



ORAMED 2011

Barcelona, 20-22 January 2011



Organised by
Universitat Politècnica de Catalunya
Barcelona Tech

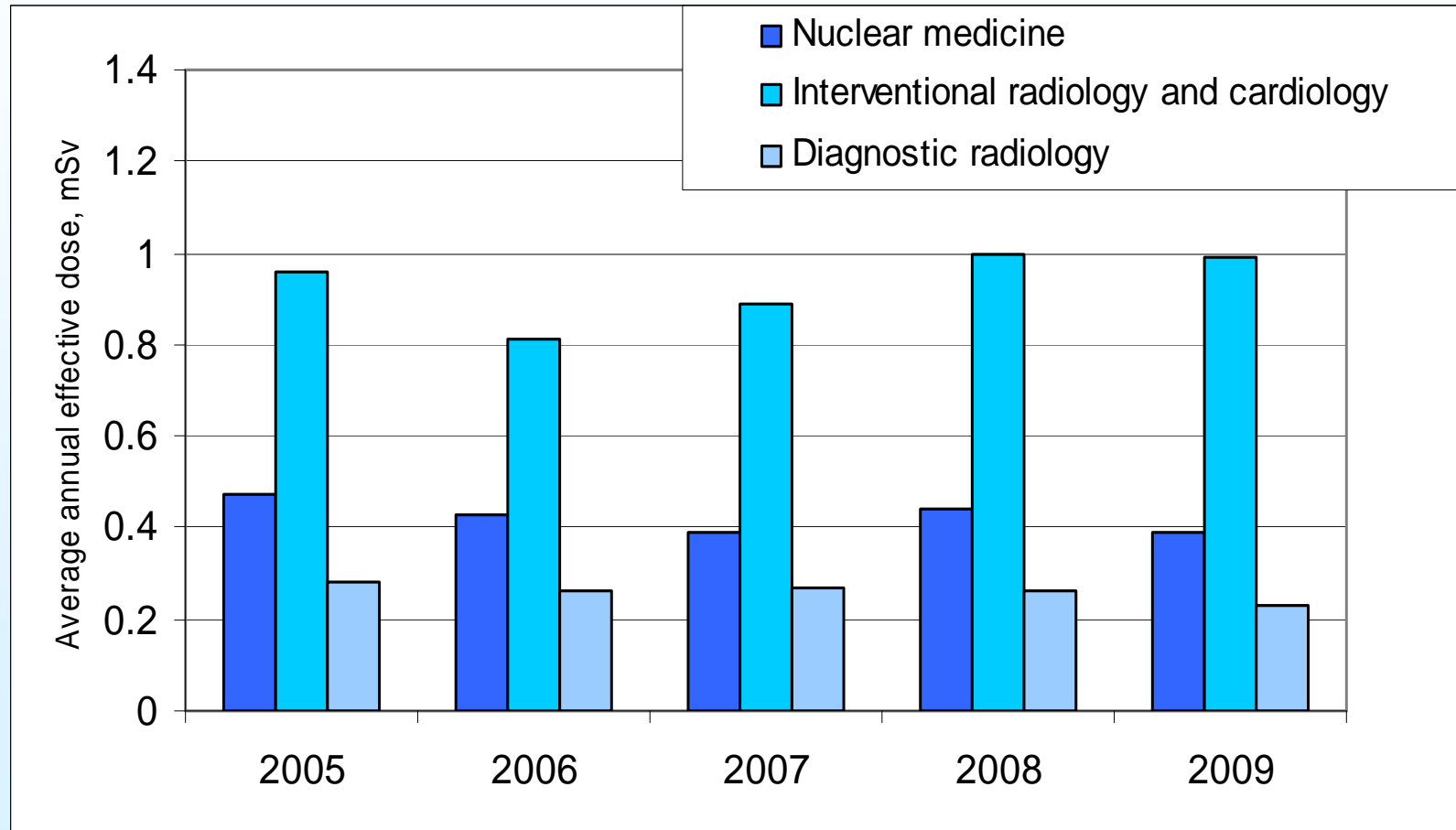
DOSES TO EYES AND EXTREMITIES OF MEDICAL STAFF DURING INTERVENTIONAL RADIOLOGY PROCEDURES

