Current Status of Technology & Quality Assurance for SRS in India: A Survey

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Objectives: To examine the current status of technology & practices of machine quality assurance (QA) & patient specific quality assurance (PSQA) as regards SRS in India.

Methods: A survey questionnaire comprising of 36 multiple choice questions was designed using Google Forms. In order to allow participants to provide responses that weren't on the list, several questions had the option "Other." The questionnaire was divided into three sections: A) Infrastructure availability /policy/ procedures for SRS treatment; B) treatment planning aspect for SRS & C) QA aspect in treatment delivery for SRS. A survey was sent to Chief/ Sr. Medical Physicist across 220 radiotherapy centers in India on 15 July of 2022 via email. Responses were collected until 31 August of 2022, to access the current status of technology and practices of machine QA & PSQA for SRS delivery. For respondents who did not practice or did have plans to start SRS in the near future, only a few questions were required to be answered.

Results: The survey was undertaken by 105 centres (48%). Of these, 45.7% (48) were performing SRS, 32.4% (34) were planning to start SRS program in near future & the remaining 21.9% (23) were not performing SRS or didn't plan to start the SRS program in near future.
64.6% (31/48) treat up to 50 patients per year, 25% (12/48) treat 50-100 patients per year & 10.4% (5/48) treat more than 100 patients per year. SRS has been used extensively for the treatment of brain mets (93.4%), followed by acoustic neuroma (68.8%) and pituitary tumours (64.6%). The new generation linac with 6 Degree of Freedom couch (68.4%) was the choice of the treatment platform for the SRS. Participation in vendor organised SRS training program was most common response (66.7%) when asked about the training of Radiation Oncologist, Physicist & RTT in SRS. Interestingly, 45.8% (22/48) centers utilized online webinars to learn/ improve SRS practice. The cylindrical micro ion chamber was the detector of choice for 80.4% of the users who performed dosimetry for the small static photon field. 66% of the respondent used RFA to position the detector for small field measurements. 91.1% (41/48) respondent referred published data to ensure the accuracy of TPS measured data for small fields. Most commonly used treatment techniques were VMAT 78.7%, conformal arc 25.5 %, 3DCRT 19.1% & IMRT10.6%. For SRS planning, 6MV FFF photon energy was selected by 78.7% users, 6MV by 31.9% & Co-60 beam (1.25MV) by 8.4% users. A wide range of responses was provided for the selection of prescription isodose line ranging from 40% to 100%, and 45% respondent selected 80% isodose line. To carry out dosimetry of small

static photon beams, 52.2% users referred IAEA TRS 398 document, 45.7% referred IAEA TRS 483 document and Gamma Knife users referred to AAPM TG 178. Regarding the question on machine QA tests performed on the day of SRS treatment, a variety of answers were received. 76.7% users performed Winston –Lutz test while others performed limited QA tests. Nearly all centres (89.4%) reported that they performed PSQA prior to patient treatment, while Gamma knife users did not perform PSQA because no PSQA protocol available for them. There was non-uniformity in setting up the analysis metrics like low dose threshold (LDT), dose difference (DD) & distance to agreement (DTA). Respondent used various combinations of DD & DTA like 1%, 1mm (26.7%); 1%, 2mm (8.9%); 2%,1mm (22.2%); 2%,2mm(35.6%); 4%,1mm (2.2%), 3%,3mm(4.4%) to analyze 3D gamma index. The SRS PSQA findings considered to be passed when gamma index was 90% for 45.7% respondent, 95% for 45.7% respondent and 80% for 8.6% users. A survey revealed that a wide range of detectors & phantoms were used for the PSQA. When asked about departments plan of action in case of PSQA fails, 56.5% users preferred another QA device, 32.6% users informed that second physicist carried out the measurements and 10.9% centres preferred replan & repeat PSQA. Only 6.5% centres gone through an independent credentialing SRS process. Almost all the centres (93.6%) have reported that there is immediate need to carry out postal dose audit for small static photon fields in India by BARC/IAEA/WHO.

Conclusion(s): The linac based SRS is increasing at a rapid pace in India. In near future, more centres will be using this technique to treat intracranial lesions. This survey reveals that variety of SRS QA program is being followed at Indian radiotherapy centres. The study demonstrates that there is a need to have a national protocol for SRS QA so that the treatment outcomes among centres practicing SRS can be compared.