EXTREMITY AND EYE LENS DOSES FOR VERTEBROPLASTY AND KYPHOPLASTY PROCEDURES IN BELGIUM

Lara Struelens, Werner Schoonjans, Sabah Krim & Filip Vanhavere

Belgian Nuclear Research Centre (SCK•CEN)
The Belgian ExDos project

Vertebroplasty and kyphoplasty procedures

Extremity and eye lens doses for vertebroplasty and kyphoplasty procedures

Extrapolation to annual doses

Conclusions
The Belgian ExDos project

- In routine practice, no monitoring is performed on
  - Extremity doses
  - Eye lens doses

- Collecting dosimetry data for medical staff for interventional procedures
  - ORAMED: measurements in 3 Belgian hospitals
  - ExDos: Extension of number of hospitals up to 10

- Same measurement protocol as for ORAMED, all data included in ORAMED analysis

- Measurements performed from June 2009 until October 2010
The Belgian ExDos project

- Interventional procedures within ExDos
  - Cardiac procedures
    - CA&PTCA
    - RF ablations
    - PM & ICD implantations
  - ERCP procedures
  - Excluded: radiology procedures
    (measurement campaign performed in a previous Belgian project)
  - Added: vertebroplasty and kyphoplasty procedures

- Poster on global ExDos results
  
  An overview of extremity and eye lens doses for interventional procedures and nuclear medicine in Belgium: The EXDOS project

S. Krim et al.
Vertebroplasty and kyphoplasty

- Minimally invasive procedures for vertebral compression fractures (fractures in the vertebra)

**Vertebroplasty:**
- Injection of a special cement mixture through a hollow needle into the fractured bone

**Kyphoplasty:**
- Insertion of a balloon through the needle into the fractured bone to create a cavity to control where delivered cement goes, restore some of the compressed height of the vertebra.
Extremity and eye lens doses

- Measurements performed in 5 hospitals
- Total of 50 measurements
- 2 kind of systems involved

<table>
<thead>
<tr>
<th>X-ray system</th>
<th>Hospital E</th>
<th>Hospital K</th>
<th>Hospital L</th>
<th>Hospital M</th>
<th>Hospital N</th>
</tr>
</thead>
<tbody>
<tr>
<td># measurements</td>
<td>9</td>
<td>10 + 10</td>
<td>8</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>X-ray system</td>
<td>C-arm</td>
<td>C-arm</td>
<td>O-arm</td>
<td>C-arm</td>
<td>O-arm</td>
</tr>
</tbody>
</table>
Extremity and eye lens doses

- Comparison with other procedures → $Hp(0.07) / KAP$

![Graph showing comparison of Hp/KAP for different procedures with a left eye highlighted.](image-url)
Extremity and eye lens doses

- Comparison of monitored locations \( \rightarrow \) \( Hp(0.07) / KAP \)
Extremity and eye lens doses

Comparison of hospitals → Hp(0.07) / KAP

Difference of factor 3
Extremity and eye lens doses

- Highest doses to the hands
  - Hands are regularly in primary beam
  - No protective equipment to protect hands and eyes
Extremity and eye lens doses

- Comparison of types of systems $\rightarrow KAP(0.07)/KAP$
Extremity and eye lens doses

- Radiation protection means to reduce doses to the hands
  - Hospital N: uses tweezers to hold the needles during irradiation

Needle held with hand during positioning
Extremity and eye lens doses

- Radiation protection means to reduce doses to the hands
- Hospital K: tests the use of lead gloves
Extremity and eye lens doses

- Radiation protection means to reduce doses to the hands
- Hospital L: Uses the Cement Delivery System (CDS)

![Graph showing comparison between direct injection and with cement delivery system.](image)
Extrapolation to annual doses

- Annual dose calculated as product of
  - Average Hp(0,07) values from ExDos project
  - Estimation of number of procedures per year

### Hospital K
- C-arm system
- 185 procedures per year
- More types of procedures are performed by operator

### Hospital E
- C-arm system
- 95 procedures per year
- Performs also 50 discographies performed by operator
Conclusions

- For vertebroplasty and kyphoplasty procedures
  - High doses are obtained for fingers and wrists
  - Non negligible doses are obtained for eyes

- Annual doses can reach the dose limit, especially for the hands

- C-arm systems give higher absolute Hp(0,07) values than O-arm systems
  - More radiation is used, higher KAP values are observed

- There exist effective radiation protection means
  - Working from a distance
    - Tweezers for positioning needles
    - kyphon@CDS for cement delivery
  - The use of lead gloves
THANK YOU FOR YOUR ATTENTION
Copyright © 2011 - SCK•CEN

All property rights and copyright are reserved. Any communication or reproduction of this document, and any communication or use of its content without explicit authorization is prohibited. Any infringement to this rule is illegal and entitles to claim damages from the infringer, without prejudice to any other right in case of granting a patent or registration in the field of intellectual property.

SCK•CEN
Studiecentrum voor Kernenergie
Centre d'Etude de l'Energie Nucléaire

Stichting van Openbaar Nut
Fondation d'Utilité Publique
Foundation of Public Utility

Registered Office: Avenue Herrmann-Debrouxlaan 40 – BE-1160 BRUSSEL
Operational Office: Boeretang 200 – BE-2400 MOL