellent as a photocoagulator, but poor as a vaporizer. For these reasons mentioned above, we use the CO₂ laser as a main weapon in neurosurgery, and the Nd-YAG laser as an adjuvant method to the CO₂ laser. The speed of vaporization is proportionate to the output of the CO₂ laser. In order to vaporize a large tumor quickly, we use a high output over 60 watts. We are now trying to develop a CO₂ laser surgical unit with an output of 300 watts.