Outcome and follow up

MRI scans were obtained six weeks post treatment (figure 7). There was no evidence of disease at the three sites treated, indicating that a complete clinical response was achieved. There were no significant medium term side effects and the patient was reported to be well at six months post radiotherapy.

Discussion and conclusions

Brain metastases are the most common malignant condition of the brain parenchyma. With improving modern treatment options, such as systemic chemotherapy, the role of using systematic chemotherapeutic approaches, such as whole brain radiotherapy (WBRT) and SRS for the treatment of brain metastases, has also been successfully applied. Treatment options, such as whole brain radiotherapy (WBRT) and SRS for the treatment of brain metastases. Overall, medium term prognosis: best supportive care of the lesion(s), the number of lesions and the patient’s mental state.

Management of such patients is dependent on the site (WBRT) and SRS for the treatment of brain metastases. Using a single isocenter and nine non-coplanar VMAT arcs, a total treatment delivery time of just 20 minutes could be achieved. This single isocenter approach has been used frequently at this institution for hypofractionated irradiation of multiple brain metastases and the use of two to three isocenters for greater than ten brain metastases has also been successfully applied.

References


About ELEKTA

ELEKTA’s purpose is to invent and develop effective solutions for the treatment of cancer and brain disorders. Our goal is to help our customers deliver the best care for every patient. Our oncology and neurosurgery tools and treatment solutions. It is not intended to promote or exclude any particular approach should be determined by a qualified medical practitioner.

Consultant radiation oncologist: Dr. Yang Tuck Lee
Medical physicist: Mr. Tay Kiat Koon

In conclusion, the combination of the Monaco treatment planning system and the reported speed, accuracy and low transmission of the Agility 160-leaf MLC allowed the successful linac-based SRS treatment of multiple brain metastases, two of which had close proximity to the brainstem. Using a single isocenter and nine non-coplanar VMAT arcs, a total treatment delivery time of just 20 minutes could be achieved. This single isocenter approach has been used frequently at this institution for hypofractionated irradiation of multiple brain metastases and the use of two to three isocenters for greater than ten brain metastases has also been successfully applied.

Disclaimer

This case study is based on the experience and expertise of medical experts, as a result it is an illustration of an innovative use of Elekta technology. It is not intended to promote or exclude any particular approach should be determined by a qualified medical practitioner.

The company is listed on NASDAQ OMX Stockholm.
Patient demographics
A 63-year-old female, treated in 2011 for stage 4 non-small cell lung cancer (NSCLC) with C-spine and sacral metastases, presented with giddiness in December 2011.

Treatment planning and delivery system
- Leksell Stereotactic System® cranial immobilization
- Monaco® treatment planning system
- Elekta Synergy® with Agility™ MLC
- XVI imaging tools

Patient history and diagnosis
A 63-year-old female patient was previously diagnosed with stage 4 NSCLC in July 2011. She received radiation therapy initially to C-spine and sacral metastases (20 Gy delivered in ten fractions) with good response. The patient also presented well to systemic chemotherapy and was progression free from December 2011.

In December 2012, the patient presented with giddiness. MRI investigation revealed three brain metastases located in the cerebellum, 10 mm, 8 mm and 7 mm in diameter. A single isocenter was placed as equidistant as possible from the metastases and a single isocenter was chosen. The Agility MLC was chosen for this treatment because of its ability to interdigitate, which is important for treating multiple targets at the same time, and due to the speed and accuracy of the MLC. Interdigitation allows treatment of multiple targets at the same time, and due to the rapid leaf speed and accuracy of this MLC, a steeper dose gradient could be achieved.

A single isocenter, nine partial arc VMAT plan was created on Monaco VMAT as a multiple target solution (figure 3). The isocenter was placed as equidistant as possible to all three targets. Margins were limited to 2 - 2.5 mm, below). The isocenter was placed as equidistant as possible to all three targets. Margins were limited to 2 - 2.5 mm, in the cerebellum (figure 1). Transverse cuts (1.3 mm) post contrast MRI scan was co-registered with the CT scan (non contrast) for target registration accuracy (figure 6).

A fine cut (1.3 mm) post contrast MRI scan was co-registered with the CT scan (non contrast) for target registration accuracy (figure 6). A gamma analysis of less than 3%/3 mm was achieved.

The dose prescribed for each lesion is shown in table 1.

Treatment delivery
Cone Beam CT (CBCT) verification was performed using Elekta XVI Intuity, prior to treatment delivery to confirm positioning accuracy (figure 6). The multiple target, single isocenter SRS/VMAT plan (nine non coplanar arcs) was delivered using an Elekta Synergy linear accelerator with the Agility MLC. Due to the rapid leaf speed and accuracy of this MLC, all three brain metastases were treated in a total treatment delivery time of 25 minutes.

The patient tolerated the treatment well, with no acute or subacute reactions of note recorded.

Table 1. Dimensions and dose for each brain lesion

<table>
<thead>
<tr>
<th>Lesion</th>
<th>Dose prescribed</th>
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<tbody>
<tr>
<td>1</td>
<td>20 Gy</td>
</tr>
<tr>
<td>2</td>
<td>18 Gy</td>
</tr>
<tr>
<td>3</td>
<td>16 Gy</td>
</tr>
</tbody>
</table>

Figures:
1. MRI scans showing three brain metastases in the cerebellum. Lesion 1 - left. Lesion 2 - middle. Lesion 3 - right.
2. Leksell Stereotactic System® cranial immobilization
3. Monaco® treatment planning system
4. Elekta Synergy® with Agility™ MLC
5. XVI imaging tools
6. CBCT treatment verification using Elekta XVI Intuity
7. Monaco treatment planning QA using point dose measurements
8. Monaco treatment planning QA using MatriXX 2D fluence measurements
9. Treatment plan created using Monaco VMAT as a multiple target solution
10. Single isocenter, nine partial arc VMAT SRS plan created using Monaco VMAT