Session 4
Radiation protection of patients, staff and the public during therapeutic use of sealed and unsealed radioactive sources
Summary of Contributed Papers

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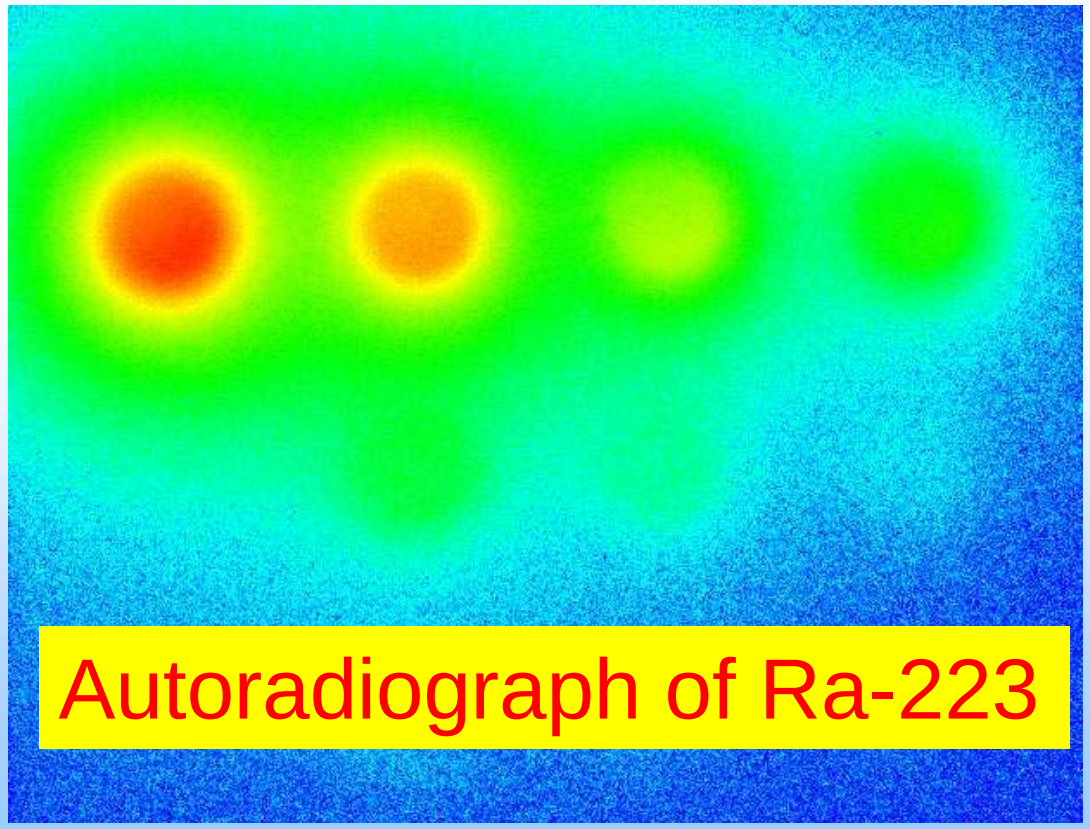
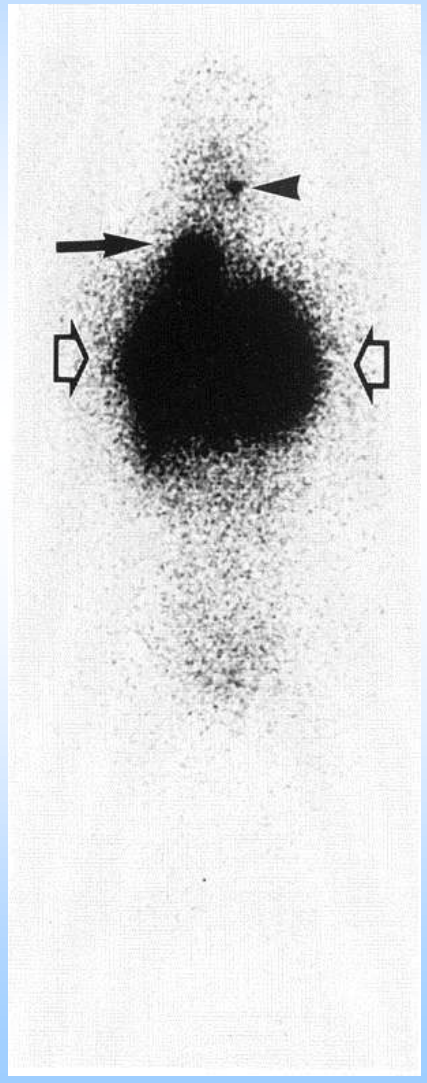
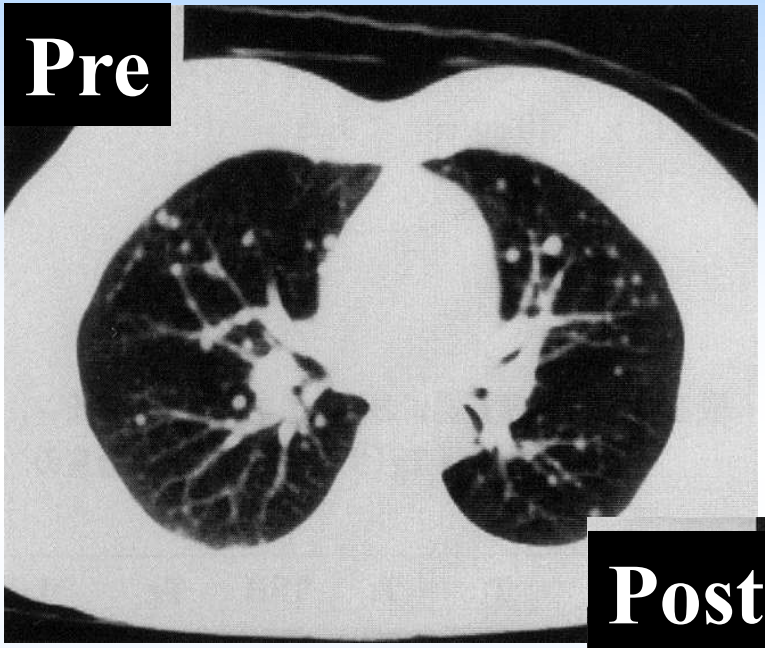
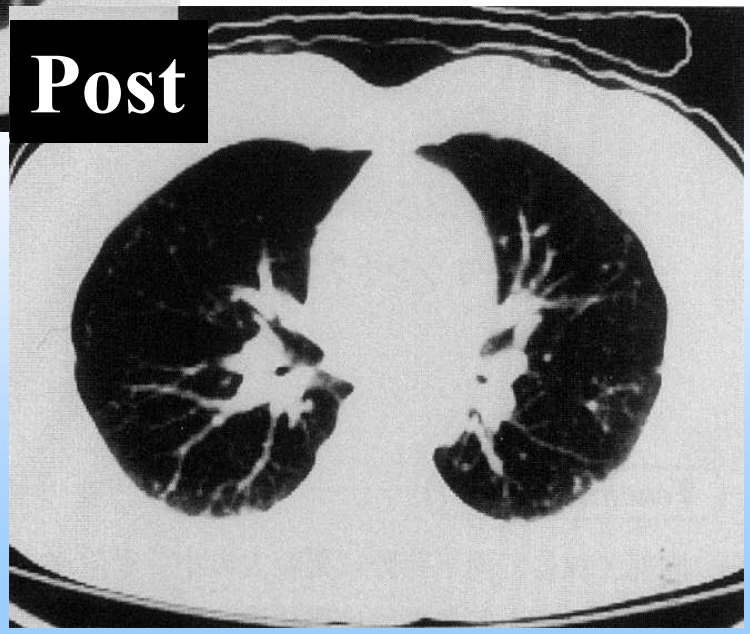


