

# Evaluation of whole-brain radiotherapy in patients with non-lung cancer brain metastases at Viet Tiep Friendship Hospital from 1/2022 to 12/2023

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## ABSTRACT

**Objective:** To evaluate the outcomes of whole-brain radiotherapy (WBRT) in patients with brain metastases from non-lung cancer at Viet Tiep Friendship Hospital between January 2022 and December 2023. **Methods:** This study described and combined prospective and retrospective analyses of 124 patients with brain metastases from non-lung cancer treated with WBRT at a dose of 30 Gy/10 sessions. **Results:** Patients with brain metastases typically originate from breast or colorectal cancer. Symptomatic improvement was achieved in 70-80% of cases, physical response in 55-70%, and imaging response in 62.07%. Response rates were significantly influenced by the extent of brain metastasis, overall health status, and progression of the primary tumor or other metastatic sites. Side effects were mild and easily managed. **Conclusion:** WBRT for brain metastases is a safe method for improving overall survival and significantly reducing symptoms. However, the extent of brain metastasis, KPS score, and control of the primary tumor significantly affected the response rates and survival times.

**Keywords:** Brain metastases, non-lung cancer, Whole-brain radiotherapy

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## INTRODUCTION

Brain metastases from cancer present a major challenge in oncology, occurring in 20-40% of adult cancer patients, with 20-40% of these cases involving multiple lesions. The biological mechanisms of brain metastasis remain unclear and involve complex interactions between invasive tumor cells and the blood-brain barrier. Various cancers can metastasize to the brain, with origins in the lung (36-45%), breast (20-25%), skin (10-15%), colorectal (5-10%), kidney, prostate (5%), ovary, soft tissue, and unknown primaries (2%).

Brain metastases from non-lung cancers account for approximately 55-64% of cases. These metastases lead to the death of nearly 170,000 Americans annually. Without treatment, the median survival of patients with brain metastases is typically 3-6 months. WBRT is a straightforward and cost-effective treatment that significantly improves patients' quality of life. Combining WBRT with other treatments for primary tumor control shows promise for extending overall survival.

Since October 2016, the Oncology Center at Viet Tiep Friendship Hospital has been treating brain metastases with radiotherapy. This study aimed to “evaluate the outcomes

of WBRT for patients with brain metastases from non-lung cancers treated at the hospital from January 2022 to December 2023”.

### METHODS

**Subjects:** This study included 124 patients diagnosed with cancer and brain metastases who underwent WBRT at a dose of 30 Gy.

**Methods:** This was a descriptive study with a longitudinal follow-up.

### Inclusion Criteria:

Histologically confirmed cancer and brain metastasis

Glasgow Coma Scale >12, 1-3 brain metastasis lesions

Completed full radiotherapy regimen

Consent to participate in the study

KPS > 60%

### RESULTS

The mean age was  $58.46 \pm 3.59$  years (minimum 41, maximum 73). Patients aged  $\geq 50$  years accounted for 87.1% of the study population, with the highest proportion (38.7%) in the 50-60 age group. The male-to-female ratio was 2.75:1.

*Adenocarcinoma was the most common histology (82.76%) and primarily originated in the breast and colon. Squamous cell carcinoma originates in the rectum and esophagus. There was one case of soft tissue cancer and one of melanoma. (Table 1)*

**Table 1. Histopathological Classification**

Histopathology	%
Adenocarcinoma	79,31%
Squamous cell carcinoma	13,79%
Other	6,9%
Primary tumor	%
Breast	41,38%
Colon	34,48%
Rectum	13,79%
Esophagus	3,45%
Soft tissue	3,45%
Skin	3,45%
Stomach	3,45%

Most patients had a KPS of > 70% (62.07%), indicating better completion of treatment. (Table 2)

**Table 2. KPS Score**

KPS Score	%
PS < 60%	13,79%
PS 60-70%	24,14%
PS > 70%	62,07%

The majority (74.8%) of patients had  $\geq 2$  metastases. Patients with a single lesion often have larger lesions (>4 cm) or poor health status, precluding surgery or radiosurgery.

All the patients experienced headaches and dizziness. The most common physical symptoms were hemiparesis (63.7%) and speech disorder (62.9%). (Table 3)

**Table 3. Common Symptoms**

Symptoms	n	%	
Functional Symptoms	Headache	124	100%
	Dizziness	112	90,3%
	Nausea	102	82,2%
	Balance loss	89	71,8%
	Memory loss	56	45,1%
Physical Symptoms	Hemiparesis	79	63,7%
	Seizures	67	54,0%
	Facial palsy	56	45,1%
	Visual impairment	45	36,3%
	Speech disorder	78	62,9%

After brain radiotherapy 70-80% of the patients experienced symptom relief, with 25-38% achieving complete symptom resolution. The motor response was the highest, with 70% of the patients recovering from hemiparesis. (Table 4)

