

IRSN

INSTITUT
DE RADIOPROTECTION
ET DE SÛRETÉ NUCLÉAIRE

Individual Dosimetry Monitoring: What Is Available In The Context Of A Retrospective Evaluation Of Potential Exposure To The Lens ?

Sophie Jacob, PhD

sophie.jacob@irsn.fr



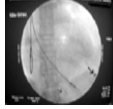

Laboratory of Epidemiology, IRSN

ORAMED 2011 - Barcelona

Thursday 20 January

INTRODUCTION

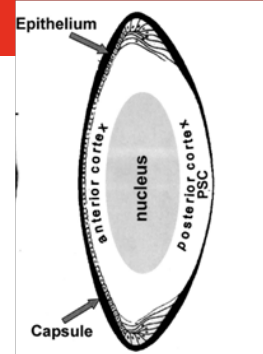
→ Interventional cardiologists are repeatedly and acutely exposed to scattered IR during the procedures, in particular to the eyes

Speciality	Procedures	Range of eye doses (μSv) by procedure*
Coronary interventional cardiology	Coronary angiography 	(3.3 → 1117)
	Coronary angioplasty 	(8.7 → 1040)
Electrophysiology	Radio frequency ablations 	(47 → 320)
	Pacemaker, intracardiac defibrillator implantation 	(39;50)

*based on studies published from 1971 to 2006
Kim *et al.*, Health Physics 2008

↳ Based on dose estimations and depending on the number of procedures performed by a cardiologist, the **cumulative dose** received may exceed **2-5 Gy** (dose threshold) or the recommended limit in the workplace of **150 mSv per year for the eye** (ICRP 2007) and potentially put them **at risk to develop cataracts**.

➔ Prevalence studies on posterior subcapsular lens opacities in interventional cardiology



Country, Year	Exposed group	Observed	Unexposed group	Observed	P-value
North America, 2004 <i>Junk, et al. 2004</i>	59 radiologists and IC	37,3% opacities 8% cataracts	None	-	-
Bogota, Colombia +Montevideo, Uruguay, 2008/2009 <i>Vano et al., 2010</i>	58 IC (42+16)	38% opacities	93 unexposed people	12% opacities	<u>RR=3.2</u> P<0.005
Malaysia, 2010 <i>Ciraj-Bjelac et al., 2010</i>	56 IC	52% opacities	22 unexposed people	9% opacities	<u>RR=5.7</u> P<0.005

