RADIOPROTECTION DES PATIENTS

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RADIOPROTECTION

Oui !

Mais n’oublions pas les bénéfices de l’imagerie médicale

UN CONTEXTE INTERNATIONAL

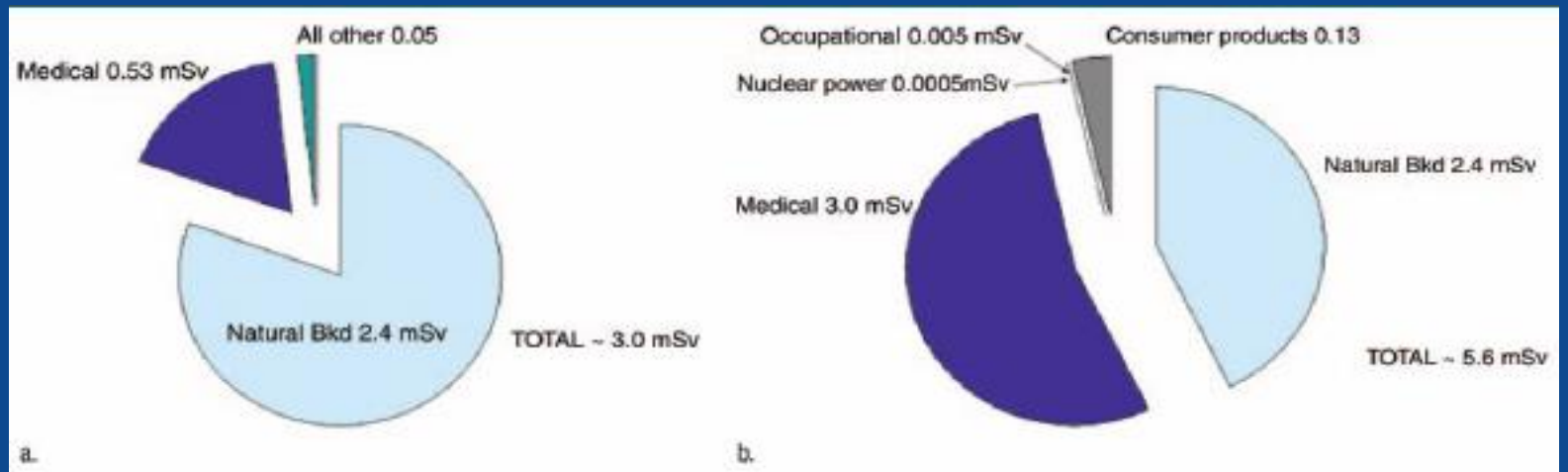


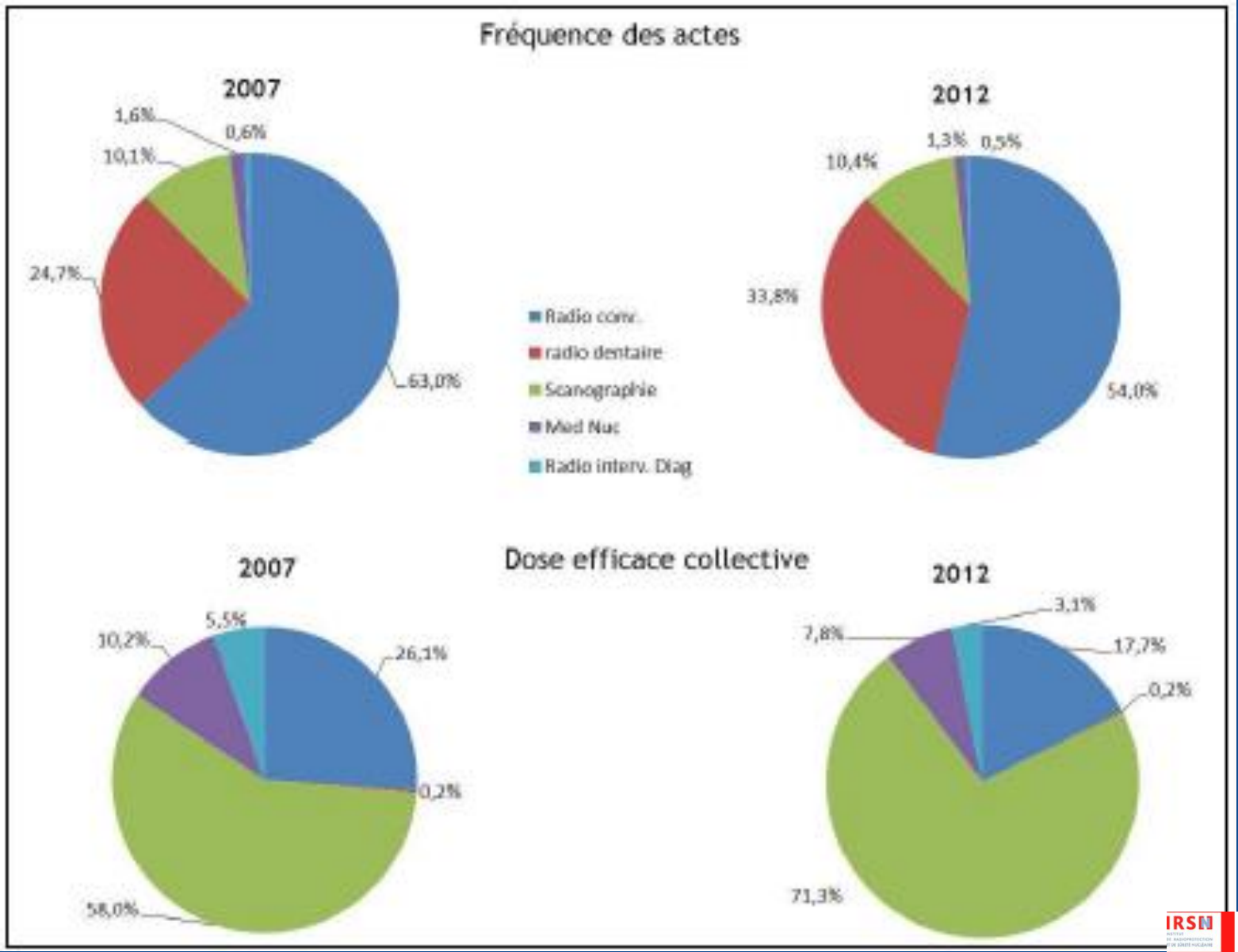
Figure 1: U.S. annual per-capita effective radiation dose from various sources for (a) 1980 and (b) 2006 by using UNSCEAR value of 2.4 mSv for natural background *(Bkd)* (for a, NCRP 1987 estimated value, 3.0 mSv; for b, NCRP 2009 estimated value, 3.1 mSv).

Radiologic and Nuclear Medicine Studies in the United States and Worldwide: Frequency, Radiation Dose, and Comparison with Other Radiation Sources—1950–2007[1]

Fred A. Mettler, ***Radiology:*** Volume 253: Number 2—November 2009

Et en France ?

- 81,8 millions d’actes en 2012
- Augmentation de 20% de la dose efficace depuis 2007 (1,3 à 1,6 mSv)


Fréquence des actes
2007
1,6%
0,6%
10,1%
24,7%
63,0%
2012
1,3%
0,5%
10,4%
33,8%
54,0%
Radio conv.
radio dentaire
Scanographie
Med Nuc
Radio interv. Diag
Dose efficace collective
2007
5,5%
10,2%
26,1%
0,2%
58,0%
2012
3,1%
7,8%
17,7%
0,2%
71,3%

