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A National Multi-Institutional Survey Of Comprehensive Workflow And Quality Assurance In Cs-131 GammaTile Implants For Intracranial Tumors

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ABSTRACT

This study surveyed clinical practices for **GammaTile®** Cs-131 intracranial brachytherapy across 15 U.S. institutions to characterize inter-institutional variability and identify opportunities for standardization and quality assurance. An anonymous 55-question survey was sent to medical physicists covering personnel involvement, workflows, imaging, contouring, dosimetry, quality assurance, and radiation safety.

Key Findings:

- Medical physicists routinely participate in tile estimation and ordering.
- Pre-operative practices showed notable variability in imaging requirements (T1-weighted MRI required in most centers), tile-count estimation methods (mostly GT lookup table) ordering lead times, and seed-use policies.
- Independent seed strength verification was common, primarily using well chambers or dose calibrators.
- Post-implant resection cavity contouring was nearly universal, but substantial variability existed in delineation methods, imaging protocols (MRI/CT), margin application (0–5 mm), target volume definition, and inclusion of residual enhancing disease.
- Target V100 and D90 reporting were relatively consistent, while organs-at-risk dose reporting and secondary independent TPS dose verification were inconsistent or rare.
- Radiation safety practices were more uniform in some areas (e.g., pregnancy time-outs) but varied in personal protective equipment use and patient release recommendations.

The survey revealed considerable variability in pre-operative imaging/ordering, post-implant planning, and certain quality assurance steps, highlighting key areas where standardization could improve consistency, safety, and quality in GammaTile programs.

Scan the QR code to participate on this survey

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INTRODUCTION

GammaTile® Cs-131 intracranial brachytherapy requires coordinated interdisciplinary efforts across pre-operative imaging, source ordering/verification, intra-operative procedures, post-implant planning, and radiation safety. However, the extent of inter-institutional variability in these practices remains undefined. This study characterizes current practices to identify areas of consistency and variability relevant to quality assurance and standardization.

METHODS AND MATERIALS

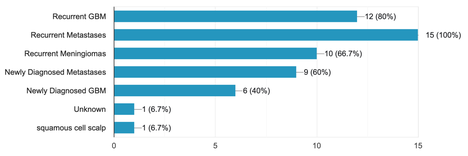
An anonymous 55-question survey addressing personnel involvement, workflow practices, pre- and post-operative imaging, contouring, dosimetry and treatment planning, quality assurance, and radiation safety was distributed to medical physicists at 15 U.S. institutions with active GammaTile programs. Responses were analyzed to characterize current practices.

RESULTS

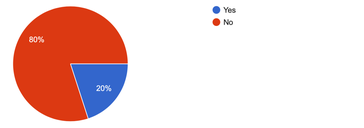
Medical physicists routinely participated in tile estimation and tile order (80%). Pre-operative imaging showed variability: T1-weighted MRI was required in 83.3% of centers, often with 1–2 mm slice thickness. Tile count estimation primarily used the GT lookup table (66.7%). Minimum ordering lead-time policies existed in 86.7% of centers, but allowable seed-use delays varied (0–2 days), and pre-op MRI validity ranged from 7–30 days. Independent seed strength verification occurred in 93.4% of centers using ADCL-calibrated reentrant well chambers (66.7%) or cross-calibrated dose calibrators (26.7%); 58.3% reviewed vendor assay reports. Post-operative resection cavity contouring was nearly universal (91.6%), but substantial variability existed in delineation methods, imaging protocols (MRI/CT), contour naming, target volume definition, margin application (0–5 mm), and inclusion of residual enhancing disease. Target V100, and D90 reporting were relatively consistent, while organs-at-risk dose reporting were inconsistent (25.0% always, 75.0% optional). Secondary independent TPS-dose verification was rare (16.7%). Radiation safety practices showed more consistency (e.g., pregnancy-related time-outs in most centers), and greater variability shown in personal protective equipment use, and patient release recommendations.

RESULTS

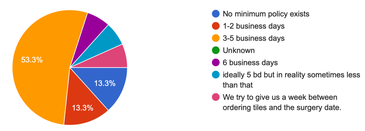
1. Which diagnoses/conditions does your GammaTile program treat? (Select all that apply)
15 responses



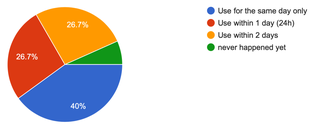
2. Does the medical physicist typically participate in the patient selection for GammaTile treatment?
15 responses



3. Does your center have a policy requiring a minimum number of days between the decision to use GammaTile therapy and the surgery date, to allow for ordering and delivery of the tiles?
15 responses

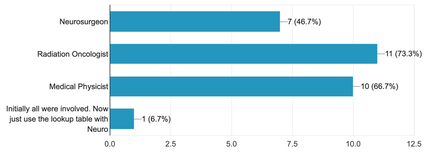


4. In case of an unanticipated delay in surgery what is your allowed time to use the already received seeds for the original implant day.
15 responses