IAEA - RELID Study

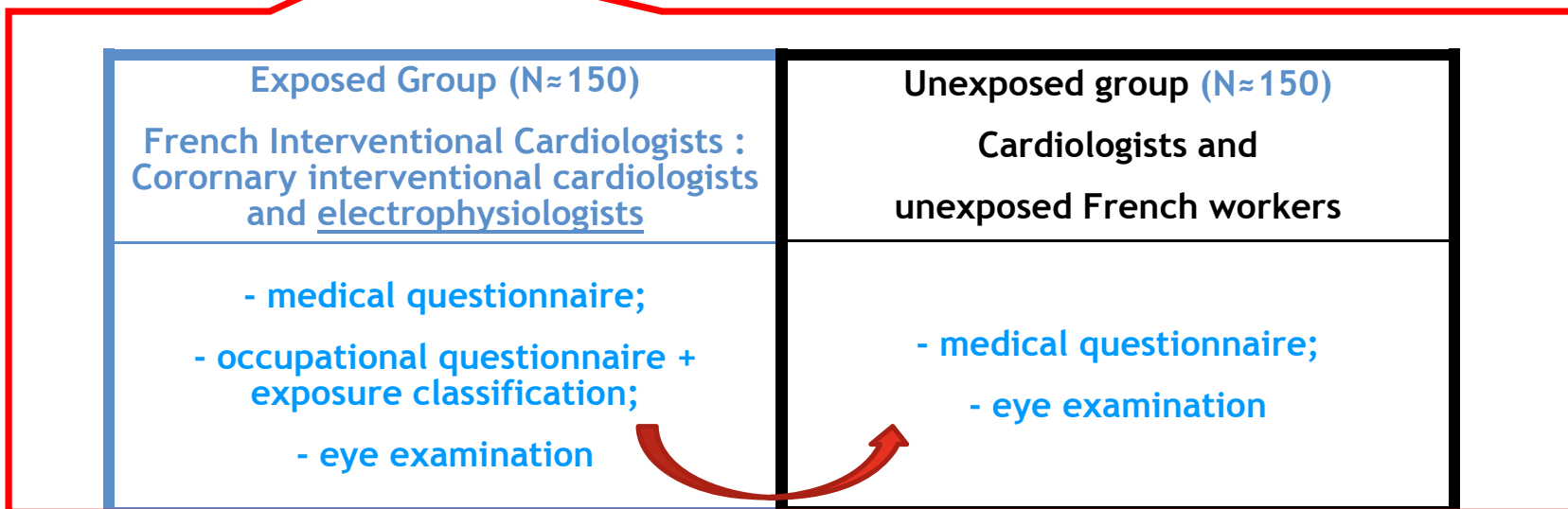
→ **In France:**

The **O'CLOC study** was launched in October 2009 - **O**ccupational **C**ataracts and **L**ens **O**pacities in interventional **C**ardiology

→ **O'CLOC aim:**

To test the existence of an increased risk of cataracts among interventional cardiologists compared with an unexposed control group including unexposed cardiologists

→ **O'CLOC design:** cross-sectional exposed/unexposed study (recruitment until April 2011)



Matching for age and sex

Jacob, et al. , 2010

Retropective evaluation of exposure in the O'CLOC study

→ Occupational questionnaire (for interventional cardiologists)

Lifetime occupational activity and most common kinds of procedures

Occupational history

List of all centres and periods of activity

For each period, precise:

Coronary angiography?

Mean number of procedures per week or year

Radial or femoral access route

Coronary angioplasty?

Mean number of procedures per week or year

Radial or femoral access route

Pacemaker or intracardiac defibrillator: implantation ?

Mean number of procedures per week or year

Mean fluoroscopy time per procedure

Pacemaker or intracardiac defibrillator: resynchronisation?

Mean number of procedures per week or year

Mean fluoroscopy time per procedure

Radiofrequency catheter ablation except atrial fibrillation ?

Mean number of procedures per week or year

Mean fluoroscopy time per procedure

Radiofrequency catheter ablation of atrial fibrillation?

Mean number of procedures per week or year

Mean fluoroscopy time per procedure

Frequency of use of radiation protection tools:

Lead apron

Lead thyroid shield

Lead eye glasses (goggles)

Other eye protection

Lead gloves

Protective mobile screen

Radiation protection cabin

Frequency of use of dosimetric badge

Retropective evaluation of exposure: use of personal dosimeters



« Many of the screened participants reported that they did not use their personal dosimeters on a regular basis. Furthermore, even when used, dosimeters were often worn under the lead apron, making any retrospective evaluation of ocular radiation dose inaccurate. » Vano et al., 2010

→ No data directly available on eye lens dosimetry, but what about passive dosimetry reliability ?

→ Aim of the present study:

Based on a sample of interventional cardiologists from the O'CLOC study, to collect information on the questionnaire (experiences and use of personal dosimeters) and **passive dosimetry** for the whole duration of individual dosimetric monitoring and to study the **reliability** of data.

Retropective evaluation of exposure: use of personal dosimeters

We combined Information from:

→ **SISERI Database** (*Système d'Information de la Surveillance de l'Exposition aux Rayonnement Ionisants*)

- Information system for occupational dosimetry registration centralized at IRSN
- Passive dosimetry, effective doses are registered (monthly or quarterly, in mSv)
- Medical staff: personal chest dosimeter is under the lead apron

→ **Use of personal dosimeters:**

In the questionnaire, for each experience:

- Always
- Not regularly
- Never

Sample description

→ 105 interventional cardiologists

- Mean age= 50 ± 7 years
- 282 distinct work periods (based on questionnaire, including education period) from 1971 to 2010
 - 2.7 work periods/IC (1.8/IC when excluding education)
 - education: n=88
 - 1 w.p. : n=105
 - 2 w.p. : n=62
 - 3 w.p. : n=22
 - 4 w.p. : n=5
- Mean duration of IC activity = 21.4 ± 8.2 years (min=8; max=39)
 - education: median=2 yrs (0. - 9)
 - 1st w.p. : median=8 yrs (0. - 38)
 - 2nd w.p. : median=9 yrs (0. - 30)
 - 3rd w.p. : median=7.5 yrs (2 - 28)
 - 4th w.p. : median=5 yrs (1 - 19)

Personal dosimeter use and information registered in SISERI

→ 282 distinct work periods (88 education periods + 194)

Never	N=106 (38%)
Not regularly	N=81 (29%)
Always	N=95 (33%)

→ Among these work periods: 93w.p. without any dosimetric information in SISERI (corresponding to 67 IC)

