IMRT Head and Neck Phantom Irradiations: Correlation of Results with Institution Size
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Purpose:
To analyze the results from 150 irradiations of an IMRT H&N phantom.

Methods and Materials continued:
Criteria for credentialing:
RPC/Iriel dose in PTVs: 0.93-1.07
Distance to agreement in high gradient region near OAR: ≤ 4 mm

This is an example of how the criteria are applied in the head and neck phantom.

Results:
43 irradiations failed to meet one or more of the criteria. 26 of the failures were dose discrepancies measured with TLD. 5 were dose distribution discrepancies measured with radiochromic film and 12 were disagreements in both TLD and film measurements. There was a 33% discrepancy rate in first time irradiations at the institutions with 3 or fewer machines and a 29% rate at the larger institutions. All of the institutions that failed multiple times were smaller institutions.

83 institutions with 3 or fewer machines irradiated the phantom. 27 of the first time irradiations were failures. There were 8 repeat failures. 34 institutions with more than 3 machines irradiated the phantom. 10 of the first time irradiations were failures. There were no subsequent failures in this group.

The following graph shows the passing and failing irradiations separated by the number of physicists per machine. There was a 32% failure rate for institutions employing less than 1 physicist per machine and a 27% failure rate for institutions employing 1 or more physicists per machine.

The following table details results sorted by linear accelerator manufacturer, treatment planning system and IMRT technique.

Conclusions:
Institutions of all sizes are capable of making mistakes in IMRT treatments. Sufficient physics coverage is an important aspect of IMRT quality assurance.

Explanations for Failures
The following are known explanations for some of the failures:
• incorrect output factors in TPS
• incorrect PDD in TPS
• inadequacies in beam modeling at leaf ends
• not adjusting MU to account for dose differences measured with ion chamber
• errors in couch indexing with Peacock system
• setup errors

References

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