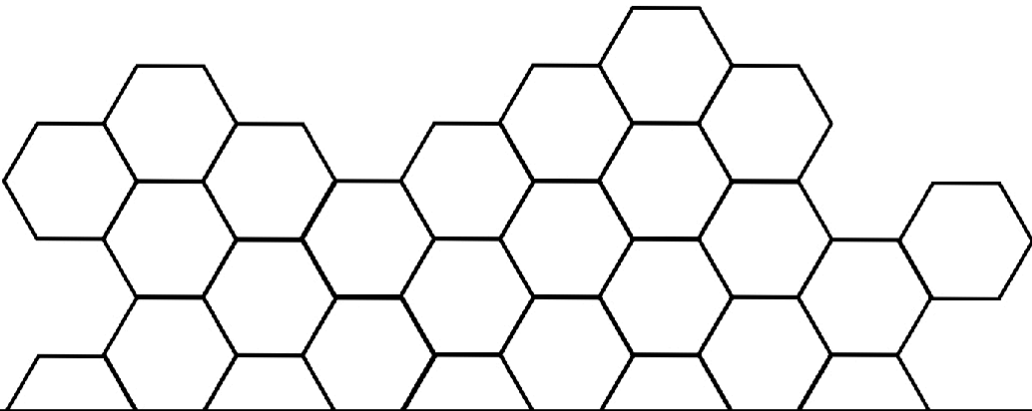


# Dosimetric Comparison of Multi-Lumen and Segmented Single Lumen Cylinder HDR Applicators of the Same Diameter

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## INTRODUCTION

Multi-lumen and segmented cylinder applicators of the same diameter differ in their overall design especially as it relates to the dome of the applicator and their assembly. These differences in applicator construction could lead to changes in dose distribution even when only using the central lumen.

## AIM

The purpose of this project is to compare the dose distribution of multi-Lumen and segmented cylinder applicators of the same size when delivering identical treatment plans. To achieve this comparison, clinically relevant points along the applicator were measured for each type of cylinder.

## METHOD

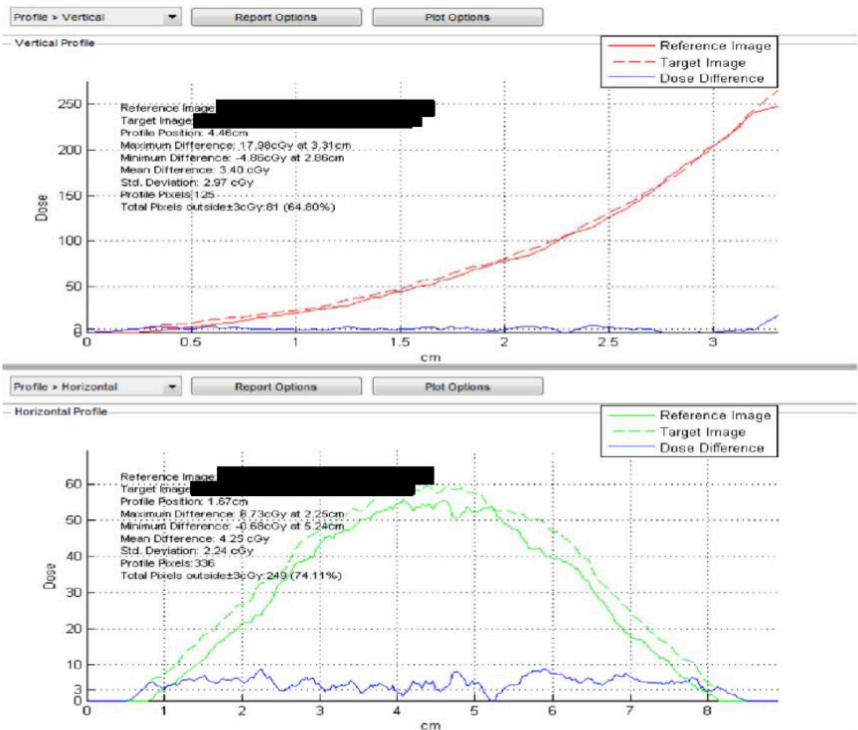
A treatment plan was created for each cylinder using Oncentra Brachytherapy TPS. The comparison was made for 25mm, 30mm, and 35mm multi-lumen and segmented single lumen cylinders at multiple points on the dome and along the sides of each cylinder. Using a PTW parallel plate ion chamber, dose was measured at , 30°, 45, and 90° on the surface of the dome. It was also measured at depth of 5mm at 90° from each applicator. The measurements at each point on the cylinder were compared for similarity. The dose profile along the sides of each cylinder were collected using EBT-3 gafchromic film. The profiles for each cylinder size were analyzed using gamma analysis with 2mm DTA, 3 cGy dose difference, and a gamma tolerance of 1 in RIT software.

