3936129 RAMP/M : MAJOR : MEDICAL PHYSICS ; M.Sc.(MEDICAL PHYSICS)

KEY WORD : WEDGE TRANSMISSION FACTOR / UNIVERSAL WEDGE / SQUARE FIELD SIZE / DEPTH IN PHANTOM/ 6 MV X-RAY BEAM

SOMSAK KHUENCHANA: ASSESSING THE EFFECTS OF VARYING FIELD SIZES AND DEPTHS IN PHANTOM ON WEDGE TRANSMISSION FACTORS FOR UNIVERSAL WEDGES USED IN 6 MV X-RAY BEAM. THESIS ADVISORS : RATANA PIRABUL M.Sc., SUPOJ UA-APISITWONG M.Sc. 65 p. ISBN 974–664-851-9.

Nowadays radiation oncology has been developed to an advanced technology. Wedge filter is a beam modifier. It is routinely placed in the path of the high energy photon beam to modify the isodose distributions, with appropriate treatment planning, the homogenous distribution will be achieved. The presence of the wedge filters decreases the dose rate of the machine along the central ray of the beam, and this must be allowed for treatment calculations. This effect is characterized by the "wedge transmission factor(WTF)". Many treatment planning systems still use a single value of the wedge transmission factor that is determined at a specified reference field size and depth such as 10 x 10 cm^2 field size or the maximum allowable field size for each wedge filter and the depth of maximum dose or the depth of calibration(5 cm) and measured with fixed source surface distance techniques(SSD). However, at the present time, many treatment techniques usually use isocentric techniques(SAD) since it is more convenient and reproducible patient setting. This study intends to assess the effect of the square field sizes and depth in phantom on wedge transmission factor in iron-alloyed universal wedge containing 15^o-60^o used in 6 MV x-ray beam. The measurements by cylindrical ionization chamber, were performed by varying field sizes 4x4 cm^2 up to the maximum allowable field size for each wedge and at 1.5 cm, 5.0 cm, 10.0 cm and 15.0 cm depths with fixed source axis distance technique (SAD).

The result showed that the maximum variation of WTF normalized to 10x10 cm^2 were small for field size not exceeding 10x10 cm^2. But for the field size larger than 10x10 cm^2, the variation were up to 3.66%,5.42%,8.93% and 6.19% for 15^o, 30^o, $45^o$and 60^o wedge filter respectively(p-value<0.001). For the depth dependence study, the WTF normalized to 5.0 cm depth increase when the depth increase. The maximum variation were 1.18%, 2.76%, 5.01%and 5.00% for 15^o, 30^o, 45^o, and 60^o wedge filter respectively(p-value<0.001).

This study showed that the wedge transmission factor measured for a single reference field size and depth are not valid for all field sizes and depths. For accurate dose calculation of the wedged field, the value of the wedge transmission factor has to be determined for each field size and depth.