Radiobiologie

EFFETS DETERMINISTES

- GRAVITE PROPORTIONNELLE A LA DOSE

- SYSTEMATIQUES AU DESSUS D'UN SEUIL

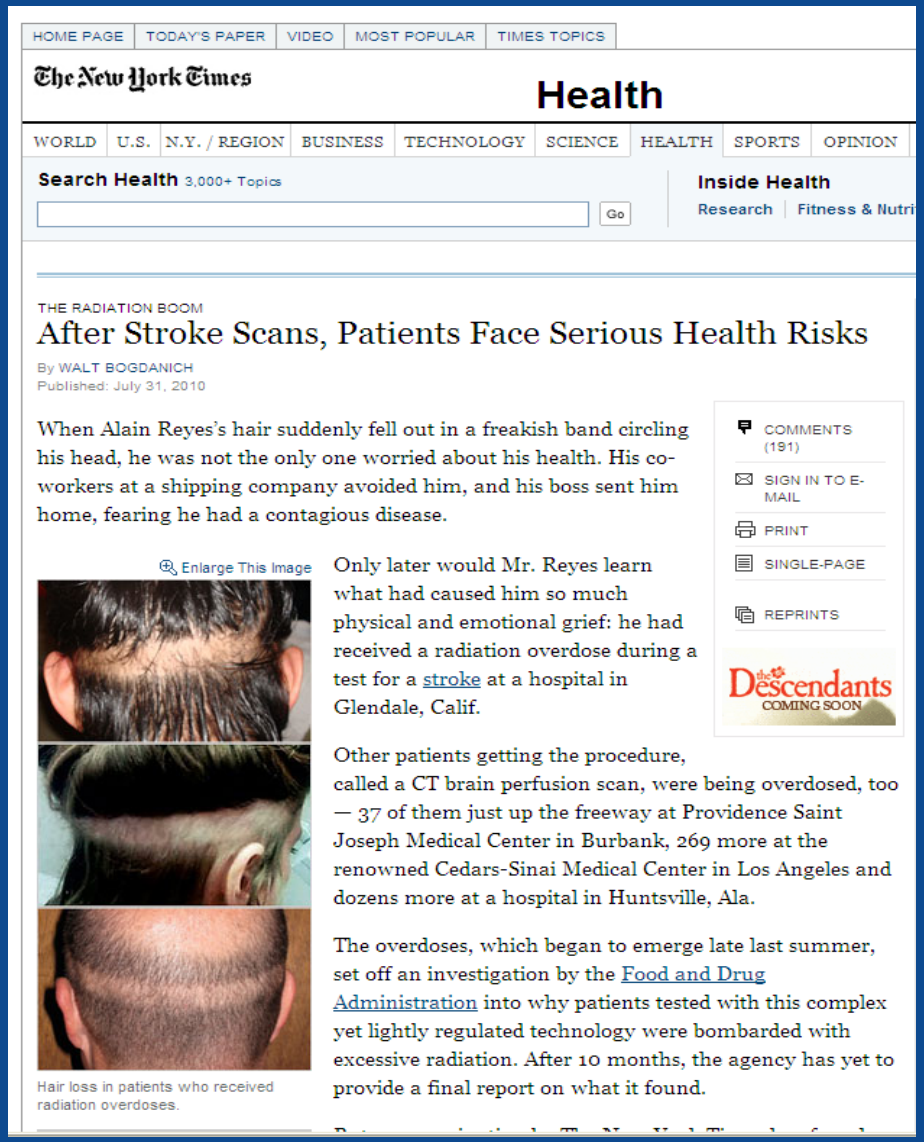
EFFETS DÉTERMINISTES EN DIAGNOSTIC :

Des erreurs …

The New York Times

Friday, October 16, 2009

Radiation Overdoses Point Up Dangers of CT Scans



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THE RADIATION BOOM

After Stroke Scans, Patients Face Serious Health Risks

By WALT BOGDANICH
Published: July 31, 2010

When Alain Reyes's hair suddenly fell out in a freakish band circling his head, he was not the only one worried about his health. His co-workers at a shipping company avoided him, and his boss sent him home, fearing he had a contagious disease.

COMMENTS (191)
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the Descendants COMING SOON

