



Hyogo Ion Beam Medical Center



Cancer eradication: the ardent wish of humanity



Tomoaki Okimoto, M.D.
Director, Hyogo Ion Beam
Medical Center

Hyogo Ion Beam Medical Center (HIBMC) was established on April 1, 2001 with the goal of eradicating cancer, which is an ardent wish of humanity. Our weapon in fighting this tough enemy is charged particle radiotherapy featuring two types of charged particles (proton and carbon-ion). HIBMC was the world's first institution that offers both of these two types of therapy, and there are only four of such institutions in the world (as of the end of March 2016). The number of cases to which we applied charged particle radiotherapy at HIBMC exceeds 7,000; we have world-class clinical experience. We have actively published our achievements through presentations and lectures in (academic) conferences, and peer-reviewed academic journals.

There are three major approaches to cancer treatment: surgery, chemotherapy and radiotherapy. In addition to these, immunotherapy is gathering attention as a fourth approach.

Under this situation, what can people expect from particle radiotherapy? The answer is improved treatment results for intractable cancers which cannot be cured with other therapies. HIBMC has been actively working on the cases that were incurable at other institutions and achieving results. The tumors we have handled include bone and soft tissue sarcoma, tumors in the head and neck, pancreas cancer, biliary tract cancer, liver cancer, lung cancer and others.

To bring satisfaction to intractable cancer patients and their families, I pledge we will continue to exert every effort to further improve our treatment outcomes.

Overview of the Center

Establishment:	April 1, 2001
Clinical department:	Radiotherapy
Number of beds:	50
Features:	Japan's first local governmental facility for charged particle radiotherapy; the world's first and Japan's only medical center where both proton and heavy-ion beam radiotherapy is performed

History

April 1, 2001	HIBMC opened (Proton beam radiotherapy started)
April 1, 2002	Carbon-ion beam radiotherapy started
August 1, 2004	Proton beam radiotherapy at HIBMC certified as a <i>Kodo senshin-iryō</i> ("highly advanced medical treatment")*
June 1, 2005	Carbon-ion beam radiotherapy at HIBMC certified as a <i>Kodo senshin-iryō</i> ("highly advanced medical treatment")*
April 1, 2016	Some indications became covered by health insurance (Pediatric tumors for the use of proton beam radiotherapy, non-resectable bone and soft tissue sarcomas for the use of carbon-ion beam radiotherapy)



