RADIATION PROTECTION IN THE MEDICAL PRACTICE: MYTH AND REALITY THE FRENCH RADIOGRAPHERS POINT OF VIEW

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1. INTRODUCTION

The use of the ionising radiation in the medical practice has evolved since its beginnings. Their benefit for the patient is considerable in term of comfort , diagnostic and therapeutic effectiveness. The users can be brought to think that the radiological risk is completely controlled and that the problems of radiation protection for the workers is now of the past. Indeed, the evolutions and the technical, material and scientific revolutions tend to decrease the doses delivered to the patients, and also to the professionals. In addition, the regulation associated with the use of the ionising radiation is strict and constraining, and one can estimate that radiation protection is a model of management of occupational hazards through its mode of declaration, authorisation, controls, management and traceability.

However, the daily practice and the experience on the hospital ground shows that the radiological exposures remain alarming and that any risk cannot be isolated, generally dependent on unsuited human behaviours.

The participation of the radiographers to this reflexion is essential. In fact, he is or should be the permanent link between the emission of radiation and the patient.

For this reason, he is the last barrier regarding radiation protection for the patient or the staff. He is thus the essential link beside the experts for a quality control in radiation protection

After a detailed and concrete description of the encountered problems, we will submit some non exhaustive but essential proposals for an improvement so that a real policy ALARA is applied and developed in the medical practice.

IS THERE A RADIATION PROTECTION PROBLEM FOR THE STAFF ?

The use of the ionising radiation in the medical practice mades it possible to make considerable diagnostic and therapeutic progress, from which the patients profit daily in fields such as radiology, nuclear medicine, and radiotherapy. These evolutions were carried out with the detriment of the professionals at the beginning of the 20th century and until the years 1950. The taking into account by the medical and industrial community of the biological consequences of the ionising radiation mades possible the improvement of the situation considerably:

Evolution of the hardware:

- the quality and sensitivity of receptors
- the quality and the reliability of the generators
- the quality of the beams obtained
- the image optimisation and the dominating use of digitalisation and data processing
- the development of software of reduction in the delivered doses

Evolution of the hardware in radiation protection

- the individual protection equipment is more and more diversified and adapted.
- minimal standards of protection are enacted. The products are of better quality and more ergonomic (use of composite materials). Moreover certain particular protections are in phase of development (glasses, …extremities)
- the collective protection equipment is spreading (folding screens, …)
- the optimisation equipment completes this description, such as the detectors at output of tube (diamentor), the hardware of operational dosimetry…

Technological developments

- Non ionising techniques such as ultrasound , MRI , fibroscopy
- ionising with the use of reconstruction thanks to the digitalisation of the data, the development of multi-slices CT, the computer evolution

Evolution of knowledge

· The problems of radiation protection are today the subject of many studies which make it possible to improve the practices.
· Moreover, the powerful means of detection and characterisation are as many tools at the disposal of the professionals.
· Training of the professionals.

On the whole, the workers exposed in France are very few, and on levels of relatively weak doses.

	Nombre d'agents	1-6 mSv	6-20 mSv	20-50 mSv	> 50 mSv
Radiology	**90621**	**90285**	**263**	**56**	**17**
Radiotherapy	7944	7894	42	5	3
Nuclear medicine	4046	4002	44	0	0
Dentists	24752	24710	33	7	2
Work medicine	5312	5307	2	1	2
Vets	3782	3373	7	2	0

ORIGINE : OPRI 2000

In fact , we note a going beyond of the future limits of doses by 103 people in the medical field, with a majority of workers practising in radiology. A strong tendency to minimise the radiological risk rises from the real reduction in the deterministic effects in 2nd half of the 20th century, and the impact of the radiological risk compared to other types of risks to which the professionals of the medical field are confronted (biological, chemical, infectious, etc.)

2. THE REPORT

The evolutions described previously have in fact induced behaviours which very often cancel their benefit. Indeed, the considerable technological progress has minimise the use of the ionising radiation in medicine.

♦ The facility of obtaining the images and their quality induce an increase in the number of acquisitions per examination. - Currently, any professional is able, with a minimum of information, to produce an image, the equipment being preset and being programmed to control the errors. Previously, the radiological technique concerned a certain "craft industry" and a thorough knowledge of the exposure parameters .

♦ This evolution makes it possible "to off-set" certain radiological or nuclear medicine acts apart from their originating departments (operating room, cardiology, rhumatology, etc.), with for consequence that radiological acts are carried out by non trained professionals, who because of lack of time and qualified personnel, acquire the images without optimising them, and often without means of protection.

