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PHASE I/II CLINICAL TRIAL WITH HEAVY ION AT
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In Japan the heavy particle therapy started already at NIRS in 1971. At first, the fast neutron beam was used in anticipation of its biological advantages. In some tumors, fast neutron therapy was more effective than conventional photon and electron therapy. But generally, the treatment results of fast neutron therapy were not satisfactory, because of its inadequate dose-distribution. Recently the proton beam with high energy is going to get into the spotlight. Its dose localization is excellent and the biological effect is almost the same as that of the photon beam. Therefore, radiation oncologists can easily become experienced in applying it to daily routine treatment.

High-LET charged particle radiotherapy has particular appeal for therapy of radioresistant neoplasms. The physical and biological properties secondary to heavy ions include, 1) advantageous dose localization at depth, 2) increased effect on hypoxic tumor cells by high-LET radiations, 3) less

repair of sublethal and potentially lethal radiation damage, and 4) less variation of radioresponse in the different phases of the mitotic cell cycle. Since June last year our challenge has been to translate these theoretical advantages into significant clinical gains in the treatment of cancer. The objects of Phase I/II clinical trial using carbon-ion beam include the brain tumor, head and neck cancer, lung cancer, hepatoma, cervical cancer and cancer of the prostate. Fifty-five patients has been already treated. It takes long time to evaluate the usefulness of heavy ion therapy, because it is very important to observe the treated patients at least several years after treatment. The preliminary results are encouraging. Although much has been learned regarding the potential of heavy charged particles, there is still a need for further research into their biology, physics and clinical applications.