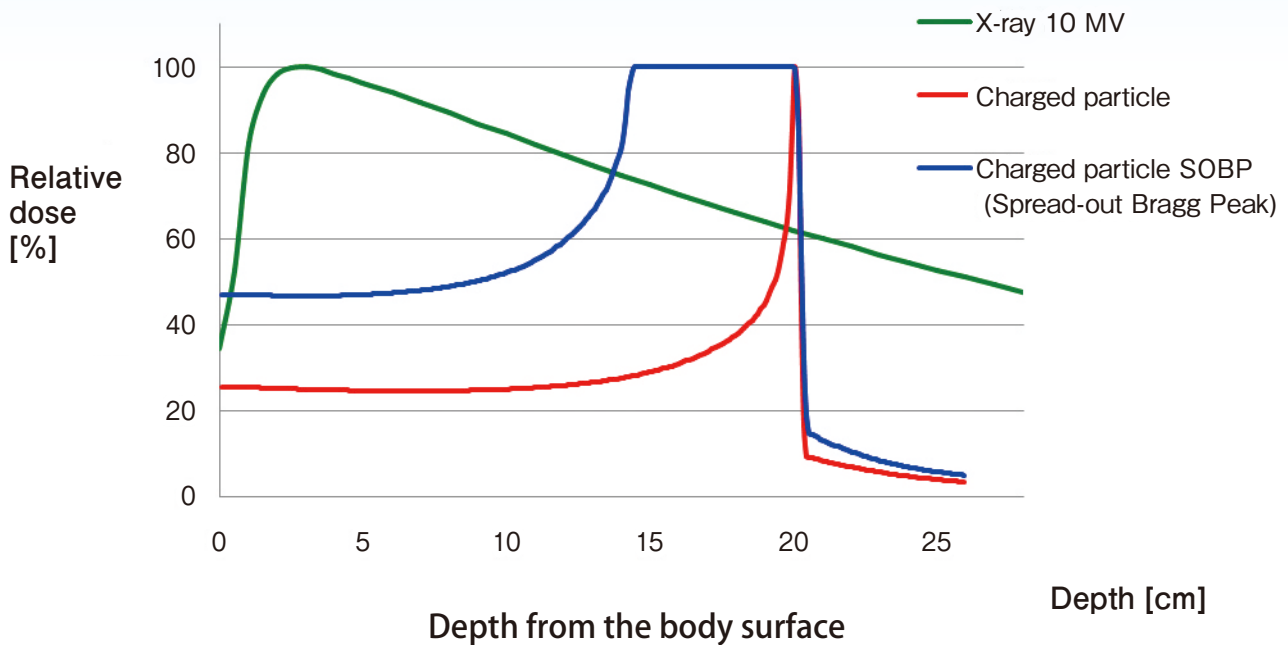
Full view of the Center

* *Kodo senshin-iryō*

Cutting-edge medical treatment certified by the Ministry of Labour, Health and Welfare of Japan. The fee for such treatment is not covered by health insurance, but related costs (such as hospitalization, medication and practice costs) become covered by health insurance. The labelling system was changed in 2006, and what was at the time *Kodo senshin-iryō* is now called *Senshin-iryō* ("advanced medical treatment").

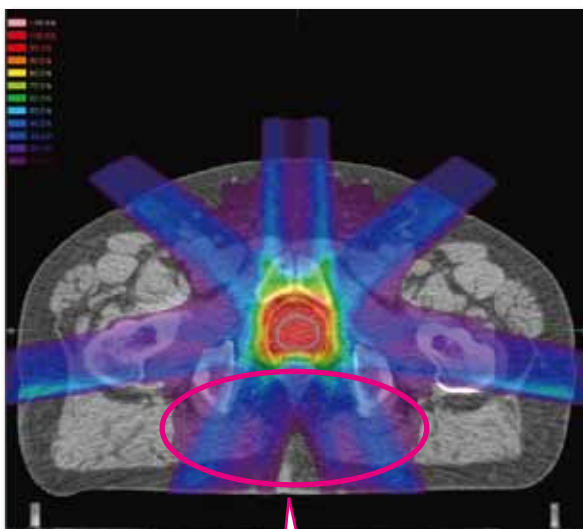
Difference from conventional radiotherapy

In the case of conventional radiotherapy using X-ray, the shallow dose at the region close to the skin is higher, and the dose at the tumor at some depth of the body is lower. Due to this, some cases result in insufficient effect. On the other hand, in the case of the charged particle, the dose is low at shallow depth and increases to a sharp maximum at a certain depth, allowing sufficient dose at the tumor. This leads to better treatment results.

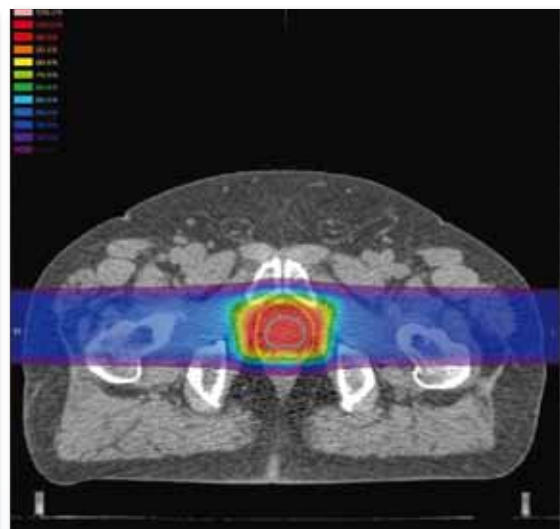


(Example) Comparison in case of prostate cancer

Photon radiotherapy (IMRT)



Charged particle radiotherapy (Proton)



Higher dose to healthy tissues at wider range
due to irradiation from multiple directions

Cancers treatable with charged particle radiotherapy

Starting April 2016, the charged particle radiotherapy is covered by health insurance for some indications. For other diseases, the charged particle radiotherapy will continue to be offered as a *Senshin-iryo* ("advanced medical treatment," see footnote on page 1), following the unified treatment policy established by the Japanese Society for Radiation Oncology (JASTRO).

■ Treatment covered by health insurance

Pediatric tumors (for proton beam radiotherapy only) and non-resectable bone and soft tissue sarcomas (tumors developed at the bones or soft tissues such as muscles, blood vessels, or subcutaneous tissues; for carbon-ion beam radiotherapy only) are covered by health insurance.

■ *Senshin-iryo*

Charged particle radiotherapy for diseases not listed above will be offered as a *Senshin-iryo*, based on the indications and unified treatment policy established by JASTRO.