^{131}I therapy for thyroid cancer





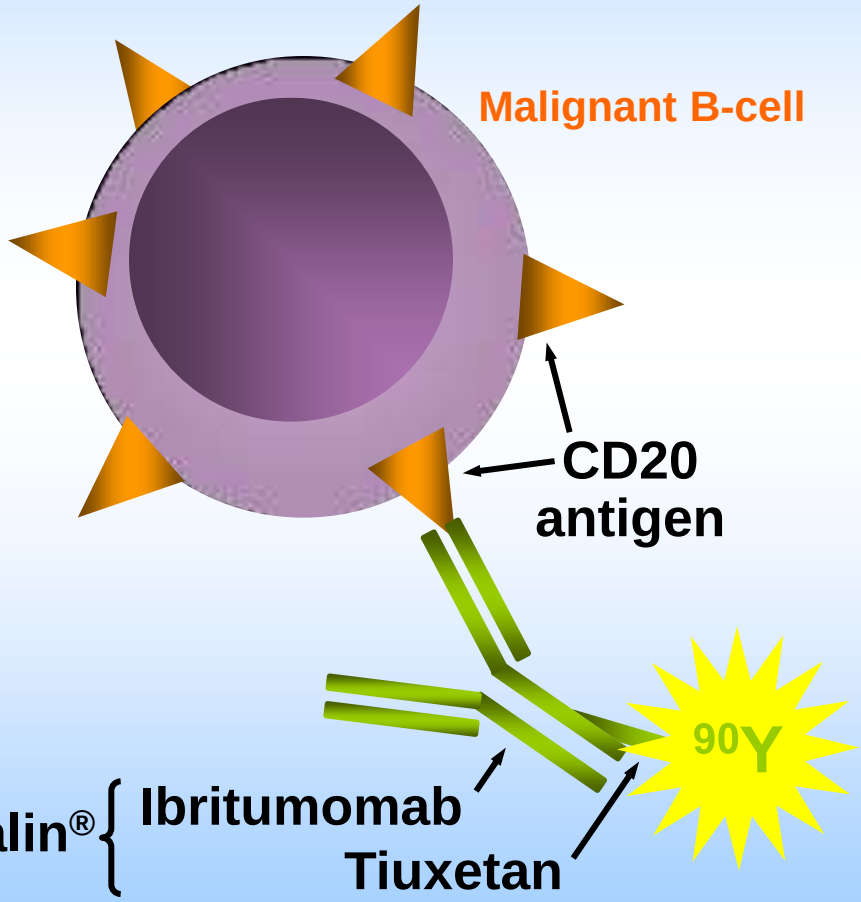


^{131}I-MIBG therapy for Neuroblastoma

Courtesy Prof. Kinuya, Kanazawa Univ., Japan

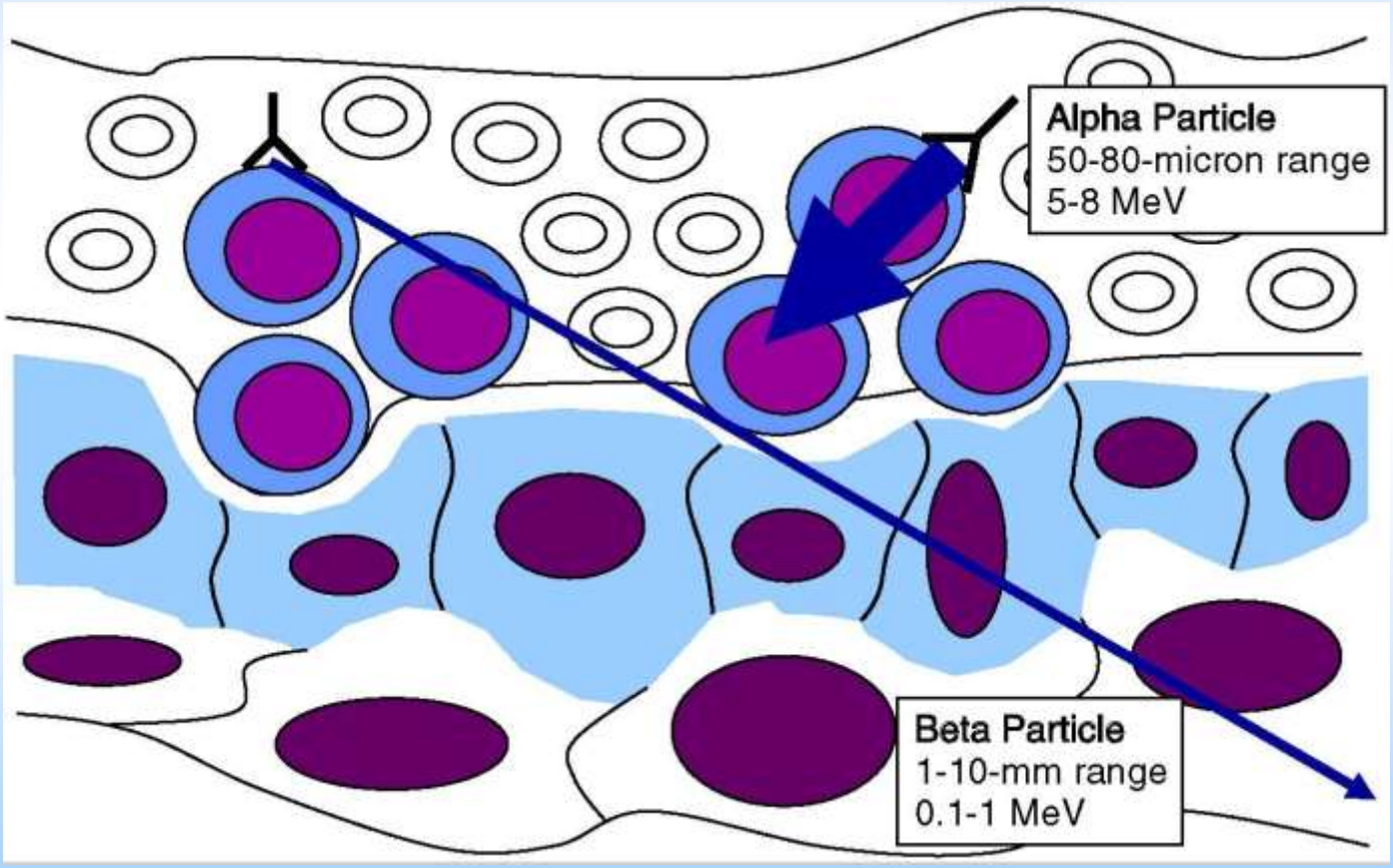
Zevalin-Radioimmunotherapy

- CD20 antigen:
- Proven target for lymphoma therapy
- Expressed only on B-lineage cells
- Does not shed into circulation
- Does not modulate upon antibody binding



Zelenetz. *Curr Opin Oncol* 1999;11:375–380
Press *et al. Blood* 1987;69:584–591
Wood. *Am J Health Sys Pharm* 2001;58:215–229

Radium-223 (α-emitter) Radionuclide Therapy

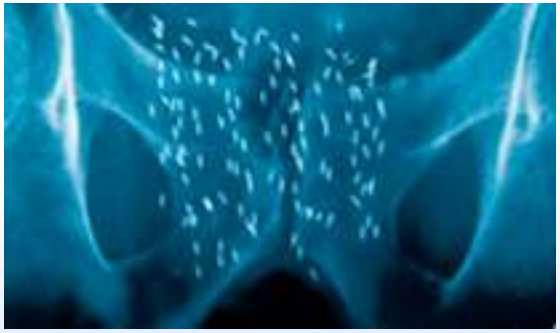


High LET: high RBE, low oxygen effect

Radium-223 chloride

Oncoseed

Iodine-125 seed for Prostate cancer

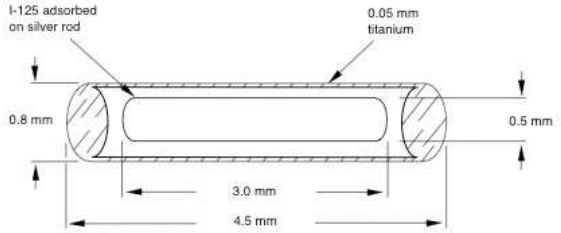


OncoSeed (Iodine-125 Seeds)™

No. 6711

DESCRIPTION

OncoSeed consists of a welded titanium capsule containing Iodine-125 adsorbed onto a silver rod.



Session 4

Issue	Number of Papers
Patient	9
Staff/Public	8
Patient/Staff/Public	1
Total	18

Session 4

Issue	Number of Papers
Unsealed	13
Sealed/External Beam	5
Total	18

Trends in Papers

- Conventional therapy
- Emerging therapy
- Patient dosimetry

Trends in Papers

- Conventional therapy
- Emerging therapy
- Patient dosimetry

^{131}I Therapy

ESTIMATION OF RADIATION DOSE TO THE CAREGIVERS/RELATIVES OF PATIENTS DURING THE TREATMENT OF CANCER THYROID AND THYROTOXIC PATIENTS IN INDIA. TANDON et al., India

- External dose measurement
  - Family members of 50 patients with thyroid cancer: 0.62-6.62 mSv, mostly 1.1-1.7 mSv
  - Family members of 51 patients with thyrotoxicosis: 1 mSv< 33/118 cases, 5 mSv< 3/118 cases

^{131}I Therapy

TANDON et al.,

In general, the doses received by the relatives of thyroid carcinoma patients are generally lower than those received by relatives of thyrotoxicosis patients due to the lower retention (thyroid remnant) and the faster washout of the I-131 activity from the body of thyroid carcinoma patients, in spite of the higher activity administered.

