MEDICAL STAFF EXPOSURE IN ELECTROPHYSIOLOGY PROCEDURES: FIRST RESULTS DURING BIVENTRICULAR ICD IMPLANTATION

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Cardiac resynchronization therapy (CRT) is a device-based therapy for patients with damaged heart muscles, electrical timing abnormalities, and symptomatic heart failure.

CRT is also known as biventricular pacing (bi-V pacing) and can be accomplished with either a pacemaker or an ICD. CRT is essentially a pacemaker or ICD with an extra, or third, wire or lead. The lead is placed in a very strategic place - inside a vein called the **coronary sinus**. Because the coronary sinus overlies the **left ventricle** (LV), pacing of the left ventricle can be accomplished. Ordinary pacemakers and ICDs can only pace the **right ventricle** (RV) and **right atrium** (RA). With both right and left ventricular leads, though, CRT can "resynchronize" the heart - helping to make it beat more efficiently and stronger.
Analyzing “cardiological procedures” at Sant’Orsola Malpighi University Hospital...

... in terms of total energy emitted by the X-ray tube

... but the distribution of this DAP values during procedures phases (i.e., graphy vs. scopy)?

... so no great differences seems to be...
In order to obtain a complete description of the scenario (i.e., correct evaluation of personal dose indexes) ...

... complete description of X-ray tube parameters and geometries during CRT procedures (to define the source of X-ray field)

... complete description of staff positions during CRT procedures (to define the geometry)
... and to measure staff dose ...

**Our choice:** measures with electronic dosimeters

- Photon energy?
- Sensitivity?
- Correct estimation?

Direct measure of the X-ray spectra scattered by patient
<table>
<thead>
<tr>
<th>TOTAL</th>
<th>DAP (mGy×cm²)</th>
<th>54'426 (21'693 - 150'069)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>PA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RAO</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LAO</td>
</tr>
<tr>
<td></td>
<td>MEDIAN</td>
<td>MIN</td>
</tr>
<tr>
<td>Projection DAP (mGy×cm²)</td>
<td>26'629</td>
<td>2'937</td>
</tr>
<tr>
<td>DAP ptc</td>
<td>56,3%</td>
<td>-</td>
</tr>
<tr>
<td>FLUOROSCOPY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tube Voltage (kV)</td>
<td>93</td>
<td>82</td>
</tr>
<tr>
<td>Tube current (mA)</td>
<td>3,0</td>
<td>2,0</td>
</tr>
<tr>
<td>Time (s)</td>
<td>630</td>
<td>144</td>
</tr>
<tr>
<td>DAP (mGy×cm²)</td>
<td>23'378</td>
<td>2'937</td>
</tr>
<tr>
<td>DAP ptc</td>
<td>57,5%</td>
<td>-</td>
</tr>
<tr>
<td>GRAPHY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tube Voltage (kV)</td>
<td>81</td>
<td>63</td>
</tr>
<tr>
<td>Frame number</td>
<td>295</td>
<td>27</td>
</tr>
<tr>
<td>DAP (mGy×cm²)</td>
<td>4'660</td>
<td>844</td>
</tr>
<tr>
<td>DAP ptc</td>
<td>39,1%</td>
<td>-</td>
</tr>
</tbody>
</table>

... that determines differences in X-ray scattered field that impinge on staff
Comparison between spectra (HV = 120 kV)

- without apron
- 120 kV - 0.25 mm Pb

... calculated Hv(10) ratio of ~ 45
First of all: literature data for CRT procedures?
... obtained with direct measure of Hp(10) with electronic dosemeters under apron
First evaluation: direct measure of \( H_p(10) \) with electronic dosemeters

\[ H_p(10) \text{ } \Gamma \text{ } (\mu \text{Sv}) \]

Frequency of Dose Value
(population = 19 cases)

**MEDIAN VALUE**

\( H_p(10) \text{ } (\mu \text{Sv}) \)
Trying to compare values between cardiologists...
“Deconvolving” the procedures…

- a complete description of the irradiation geometry on patient (to define the scattering field that impinge on staff)

- a complete description of the CRT phases (graphy vs. scopy)
Future works ...
Future works …

1

2

3

A “concerned involvement” of electrophysiologists, some suggestions...

Eye and hand?

~ 0.1 mSv and ~1.1 mSv

… “very first data” …

THANK YOU for ATTENTION!!!