ESTRO MOBILITY GRANT (TTG) REPORT

Title of the report: Gynaecological Interstitial BT

HOST INSTITUTE:
Medical Physics Unit, Fondazione IRCCS Istituto Nazionale dei Tumori , Milan Italy

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The aim of visit IRCCS Institute was familiarize with interstitial implant techniques in brachytherapy (BT). In particular, MRI-based and US-based treatment planning procedures adopted in cervix BT (intracavitary +interstitial applications) will be investigated. Aim is to possibly implement this treatment modalities at Sina Radiotherapy and Oncology Center.

The second aim is get information about Gated external beam radiotherapy (VMAT) with Calypso electromagnetical transponders.

Brachytherapy

1. Applicators

Venezia: this applicator allows radiation oncologist to access tumors in the parametrium and the vagina with ease. The Advanced Gynecological Applicator allows treatment of patients with IIIB cervical cancer, but also IB, IIA/B, IIIA and stage IVA tumors. Venezia is a good option for advanced stage cervical cancer. The parallel and oblique needle holes in the ovoids and perineal template guide the needles to the desired location.

Utrecht Interstitial applicator: In regular intracavitary treatment, the ovoids act as a template for placing additional needles in the cervical area. Really easy to use applicator and also CT and MR Compatible.

Vienna ring applicator: The interstitial needles provide additional control of dose coverage to the tumor, while sparing the surrounding tissue.

Vaginal Multi Channel Applicator: great coverage of tumor in vagina with sparing OARs.

2. Using MRI to Guide Brachytherapy

The ability of magnetic resonance imaging (MRI) to create exquisite images of the body's soft tissues – and the tumors that arise amid them – is helping physicians at (IRCCS) to precisely shape brachytherapy doses to cervical tumors, while at the same time avoiding exposure to critical healthy organs and tissues.

3. Using ultrasound to Guide Brachytherapy

In IRCCS physicians use transabdominal ultrasound (TAUS) for the placement of the intrauterine tandem and also interstitial gynecological insertion in cervix cancer patients during brachytherapy.

In IRCCS used real time B-mode for measuring the tumor volume and assessing the position of the uterus for tandem and needles implantation for each patient.

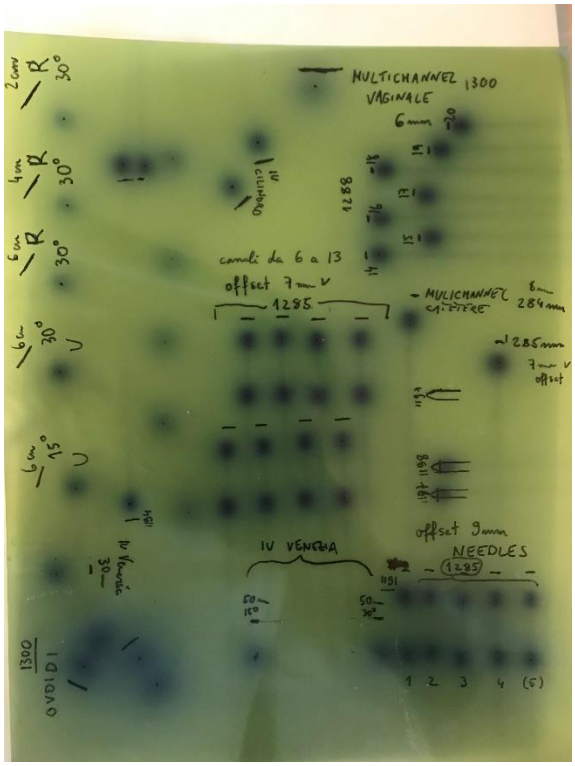
4. Oncentra Treatment Planning System (TPS)

This TPS works with collapsed cone engine and based on TG-43 and also TG-186 AAPM recommendations. Working with TG-186 recommendation able us to discriminates between tissue, air and bone and accounts for tissue heterogeneities.

5. Brachytherapy TPS and applicators Commissioning and verification

For applicator verification we need to verify physical characteristics that contains: channels, maximum source distance , approximate tip length, guiding tube length and also digital library that contains : anchor points definition, tip length, tip position.

For TPS verification we should check several parameters like: Air Kerma strength , g(r) , f(r,ɵ) , calibration data that in IRCCS all data check with TG229 and ESTRO dosimetry calculation working group.

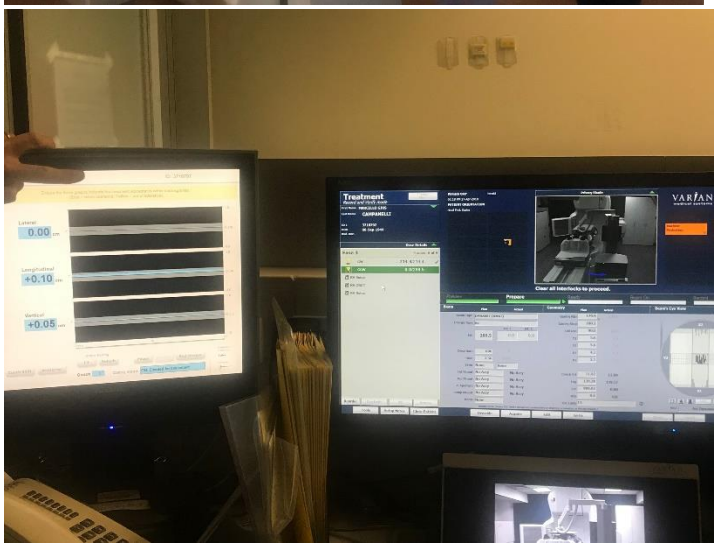


Gated external beam radiotherapy (VMAT) with Calypso

This system detects even slight movement of the target. Tighter treatment margins can help you reduce potential side effects and improve the quality of life for your patients, escalate dose to improve disease control, or accelerate treatments with SBRT.

Calypso System contain several parts:

- Electromagnetic transponder implants
- 4D electromagnetic array detector
- In-room infrared cameras
- 4D tracking station
- Control station



Three transponders each with different frequency were implanted inside the prostate of the patient. Planning CT was taken and transponders were identified in the TPS.

The coordinates of transponders were then recorded and input into the Calypso 4D tracking station.

Couch shift along the lateral, longitudinal, and vertical axes is determined in Calypso system by comparing the planned and measured coordinates of the three transponders. Calypso switches to tracking mode to monitor the real-time target motion. Radiation delivery pauses when the target moves outside the clinician-defined threshold. Radiation delivery resumes when the target is within the motion.