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PS07 - 1.10

## IRIDIUM RADIOACTIVE SOURCES PRODUCTION FOR BRACHYTHERAPY USE

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In Brazil, cancer has become a major public health problem, reflected as an important cause of mortality.

In this context the Nuclear Energy Research Institute (IPEN) established the project Iridium Radioactive Source Production, in wire form, for Brachytherapy Use, four years ago.

The technological qualification program of the Institute has allowed the construction of a source irradiation facility and a hot cell for radioactive source handling, quality control and package.

Raw material wire characterization has been made by following techniques: X-ray fluorescence, neutron activation analysis, electronic scan microscopy, optic metallography, microsound.

Experiences were gathered by source activation, by means of neutrons at IEA-R1 reactor, in order to produce Ir-192 with a 74 day half life and a main gamma ray of 318 Kev. Wires were irradiated in different ways in order to get the homogeneity of the activity all along the wire. To apply irradiation wires were conditioned to the following features: 50cm length, 0,3/0,5mm diameter, 2/3 mCi/cm specific activity.

By means of special irradiation device, a study was done to obtain the reactor neutron flux profile, in the position where irradiation are being carried out. This Ir-192 wire production station enables the country's supply of such radioactive sources, allowing its application to a larger number of patients.

## PS07 - 1.11

OPTIMIZED GYN BRACHYTHERAPY TREATMENT PLANNING  
FOR LOW DOSE RATE <sup>137</sup>Cs

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**Introduction:** The aim of this work is to show the importance of the individualized brachytherapy treatment planning using a computerized system over the empirical method of calculation, in order to achieve a desirable degree of accuracy in tumor delivery minimizing the complications rates.

**Materials and Methods:** Several patients with cervix cancer stage IIB and IIIB were randomly chosen for this study. X-ray films were taken after the insertion <sup>137</sup>Cs spherical sources from a Low Dose Rate Selectron into the Fletcher applicators (tandem and ovoids). The doses were calculated for the points A, B, bladder, rectum, and vagina using a TP-11 treatment planning system.

**Results:** The patients received a tumor dose of 50 Gy with a high energy photon beams (four fields technique), prior to the brachytherapy treatment following the Toronto scheme. Table 1 shows the results of the comparison of the percentage variations of the dose rates between the standard (which is an approximation of the Manchester scheme) and the optimized treatments, when the individual anatomical reference points are taken into account. The results indicates that the empirical calculations may lead to an undesirable dose levels due to the natural differences among the patients. This Table also shows a comparison between the Toronto and Manchester techniques. The dose rate variations observed in the reference points may be one of the reasons that might explain the high degree of complications, around 30%, found in this service. The adoption of the combined Fletcher applicators and the Manchester scheme, is expected to have a considerable improvement in the complication rate, and an increase in the local tumor control.

Table 1 - Point dose variations between the scheme treatments

Reference Point	Standard/Optimized treatments (%)	Toronto/Manchester (%)
A	-21 to +6	-50 to +113
B	-11 to +8	-61 to +62
Bladder	-17 to +21	-85 to +37
Rectum	-34 to +61	-37 to +43
Vagina	-8 to +180	-169 to +3