Enlarge This Image

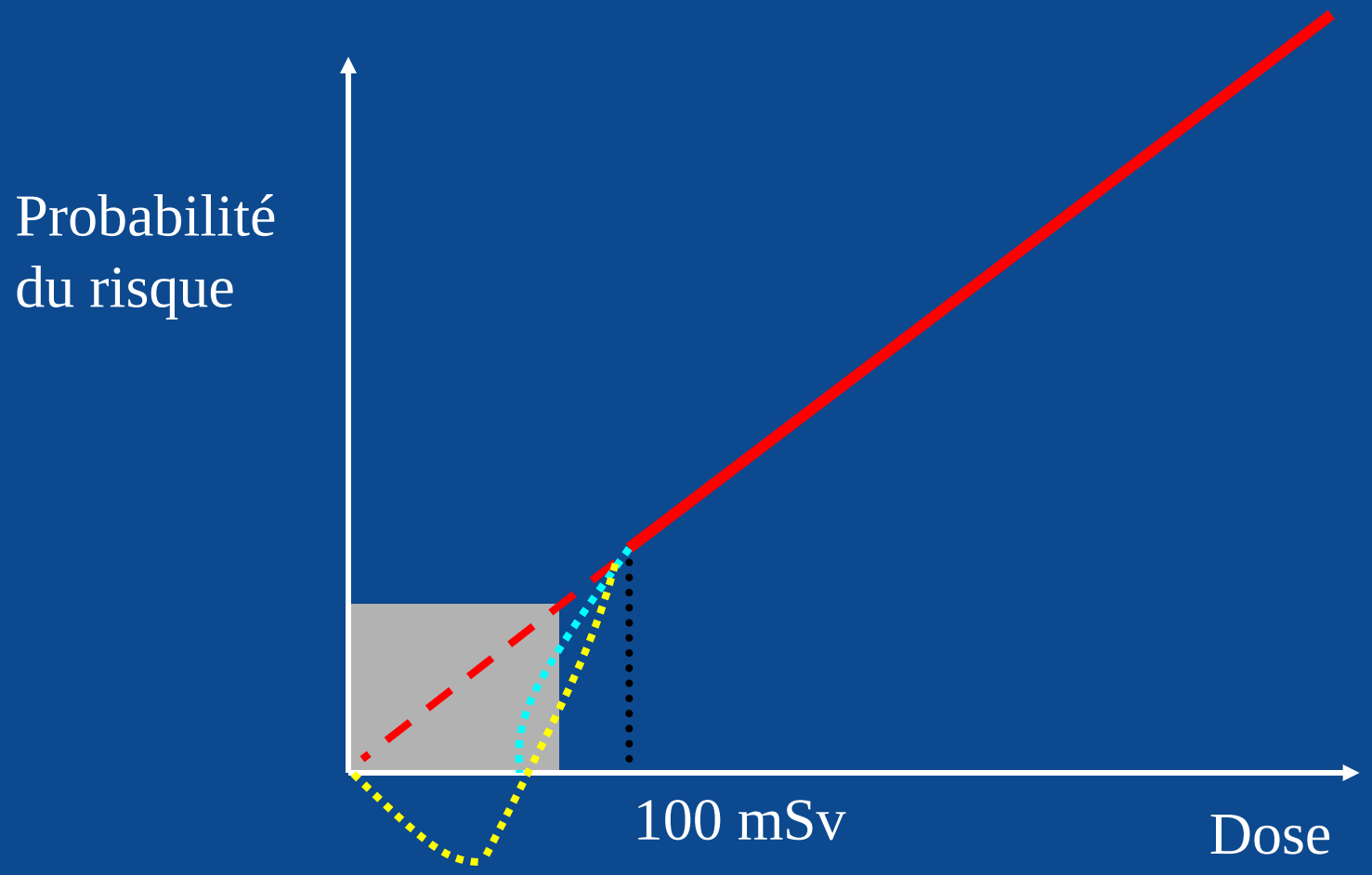
Hair loss in patients who received radiation overdoses.

Only later would Mr. Reyes learn what had caused him so much physical and emotional grief: he had received a radiation overdose during a test for a stroke at a hospital in Glendale, Calif.

Other patients getting the procedure, called a CT brain perfusion scan, were being overdosed, too — 37 of them just up the freeway at Providence Saint Joseph Medical Center in Burbank, 269 more at the renowned Cedars-Sinai Medical Center in Los Angeles and dozens more at a hospital in Huntsville, Ala.

The overdoses, which began to emerge late last summer, set off an investigation by the Food and Drug Administration into why patients tested with this complex yet lightly regulated technology were bombarded with excessive radiation. After 10 months, the agency has yet to provide a final report on what it found.

Effets stochastiques
(cancers, génétiques)



Des calculs fondés sur une hypothèse !

Brenner en 2001 Estimated Risks of Radiation-Induced Fatal Cancer from Pediatric CT (AJR:176, February 2001) **: 600 000 scanners abdominaux et crâniens sont responsables de 500 cancers*.**

www.usatoday.com — THE NATION'S NEWSPAPER — 50 CENTS

LATE SPORTS

Super Bowl

Let the hype begin

Clock is ticking toward Sunday. Full report, 1-4C
▸ 10 years ago, war was on our minds, 1C
▸ Coming Friday: Bonus Section

USA TODAY — NO. 1 IN THE USA

'Gladiator' top film at Golden Globes

Julia Roberts takes best actress for *Erin Brockovich*; George Clooney gets comedy nod; Kate Hudson wins for *Almost Famous*, 1-2D
▸ The red carpet, 5D

Hudson: Best supporting actress.