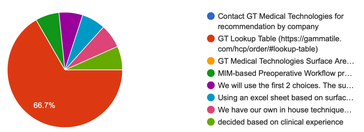


5. Does your center have a policy regarding the maximum time allowed between the preoperative MRI used to determine the number of GammaTiles to order, and the date of surgery?
15 responses

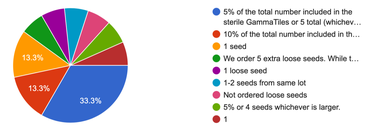
8. Which health care practitioners routinely determine the number of GammaTiles to order? (select all that apply)
15 responses



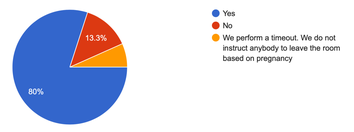
9. What method is routinely used to determine the number of GammaTiles to order? (select all that apply)
15 responses



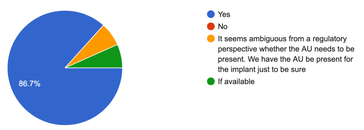
How many loose seeds do you require for source strength verification?
15 responses



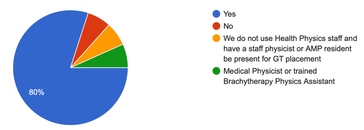
17. Is a radiation timeout performed before tile exposure in the OR to ensure no pregnant staff are present?
15 responses



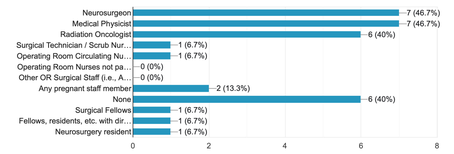
20. Does your center have a policy requiring the physical presence of a radiation oncologist during placement of GammaTiles? If sometimes, select "other" and please explain.
15 responses



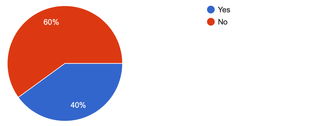
21. Does your center have a policy requiring the physical presence of a medical physicist during placement of GammaTiles? If sometimes, select "other" and please explain.
15 responses



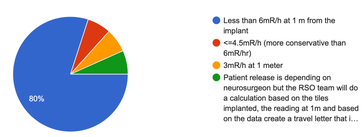
23. Which health care practitioners are routinely required to wear extremity dosimeters, if present during the placement of GammaTiles (i.e., ring badges)? (Select all that apply)
15 responses



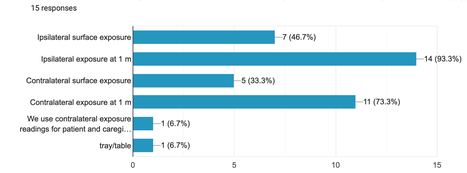
24a. Radiation shielding garments: Does your center routinely require the use of lead aprons?
15 responses



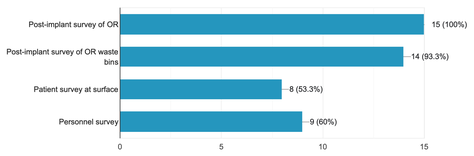
26. What criterion is used to determine if the patient may be released from care of the Authorized User (i.e., released from the hospital)?
15 responses



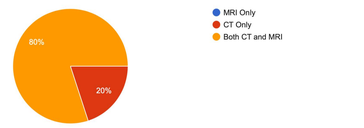
27. Select all additional exposure rate or dose rate patient measurements that are routinely performed postoperatively in the OR and/or before t...scharged from the hospital? (Select all that apply)
15 responses



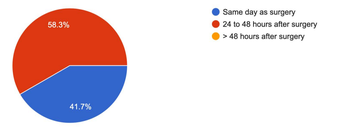
28. Select all additional exposure rate or dose rate area survey measurements that are routinely performed postoperatively in the OR? (Select all that apply)
15 responses



30. Which image sets are required for postoperative dosimetry calculations?
15 responses



When is the post-operative MRI acquired? (Place any comments in "other.")
12 responses



DISCUSSION

This survey of 15 U.S. institutions highlights substantial practice variability in GammaTile® Cs-131 brachytherapy. While physicist participation in tile ordering (75%) and post-implant cavity contouring (92%) are highly consistent, major differences exist in pre-operative imaging protocols, tile estimation methods, margin selection (0–5 mm), target volume definitions, and inclusion of residual disease. Organs-at-risk reporting and secondary dose verification remain inconsistent or rare (17%).Because GammaTile dosimetry is largely determined intraoperatively, such variability may affect treatment reproducibility and quality. Radiation safety practices were more uniform, but opportunities remain for standardization.

CONCLUSIONS

This multi-institutional survey showed substantial variability in pre-operative imaging requirements, ordering policies, post-implant planning practices, and secondary quality assurance. These findings identify clinical aspects where standardization could enhance quality assurance and consistency.

REFERENCES

1. **Clara Ferreira et al.** First clinical implementation of GammaTile permanent brain implants after FDA clearance, Brachytherapy, 2021 May-Jun;20(3):673-685.
2. **Gregory P Penoncello et al.,** Comprehensive Commissioning and Clinical Implementation of GammaTiles STaRT for Intracranial Brain Cancer, Adv Radiat Oncol, 2022 Feb 5;7(4)