

Optimal irradiation intervals in stereotactic radiotherapy for patients with brain metastases

Submission date 22/11/2022	Recruitment status Recruiting	<input type="checkbox"/> Prospectively registered <input checked="" type="checkbox"/> Protocol
Registration date 23/11/2022	Overall study status Ongoing	<input type="checkbox"/> Statistical analysis plan <input type="checkbox"/> Results
Last Edited 17/03/2026	Condition category Cancer	<input type="checkbox"/> Individual participant data <input checked="" type="checkbox"/> Record updated in last year

Plain English summary of protocol

Background and study aims

Radiobiological daily changes within tumors are considered to be quite different between stereotactic radiotherapy (SRT) (e.g., 50 Gy in 4 fractions) and conventional radiotherapy (e.g., 60 Gy in 30 fractions). Most tumors have hypoxic tumor cells which are radioresistant and can cause a recurrence after radiotherapy. During the period of daily irradiation, surviving hypoxic cells within tumor reoxygenate and get more sensitive to successive irradiation. From the data of radiobiological basic experiments, we consider that reoxygenation continues more than three days after single high-dose irradiation. We think that longer intervals more than 24-hour may be necessary to allow more reoxygenation to occur and enhance therapeutic efficacy of SRT. We aim to assess the optimal interval of irradiation in SRT and compare outcomes of daily irradiation with irradiation at two- to three-day intervals in SRT for patients with one to five brain metastases.

Who can participate?

Patients aged 20 or older with one to five brain metastases, less than 3.0 cm diameter, and Karnofsky Performance Status greater than or equal to 70.

What does the study involve?

A total of 70 eligible patients will be enrolled. After stratifying by the number of brain metastases (1, 2 vs. 3–5) and diameter of the largest tumor (<2 cm vs. ≥2 cm), we randomly assigned patients (1:1) to receive daily irradiation (Arm 1), or irradiation at two- to three-day intervals (Arm 2). Both arms are performed with total dose of 27-30 Gy in 3 fractions.

What are the possible benefits and risks of participating?

No particular benefit is expected from participating in this clinical trial. With regards to risks of participating, mini mental status examination (MMSE) needs to be evaluated every 6 months after SRT.

Where is the study run from?

Participating institutions will be six academic and four general hospitals in Japan. One of the

participating institutions is Nagoya City University Hospital (Japan), and the Principal Investigator, Dr Natsuo Tomita is based there. In each participating institution, the institutional review board will approve the protocol before patient enrollment occurred.

When is the study starting and how long is it expected to run for?
August 2022 to September 2028

Who is funding the study?
Hori Science and Arts Foundation (Japan)
Grant-in-aid for research on radiation oncology of JASTRO 2021-2022 (Japan)
Japan Society for the Promotion of Science (JSPS) KAKENHI

Who is the main contact?
Dr Natsuo Tomita, c051728@yahoo.co.jp

Contact information

Type(s)

Principal investigator

Contact name

Dr Natsuo Tomita

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Additional identifiers

Protocol serial number

UMIN000048728

Study information

Scientific Title

Daily irradiation versus irradiation at two- to three-day intervals in stereotactic radiotherapy for patients with 1-5 brain metastases: a multicenter randomized phase II trial

Study objectives

Local control is superior in irradiation at two- to three-day intervals than in daily irradiation in stereotactic radiotherapy for patients with one to five brain metastases.

Ethics approval required

Old ethics approval format

Ethics approval(s)

Approved 02/08/2022, IRB of Nagoya City University Graduate School of Medical Sciences (Nagoya City University Hospital, 1 Kawasumi, Mizuho-cho, Mizuho-ku, Nagoya, Aichi, 467-8601, Japan; no telephone number provided; irb_jimu@med.nagoya-cu.ac.jp), ref: 46-22-0004

Study design

Multicenter open-label randomized phase II trial

Primary study design

Interventional

Study type(s)

Treatment

Health condition(s) or problem(s) studied

One to five brain metastases with less than 3.0 cm diameter.

Interventions

In stereotactic radiotherapy (SRT) of 27-30 Gy in three fractions for patients with one to five brain metastases with less than 3.0 cm diameter, daily irradiation is used in the standard arm while irradiation at two- to three-day intervals is performed in the experimental arm. Both arms are performed daily with a total dose of 27-30 Gy in 3 fractions (9-10 Gy per fraction). Arm 1 (standard arm): consecutive daily irradiation; total SRT duration, 3 days. Arm 2 (experimental arm): irradiation at two- to three-day intervals; total SRT duration, 8 days.

