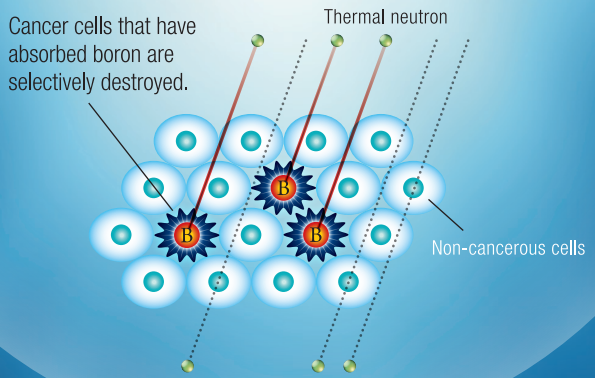
Qualitatively different from the treatments of the past, selective radiation therapy is a next-generation cancer treatment that may prove to be effective for difficult-to-treat cancers and recurrent cancers.

The reaction between the boron atom and neutrons selectively destroys cancer cells.

BNCT

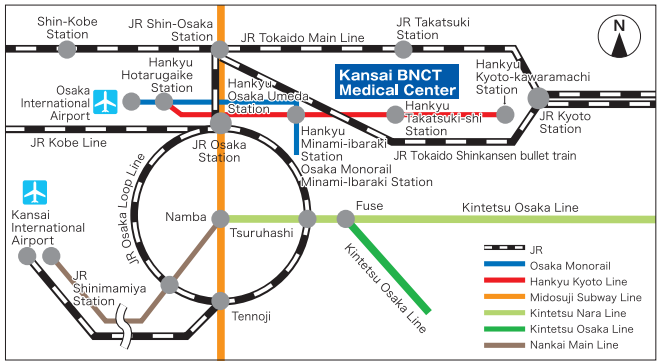
Boron neutron capture therapy (BNCT) is a treatment technique that destroys cancer cells by means of a nuclear reaction between boron atoms and neutrons. When a boron atom absorbs neutrons highly efficiently, it emits radiation that only travels the distance of about one cell in diameter. As a result, BNCT selectively destroys boron-accumulating cancer cells from the inside, without injuring nearby non-cancerous cells.



Medical facilities for BNCT

Osaka Medical and Pharmaceutical University opened a center equipped with the latest medical equipment for BNCT in June 2018, and is promoting the spread and further development of BNCT.

Osaka Medical and Pharmaceutical University **Kansai BNCT Medical Center**
2-7 Daigaku-machi, Takatsuki-shi, Osaka Prefecture 569-8686 (at Osaka Medical and Pharmaceutical University)
Phone: +81-72-683-1221 (college operator) Fax: +81-72-684-5730



Access by Tokaido / Sanyo Shinkansen bullet train

- Alight at "Shin-Osaka" Station and change to JR Tokaido Main Line (JR Kyoto Line) in the direction of Kyoto. Alight at "Takatsuki" Station. **Travel time: approximately 10 minutes (by special rapid or shin-kaisoku)**
- Alight at "Kyoto" Station and change to JR Tokaido Main Line (JR Kyoto Line) in the direction of Kyoto. Alight at "Takatsuki" Station. **Travel time: approximately 12 minutes (by special rapid or shin-kaisoku)**

Access From Osaka International(Itami)Airport

- Take the Osaka Monorail at "Osaka-Airport" Station and alight at "Minami-Ibaraki" Station. Change to Hankyu Kyoto Line "Minami-ibaraki" Station towards Kyoto-kawaramachi and get off at "Takatsuki-shi" Station.
Travel time : approximately 55 minutes

Access from Kansai International Airport

- Change to JR Tokaido Main Line (JR Kyoto Line) in the direction of Kyoto and get off at "Takatsuki" Station.
Travel time : approximately 90 minutes
- Access by airport limousine bus (to JR Ibaraki Higashiguchi (east exit) via Hankyu Ibaraki Higashiguchi) . Alight at "Hankyu Ibaraki Higashiguchi." Change to Hankyu Kyoto Line "Ibaraki-shi" Station towards Kawaramachi and alight at "Takatsuki-shi" Station.
Travel time : approximately 100 minutes