^{131}I Therapy

TANDON et al.,

In a few cases, the doses received by the relatives of patient are more than 5mSv. The reason may be that the instructions given by the radiation safety staff at the time of patient discharge were not properly followed.

^{131}I Therapy

TANDON et al.,

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^{131}I Therapy

RADIATION PROTECTION ISSUES ASSOCIATED WITH OUTPATIENT

TREATMENT OF THYROID CANCER USING HIGH DOSES OF IODINE-131: THE U.S. EXPERIENCE

CRANE.

^{131}I Therapy

CRANE.

Radioactive patients are frequently released to hotels, where they are a hazard to other guests and above all to housekeepers, who are typically women of childbearing age and may be pregnant or nursing.

^{131}I Therapy

TUNCEL et al.

- The overall results were 0.43 ± 0.56 mRh^{-1} and 1.49 ± 1.99 mRh^{-1} respectively.
- The maximum dose rate was at toilet bowl for both situations 1.13 ± 1.51 mRh^{-1} and 4.22 ± 2.20 mRh^{-1} respectively.

^{131}I Therapy

TUNCEL et al.

- Clean and unclean pillow dose rate range 0.03-2.12 mRh^{-1} and 1.33-13 mRh^{-1}, also the median values were 0.15 mRh^{-1} and 3.25 mRh^{-1} respectively.
- Therefore maximum care should be given to the cleaning of these places and the patient and their relatives should be educated in this respect.

High Dose Rate Brachytherapy for Prostatic Cancer

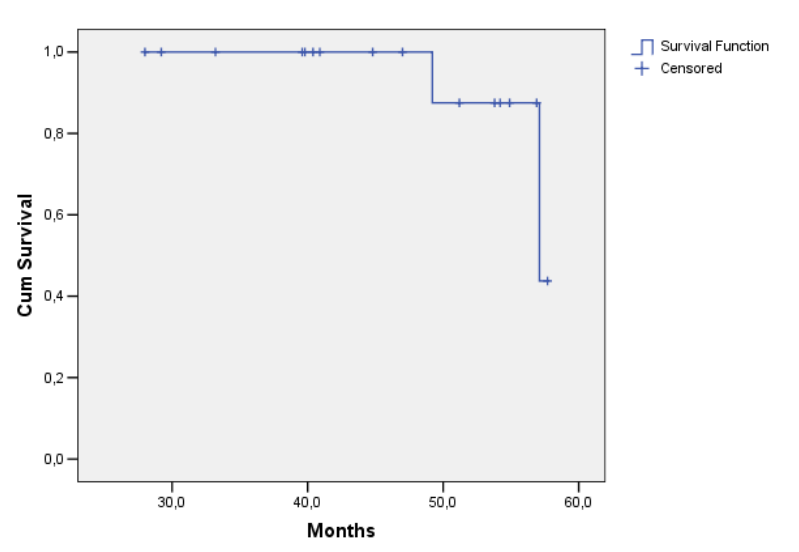
PROSTATE CANCER AND RADIATION PROTECTION – A FUTURE HEALTH AND RADIATION PROTECTION ISSUE IN DEVELOPING COUNTRIES. PELLIZZON et al. Brazil

- Brachytherapy with Ir-192

High Dose Rate Brachytherapy for Prostatic Cancer

PELLIZZON et al. Brazil

- Brachytherapy with Ir-192
- Radiation Protection concerns for family members and personnel is smaller that with low dose rate brachytherapy with I-125 seed sources.



Good control in regard to overall and disease free survival.

Incidence Report on high dose rate remote after loading

UNUSUAL INCIDENT IN HIGH DOSE RATE REMOTE AFTERLOADING SYSTEM. SAMINATHAN et al. India

- When carcinoma cervix patient was undergoing intracavitary treatment in high dose rate brachytherapy machine, during the source travel in channel 3, the source was remained stationary.

Incidence Report on high dose rate remote afterloading

SAMINATHAN et al.

- The patient was taken away from the treatment room, by manually retracting the source cable and pushing into the emergency container. The excess treatment time delivered was 40 seconds. This almost compensated untreated time. The physicist personnel monitoring badge recorded 4.5 mSv.