Ausra Urboniene, Birute Griociene
Radiation Protection Centre
Lithuania



Introduction

Medical staff during interventional radiology procedures receives higher doses in comparison with other groups of medical workers



Introduction

- Interventional radiology and cardiology workers is more likely caused to negative effects (such as cataract) of ionizing radiation exposure to their health.
- During interventional radiology procedures the individual protective aprons covers breast, waist, upper part of legs, however used additional radiation shielding in many cases do not help to avoid external exposure to eyes, hands and lower part of legs.
- The routine measurements of eye lens and extremity doses of interventional radiology and cardiology workers are not performed.
- The aim of this work was to assess exposure to eyes and extremities of medical staff during interventional radiology procedures.



Thermoluminescent dosimetry method

- The lithium fluoride (LiF:Mg,Ti) pellets were used.
- All doses were measured in terms of personal dose equivalent $H_p(0.07)$,
- it is equivalent dose in soft tissue below specified point on the body at a depth of 0,07 mm.
- Dosimeters after irradiation were read out with the RADOS thermoluminescent dosimetric system.
- The minimum measured dose of the system is 0.01 mSv.
- The total expanded measurement uncertainty is $\pm 25\%$ with coverage factor $k=2$.



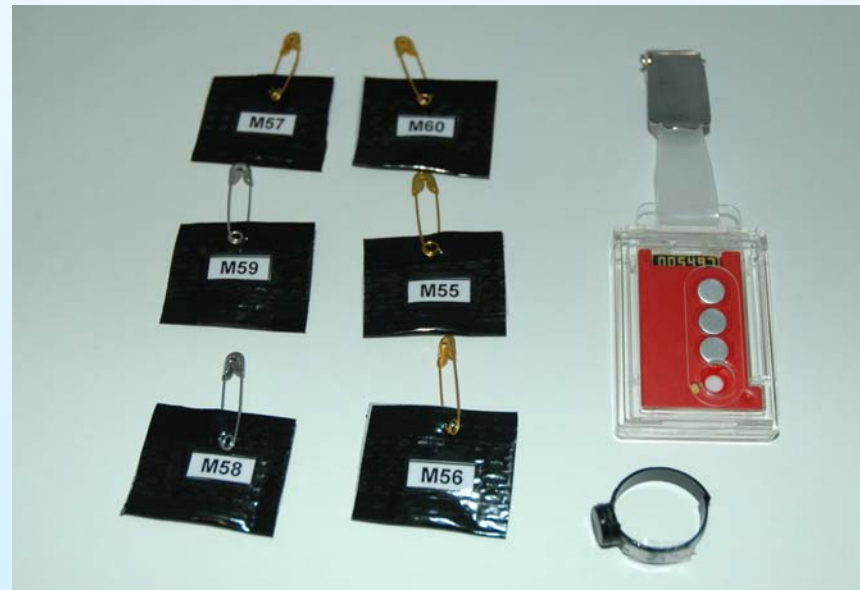
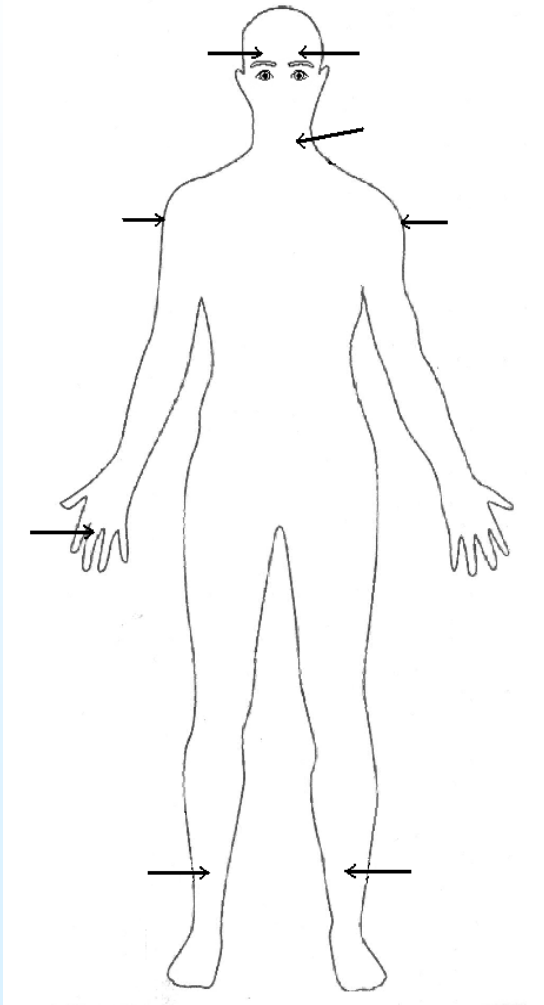
Lithium fluoride pellets