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With cooperation from: BNCT review meeting
(Secretariat stakeholders: Institute for Integrated Radiation and Nuclear Science, Kyoto University; Kansai BNCT Medical Center; Kumatori Town Office; and Osaka Prefectural Government)

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BNCT

Boron Neutron Capture Therapy

Introducing an innovative radiation therapy that selectively destroys cancer cells, making it gentle on the body

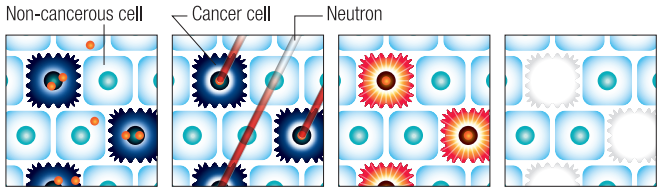
BNCT is delivering new potential in cancer treatment.

Boron neutron capture therapy

BNCT is a new therapy technique that utilizes neutrons and a boron agent that is readily absorbed by cancer cells.
Since it selectively destroys cancer cells, it can be used to treat cancers that are considered difficult to treat with conventional radiation therapy.
In addition to proving its effectiveness in the treatment of cancer that has relapsed after radiation therapy, it also serves to expand the range of treatments available to patients.

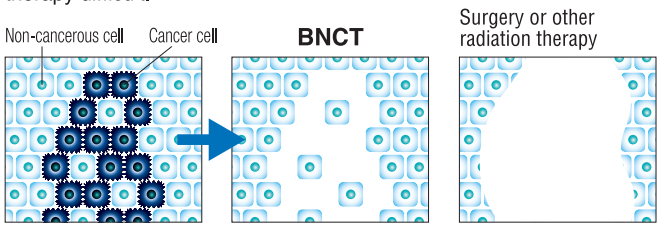
1 BNCT selectively destroys cancer cells using a boron agent.

Unlike conventional radiation therapy, in which the diseased area is irradiated so as to destroy cancer cells from the outside, BNCT utilizes a reaction between the boron atoms and neutrons to selectively destroy cancer cells from the inside. The effectiveness of the radiation in killing cancer cells created by this reaction is so great that treatment generally requires only a one-time irradiation.



2 The technique may prove to be effective in treating cancers that have recurred following radiation treatment as well as difficult-to-treat infiltrative cancers.

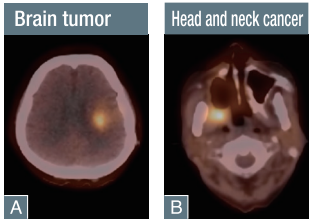
Since BNCT causes less damage to non-cancerous cells than conventional radiation therapy, the technique can be used to treat areas that have already undergone radiation therapy. Furthermore, it can be used to treat infiltrative cancers in which complex coexistence of non-cancerous cells and cancer cells make treatment by surgery or other radiation therapy difficult.



Unlike surgery or other radiation therapy, BNCT selectively destroys cancer cells. As a result, the effect on non-cancerous cells is predicted to be minor, even when treating infiltrative cancers in which cancer cells and non-cancerous cells are co-existing.

3 The effectiveness of the treatment can be predicted by a PET study in advance.

The effect of BNCT can be predicted by investigating in advance how much boron drug accumulates in cancer cells. Since a PET study predicts the likelihood of a successful outcome of BNCT treatment, the stress of patients is lowered.



