**Initial experience of patient quality assurance for RapidArc using ArcCheck at HOPE at Guatemala**

M.E. Ixquiac-Cabrera¹, J. M. Ixquiac Cabrera ²

¹ Medical Physics Department, Hope International Radiotherapy Center, Guatemala; ²Physics Department, Engineering Faculty, Universidad de San Carlos de Guatemala, Guatemala

**INTRODUCTION**

The purpose of this document is to report our initial experience with treatments performed during the first year using volumetric arc therapy ‘RapidArc’ (first one in it’s kind in Latin America). The quality control treatments for cranial and prostate cancer is done with the ArcCheck phantom with solid state detectors. And also using the IMRT Phantom by IBA to evaluate the absolute dose with an ionization chamber, this is done for each person.

The treatment plans are calculated in Eclipse using the anisotropic analytic algorithm (AAA 8908). More than 150 treatment plans were evaluated with ArcCheck phantom, from which are 27 prostate cases and 20 cranial. Because of its clinical similarities 5 prostate treatments with seminal vesicles and lymph nodes reaching a dose of 50.4 Gy in standard fractionation of 1.8 Gy per day. Likewise 7 cases of multiforme glioblastoma that reached a dose of 50.4 Gy with standard fractionation of 1.8 Gy per day. In both locations only the first phase of irradiation was compared.

<table>
<thead>
<tr>
<th>Localization</th>
<th>Field size (cm)</th>
<th>UM</th>
<th>CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prostate</td>
<td>13.8 (2.3)</td>
<td>18.8 (1.5)</td>
<td>362 (68)</td>
</tr>
<tr>
<td>Brain</td>
<td>11.1 (2.5)</td>
<td>11.1 (2.6)</td>
<td>170 (42)</td>
</tr>
</tbody>
</table>

The values in parenthesis show the standard deviation.

**RESULTS**

The evaluations are summarized in Table 2, which shows the differences between the used criterias. The minimum percentage of points that pass the 3%, 3 mm criterion for prostate cancer is 96.8% and 97.0% for cranial cancer. The average percentage of points passing the criteria 3%, 3 mm in both locations is > 97.0% and with 2%, 2 mm criteria is > 89.0%.

The maximum percentage in dose difference determined with ionization chamber and the predicted value by eclipse is 1.8% in prostate and 0.9% in cranial.

The variation in the results of dose determination was -0.4% to 1.8% and -0.8% to 0.9% for prostate and head treatments respectively.

Confidence limit (k = 1.96) for the prostate treatment is 1.0 (99.0%) and brain 1.0 (99.0%).

<table>
<thead>
<tr>
<th>Localization</th>
<th>No. of used detectors</th>
<th>γ 3% 3 mm</th>
<th>γ 3% 2 mm</th>
<th>γ 2% 3 mm</th>
<th>γ 2% 2 mm</th>
<th>DTA 3 mm</th>
<th>Ionization Chamber</th>
<th>Percentual Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prostate</td>
<td>120/1 (35)</td>
<td>97.9 (0.72)</td>
<td>96.2 (0.94)</td>
<td>97.7 (0.94)</td>
<td>99.4 (0.95)</td>
<td>95.0 (1.43)</td>
<td>1.10 (0.015)</td>
<td></td>
</tr>
<tr>
<td>Brain</td>
<td>76/6 (211)</td>
<td>98.0 (0.95)</td>
<td>97.8 (1.92)</td>
<td>96.8 (1.90)</td>
<td>93.0 (3.05)</td>
<td>97.3 (2.13)</td>
<td>0.5 (0.004)</td>
<td></td>
</tr>
</tbody>
</table>

The values in parenthesis for detectors are standard deviation, Gamma evaluation confidence limit, and the percentual difference ionization chamber measures.

**CONCLUSIONS**

> The treatments delivered with RapidArc are consistent with the calculated by the planning system. Our results for the percentage of points passing the criterion of 3% for 3mm diode array, is around 98 and 99 for prostate and brain cases respectively.

> The results in Table 2 show the parallelism between eclipse prediction and ionization chamber measures.

> Based on these results, the evaluation criteria for RapidArc treatments used with the ArcCheck phantom (3% in relative dose and 2 mm of dose to agreement) is equal to the one for checking in IMRT with portal dosimetry at HOPE pretreatments evaluations.

> Although evaluations are acceptable, quality control made to the accelerator must not be limited in testing or verify the operation of the MLC only, these tests must also verify the parameters used in RapidArc treatments. And the general recommendation is to apply the quality control of patient’s treatment when using any treat modality, with the quality assurance equipment according to the complexity required.

**ACKNOWLEDGMENT**

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