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# Computed Radial Dose Function of Designed for Gynaecologic High Dose Rate Ir-192 Source

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## INTRODUCTON

Since the iridium-192 source has high specific activity and small half value layer, the availabi lity of high dose rate brachytherapy is rapidly increased in recent. The high activity of iridium-1 92 source replaces the Co-60 as high dose rate source(HDR). The authors designed the iridium-1 92 source for gynaecologic cervical cancer with remote afterloading system(Buchler 3K, German) to substitute an iridium-192 for Co-60 source.

## METHOD

The Ir-192 HDR source was created in neutron reactor (3.39x1013n/cm2/sec, 20MW, KAERI) by Ir-191(n,r)Ir-192 nuclear reaction. The source dimension is 2.5 mm in a diameter and 0.25 mm thickness of disk layered to total 2.5 mm thickness and encapsulated with 4 mm diameter o f stainless steel (SUS304) for the original Co-60 source size. The dose distributions around sourc e was derived from the computation of self-absorption of source, filtration of cylindrical-sphere c apsule wall and experimental tissue scatter corrections with segmented source. The output dose fr om designed source was derived from apparent activity and gamma constant of Ir-192 from ener gy spectrum. The dose distributions of designed HDR Ir-192 source compared to that of Co-60 by experimental film and TLD dosimetry with a same gynecologic tandem applicator.

## RESULTS

The duration of neutron exposure for production Ir-192 source (apparent activity 8.8 Ci) and cooling time needs for one month to clear the contaminated iridium-194(HVT 19.2hours). The co mputed effective filtration of designed Ir-192 source revealed to 54.6 % of single point source of same activity. This effective attenuation factor is useful for comparison the source activity of c urie meter to the output dose rate of thimble ionization chamber and computation of the apparent activity of Ir-192 source. Calculated the conversion factor Fmed which is defined as a ratio o f absorbed dose to exposure dose was determined to 0.973 and gamma constant 4.69 Rcm2/mCi-hr from the Ir-192 spectrum with energies greater than 10keV. The air kerma strength of Ir-192 obtained 4.11 cGycm2/mCi-hr by strength Sk=Rx(W/e), where Rx is gamma constant. The aniso

tropy of dose distribution was investigated in tabular form the caculated filtration and experiment al tissue scatter correction factor in large distance from segmented source. The Meisbeger constan t for tissue scatter correction showed as a 30% of discrepancy in 20 cm of distance in our expe riments. The dose distribution of gynecologic applicator with irrdation of Ir-192 source was comp ared the calculated dose to that of film and TLD experiments within 3% uncertainty.

## DISCUSSION

In recent, as the production of Co-60 brachytherapy source is rapidly decreased, many hospita l's demands are rapidly increased the substitude Ir-192 for Co-60 HDR source. The Ir-192 HDR source was designed for gynecologic applicator as 4mm in a diameter as same size and shape of original Co-60 source. Since the spectrum of Ir-192 is relatively complex, the gamma constant (R/Ci-hr) is not clear as many authors have published difference value range from 3.5 to 5.0 R/ mCi-hr. In this experiment, used value gamma constant is 4.69 Rcm2/mCi-hr based on the publis hed spectrum data of Glasgow with cutoff energy of 10 keV. The computed dose distributions ar ound the designed source was derived from the 4401 segmented sources considered the self-absor ption, capsule filtration and tissue scatter correction factor as a function of tissue thickness. The empirical tissue scatter correction factor was derived from 4th polynomial fitting parameters withi n 1 % discrepancy to experimental measurements in the 20 cm distance from source center. In dose compution of gynaecologic application size of 3 to 10 cm length includes the uterus and va ginal mold source, the prepared data of radial dose should be fully covered to large sized applic ator.

## CONCLUSION

The high activity Ir-192 source was designed for gynaecologic application for compatible Co -60 HDR source in Buckler 3K uint. Dose computation around the modified Flecture typed appli cator used the already prepared radial dose and anisotropy distribution in experimental software.