

9 - 1 The First Home-Made Carbon Ion Cancer Therapy Facility Achieved Remarkable Clinical Effect

Wang Kun and Technology Transfer & Industrialization office

Energetic carbon ions have characteristics of high ionization density and relative biological effectiveness (RBE), culminating in a sharp maximum at a discrete penetration depth that coincides with the maximum physical dose around the so-called Bragg peak. The peak energy depositions can be targeted three-dimensionally with a minimal risk of directly harming surrounding healthy tissue. Heavy ion beam is considered to be the most optimal radiation for tumor treatment in the field of radiotherapy, and therefore heavy ion therapy is attracting growing interest all over the world.

The hospital-based Heavy Ion Medical Machine (HIMM) was developed for tumor therapy by Institute of Modern Physics, Chinese Academy of Sciences (IMP, CAS) cooperating with Lanzhou Kejin Taiji Corporation, LTD. The first demon facility of HIMM was installed in Wuwei, Gansu Province, China, and was certificated as the medical device equipment on Sept. 29, 2019 (Fig. 1) HIMM in Wuwei was put into clinical operation on March 26th, 2020. Including 46 participants for clinical trial, a total of 651 patients have been treated with remarkable therapeutic effects and received much attention from the society by the end of 2022. And the three-year local control rate of 46 clinical trial participants reached 84%. It created significant social and economic benefits.

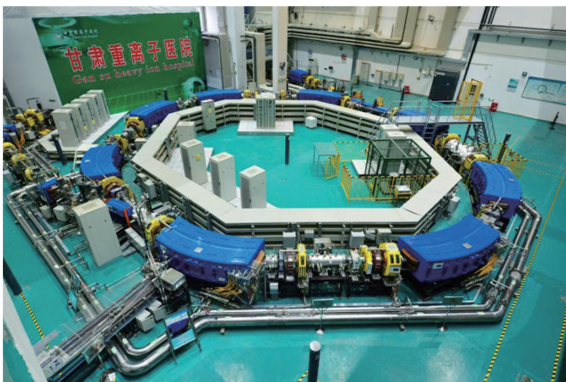


Fig. 1 (color online) Synchrotron accelerator in Carbon Ion Therapy Facility.



Fig. 2 (color online) The clinical trial of HIMM in Lanzhou is finished.

New carbon ion projects have been respectively launched in Lanzhou, Putian, Wuhan, Hangzhou, Nanjing, Changchun and so on. The clinical trials of HIMM in Lanzhou including 22 patients was finished (Fig. 2), and remarkable clinical effect was achieved. More carbon ion facilities in operation, more cancer patients will be benefited from heavy ion therapy.

HIMM, the first heavy ion therapy facility with independent intellectual property rights in China, filled the gap of localization of top radiotherapy equipment, which is of great significance for improving the means and level of cancer diagnosis and treatment in China. It successfully practiced a road of whole industrial chain with independent innovation from basic research, technology research and development, product demonstration to industrial application, and shaped a great model of big science and engineering serving the human health and society.