Efficacy of a Radiation Absorbing Drape during Peripheral Endovascular Interventions; a Preclinical Study

M.M. Jansen, Q.M.B. de Ruiter, C.E.V.B. Hazenberg, J.A. van Herwaarden

UMC Utrecht, the Netherlands

To compare the effectiveness of a radiation absorbing drape (Radpad®) with conventional radiation protection methods during endovascular revascularization of the lower limb, using a cadaveric model.

Materials & Methods

Measurement setup:
- Fresh frozen human cadaver
- Effective dose rate (E) in mSv/h measured on:
  - 4 operator positions for iliac revascularization (figure 1)
  - 3 operator positions for femoral revascularization (figure 2)

Measurement conditions:
- Fluoroscopy protocols and DSA
- Different methods of radiation protection:
  - No radiation protection (baseline)
  - Two Radpads®
  - Field size reduction of 60% (800cm²)
  - Two ceiling mounted lead screens

Analysis:
Multivariate linear regression, to analyze relative impact of the radiation protection methods for each operator position.

Results

The radiation absorbing drape showed significant radiation reduction (P<0.01) in all five operator positions, with dose reduction rates of 18-88%.

Table 1 describes the dose reduction rates of the different radiation protection methods. Figure 3 and 4 display the measured effective dose rates from DSA acquisitions in each operator position.

Table 1: Dose reduction rates of different radiation protection measures in percentage. (*) indicates a significant effect (P<0.01).

<table>
<thead>
<tr>
<th>Position</th>
<th>Iliac - Femoral</th>
<th>Radpads*</th>
<th>Field size reduction</th>
<th>Lead screens</th>
</tr>
</thead>
<tbody>
<tr>
<td>Position 1</td>
<td>18%*</td>
<td>57%*</td>
<td>99%*</td>
<td></td>
</tr>
<tr>
<td>Position 2</td>
<td>39%*</td>
<td>63%*</td>
<td>71%*</td>
<td></td>
</tr>
<tr>
<td>Position 3</td>
<td>30%*</td>
<td>58%*</td>
<td>7%</td>
<td></td>
</tr>
<tr>
<td>Position 4</td>
<td>28%*</td>
<td>57%*</td>
<td>11%</td>
<td></td>
</tr>
<tr>
<td>Position 5</td>
<td>6.7%</td>
<td>19%*</td>
<td>45%*</td>
<td></td>
</tr>
</tbody>
</table>

Conclusion

Radiation absorbing drapes form an effective addition to the conventional radiation protection measures. While field size reduction and ceiling mounted lead screens remain of major importance, the addition of a radiation absorbing drape causes further minimalization of radiation exposure of the medical staff.

The effect of the drape is significant for each operator position, unlike the effect of ceiling mounted lead screens, which merely shield operators located nearby the screens.