Hitachi, Ltd., Healthcare Business Unit — **Hitachi, Ibaraki Prefecture**

The Joint Circular Arc-Type R Guide Makes Compact, High-Precision Particle Therapy Equipment Possible

What is particle therapy equipment?

There are three primary methods of treatment for cancer: surgery, chemotherapy, and radiation therapy. Particle therapy equipment is a type of radiation therapy equipment. A proton beam irradiates cancer tissue, shrinking or killing cancer cells without any incisions or side effects from medication.

X-ray therapy is a widely used radiation therapy, but x-rays radiate much more energy near the surface of the body, and they can damage normal tissue around the cancer tissue. In comparison, with particle therapy, the peak energy emitted from the proton beam can be matched to the specific location and depth of the cancer tissue. The radiation will not reach the surrounding tissue, so this treatment method makes it possible to have a minimal impact on normal tissue. Particle therapy causes little pain and few side effects, enabling patients to balance their treatment and regular life through outpatient care.

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Minimizing equipment size is key

Particle therapy equipment is essentially made up of a particle accelerator and a gantry. In the accelerator, protons are accelerated to 2/3 the speed of light. The protons are transported to the gantry, and then they are delivered from the beam transport nozzle to the cancerous area. The gantry can be rotated 360 degrees to the required angle and deliver the proton beam from any direction while avoiding vital organs.

The gantries used in particle therapy equipment are massive, with weights in excess of 100 tons because of the many magnets of various sizes that transport the protons. The size was a major obstacle for the widespread use of this equipment, as hospitals would require a dedicated facility on their campus for this large-scale equipment.

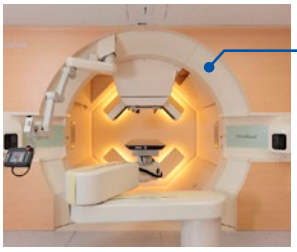
With the gantry being supported from beneath, the rotation tracks on previous models of equipment would deform and become slightly elliptical just from the gantry's weight. Because of that, the support structure and rotating parts were made to be larger and heavier to achieve the necessary rigidity. However, the equipment we provided to Hokkaido University uses Circular Arc-Type R Guides to support the gantry. Rotation accuracy was much improved due to the smoother rotation provided by the preservation of a true circular shape. At the same time, the equipment also became lighter and more compact. Gantries are required to achieve the highest precision, with the position error of the center of radiation being no wider than 2 mm for a 360-degree rotation. It was the Circular Arc-Type R Guides that made it possible for this equipment to meet those size and precision requirements.

Working with THK to create solutions

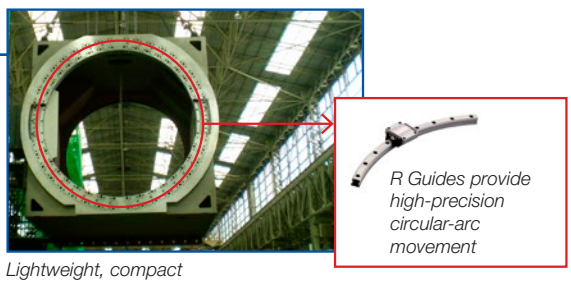
We faced many challenges before this equipment was complete, but we overcame them with the help of THK, who worked with us starting from the design phase. Combining our respective fields of expertise allowed us to move forward with this project, as THK provided design support, assistance during assembly, and more. The end result was a success. It took very little time to go from starting the design process to finishing the assembly process.

Thanks to THK, this equipment is highly regarded, and the next customers in line are also asking us to give them the same state-of-the-art particle therapy equipment that we provided to Hokkaido University.

We hope to continue collaborating with THK to create better products and help create a better society.



State-of-the-art particle therapy equipment that excels at targeting cancer tissue



Lightweight, compact gantry made possible with Circular Arc-Type R Guides