Influence of the Difference in the Size of Cobalt-60 Source (Wafer Type and Pellet Type) on the Spatial Dose Distribution of Moving Therapy

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^{60}Co 線源サイズの相違（wafer type と pellet type）が運動照射の空間的線量分布に及ぼす影響について

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（昭和43年8月31日受付）

^{60}Co 運動照射装置（島津製 RT- 2,000）の線源を増量する機会に，線源の出射面の大きさを小さくし，すぐれた空間的線量分布がえられるかどうかを検討した．

従来の線源 600 Ci は wafer type で，出射面の大きさは20mm φ であつたものを，pellet type の 2,000Ci に増量，出射面の大きさは12.5mmφ と小さくした．

断面が略々楕円形の水ファントームの中心を回転中心として，照射野4cm×10cm，5cm×10cm，6cm×10cmの全回転を行なつてみたところ，各照射野とも回転中心に近いところでは両者に余り差はないが，周辺部では線源の大きさの小さい pellet type の方がすぐれた線量分布を示した．

すなわち，線源の大きさを小さくすることにより，健常部の不必要な照射が減じ，従つて容積線量も小さくなつて有利なことがわかつた．

Introduction

When moving irradiation conducted, to make the size of the source and penumbra as small as possible is important for an excellent dose distribution[1)8)]. With the opportunity of increasing the source of cobalt-60 from 600 Ci (wafer type) to 2000 Ci, the size of the source was therefore made smaller (pellet type) to see if a better spatial dose distribution was obtained.

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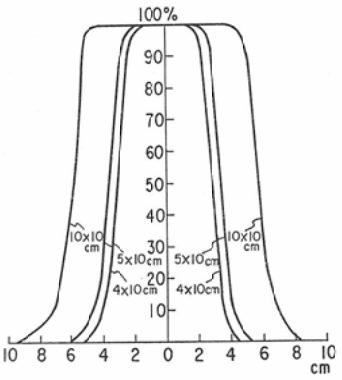
Method of Measurement, Results and Discussion

As the apparatus for irradiation, a Shimadzu double rotation type RT-2000 was used. The conventional source was 600 Ci (as of September 1960) in wafer type with a size of 20 mmϕ × 1 mm × 6. The new source is 2000 Ci (as of October 1961) in pellet type with a size of 12.5 mmϕ × 18.5 mm. As the instrument for measurement, a Colonial's rate meter (Nihon Hoshasen Bogyo Co. Ltd.) was used.

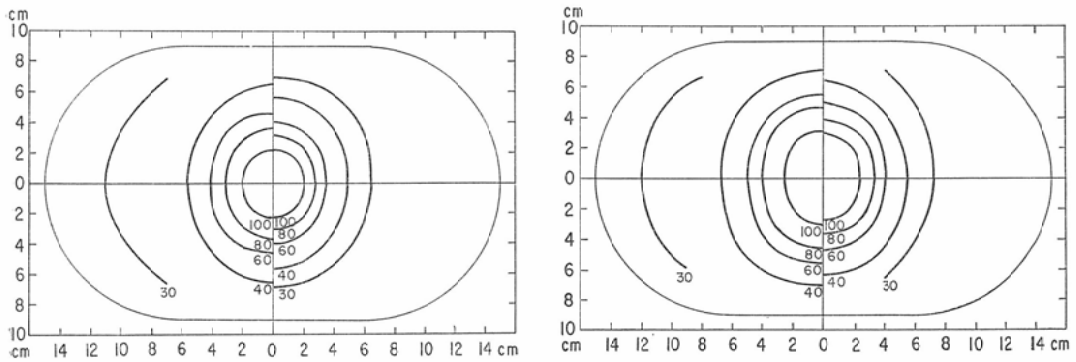
At first the dose distribution in air was measured at 75 cm from the source under stationary irradiation. The penumbra proved to be somewhat smaller in the pellet type (Fig. 1).

Fig. 1. Penumbra at SSD 75 cm (measured in air). Field size of 4 cm × 10 cm, 5 cm × 10 cm and 10 cm × 10 cm.
Left side: Wafer type (size of the source 20 mm ϕ)
Right side: Pellet type (size of the source 12.5 mm ϕ)

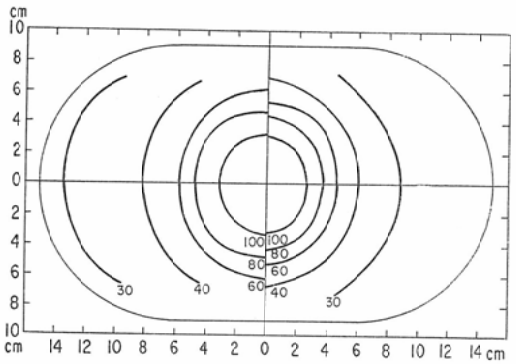


A full rotation of 360 was carried out around the center of an oval-shaped phantom, containing water, 30 cm in transverse diameter, 18 cm in longitudinal diameter, and 40 cm in length made of 5 mm thick plastic. Source-center distance was 75 cm. The field size was 4 cm × 10 cm, 5 cm × 10 cm and 6 cm × 10 cm at the center of rotation. The method of measurement was as described in our previous report.[2] The spatial dose distribution is shown in Fig. 2. A, B and C. In each Fig., the left side represented the

Fig. 2. Isodose chart in water phantom.
Left side: Wafer type (size of the source 20 mm ϕ)
Right side: Pellet type (size of the source 12.5 mm ϕ)
A: Field size of 4 cm × 10 cm B: Field size of 5 cm × 10 cm



C: Field size of 6 cm × 10 cm



wafer type (size of the source 20 mmϕ) and the right side pellet type (size of the source 12.5 mmϕ). In each instance, a similar dose distribution was seen near the center of rotation, while the pellet type, with a smaller size source, gave better dose distribution in the peripheral portion. In other words, by a smaller size of source the volume dose can be made remarkably smaller.

Summary

With telecobalt moving therapy, good spatial dose distribution was obtained by making the size of the source smaller. Consequently, unnecessary irradiation of normal tissues and the volume dose as well decrease advantageously.

(The guidance and review of this manuscript by Prof. S. Tarusawa and Prof. Y. Hata are appreciated. The outline of the present study was presented at the 21th Annual Meeting of Japan Radiological Society.)

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