Incidence Report on high dose rate remote afterloading

SAMINATHAN et al.

- It was noticed that the malfunction was due to the rubber gasket in between two rubbing wheels not gripping the source cable.
- After this incident, the drive motor gaskets are being replaced at every new source loading.

Trends in Papers

- Conventional therapy
- Emerging therapy
- Patient dosimetry

^{177}Lu-Octreotate

Patient's Retained Activity in Neuroendocrine Tumours Treatment with[^{177}Lu; Tyr3] octreotate.

Costa et al. Brasil

Complete Remission	2%
Partial Remission	26%
Minimum Remission	19%
Stable Disease	35%
Progressive Disease	18%

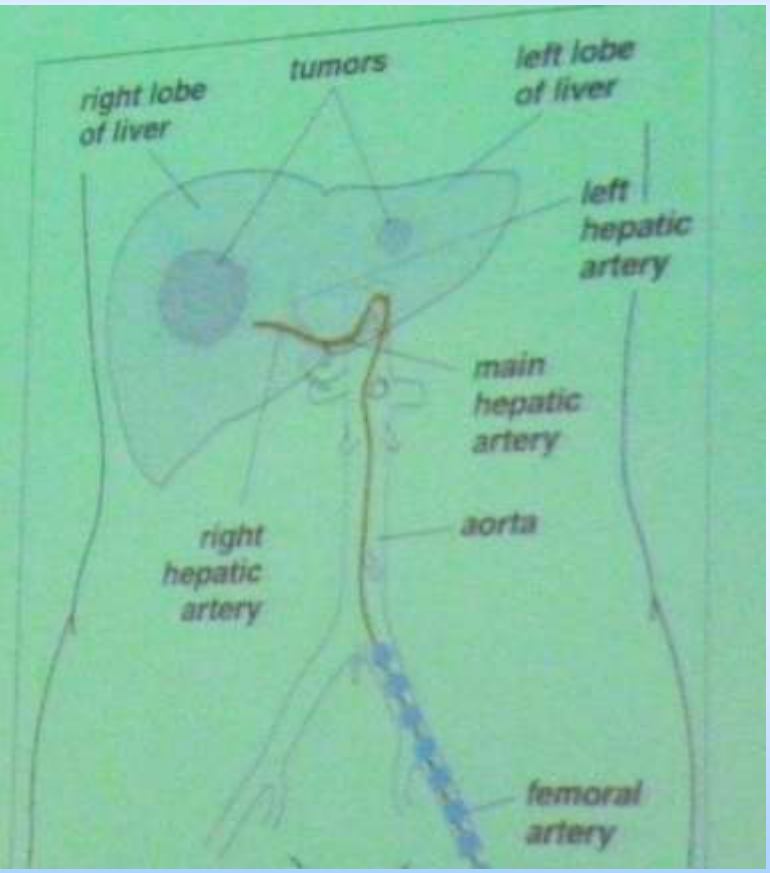
^{177}Lu-Octreotate

Costa et al.

Although every patient had received the same activity (7400 MBq), there is a large fluctuation between the results, from 1337 ± 93 MBq to 4933 ± 345 MBq. The average retained activity in 24h among the patients was of 40% and a dose rate 65.15μSv. The effective half-live was evaluated resulting on t½ = 0.76 days (18.16 hours).