* For details about the indications, please refer to **JASTRO's website**.

Number of patients treated at HIBMC (As of the end of March 2016; including clinical trials)

Head and neck	Lung	Liver	Pancreas	Prostate gland	Bone and soft tissues	Others	Total
965	690	1,403	533	2,427	313	1,210	7,541

Cancers not treatable with charged particle radiotherapy

Through our experiences so far, we must say that charged particle radiotherapy is not suitable for some cancers.

Whether the therapy can be applied to a patient or not is decided after evaluating the size, stage and location of the cancer, as well as the overall condition of the patient.

Radiation tends to promote ulcer development in gastrointestinal mucous membranes, so charged particle radiotherapy is usually not applied to cancers in the digestive tract (stomach, large intestine, etc.). It may also be difficult to apply charged particle radiotherapy to cancers not in the digestive tract but in organs contacting with or close to the stomach and intestines, due to the high risk of mucosal ulceration.

* When it is difficult to irradiate the charged particle because the affected area is close to the digestive tract, surgical spacer placement (placing an object between the digestive tract and the tumor; not covered by health insurance) may allow appropriate irradiation.

Restriction by the stage of the cancer

In cases where the primary cancer has spread to multiple organs (lung, liver, bone, etc.), charged particle radiotherapy cannot be applied. We cannot expect sufficient effect when cancer has spread to lymph nodes either.

Restriction by the size of the cancer

When the size of the cancer exceeds 12 cm, it is difficult to effectively apply the therapy due to technical reasons (constraints of therapeutic devices).

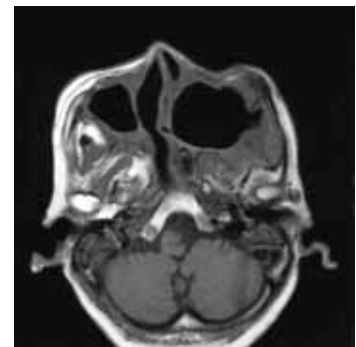
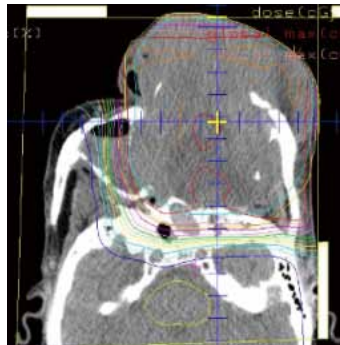
Treatment cases

Head/neck cancer



Before treatment

Treatment plan



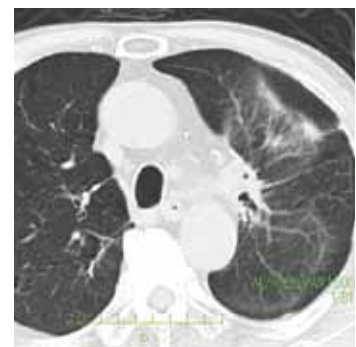
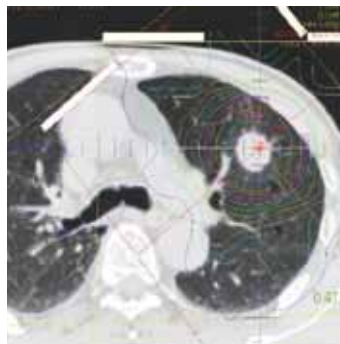
31 months later

Lung cancer



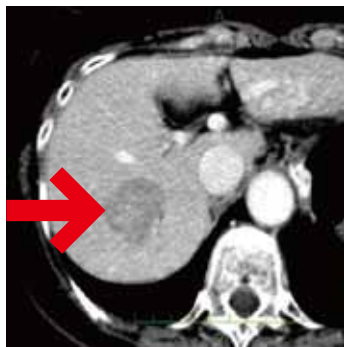
Before treatment

Treatment plan



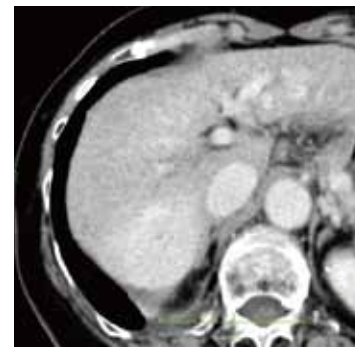
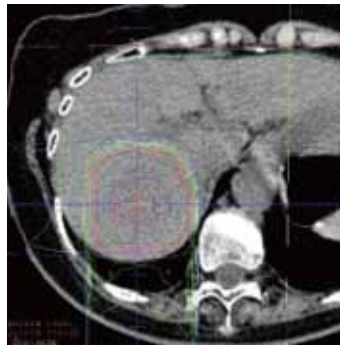
26 months later

