



Australian Government

Australian Radiation Protection and Nuclear Safety Agency

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Ms Liz Bailey
President, ANZSNM
PO Box 202
Parkville Victoria 3052

Dear Ms Bailey

This is an important update for your members and interested parties concerning the increased risk of eye damage from the operation of interventional fluoroscopy equipment.

The International Commission on Radiological Protection (ICRP) has examined recent epidemiological evidence relating to tissue reaction effects for doses to the lens of the eye. Regarding occupational exposure in planned exposure situations, the Commission now recommends an equivalent dose limit for the lens of the eye of 20 mSv in a year averaged over defined periods of 5 years, with no single year exceeding 50 mSv.

The ICRP now considers the threshold for tissue reactions to be an absorbed dose of 0.5 Gy. Based on the new limit for the lens of the eye, this effect threshold could feasibly be reached within a working lifetime. The end point of concern for the eyes is cataract formation. This latest ICRP recommendation, which represents a significant reduction in the occupational dose limit for the lens of the eye from 150 mSv to 20 mSv, has been incorporated into the revised Basic Safety Series recently published by the International Atomic Energy Agency¹.

Based on work carried out internationally and the subsequent statement produced by the Australian Radiation Health Committee² (RHC), ARPANSA has released a fact sheet dealing with reducing the risk of radiation induced eye damage in image guided interventional procedures.

I would ask that you notify your members and any other appropriate persons of the availability of this fact sheet to encourage best personnel radiation safety practice in this area.

Pdf copies of the Fact Sheet titled 'Improving Eye Safety with Personal Protective Equipment in Image Guided Interventional Procedures (IGIP)' can be found at <http://arpansa.gov.au/radiationprotection/factsheets/>

Yours sincerely

Carl-Magnus Larsson
CEO
ARPANSA

1 IAEA, Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards – Safety Standards Series No. GSR Part 3 Interim Edition (2011)

2 Radiation Health Committee, Statement on Changes to Occupational Dose Limit for Lens of the Eye. http://www.arpansa.gov.au/Publications/RHC/rhc_stat.cfm#eye



Improving Eye Safety in Image Guided Interventional Procedures (IGIP)

Previously the International Commission on Radiological Protection (ICRP), in its publication 60 (1991) recommended annual limits for the lens of the eye at 150 mSv. However recent epidemiological evidence relating to tissue reaction effects for doses to the lens of the eye and possible cataract formation has seen the ICRP now recommend¹ an equivalent annual dose limit for the lens of the eye of 20 mSv, averaged over defined periods of 5 years, with no single year exceeding 50 mSv.

Basis of Health Concern



Limits on equivalent dose to the lens of the eye (and extremities and the skin) have been seen as necessary to ensure the avoidance of significant detrimental tissue and/or organ damage.

The new lower limit has important implications for some areas of occupational practice, including those procedures that involve image guided x-ray interventional procedures (IGIP), emphasising the need for optimisation of protection measures with respect to the lens of the eye. The IGIP applications of particular interest are those which require high dose angiographic acquisitions and/or CT fluoroscopy guided interventions.

The nature of IGIP is that if no additional protective measures for the eyes are applied, personnel with a typical workload may receive doses to the lens of the eye that would greatly exceed the new dose limit, and over time could result in lens opacities.

Equally, if the IGIP equipment is performing correctly, procedure protocols have been optimised and personal protective equipment (PPE) for the eyes are being used, then the dose to the lens of the eye would be less than the dose limit, and likely to be a few mSv per year for a typical workload.

Results from a recent International Atomic Energy Agency survey of occupational dosimetry (ISEMIR²) suggest that the use of PPE and personal dosimeters are uneven, the quality of occupational dose monitoring is poor, and as a consequence knowledge about actual doses is limited. This has implications for the professions, hospital/clinic management, and regulatory bodies.