Monday, January 22, 2001

Newsline

usatoday.com's new look

Get the latest news, stocks, scores and more right now at USA TODAY's 24-hour online news site, all with a clean new interface. Plus, a stand-alone Tech section.

Election still splits court

Friction over justices' ruling on ballot count in Florida continues to cause hard feelings, draw angry letters.

By Joan Biskupic
USA TODAY

WASHINGTON — Six weeks after an uneasy U.S. Supreme Court cleared the way for Republican George W. Bush to become president, the scars left on the nation's highest court by the Florida election case are evident.

The court's nine justices, uncomfortable behind wonder been behind the court's white marble edifice, nevertheless are nursing grudges.

Meanwhile, the court has been bombarded with thousands of letters from angry Americans, some of whom have sent in their voter registration cards suggesting that going to the polls in November was a waste of time. "For shame!" one letter said. Many messages to the justices have been sarcastic.

CT scans in children linked to cancer later

By Steve Sternberg
USA TODAY

Each year, about 1.6 million children in the USA get CT scans to the head and abdomen — and about 1,500 of those will die later in life of radiation-induced cancer, according to research out today.

What's more, CT or computed tomography scans given to kids are typically calibrated for adults, so children absorb two to six times the radiation needed to produce clear images, a second study shows. These doses are "way bigger than the sorts of doses that people at Three Mile Island were getting," David Brenner of Columbia University says. "Most people got a tenth or a hundredth of the dose of a CT."

Both studies appear in February's *American Journal of Roentgenology*, the nation's leading radiology journal. The first, by Brenner and colleagues, is the first to estimate the risks of "radiation-induced fatal cancer" from pediatric CT scans. Until a decade ago, CT scans took too long to perform on children without giving them anesthesia to keep them still. Today's scanners spiral around the patient in seconds, providing cross sections, or "slices," of anatomy.

Doctors use CT scans on children to search for cancers and ailments such as appendicitis and kidney stones.

"There's a huge number of people who don't just receive one scan," says Fred Mettler of the University of New Mexico, noting that CT scans are used for diagnosis and to plan and evaluate treatment. "The breast dose from a CT scan of the chest is somewhere between 10 and 20 mammograms. You'd want to think long and hard about giving your young daughter 10 to 20 mammograms unless she really needs it."

Mettler recently published a study showing that 11% of the CT scans at his center are done in children under 15, and they get 70% of the total radiation dose given to patients. Children have more rapidly dividing cells than adults, which are more susceptible to radiation damage. Children also will live long enough for cancers to develop.

Researchers led by Lane Donnelly at Cincinnati's Children's Hospital found that children often get radiation doses six times higher than necessary. Cutting the adult dose in half would yield a clear image and cut the risk a like amount, Brenner says. "Radiologists genuinely believe the risks are small," he says. "I suspect they've never been confronted with numbers like this."

***Attention : il s'agit d'un calcul fondé sur l'hypothèse d'une relation linéaire sans seuil.**

Des études épidémiologiques

Radiation exposure from CT scans in childhood and subsequent risk of leukaemia and brain tumours: a retrospective cohort study

Mark S Pearce, Jane A Salotti, Mark P Little, Kieran McHugh, Choonsik Lee, Kwang Pyo Kim, Nicola L Howe, Cecile M Ronckers, Preetha Rajaraman, Sir Alan W Craft, Louise Parker, Amy Berrington de González

www.thelancet.com Published online June 7, 2012

Etude rétrospective de cohorte près de 177 000 National Health Service (jan 85-Dec 2008).

Cancer risk in 680 000 people exposed to computed tomography scans in childhood or adolescence: data linkage study of 11 million Australians

John D Mathews

BMJ

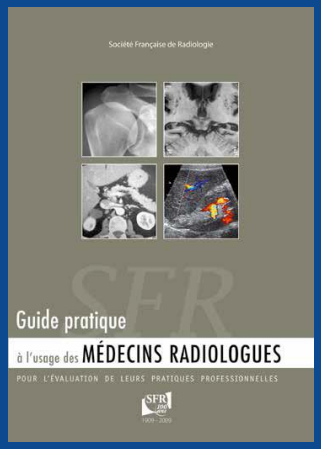
BMJ 2013;346:f2360 doi: 10.1136/bmj.f2360 (Published 22 May 2013)