Hepatoma



Before treatment

Treatment plan



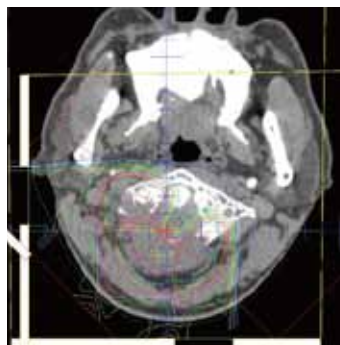
21 months later

Metastatic bone cancer



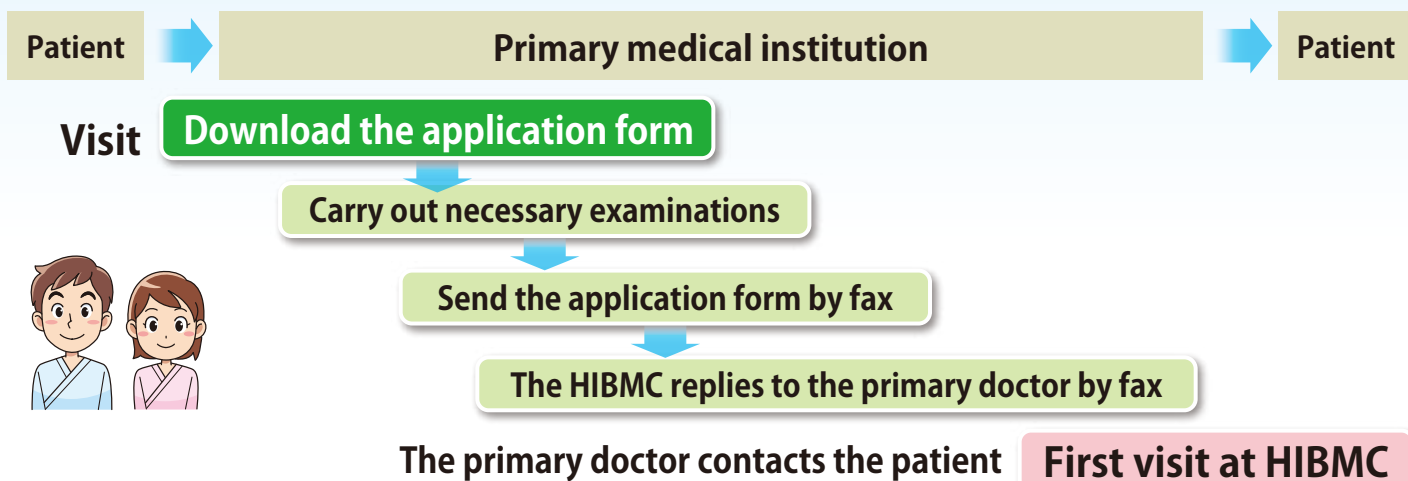
Before treatment

Treatment plan



27 months later

Pre-therapy process



At the first visit, whether or not the therapy is applicable is determined.

(Diagnosis documents and image data from the primary doctor is necessary)

When the therapy is determined applicable, the remainder of the process, from preparation to completion, will be conducted via clinical path schedules.

Preparation

- Examinations
Blood test, electrocardiogram, etc.
- Make immobilization device
The braces immobilize the patient during the therapy session.
- CT, MR
The patient undergoes these exams with their braces on. These will become the fundamental image data used in discussing the best irradiation method.



A brace

Treatment planning

- The best irradiation method for the best treatment is discussed.
- * It may be decided at this stage that the therapy cannot be applied.



Approval of the plan

The treatment policy is determined at a multi-disciplinary conference.



Informed consent

Explanations will be given about the irradiation method, period, expected effects and side effects.

Rehearsal

The patient is positioned in the same way as the actual therapy session on the treatment couch. Position arrangement is conducted at this stage.

* This is the final confirmation before the therapy session.

Therapy sessions

The treatment period differs according to the disease; usually between one week and two months.

Therapy method

It takes approximately 15 to 30 minutes of preparation in order to specify the cancer's location accurately and provide precise irradiation. Actual irradiation time is usually 2 to 3 minutes, and approximately 5 minutes for regions that move with the action of breathing.



No pain or itch is felt during irradiation.

Hospitalization is not necessarily required.

