REX 6 - YEAR 2022

Incident description

A patient is to be treated with external radiotherapy ('flash' irradiation for pain relief) for two bone metastases: one in the left thumb (8 Gy) and one on the hip (8 Gy). For the thumb, there are 2 treatment fields to be applied: an anterior field (0°) and a posterior field (180°).

For the comfort of the RTT's and for some patients who are difficult to handle, it is possible to place the patient on the treatment table using a tilted laser (and not the ISO laser), by lowering the table. The table is then raised afterwards for treatment. To avoid any confusion, the tilted lasers are red and the ISO lasers are green. Unfortunately, in the treatment room of the machine the patient is to be irradiated with, one of the three ISO lasers (lateral) is red instead of green.

On the day of the treatment, the RTT's position the patient on the lowered table but forget to raise the table when leaving the room. The SSD (skin-to-source distance) is not checked. A doctor must verify the imaging according to the list determining the type of image (and its frequency) to be taken, depending on the region to be treated and the type of treatment applied. In the case of an anterior-posterior treatment of a limb, only one anterior MV-image is requested.

The attending physician is not available, so an assistant checks the image. The limb is correctly positioned but the image is smaller because the distance between the limb and the source is bigger since the table had not been raised. This subtlety is noticed both by the RTT's and the assistant, but they assume it's a "zoom" issue. The assistant therefore authorises the treatment and the 2 treatment fields are administered to the patient, at a bigger distance (+ 30cm) for the anterior field and a smaller distance (- 30cm) for the posterior field. The RTT's realise the error when they return to the treatment console after setting up the patient for the hip treatment. After a check on the camera, they realise that there's a discrepancy between the colours of the lasers.

Root cause analysis

The following root causes have been identified:

Technical factors:

- The treatment machine is not equipped with a delta couch positioning system.
- For this treatment machine, the lateral ISO laser of the ISO is red instead of green.
- There's no homogeneity of laser colours in the different treatment rooms:
  - Room 1: ISO = Red and Tilt = Green
  - Room 2 and 3: ISO = Green and Tilt = Red
  - Room 4 : ISO = Green and Red and Tilt = Red
- Poor quality of the DRR

Organisational factors:

- SSD verification is no longer carried out in practice since the daily use of 3D imaging.
- The tilt laser is permanently activated.
- Difficult thumb placement without immobilisation.
- Atypical treatment.

Human factors:

The assistant only has experience with CBCT-imaging and not MV images due to an internship at a hospital that only uses CBCT-imaging.

Corrective actions:

1. Revision of the sheet with the standard imaging schemes in radiotherapy and addition of the task "Verify table height by SSD" for various palliative treatments where only a kV- or MV-image is requested. Reminder given to the teams and training to new staff (doctors, RTT's).
2. De-activation of the tilt lasers as long as there is a colour difference. Activation of the tilt lasers is allowed only when necessary.
3. Performance of a study on specific limb immobilisation devices.
4. Creation of a function of "RTT Training Coordinator" and presentation of all atypical treatment plans to the RTT's.
5. Replacement of the treatment machines with no delta couch positioning system in the (near) future.
6. Revision of tolerance values for pre-encoded table positions.
7. Installation of SGRT (Surface Guided Radiation Therapy) on all machines.
8. Systematic training of assistants in MV imaging.
9. Reminder to call the attending physician at the slightest doubt and for help in general (medical physicist, other doctors and so on).
10. Reminder to choose "bone" window reconstruction for a bone target and optimise the creation of the DRR.