RADOS TLD Reader

Dosimeter location on the worker's body

1. above left eyebrow
2. above right eyebrow
3. left shoulder
4. right shoulder
5. left leg
6. right leg
7. finger of right hand
8. near the neck above protective collar



Results

- 6 hospitals participated in the study.
- 34 interventional radiology and cardiology physicians, 30 nurses, technicians and assistants.
- 512 doses were measured during 55 interventional radiology procedures.
- Fluoroscopy time was in the range of 18 seconds – 30 minutes per procedure (average 12 min.).
- Due to very short fluoroscopy time the doses of 11 physicians were less than minimum measured dose.



Doses of assisting staff

- The measured doses of assisting staff were much lower than physicians.
- The doses above the minimum measured dose level for assisting staff were measured in three cases.
- The maximum measured dose for left leg of assisting nurse was 0,15 mSv per procedure.
- The lower doses assisting staff in comparison with physicians are received due to longer distance from X-ray equipment during interventional procedures.



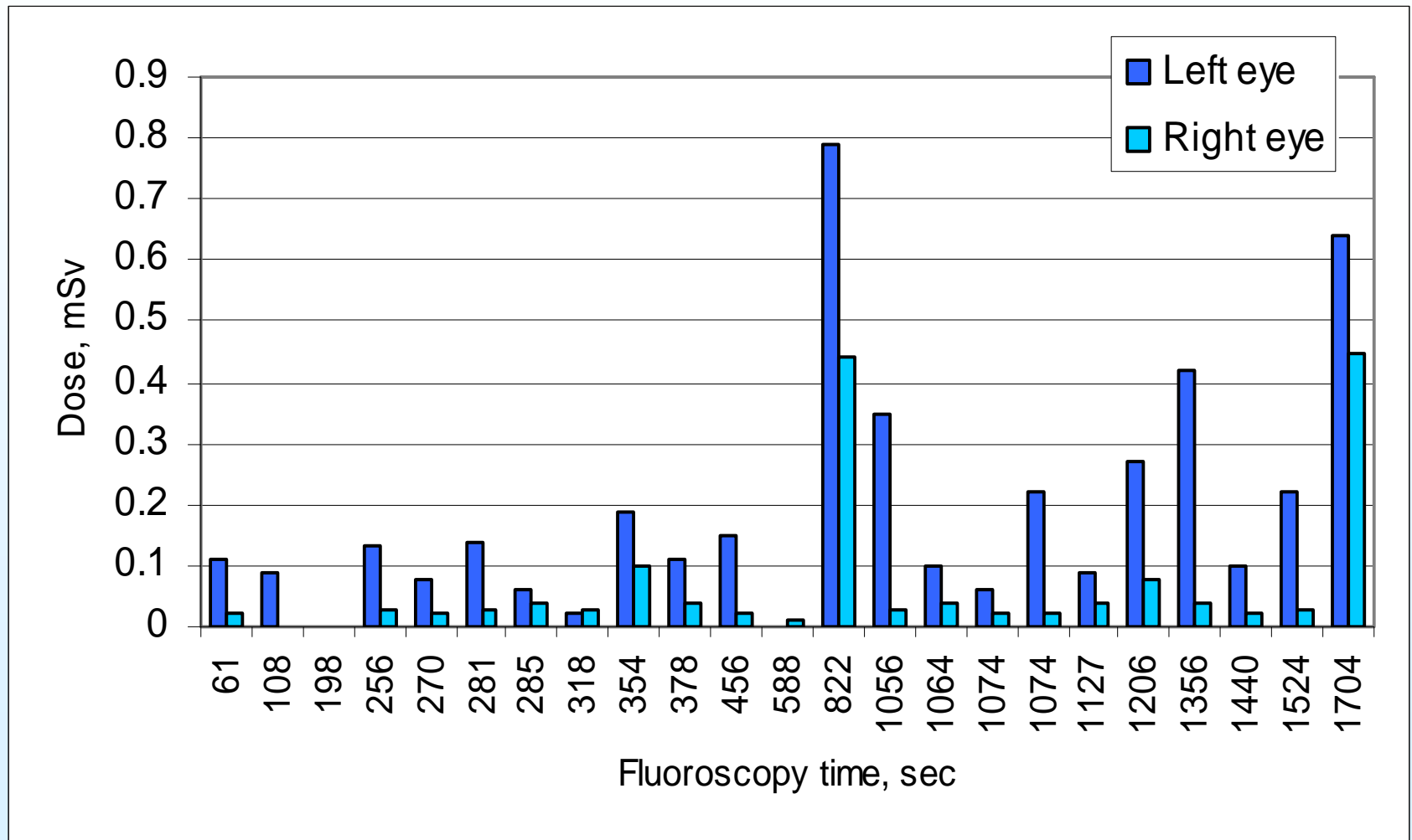
Ranges of measured doses per procedure of interventional radiology and cardiology physicians