Proton radiotherapy:
usually 5 times a week
Carbon-ion radiotherapy:
usually 4 times a week

* We may offer treatment on weekends when device checks are being conducted on weekdays.

Side effects may occur, but appropriate measures will be taken.

Follow-up system

After therapy, the patients will be seen and examined at the primary medical institution.

HIBMC will also confirm the patient's status via the report sent by the patient based on the *My Karute* ("My clinical record") system. This is an important system to confirm the treatment effects, deal with side effects and detect recurrence at an early stage.

* We may ask patients to pay regular visits to HIBMC under the instruction of the HIBMC doctor, depending on the status.



Consultation

The staff receiving telephone consultation from a patient after the therapy



My Karute

This is the clinical record held by the patient for post-therapy health management.

Inquiries and application

Dear primary doctor

●Application for the patient's visit to HIBMC

Please download the application form on the HIBMC website, fill out the necessary information and send it by fax.

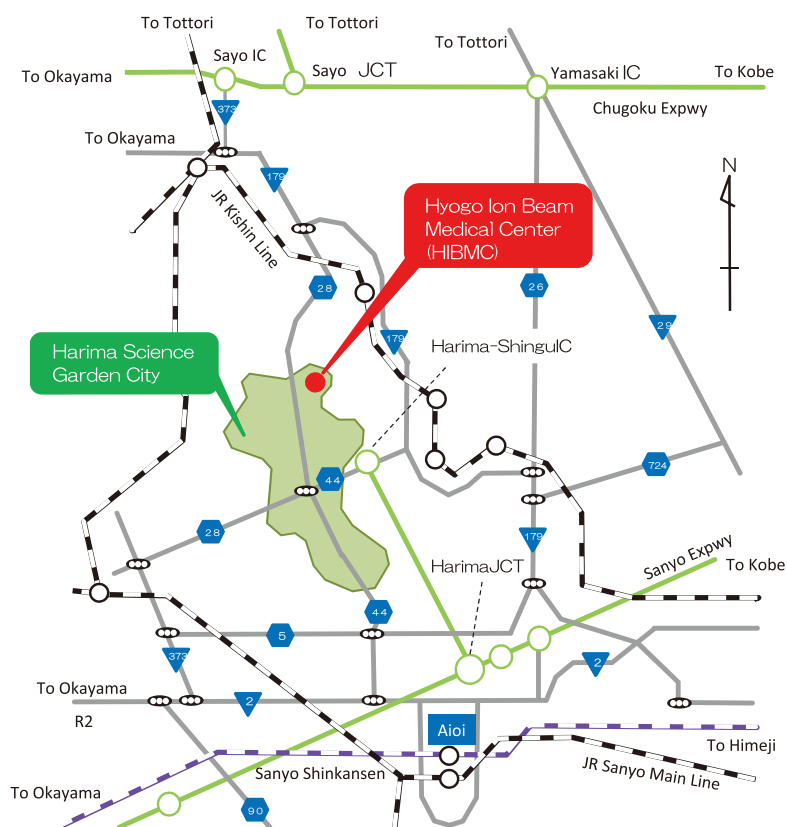
Fax number: +81-(0)791-58-2600

* The date and time for appointment will be sent to the primary doctor by fax.
(Replies will be sent on the following business day.)

●Consultation via email

HIBMC accepts consultation via email about adaptation of the charged particle radiotherapy.
For details, please check the HIBMC website.

Access



By Shinkansen (Fastest way to JR Aioi Station)

Approx. 3 h 40 min from Tokyo Sta.
Approx. 50 min from Shin-Osaka Sta.
Approx. 2 h 10 min from Hakata Sta.

By car

Approx. 40 min from JR Himeji Sta.
* Sanyo Expwy Harima JCT → Harima Expwy →
Approx. 6 min from Harima-Shingu IC
Approx. 20 min from JR Aioi Sta.

By air

Approx. 90 min by car from Osaka (Itami) Int'l Airport
Approx. 70 min from Okayama Airport

By bus

Approx. 35 min from JR Aioi Sta.
* Take a Shinkai Bus bound for SPring-8 and
get off at Ryushisen Iryo Center bus stop.

Hyogo Ion Beam Medical Center

1-2-1 Koto, Shingu-cho, Tatsuno City, Hyogo 679-5165

Tel: +81-(0)791-58-0100 Fax: +81-(0)791-58-2600

Hours: 8:30-17:00 on weekdays (Closed on Sat, Sun and holidays)

<http://www.hibmc.shingu.hyogo.jp/>