Never	N=58 (62%)
Not regularly	N=17 (18%)
Always	N=18 (20%)



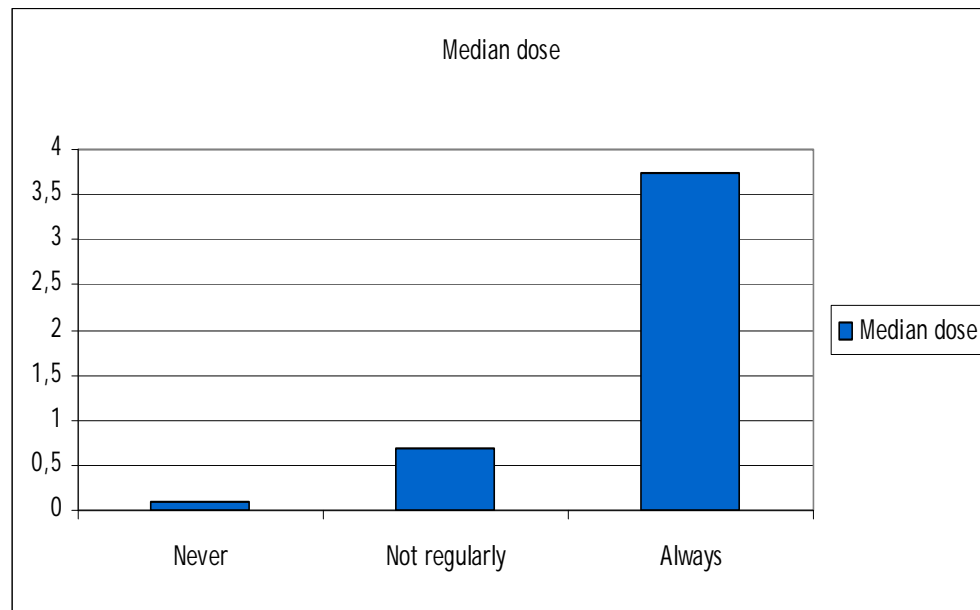
Either no dosimeter or no information back to SISERI

→ Finally, 189 work periods with dosimetric information registered in SISERI database, corresponding to 102 IC (97% of the initial sample)

Cumulated doses registered in SISERI by work periods

→ [189](#) distinct work periods and dosimeters use

Never N=48 (26%)	Median=0.11 mSV Min=0 Max=75.38
Not regularly N=64 (33%)	Median=0.69 mSV Min=0 Max=141,5
Always N=77 (41%)	Median=3.73 mSV Min=0 Max=290.5



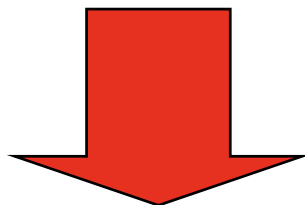
Cumulated doses registered in SISERI by interventional cardiologist

→ [102](#) interventional cardiologists and dosimeters use

Never N=17 (17%)	Median=0.55 mSV IQR= (0.0 - 21.1) Max=77.6 Cardiologists with 0 : n=6
Not regularly N=50 (49%)	Median=5.8 mSV IQR=(0.9 - 19.8) Max=216.7 Cardiologists with 0 : n=2
Always N=35 (34%)	Median=5.3 mSV IQR=(1.3 - 44.7) Max=299.0 Cardiologists with 0 : n=5

Discussion

- No direct information for eye lens dosimetry in a centralized information system
- Alternative solution to classify interventional cardiologists:
Passive dosimetry and registered effective doses in SISERI ?
 - Enabled confirming the ICs potential exposure status for 97% of the sample
 - Doses registered depend on personal dosimeter use
 - Discrepancies between self declared use of dosimeter and follow-up in SISERI



Information on eye lens doses ?

Need to collect information in the questionnaire and to estimate doses based on “mean doses” of each type of procedure observed in specific dosimetric studies.

Conclusion

→ In the context of epidemiological studies like the O'CLOC study,

➤ Exposed status can be confirmed with SISERI database

➤ Assessment of exposure with effective doses registered in SISERI database is limited by personal dosimeter use, except for “always used” cardiologists...

➤ For eye lens dose:

▪ Further developments are needed to take into account exposure and exposure variability due to the specificities of the IC procedures and the use of radiation protection tools, all this information been available in the questionnaire.

▪ Need to have “mean” doses for each procedure, and impact of radiation protection tool → “Procedure Exposure Matrix”

→ May ORAMED provide answers ?

Thank you for your attention !