**Table 4. Functional response rate after brain radiotherapy**

Symptom	Complete Response	Partial Response	No Response
<b>Functional response</b>			
Headache	37,93%	48,28%	13,79%
Dizziness	34,48%	41,38%	24,14%
Nausea	38,46%	42,31%	19,23%
Balance loss	26,09%	43,48%	30,43%
Memory loss	23,81%	47,62%	28,57%
<b>Physical Response</b>			
Hemiparesis	26,09%	43,48%	30,43%
Seizures	22,22%	44,44%	33,34 %
Facial palsy	23,08%	46,15%	30,77%
Visual impairment	18,18%	36,36%	45,46%
Speech disorder	25%	40%	35%

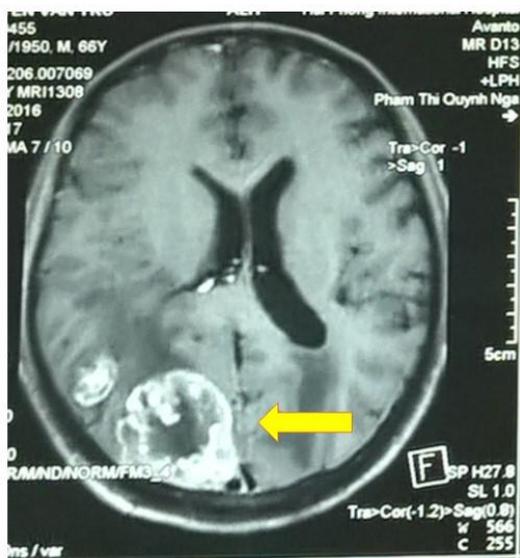
The radiology response rate was 62.07%. (Table 5 and Figure 1)

**Table 5. Response Rates according to radiology**

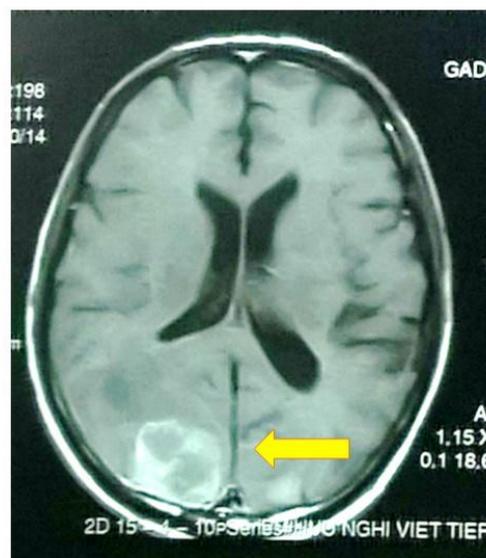
Response on CT	%
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No tumor on imaging	20,69%
Tumor <50% of initial size	24,14%
Tumor size 50%–75% of initial size	17,24%
Tumor >75% of initial size or progression	37,93%

### Before treatment



### After treatment



**Figure 1.** The decrease in tumor size on CT after radiotherapy (Yellow arrow)

Regarding adverse effects, 24.14% of the patients experienced hearing loss, and 62.07% experienced hair loss. Other side effects, such as fatigue (37.93%), dizziness (41.38%), and insomnia (34.48%), were also noted but were generally mild and manageable with medical treatment.

The survival rate immediately after treatment was very high at 100% and remained relatively good at 68.96% after six months. (Table 6)

**Table 6.** Progression-free Survival Rates and Mortality Rate

Time	Percentage of Patients Alive Without Disease Progression	Cumulative Mortality Rate
After 2 months	89,65%	10,35%
After 4 months	79,31%	20,69%
After 6 months	68,96%	31,04%

## DISCUSSIONS

In our study, clinical symptoms improved by 60-80%, with 20-30% showing no change. This rate is related to disease status (size, location, and number of brain

metastases), overall condition, and other metastatic sites. Patients with large tumors, multiple tumors, and poor overall health generally show less improvement. We observed that patients with glandular

carcinoma generally had better responses than those with other types; however, the number of patients was still small, so further analysis is needed.

The rate of complete clinical response after treatment was 20.69% for patients with small brain tumors (<2 cm) and no metastases in other organs. For patients in a good condition without severe organ metastases, receiving a full dose of radiation is a favorable prognostic factor. Partial response was mainly observed in patients with multiple metastases, tumors >2 cm, partial reduction in tumor size or no increase after 3 months of treatment, no new metastases, and reduced cerebral edema. This result is significant because it saves costs for patients compared to gamma knife radiation for brain metastases.

Our study found that deaths were usually due to complications from primary tumors and metastases to other organs rather than complications from brain metastases.

The side effects of whole-brain radiation therapy at a dose of 30 Gy are generally mild, and patients can tolerate the treatment to completion. This has been recognized by many authors, both domestically and internationally, as a favorable prognostic factor for whole-brain radiation therapy.

## CONCLUSIONS

Whole-brain radiation therapy using a linear accelerator significantly improved the quality of life of patients with brain metastases, with noticeable improvements in both functional and physical symptoms. The side effects of a 30 Gy dose are generally mild and manageable. Whole-brain radiation therapy has contributed to improved overall survival in patients with brain metastases that do not originate from lung cancer.

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## CONFLICT OF INTERESTS

The authors declare that there is no conflict of interest regarding the publication of this article.

## SOURCES OF FUNDING

None.

## CONSENT

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

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