⊕

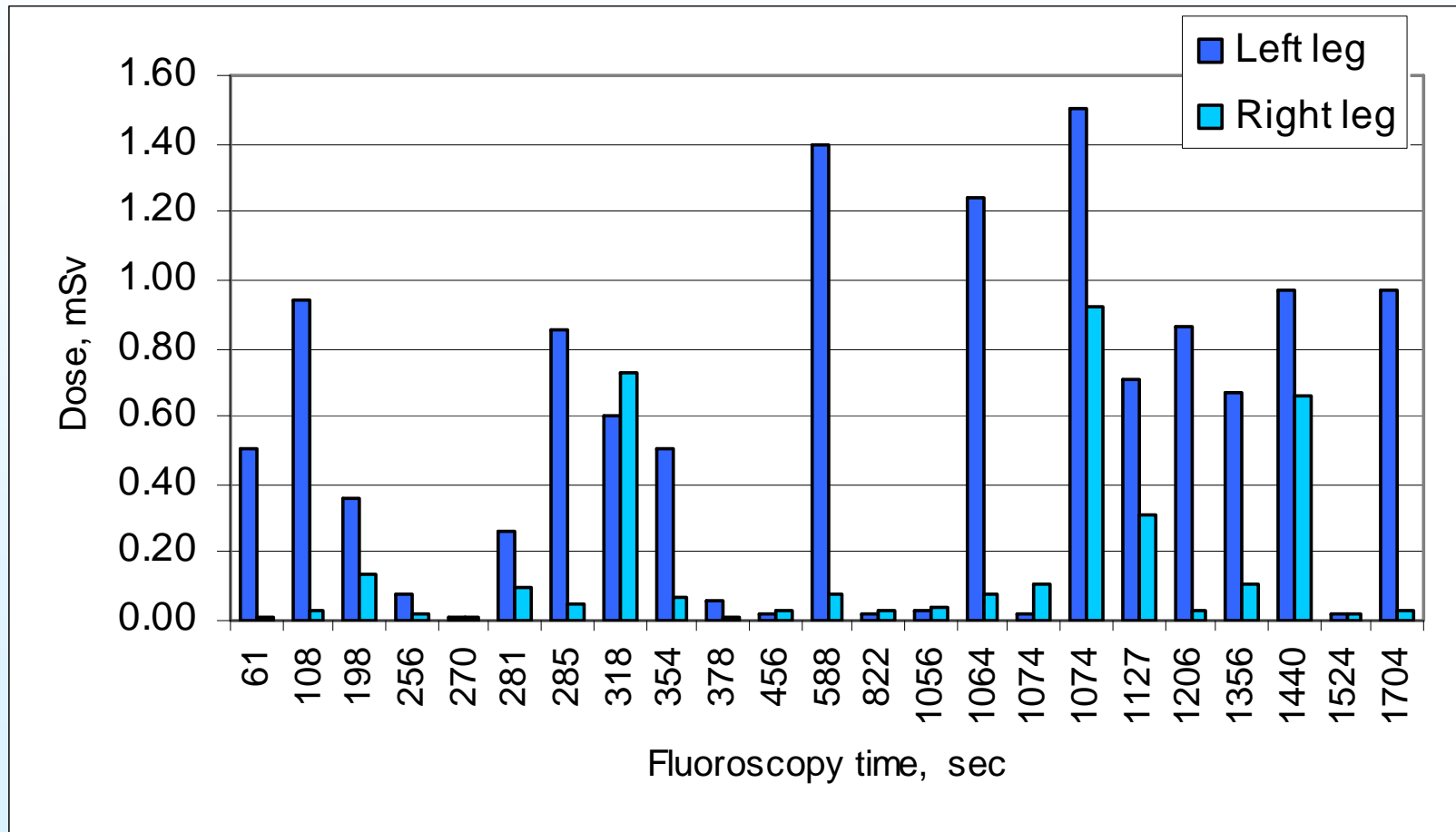
| Interventional procedure (amount) | Dose per procedure, mSv | | | | | | |
|--------------------------------------|-------------------------|---------------|----------------------|----------------|----------------------|----------------------|---------------|
| | Left eye | Right eye | Left shoulder | Right shoulder | Hand | Left leg | Right leg |
| Coronariography and angioplasty (31) | 0,01- <u>0,79</u> | 0,01- 0,45 | 0,01- <u>1,01</u> | 0,01- 0,17 | 0,04- <u>1,29</u> | 0,01- <u>1,50</u> | 0,01- 0,92 |
| Coronariography (11) | 0,01- 0,09 | 0,01- 0,03 | 0,01- 0,08 | 0,01- 0,06 | 0,03- 0,18 | 0,01- 0,94 | 0,01- 0,73 |
| Angiography of limb (6) | 0,01 | 0,01 | 0,01- 0,06 | 0,01 | 0,01- 0,09 | 0,01- 0,36 | 0,01- 0,14 |
| Embolization of head (1) | 0,42 | 0,04 | 0,89 | 0,02 | – | 0,67 | 0,11 |
| Other (6) | 0,11- 0,19 | 0,02- 0,10 | 0,03- 0,18 | 0,01- 0,21 | 0,07- 0,55 | 0,08- 0,50 | 0,01- 0,10 |

