Ask EuroSafe Imaging Tips & Tricks

CT Working Group

Trauma board in CT examinations – effect on dose and image quality

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Background

- Trauma patients often arrive at the x-ray department placed on a trauma board if spine or head/neck injuries are suspected.

- The use of a trauma board will increase the attenuation of the radiation and the patient absorbed dose if automatic tube current modulation is being used.

- The trauma board will have different effects on the absorbed dose and the image quality depending on its configuration and attenuating characteristics.

- Children should be placed on a paediatric trauma board in order to keep the radiation dose to a minimum.
Considerations when using a trauma board

- A trauma board will position the patient higher up from the examination table than normal: correct centering (if possible) is, however, still important.

- Since a regular head holder cannot be used, an extension of the table or simply the board itself “free-in-air” can be used.
Increase in absorbed dose at a fixed scan length

- Comparing DLP for an adult Alderson phantom positioned on or off a trauma board during a trauma scan will give an example of the increase in absorbed dose to the patient.

- Potential artefacts in the images can also be evaluated.
Increase in absorbed dose for a “child” on an adult trauma board

- Using smaller water phantoms is a rough illustration of the absorbed dose to a child placed on an adult trauma board
Total DLP for the phantoms and resulting increase in DLP when using the trauma board

<table>
<thead>
<tr>
<th>Age Group</th>
<th>DLP (mGy*cm) without board</th>
<th>DLP (mGy*cm) with board</th>
<th>Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-5 y</td>
<td>488.45</td>
<td>607.49</td>
<td>+24.4%</td>
</tr>
<tr>
<td>6-10 y</td>
<td>557.26</td>
<td>749.47</td>
<td>+34.5%</td>
</tr>
<tr>
<td>11-16 y</td>
<td>944.45</td>
<td>1188.80</td>
<td>+25.9%</td>
</tr>
<tr>
<td>Adults</td>
<td>1063.38</td>
<td>1246.89</td>
<td>+17.3%</td>
</tr>
</tbody>
</table>

DLP (mGy*cm) without board

DLP (mGy*cm) with board

Increase in DLP (%)
<table>
<thead>
<tr>
<th>Age Group</th>
<th>Head*</th>
<th>Neck</th>
<th>Chest/abdomen</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child 1-5 years</td>
<td>22.7%</td>
<td>28.1%</td>
<td>32.9%</td>
<td>24.4%</td>
</tr>
<tr>
<td>Child 6-10 years</td>
<td>37.4%</td>
<td>12.7%</td>
<td>29.5%</td>
<td>34.5%</td>
</tr>
<tr>
<td>Child 11-16 years</td>
<td>34.3%</td>
<td>10.9%</td>
<td>16.7%</td>
<td>25.9%</td>
</tr>
<tr>
<td>Adult</td>
<td>33.6%</td>
<td>0.0%</td>
<td>2.6%</td>
<td>17.3%</td>
</tr>
</tbody>
</table>

*including an extension of the table*
Any artefacts?
Conclusions

- Patients with suspected spine and/or head/neck injuries placed on a trauma board will receive an increase in absorbed dose. For this particular trauma board, approximately 20%.

- Artefacts can occur.

- Children should be placed on trauma boards that are adapted to their size in order to minimise dose increase and risk of artefacts.

- Patients that do not have reasonable indications of spine and/or head/neck injuries should not be placed on a trauma board.

- There are several manufacturers of trauma boards. The attenuation and risk of artefacts should be considered when purchasing a new trauma board to the emergency department.
Acknowledgements

- The measurements in this example were performed and summed up by radiographers Zandra Ek and Tove Törner at Skaraborgs Hospital in 2014, who provided all images and graphs.