ACCELERATORS IN HADRONTHERAPY

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The name 'hadrontherapy' is being currently recommended by accelerator physicist, although it has not, as yet, become widely known in the medical world. It denotes the therapy of radioresistant tumours or those located near critical body structures, using elementary particles as neutrons, protons, pions, helium ions and/or heavy and light ions. The progress in the construction and use of accelerators has made it possible to use hadrontherapy on a larger scale. Protons and light ions are suitable for conformal treatments, and those with high LET values can be used radioresistant tumours, whereas neutrons, Especially in the so-called BNTC (Boron-Neutron Capture Therapy) therapy are proposed for deep, inoperable brain tumours. Pions, i.e. negative π^- mesons, produced in meson 'factories' have the advantage of a high dose within the tumour area and low dose in the healthy tissues. Protons with low energies are being used in irradiating eye tumours, and those with high energies are suitable for large and deep tumours. There are at present 16 proton centres the world over; the project Progretto Adroterapia being implemented in Italy is of special importance since it is planned to treat about 12,000 patients annually. In the USA (Loma Linda) a dedicated hospital proton accelerator has been built and in Boston a cyclotron was put into operation to employ protons clinically. In Japan (Tsukuba), an accelerator is also being constructed to use protons for medical purposes. The use of light ions of neon, carbon and oxygen have been initiated at Berkeley (USA) for the treatment of 2000 patients with eye tumours. The HIMAC programme in Japan is also envisaged exclusively for medical applications. The European EULIMA programme came to an end in 1991, whereas at GSI the treatment with light ions was started in the late 1996.

It may be concluded that what we are witnessing now is a transformation period of proton therapy into a fully routine method, while the work on neutron therapy (particularly BNTC) and the use of accelerators for the production of light ions for medical purposes has every chance of success in the not too distant future.