□

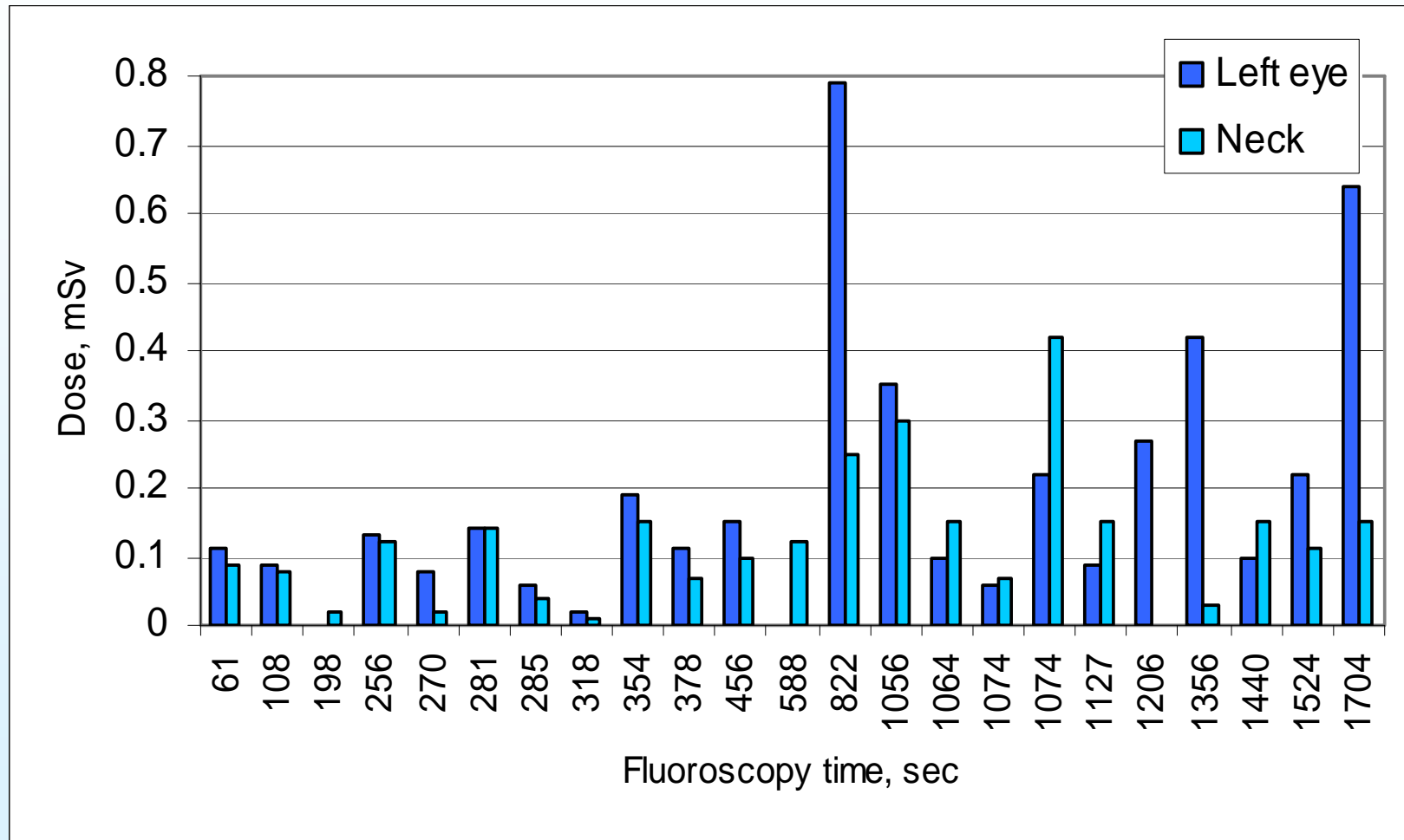
Dose of the left and right eye of 23 interventional radiology and cardiology physicians



