Purpose:
The mission of the Radiological Physics Center (RPC) is to assure NCI and the Cooperative Groups that institutions participating in clinical trials deliver radiation doses that are clinically comparable and consistent. Recalculation of patients treated with brachytherapy on a cervix trial were reviewed for completeness, consistency with the protocol, and dosimetric accuracy. Independent dose calculations were performed at points A, B, vaginal surface, bladder and rectum.

Methods and Materials:
The RPC reviewed 482 HDR and LDR implants. Doses were calculated to points A, B, bladder, rectum and the vaginal surface as defined by the protocol in accordance with ICRU–38.

ICRU – 38 Definitions
Point A – Defined as 2 cm along the intratuberine tandem in the superior direction from the flange, and 2 cm perpendicular to the tandem in the lateral direction.

Point B – Defined as 2 cm along the intratuberine tandem in the superior direction from the flange, and 5 cm lateral from the midline of the patient.

Methods and Materials continued:
Bladder Reference Point
A Foley catheter is used. The balloon must be filled with 7 cm³ of radio-opaque fluid. The catheter is pulled downwards to bring the balloon against the urethra. On the lateral radiograph, the reference point is obtained on an anterior-posterior line drawn through the center of the balloon. The reference point is taken on this line at the posterior surface of the balloon. On the AP radiograph the reference point is taken at the center of the balloon.

Rectal Reference Point
On the lateral radiograph, an anteroposterior line is drawn from the inferior end of the intratuberine sources (or from the middle of the intravaginal sources). The point is located on this line 5 mm behind the posterior vaginal wall. The posterior vaginal wall is visualized, depending upon the technique, by means of an intravaginal mould or by opacification of the vaginal cavity with a radio-opaque gauze used for the packing. On the AP radiograph, this reference point is at the inferior end of the intratuberine sources or at the middle of the intravaginal source(s).

Description of ICRU Bladder/Rectum Reference Points

Results: continued:
Table 1: The results of 482 implants that were reviewed by the RPC.

<table>
<thead>
<tr>
<th>Point of Calculation</th>
<th>Total # of Points Recalculated</th>
<th># Dose Deviations</th>
<th>% Deviations</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>687</td>
<td>45</td>
<td>6.5%</td>
</tr>
<tr>
<td>B</td>
<td>599</td>
<td>184</td>
<td>30.9%</td>
</tr>
<tr>
<td>Bladder</td>
<td>470</td>
<td>76</td>
<td>16.8%</td>
</tr>
<tr>
<td>Rectum</td>
<td>431</td>
<td>92</td>
<td>21.4%</td>
</tr>
<tr>
<td>Vaginal Surface</td>
<td>116</td>
<td>80</td>
<td>68.0%</td>
</tr>
</tbody>
</table>

- The number of calculation points is fewer than might be expected because:
  - Some institutions only calculated the first of several implants for the same patient
  - Only one of several protocols required calculation of vaginal surface dose
  - Bladder contrast was not used in some patients
  - The rectum could not be identified clearly in some patients
- 3% of the calculations at Point A were revised by the institutions after errors were identified by the RPC, improving the agreement at this point.

Conclusions:
Participants in clinical trials should follow the protocols carefully to avoid making errors that can result in protocol deviations.

Support:
The investigation was supported by PHS grants CA10953 awarded by the NCI, DHHS.

References


Support:
The investigation was supported by PHS grants CA10953 awarded by the NCI, DHHS.