Recommendations

- Training in radiation protection for all IGIP personnel should include methods for reducing doses to the lens of the eyes, with practical exercises or demonstrations. Real time dosimeters should be used in training.
- IGIP professionals working close to the patient should use a ceiling suspended protective screen, positioned appropriately. If the use of such screens is not feasible with a given procedure, lead glasses with side shields should be worn. If appropriate, both devices should be used.



Photo provided by Imaging Solutions

- Protective measures for IGIP professionals working more distant from the irradiated volume of the patient should be specified by the local expert in radiation protection (e.g. radiation protection officer, medical physicist).
- IGIP professionals should always wear their personal dosimeters, following their local rules.

¹ ICRP ref 4825-3093-1464 Statement on Tissue Reactions

² <http://www-ns.iaea.org/tech-areas/communication-networks/norp/isemir-web.htm>

- Hospital management should perform regular reviews of personnel occupational eye doses.
- Personal dosimetry monitoring protocols should include assessment of the dose to the lens of the eye.
- Elements of a monitoring protocol may include the following:
 - The use of double dosimetry (over-apron at neck level and under-apron at chest/waist level)
 - The use of ambient dosimeters (such as at the C-arm) in identifying the lack of compliance in wearing personal dosimeters and to help to estimate occupational doses when personal dosimeters have not been used
 - The use of real time dosimeters to identify means for improving radiation protection practice.
- Manufacturers of interventional equipment should be able to supply systems that provide a second ceiling suspended screen to afford protection for situations where personnel are working on both sides of the table.
- National dose registers should include records for lens of the eye dose assessments. Such records should include the occupation and function of the individual to enable identification of areas of concern.

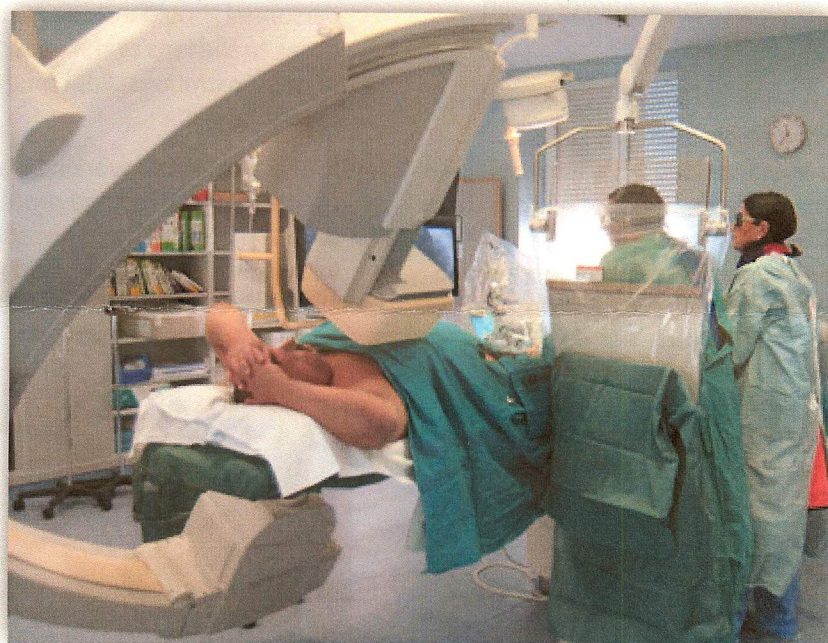
Conclusion

The ICRP has maintained the previous judgment that acute doses up to approximately 0.1 Gy produce no functional impairment of tissues. The risks of radiation-induced cancer and hereditary effects continue to be the principle risks to consider for most applications in occupational situations.

However, after acute or accumulated doses of more than 0.5 Gy, the risk of tissue effects becomes increasingly important for the lens of the eye after prolonged periods of time following radiation exposure.

There is no indication that protracted delivery of the dose to the lens of the eye is less damaging than acute exposure.

It is therefore recommended that owners, operators and ancillary staff take appropriate measures to ensure the limitation of this exposure by applying the above recommendations.



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More information is available from the ARPANSA website www.arpansa.gov.au