RO-ILS
RADIATION ONCOLOGY
INCIDENT LEARNING SYSTEM
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CLARITY PSO
A Patient Safety Organization

RO-ILS CASE STUDY 10

CONTOUR DELINEATION: A CRUCIAL TREATMENT PLANNING PROCESS

Introduction:

Contour delineation is a crucial treatment planning process that involves outlining target(s) and organs at risk (OARs) to guide radiation therapy plans that optimize tumor control and reduce radiation toxicity. Variations in target volume delineation among radiation oncologists is common and can affect patient outcomes.[1-3] Analyses of prospective clinical trials for radiation quality assurance have shown that differences in contours can result in worse treatment-related toxicity and decreased survival.[4-6]

Contours that correctly identify target volumes and OARs are especially important when ablative-type doses are delivered and when the OARs lie adjacent to the target volume. In the abdominal cavity, differentiating target volumes from normal structures can be particularly difficult given the poor soft-tissue contrast offered using CT simulation. Fusion of diagnostic scans may help assist in clarifying anatomy and thus target volume and normal tissue delineation.

Event Overview:

Target contours were drawn for a patient requiring simultaneous integrated boost (SIB) treatment to the pancreas. The tumor was difficult to see, and the gross tumor volume (GTV) was mistakenly contoured in the stomach. When the physicist reviewed contours, they thought the location was incorrect, so they obtained the MRI and diagnostic CT with contrast and fused them together. The radiation oncologist reviewed the scans and agreed the GTV was drawn in the stomach, and the contours were adjusted. If the contours had not been questioned, the patient's stomach would have received 6500 cGy. The physicist commented that pancreatic SIB target contours are not consistent between radiation oncologists at the practice and that more physician collaboration and education may be helpful for these cases.

Contributing Factors:

1. Staff performance
   - The radiation oncologist contoured the target volume using the CT simulation images only. In the abdominal cavity, differentiating target volumes from normal structures can be especially difficult given the poor soft-tissue contrast offered by CT. The radiation oncologist did not request any fusions to help assist them and did not ask another radiation oncologist to review the contours; it is unclear whether the radiation oncologist sought assistance from a radiologist to help identify structures.
2. Intradisciplinary peer review inadequate
   - This error was caught in the planning stage during a peer review between one radiation oncologist and one physicist. However, there was no intradisciplinary peer review involving another radiation oncologist.

Lessons Learned/Mitigation Strategies:

1. Utilization of all available resources.
2. Standardization of contouring processes.
3. Peer review.
4. Adequate safety culture.

Target and normal tissue delineation are best accomplished by using all resources available. In the case of pancreatic cancer, target and OAR delineation is limited on CT simulation, which offers poor soft-tissue contrast. Fusing additional scans (i.e., diagnostic MRI, pancreatic protocol CT abdomen/pelvis and PET-CT) to the CT simulation images prior to contouring may have helped clarify the borders between the target and the stomach in this case. Reviewing volumes with a radiologist may also be of value.

The comprehensive delineation of OARs is crucial to the quality of radiation therapy treatment plans. Standardizing Normal Tissue Contouring for Radiation Therapy Treatment Planning: An ASTRO Consensus Paper is a great resource that provides information regarding specific OARs to be contoured for each disease site.[7] The document contains tables that serve as quality assurance for practices. NRG Oncology contouring atlases are another valuable resource.[8] In addition, for each disease site, it may be helpful to contour structures in the same order (i.e., from easiest to most difficult) and standardize the type of imaging that should be fused prior to contouring. Having a consistent approach improves efficiency and accuracy of treatment plans.

This error was caught in the planning stage during interdisciplinary peer review between one radiation oncologist and one physicist. Intradisciplinary peer review involves having another radiation oncologist check the treating physician's contours (in addition to other aspects of the plan, such as dose). In this case, prospective intradisciplinary peer review could also have caught this error and would have provided an educational opportunity for the treating and reviewing radiation oncologists to learn from each other. Prospective peer review provides a structured opportunity to suggest improvements early, enabling errors to be identified prior to the time-consuming planning process.

Finally, this event shows the importance of a safety culture where staff feel comfortable to bring up concerns and address errors. Leaders play an essential role in creating psychological safety in the workplace and can do so by stressing the uncertainty and interdependence of work, soliciting staff for suggestions and feedback and thanking those who speak up.[9]

SAFETY CHECK

What process improvements could your practice implement to ensure accuracy of contours?

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