Session Title: “Advances in Permanent Seed/Source Implantation (PSI) Brachytherapy”

Session Duration: 1 Hour
Number of Required Question: 6
Number Speakers: 3

Speaker 1: Firas Mourtada, PhD

Presentation Title: Fundamental of LDR Prostate Program Quality and Safety

Synopsis:
High quality in prostate seed implantation (PSI) has fundamentals physics elements that drive superior patient outcomes. This talk will focus on critical considerations needed to establish a Quality Management Program (QMP) for LDR PSI brachytherapy. This must be established by the brachytherapy team prior to starting a new PSI program. The PSI best of practice procedure workflows and equipment are provided. The established QMP should be a dynamic process with continual improvement cycle. This presentation will include a practical example of QMP implementation to help those wishing to start PSI at their institution.

Question set 1:
1. Increasingly apparent that efficacy surrogates such as biochemical relapse-free survival and morbidity are dependent on implant quality
   a) True
   b) False

Answer: (a)

2. Regardless of the radionuclide used for prostate seed implantation, transrectal ultrasound (TRUS)-guided permanent prostate brachytherapy planning approach recommended by the American Brachytherapy Society is (are):
   a) Preplanning
   b) Intraoperative
   c) Preplanning or Intraoperative
   d) None of the above

Answer: (b)
https://www.americanbrachytherapy.org/consensus-statements/prostate

3. AAPM TG-128 Quality assurance tests for prostate brachytherapy ultrasound systems list several tests and action levels to be done on US units used for LDR prostate implants at which frequency:
Speaker 2: Mark Rivard, PhD
Presentation Title: Advances in Permanent Source Implantation for LDR Brachytherapy of Various Anatomical Sites

Synopsis:
Scientific merits and favorable clinical outcomes of permanent seed or source implantation (PSI) for treating prostate cancer are well established. In addition to the prostate, PSI brachytherapy for cancers in other anatomical sites such as lung, breast, brain, and head & neck demonstrate favorable clinical outcomes. Different radionuclides are used for different anatomical sites, and their clinical efficacies are varied.

Question set 2:
1. The 2016 American Brachytherapy Society Guidelines for using permanent implantation of LDR brachytherapy sources ($^{103}$Pd, $^{125}$I, $^{131}$Cs) for boost or re-irradiation of lung cancers covers what dose range?
   a) 45 to 60 Gy
   b) 50 to 80 Gy
   c) 80 to 100 Gy
   d) 100 to 145 Gy

   Answer: (b)

2. Permanent breast seed implantation is most frequently performed using which radionuclide?
   a) $^{103}$Pd
   b) $^{125}$I
   c) $^{131}$Cs
   d) $^{192}$Ir

   Answer: (a)

3. Permanent brain seed implantation is most frequently performed using which radionuclide?
   a) $^{103}$Pd
   b) $^{125}$I
   c) $^{131}$Cs
   d) $^{192}$Ir

   Answer: (c)


4. What technique is used to improve dose uniformity when using permanent seed implantation for head-and-neck cancers?
   a) alter seed placement with spacers
   b) begin implants with gel injection
   c) cross strands in a “XXX” grid geometry
   d) distribute seeds using a surgical mesh

   Answer: (d)


---

**Speaker 3:** Tarun Podder, PhD  
**Presentation Title:** Latest and Greatest in Permanent Source Implantation  
**Synopsis:**

Scientific merits and favorable clinical outcomes of permanent seed or source implantation (PSI) for treating prostate cancer are well established. Over the years, significant technological advancements such as usage of multimodal imaging for tumor or OAR delineation, model-based dosimetric computation, real-time dynamic dose computation, robot-assisted seed/source delivery, MRI based or MRI-only post-operative dosimetry, automatic or semi-automatic seed identification in various imaging system (CT, MRI, US, etc.), and application of artificial intelligence or machine learning are observed in PSI brachytherapy area. An update on these advanced technologies and their clinical benefits would be interesting to the medical physics community for further advancing the field.
Question set 3:
1. Dose painting or dose escalation (V150) to dominant lesion (DL or GTV) of prostate cancer is clinically attractive technique. What is the reasonable coverage that can be achieved when evaluated in post-operative PSI plans?
   a) <50%
   b) 50-60%
   c) 60-70%
   d) 70-80%
   e) >80%

Answer: (e); over 80% DL/GTV coverage is achievable.

2. Generally, a brachytherapy robotic system has multiple degree-of-freedom (DOF) for placing a catheter or needle at a desired location. What is the minimum number of DOF required to insert a needle in a gland (prostate, breast, liver, lung)?
   a) 1 DOF
   b) 2 DOF
   c) 3 DOF
   d) 5 DOF
   e) 6 or more DOF

Answer: (a); at least 1 DOF is required to push the needle into the prostate gland.

3. “In prostate seed implantation, depositing seeds is more challenging as compared to placing a needle in the prostate while both tasks are performed by a robotic system.”
   a) True
   b) False

Answer: (a); ejecting a seed from spring-loaded seed cartridge and depositing it at a desired location in the prostate is more challenging. A very few robotic systems can perform it automatically.