## RESULTS

The 25mm cylinders agreed within 2.1% for each position on the dome and had a gamma analysis pass rate of 96.5% along the sides of the cylinder. The 30mm cylinders agreed within 3.5% for each point on the dome and had a gamma analysis pass rate of 97% along the sides of the cylinder. The 35mm cylinders agreed within 1.6% at each point on the dome and a gamma analysis pass rate of 98.4%.

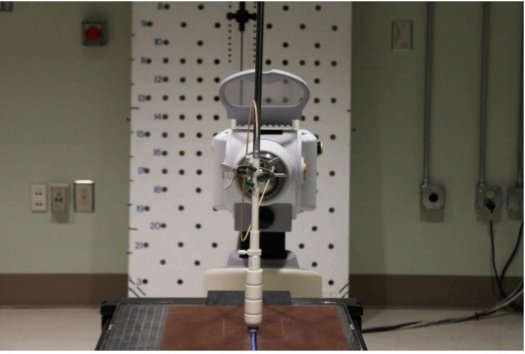
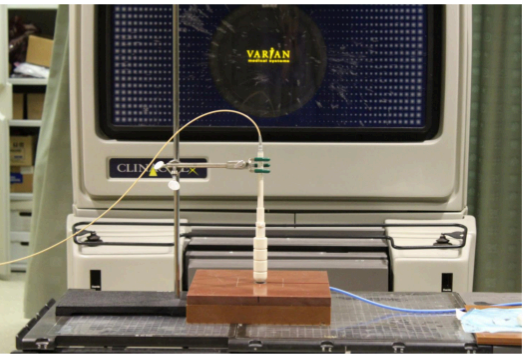
25mm Cylinder	
Ratio(Seg/MLC)	Dome
Surface	1.008
5 mm	0.98
30 deg	0.998
45 deg	0.982
Gamma(sides)	2mm/3cGy
	96.6
30mm Cylinder	
Ratio(Seg/MLC)	Dome
Surface	1.012
5 mm	1.024
30 deg	0.978
45 deg	0.965
Gamma(sides)	2mm/3cGy
	99.5
35mm Cylinder	
Ratio(Seg/MLC)	Dome
Surface	1.003
5 mm	0.984
30 deg	1
45 deg	1.002
Gamma(sides)	2mm/3cGy
	98.4

Table of Measurement point ratios of the segmented cylinder compared to the multi-lumen cylinder.



30 mm dose profile gamma analysis with 2mm/3 cGy analysis parameters using RIT software.

## MEASUREMENT SETUP



Set up for 30mm 90 degree surface dose measurement using solid water and PTW parallel plate chamber.

## CONCLUSIONS

The 25mm cylinders showed the strongest agreement in dose measurements at each point while the 30mm cylinders showed the weakest agreement at each measurement point. Overall, the dose distribution of all cylinder sizes showed reasonable agreement between the two types of cylinder applicators at each measurement point and along the sides.



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