^{90}Y Microspheres for liver

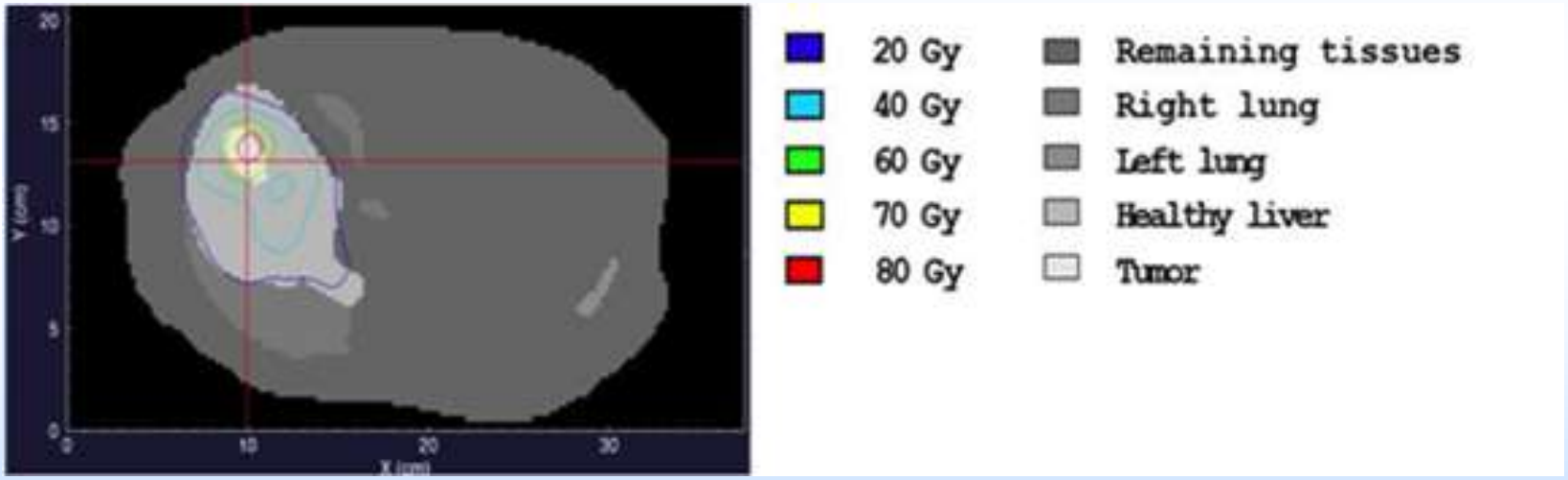
- Hypervascularised tumors
- Intra-arterial injection of microspheres
- β^- CSDA : 2.5 mm (max 11 mm)
- Lobar, segmental or sub-segmental treatment



^{90}Y Microspheres for liver

- MONTE CARLO TREATMENT PLANNING IN NUCLEAR MEDICINE: APPLICATION IN Y-90 MICROSPHERES THERAPY OF LIVER CANCER. PETITGUILLAUME et al. France

^{90}Y Microspheres for liver



Targeted Alpha Therapy

Radiobiological Evaluation of ^{213}Bi and ^{149}Tb radioisotopes for Targeted Alpha Therapy by computational methods. Natouh et al. Libya

- This work aims to evaluate the radiobiological effects of ^{149}Tb and ^{213}Bi α-emitting radionuclides on human fibroblasts cells for TAT.

Targeted Alpha Therapy

Natouh et al.

- Evaluate the DNA damage and its probability of correct repair, and study the cellular kinetics, following ^{149}Tb and ^{213}Bi α-emitting radionuclides irradiation.

Targeted Alpha Therapy

Natouh et al.

- Three different computational simulators were used to study the therapeutic potential of ^{149}Tb and ^{213}Bi on 1000 human fibroblasts cells for TAT.
- ^{149}Tb alpha particle has a higher therapeutic potential than ^{213}Bi. Based on the results here, ^{149}Tb α-emitting radionuclide is more useful for TAT.

Trends in Papers

- Conventional therapy
- Emerging therapy
- Patient dosimetry

Patient dosimetry

Analysis of the influence of cell size detectors considering conventional scenarios and voxel structures in DICOM medical images using Monte Carlo simulation code MCNP. Menezes et al. Brasil

- ^{125}I prostate brachytherapy radiation sources.

Patient dosimetry

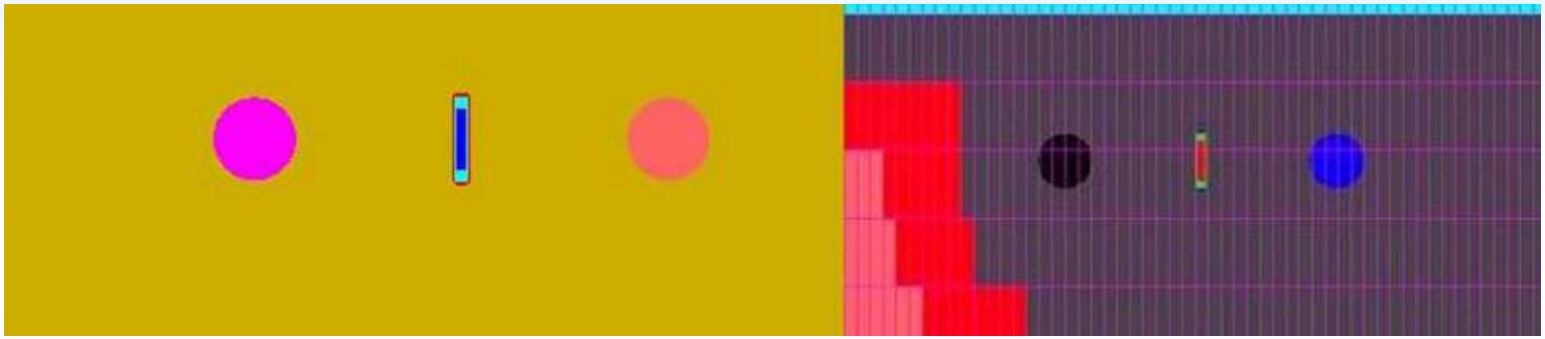
Menezes et al.

