

ORAMED's recommendations to reduce medical staff exposure in interventional radiology and cardiology



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ORAMED Why ?

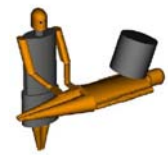
- High doses to hands, feet and eyes for the personnel involved in interventional radiology and cardiology procedures (IR/IC).
- Wide dose ranges for the same kind of procedures, since many factors affect extremity doses.
- Eye lens doses can be high in IR/IC, and cases of cataracts have been reported in recent years.
- Lack of appropriate active personal dosimeters (APD) since very few devices can detect low energy fields, and none of them are designed for pulsed radiation.

ORAMED How?

A coordinated measurement program in European hospitals was organised in IR/IC procedures.

Simulations of the most representative procedures were performed to determine the main parameters that influence the extremity and eye lens doses.

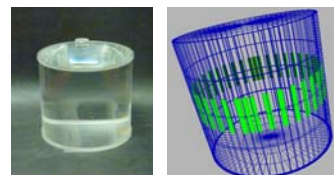
Next to these, some dedicated studies on improving the eye lens dosimetry and active personal dosimetry were conducted.



Measurement and simulation campaign

ORAMED's results: Guidelines 1

- The equipment used for IR/IC should fulfill specific requirements in their design and maintenance.
- Personal protective equipment should be used by all personnel in the room (at least lead collar and aprons).
- The ceiling suspended shield should be placed just above the patient. When ceiling shield is not available, protective lead glasses should be used.
- Lead glasses with side protection should be preferred.
- Table shield should be always properly adjusted to protect both legs.
- Mobile floor shield should be used for the assisting personnel.
- The X-Ray tube should be placed below the operating table.
- When possible, the femoral access of the catheter should be preferred to the radial one.
- Operators should avoid direct exposure of hands to primary radiation.
- Monitoring of the eyes and fingers (or wrists) should be performed on routine basis. Dosimeters should be worn on the side of the operator which is closest to the X-ray tube.



Cylindrical phantom proposed for eye lens dosimetry



APDs selected for the study

ORAMED's results: Guidelines 2

- The APD has to fulfill the requirements of the IEC 61526 standard in particular the energy, angular and dose rate response.
- The APD characteristics in pulsed field are needed.
- The APD has to be periodically (according to local regulation) calibrated in terms of Hp(10) with X-ray beams in a calibration laboratory traceable to a primary standard.
- The APD should be worn over the lead apron.
- The alarm should be switched ON (only visual alarm) in order to warn the operator when he/she is too close to the direct beam

ORAMED's results: Developments

A new dosimeter specially designed to monitor eye lens (EYE-D™) has been developed together with the corresponding specific calibration procedure to determine the operational quantity Hp(3).



Conclusions

The outcome of the ORAMED project will improve the radiation protection standards for medical staff. The systematic measurements and simulations are the new standards that will be used for many years to come. The practical guidelines that are developed can be used in the hospitals by the medical staff. In particular, the developments on the eye-lens dosimetry and the active personal dosimeters will result in an improvement of the practical measurement capabilities in the field.

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