The study will employ a 1:1 randomization between Arm 1 (consecutive daily irradiation) and Arm 2 (irradiation at two- to three-day intervals). Patients will be stratified by (1) maximum diameter (≤ 2 cm vs. > 2 cm) among their brain metastases and (2) number of brain metastases (1, 2 vs. 3-5). Random assignment of treatment groups is centrally managed using the web-based system of Mujinwari (Iruka System Ltd., Tokyo, Japan).

Intervention Type

Procedure/Surgery

Primary outcome(s)

Intracranial local control rate (IC-LC), defined as intracranial local control at initially treated sites at 12 months

Key secondary outcome(s)

1. Intracranial progression-free survival (IC-PFS), defined as intracranial PFS at initially treated and new sites at 12 months (and 6 and 24 months).
2. Overall survival (OS), defined as the time from the date of randomization to death from any cause at 12 months (and 6 and 24 months).
3. Toxicity, assessed by the National Cancer Institute Common Terminology Criteria for Adverse Events version 5.0 at 12 months (and 3 and 24 months).
4. Non-worsening of Karnofsky performance status (KPS), defined as the time from randomization to decline of KPS from any cause.

5. Non-worsening of mini mental status examination (MMSE), defined as the time from randomization to decline of MMSE from any cause.

Completion date

01/09/2028

Eligibility

Key inclusion criteria

1. Age 20 years or older.
2. Karnofsky Performance Status (KPS) > or = 70.
3. Total number of 1-5 brain metastases by enhanced magnetic resonance imaging (MRI).
4. Brain metastases with less than 3.0 cm diameter by enhanced magnetic resonance imaging (MRI).
5. Willing to provide informed consent.

Participant type(s)

Patient

Healthy volunteers allowed

No

Age group

Mixed

Lower age limit

20 years

Upper age limit

110 years

Sex

All

Total final enrolment

0

Key exclusion criteria

1. Histological type of the primary site is lymphoma, small cell lung cancer, and germ cell tumor.
2. Metastases of the brainstem.
3. Meningeal carcinomatosis.
4. History of whole brain radiation therapy (WBRT) or substantial overlap with a previously treated radiation volume.
5. Surgical history for BM.
6. Difficult to be enrolled to the study by reason of insanity.
7. Inability to use enhancing agent for MRI due to low renal function or allergy.
8. In pregnancy or with expectation of pregnancy
9. Physician dismiss as subject of the study.

Date of first enrolment

01/09/2022

Date of final enrolment

31/03/2027

Locations

Countries of recruitment

Japan

Study participating centre

Nagoya City University Hospital

Japan

467-8601

Study participating centre

Kitasato University School of Medicine

Japan

252-0329

Study participating centre

Gifu University Hospital

Japan

501-1194

Study participating centre

Aichi Medical University

Japan

480-1195

Study participating centre

Nagoya City University East Medical Center

Japan

464-8547

Study participating centre

Nagoya City University West Medical Center

Japan

462-8508

Study participating centre
Ichinomiya Municipal Hospital
Japan
491-8558

Study participating centre
Okazaki City Hospital
Japan
444-8553

Study participating centre
Nagoya Ekisaikai Hospital
Japan
454-8502

Study participating centre
Japanese Red Cross Aichi Medical Center Nagoya Daini Hospital
Japan
466-8650

Study participating centre
Seirei Hamamatsu General Hospital
Japan

Study participating centre
Gifu Prefectural General Medical Center
Japan

Sponsor information

Organisation
Nagoya City University Hospital

ROR

<https://ror.org/02adg5v98>

Funder(s)

Funder type

Charity

Funder Name

Hori Science and Arts Foundation

Funder Name

Grant-in-aid for research on radiation oncology of JASTRO 2021-2022

Funder Name

Japan Society for the Promotion of Science (JSPS) KAKENHI

Results and Publications

Individual participant data (IPD) sharing plan

The datasets generated during and/or analysed during the current study will be available upon request from Natsuo Tomita (e-mail: c051728@yahoo.co.jp).

IPD sharing plan summary

Available on request

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Protocol article		05/12/2026	17/03/2026	Yes	No