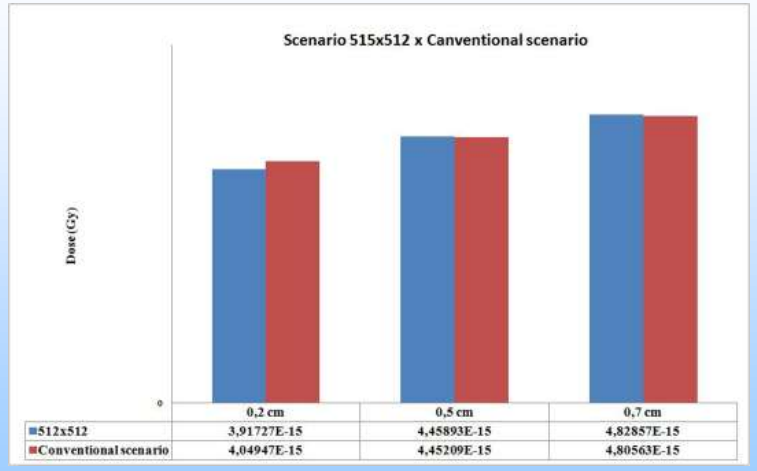
^{125}I prostate brachytherapy radiation sources.

- DICOM images group was exported to Scan2MCNP software to be converted into a computational phantom based in voxel structures which allows the generation of a MCNP input file.

Patient dosimetry

Menezes et al.





Patient dosimetry

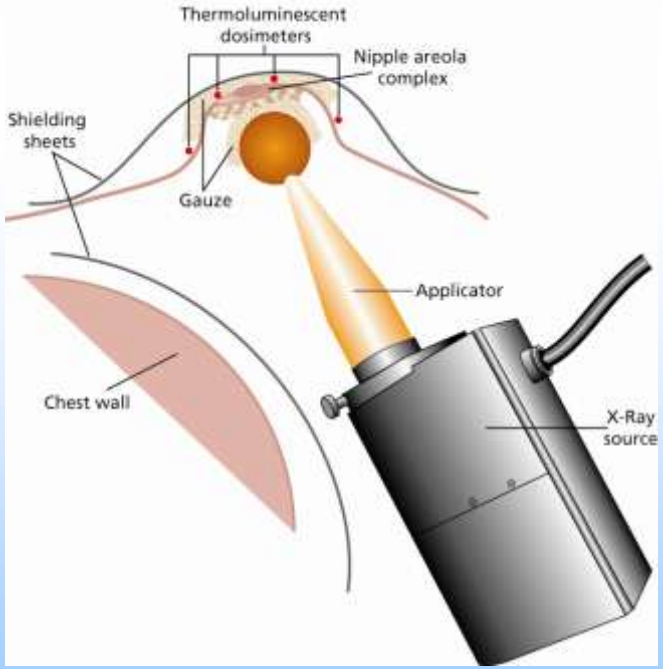
Thermoluminescent in vivo dosimetry for patient protection in intraoperative radiotherapy-Applications in breast cancer treatment. Eaton et al. UK

- Intraoperative radiotherapy (IORT) using the INTRABEAM compact mobile 50kV x-ray source used to treat brain and breast tumors.

Patient dosimetry

Eaton et al. UK

- Thermoluminescent dosimeters are flexible and reliable for the measurement of doses to critical structures.



Summary

- Radiation protection measures should repeatedly be disseminated in conventional therapies, and should well be constructed in emerging therapies.

Thank you very much.