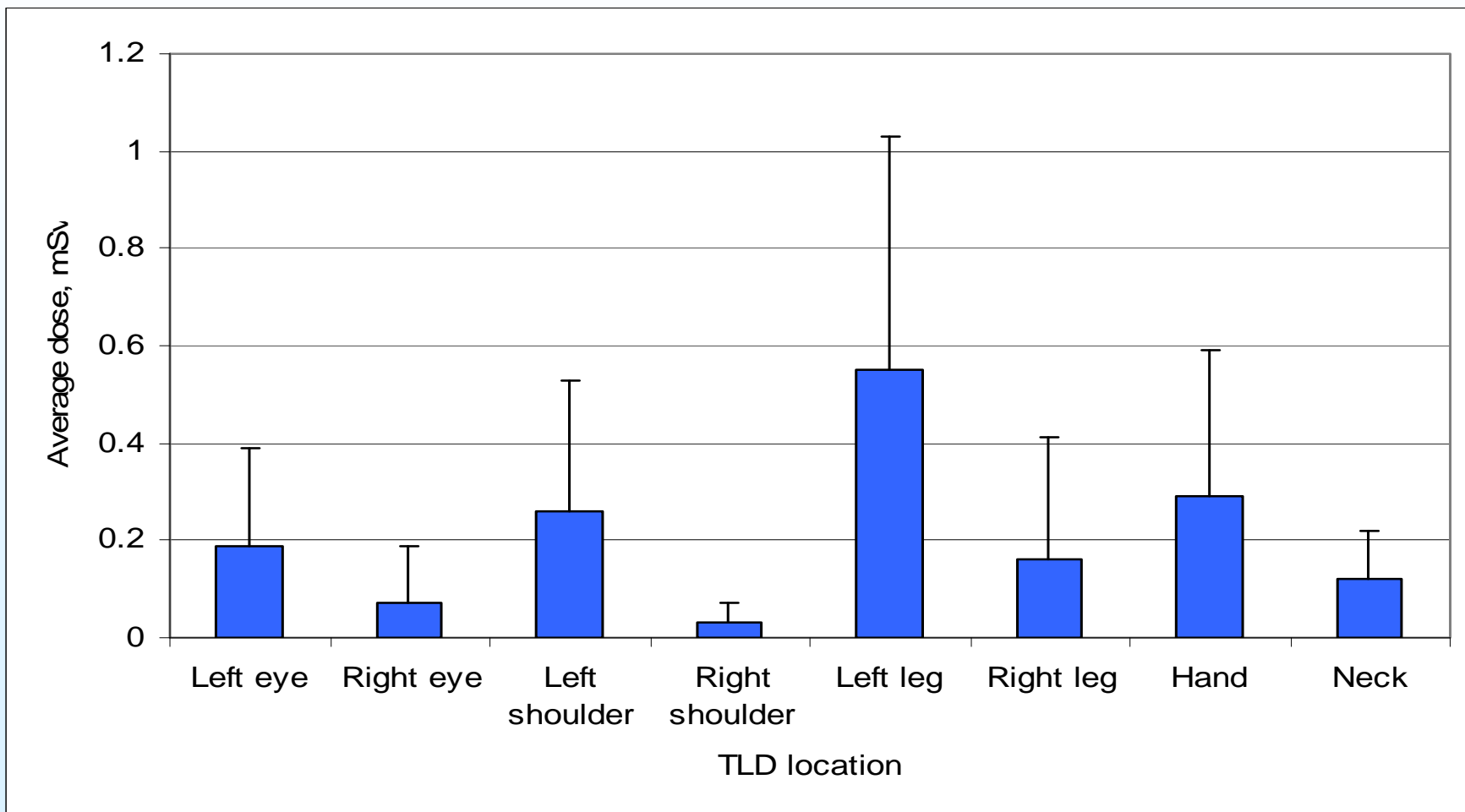
Dose of the left and right leg of 23 interventional radiology and cardiology physicians



Dose of the left eye and near the neck of 23 interventional radiology and cardiology physicians



Average dose per procedure of interventional radiology and cardiology physicians



Average doses in comparison with annual dose limits

Taking into account that physician's average fluoroscopy time per month is 130 min was calculated the annual average dose to eyes, legs and hands.

The calculated average annual doses do not exceed dose limits, but results show that annual average dose of left eye and left leg could be more than 10 percent of the annual dose limit to eyes and extremities.

| Part of body | Average dose per procedure, mSv | Annual average dose, mSv | Annual dose limit, mSv | 10% of annual dose limit, mSv |
|--------------|---------------------------------|--------------------------|------------------------|-------------------------------|
| Left eye | 0,19 | 25,2 | 150 | 15 |
| Hand | 0,29 | 37,2 | 500 | 50 |
| Left leg | 0,55 | 72,0 | 500 | 50 |

Conclusion

- The average eye dose of interventional radiology and cardiology physicians were about two times higher than the average dose near the neck above the protective apron.
- The study results show that annual doses of eyes and extremities of interventional radiology and cardiology physicians might result in more than 10 percent of the annual dose limit to eyes and extremities. In such cases individual monitoring of extremities and eyes should be performed.



Thank you for your attention