♦ The digitalisation and the evolutions of the implants and prostheses have as a consequence a multiplication of the films , and the development of interventional radiology, real progress for the concerned patients since one thus avoids serious and risky interventions, that the duration of the hospitalisation is reduced by it, but which is accompanied by prolonged use of x-rays.

The development of new techniques generates additional risks:

✓ the fluoroscanner
✓ PET SCAN
✓ Internal radiotherapy (Yttrium 90 for example)

The dosimetric results with previously accompanying notes are reassuring, but:

✓ How many professionals are exposed without dosimetric follow-up because of lack of classification?
✓ As for those who profit from it, it is frequent that they do not carry it regularly, or that the dosifilm is not exploited because not returned or deteriorated.

We can thus probably ensure that the announced dosimetric results are an inaccurate reflection of reality.

- ✓ In interventionnal radiology, the passive dosimetric follow-up is necessary but is badly adapted since the dose at the extremities and with crystalline lens are very seldom evaluated, but they are the principal sources of concern.
- ✓ Its complement by active dosimetry is insufficient (port of the electronic dosemeter under the lead jacket)

The regulation is not always adapted:

- ✓ Euratom directive 90-641 relating to operational dosimetry is transposed in French law without taking account of the specificity of the medical practice
- ✓ The French standards do not correspond any more to the evolution of radiological utilisation
- ✓ Euratom directive 96/29 deals with the pregnant woman and limit the amount to the foetus at 1 mSv. This text is likely to have for translation in the facts a certain discrimination at the time of recruitment of the young professional . women

When it is , it is not much respected :

"Any use of ionising radiation in a medical act must be made under the responsibility of competent experts having received a training in radiation protection "
"the auxiliary staff must receive a training… in particular in radiation protection "
(Euratom directive 84/466).

This text is not applied in France. The French regulation imposes the obligation to inform the personnel on the radiological risk. This point is reinforced by article 19 of Euratom directive 96/29.

- This point is not or a little respected.
- The continuous development and the update of knowledge in radiation protection is almost non-existent
- These requirements in term of initial and continuous education are included in directive 97/43 for the protection of the patients, and thus for the staff.

Means allocated with radiation protection in the medical practice.

They are almost non-existent, depend only on the will of the employer and his implication in the process of risk management. The materials means are expensive and must be used by trained experts, they are function of the size of the structure and its branches of industry. The human means, released time, initial and continues education, are the prerogative of significant structures and are left to the appreciation of the head of the institution. Moreover, the application of the new texts relating to controls of sources and waste, to the operational dosimetry require time and means.

3. SOME PROPOSALS

Application of the lawful texts

- Concerning the equipment and their controls, by approved external and internal organisation - texts governing the quality control of the equipment
- Control the training of the actors using the ionising radiation and to lead to a "licence to irradiate"
- Quality control of the equipment
- Periodic controls by external organisations are essential but insufficient to be able to have an operational practical aspect. It is thus essential to supplement them by simple internal daily and weekly audits.

The implication of the radiographers in this step is of primary importance, since they are the first concerned with the functionality of their working tool. More generally, it is a question of making with the staff aware of the importance of these regular controls which answer the concept of optimisation of the amounts for the patients and the exposed staff.

Evaluation of the techniques

The new techniques must be evaluated by dosimetry before their installation to optimise the practices and to train the concerned staff. This approach can be generalised to all the examinations.

Organisation of radiation protection

It would be wise to generalise the structures "radiation protection and quality control", according to the needs for the , institutions which would associate various professionals - attached to the employer.

To better form

It is a question of improving the initial and continuous training in radiation protection of theradiographers, currently very reduced. A European harmonisation is essential. The doctors using ionising radiation must also be better trained, like their colleagues prescribes, which could lead to a better justification of the radiological acts and prescribed examinations.

3. CONCLUSION

The radiographer is the professional who currently delivers the most doses, it is in general him which starts the exposure and defines the parameters. It is thus of primary importance to integrate ~~it~~ him in the radiation protection networks.
Its role like guarantor of correct use of the ionising radiation, as permanent "whatchdog", make an essential link of him. However, we should recognise the need for improving his initial and continued training, to harmonise it and to control it regularly. Lastly, these networks must have of experts , human and material means to be effective and develop a real policy of optimisation in the medical practice.