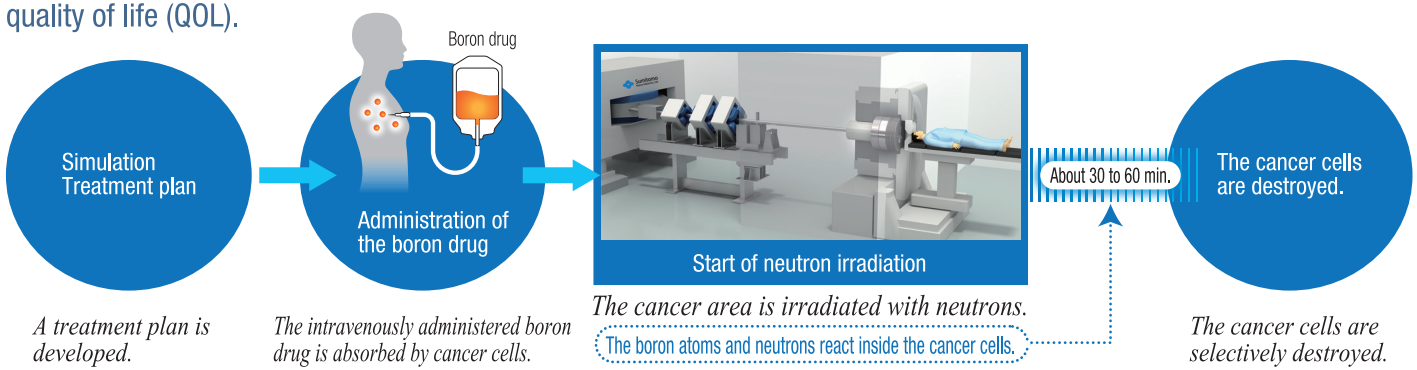
Source: Osaka University

A Since tumor cells absorb the boron drug about six times more than do non-cancerous cells, this result supports a judgement that BNCT can be effective.

B After conventional radiotherapy, a FBPA-PET examination was conducted to evaluate the effectiveness of treatment. Through this test, the doctor was able to accurately assess the position and size of the remaining tumor and judged that additional treatment with BNCT would be effective.

Treatment process

The treatment takes about 30 to 60 minutes and imposes little stress on the body and can be expected to improve quality of life (QOL).



A treatment plan is developed.

The intravenously administered boron drug is absorbed by cancer cells.

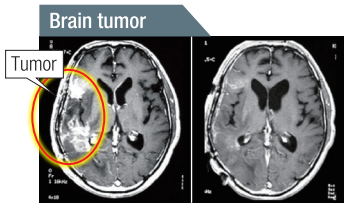
The cancer area is irradiated with neutrons.

The boron atoms and neutrons react inside the cancer cells.

The cancer cells are selectively destroyed.

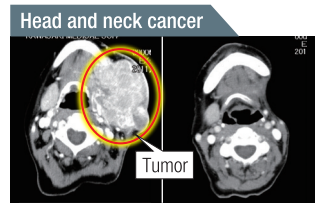
Cases where the efficacy of BNCT has been reported in clinical research

Based on clinical research, clinical tests are being carried out to treat brain tumors, and head and neck cancer.



Source: Osaka Medical and Pharmaceutical University

The tumor began to shrink about two days after BNCT. This treatment is considered to be effective for brain tumors, particularly malignant gliomas.



Source: Kawasaki Medical School

In this case, in which the cancer had recurred on the left side of the neck following surgery, the cancer completely disappeared six months after BNCT. As such, BNCT is considered to be effective for recurrent head and neck cancer.

Currently, the disease covered by insurance is "head and neck cancer." Other treatments cannot be received as general medical treatment.

A research network that is the best of its kind in the world

In the Kansai area, including Osaka, there are many institutes that bring together the four elements necessary for BNCT (an accelerator neutron source/irradiation system, boron chemistry and drugs, nuclear medicine for PET, and experts with specialized knowledge). These institutions are leading the world in BNCT research, working closely together to pursue innovative research and development programs.

- Institute for Integrated Radiation and Nuclear Science, Kyoto University
  http://www.rri.kyoto-u.ac.jp
- Osaka University
  https://www.med.osaka-u.ac.jp/pub/tracer/about/research/pet_02.html
- BNCT Research Center, Osaka Metropolitan University
  http://www.bnct.osakafu-u.ac.jp