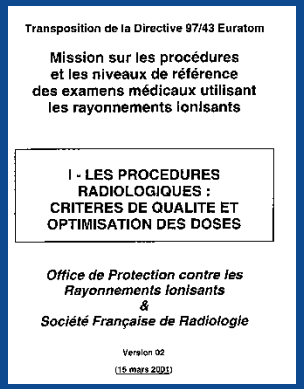
Excès de risque 1 pour 10 000

Directive EURATOM 2013-59

- **Justification** → Privilégier les techniques pas ou peu irradiante – Guide du bon usage

- **Optimisation** → Guide pratique à l'usage du radiologue, contrôle de qualité, NRD, indication de la dose délivrée




Transposition de la Directive 97/43 Euratom

Mission sur les procédures et les niveaux de référence des examens médicaux utilisant les rayonnements ionisants

I - LES PROCEDURES RADIOLOGIQUES : CRITERES DE QUALITE ET OPTIMISATION DES DOSES

Office de Protection contre les Rayonnements Ionisants & Société Française de Radiologie

Version 02

(15 mars 2001)

Nos interlocuteurs

AUTORITÉ DE SÛRETÉ NUCLÉAIRE

INSTITUT DE RADIOPROTECTION ET DE SÛRETÉ NUCLÉAIRE

Division de Paris

AUTORITÉ DE SÛRETÉ NUCLÉAIRE

asn Paris

Contrôle de l'AP-HP

22 établissements de l'AP-HP

- 85 inspections en 4 ans [2011-2014]

Curiethérapie	5
Médecine nucléaire	27
Radiologie intervent.	18
Radiothérapie	14
Scanographie	9
Sources non scellées	3
SSHA Irradiateur	4
TMR	5

- + 1 inspection de revue PSL 2014 (11 inspections)

La Pitié-Salpétrière	12
HEGP	10
Saint-Louis	9
Tenon	8
Henri Mondor	6
Bicêtre	5
Bichat	5
Cochin	5
Armand Trousseau	4
Saint-Antoine	3
Avicenne	3
Antoine Béclère	2
Beaujon	2
Lariboisière	2
Necker	2
Robert Debré	2
Corentin Celton	1
Hôtel-Dieu	1
Jean Verdier	1
Louis Mourier	1
Paul Brousse	1
Raymond Poincaré	1

asn Paris

Constats - AP-HP

Radiologie interventionnelle radioprotection des patients : trois faiblesses identifiées

- 2013-2014 : 9 inspections en radiologie interventionnelle
- Rares constats sur POPM (1 LDS / 9), Contrôles qualité (1 LDS / 9), PSRPM (seulement 1 LDS / 9)
- 3 faiblesses identifiées :
  - **optimisation des doses au patient (constat d'insuffisance dans 6 LDS sur 9), avec implication insuffisante du physicien**
  - **formation RP patients (7 LDS sur 9), principalement les médecins : 5 constats sur 7 les concernent spécifiquement**
  - **report dose sur CR d'acte (5 LDS sur 9)**
- Défaut d'optimisation :
  - **Blocs opératoires surtout : démarche non amorcée dans 5 plateaux opératoires sur 7 inspectés**

Radiologie interventionnelle : actes radioguidés et radiologie d'intervention

asn Paris

Conclusion générale

Des efforts et des améliorations / des moyens matériels conséquents

La récurrence d'exigences non satisfaites (cf. diapositives précédentes)

Enjeux propres de la radiologie interventionnelle

Des médecins s'exonérant facilement (formations, suivis , ports des bagues etc.)

Se donner les moyens d'apprécier le risque

- Avec des moyens minimaux : travaux standards rassurants, peu de présence, dosimètres insuffisamment portés, bilan rassurant;
- Avec des moyens adaptés : travaux réalistes, prévisionnels de dose réalistes, dosimètres portés, optimisation

Lutter contre les mauvaises pratiques des opérateurs au bloc opératoire

- Pas de culture (disciplines trop jeunes), pas de formation (RP et machines), pas de présence (accompagnement, sensibilisation, rappels) , donc pas de percolation

Vétusté des installations effluents (cuves, canalisations, fosses)

Conclusions

- Besoin de physique médicale
- Formation des opérateurs (médecins dont le métier n'est pas l'utilisation des rayonnements ionisants)
- Renouvellement du parc d'équipement et accroitre le nombre d'IRM
- Mise en place de systèmes de surveillance de la dose (DACS)
- EPP sur justification et optimisation