

Risk Concerns Following Diagnostic X-ray Procedures

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“Patient Medical and Dental Issues”

HPS “Ask the Experts” Web Site –

Topics

- Mostly personal comments and observations
 - Some typical questions/comments
- Issues to consider in answering questions
 - What patient understands or was told
 - Technical aspects associated with dose information
 - What patient you need to or should tell patient
- Considerations and musings (along the way)
 - Use of e-mails for correspondence and follow-up
 - Media
 - Relevant dosimetry issues

Typical Comments

- If I knew the risks I would have not had the scan . . .
- My child had a CT scan of the head. Will he get cancer?
- I read in the paper (or saw on the Internet) that . . .
- I had x CT scans of . . . Will I get cancer?
- I receive a CT scan and they said me dose was 29 rem. Is this high?
- My baby had a head CT, will he be retarded?

QUESTION: "hi

i had i just one year a number of xrays in many parts of my body. they include:

- barium swallow

- soft tissue throat xray

- cervical spine series including AP and open mouth total pictures of 6 -three chest xrays

Can you please tell me the dose of the radiation that iam exposed to, and its risks please. iam mainly concered that of open mouth picture which i had two of them"

Unknown aspects of the question

- Interactions with physicians and medical staff
 - Relationship – seldom question at time of scan
 - What was told and when was it told?
- What does patient know about the test?
 - Technical aspects about exams and risks
 - 68 scans - 300 mA, 120 k Vp, 0.75 sec = 0.48 rem
 - Cancer risks – incidence and death rates
- What does the patient want to know
 - Dose vs. risk
 - At what level of understanding?

QUESTION: "I have checked the other questions and I fear I am FAR worse off than anyone who has posted about medical tests.

To the best of my knowledge I have had:

2 Ct Scans - Chest

5-10 Ct Scans – Head

3 Ct Scans - Abdominal (with the stuff you drink)

10 V/Q Lung Scans

2 Barium Swallows

More chest x-rays than I can count, seriously a lot.

MRI's with contrast ."

My concern is of course with the cancer risk but of most concern to me at given moment is radiation sickness. I read that your body keeps count of your radiation exposure and since I just had another chest x-ray I fear now that it will be my undoing and that I'm going to get sick any minute and die. Does it work like this? Is radiation sickness that kills you (not talking about cancer here) something that you can get from an accumulation over time. Most of these scans were in 02/03 but a few were after. I was having a lot of anxiety problems back then and overreacted and no one told me about the risk of cancer or anything and I let them do a lot of tests that I know now, were not need. I've been crying because I feel I have caused my own death. If not now, eventually from cancer and that's bad enough but to think I could die any second because I allowed myself to have another scan. I'm just freaking out over here!

Can someone provide me with some answers? I really want to know the truth, if I am going to die in a few days, I need to know. I don't want to feel better, I just want to know the truth."

What influence patient concerns?

- Health and risk issues
 - Patient develops a medical symptom, e.g., rash
 - Impotence and pregnancy concerns
 - I had a CT scan and they did not find anything and now I am going to get cancer (sic)
- Media (Not necessarily a new issue)
 - Brenner paper in NEJM (latest)
 - Does the media understand the issues
- Lack of medical staff involvement
 - Is the patient told anything?
 - Is the information useful?
 - Use of brochure discussing child CT exam

What dose do you discuss

- Confusing for patients
 - Typical issue of rem, rad, mSv
 - Tissue dose v. Equivalent dose v. Effective dose v. air kerma v. entrance dose, etc.
 - Important as they may have not gotten the right terminology in the first place
- What is better organ dose or effective dose?
 - What was the dose to my abdomen?
 - Risks are based on effective dose
 - Used in BEIR VII and other documents

Technical issues in providing dose information based on exam

- Individual machines and techniques
- Information the patient received or looked up, not what is helpful
 - Patient wants to know dose to abdomen
 - received hi-resolution CT kidney scan
 - “68 scans - 300 mA, 120 k Vp, 0.75 sec and 0.48 rem” – told total for all scans was 10 rem
- For CT, what is being cited?
 - CTDI, $CTDI_{(vol)}$, DLP, dose equivalence, effective dose(?)

What should you say about the dose

- Variability of individual dose calculation
 - Type of study but little about unit
 - Martin paper in BJR considers variables
- Use of reference values vs. specific values
 - ICRP 73 – reference values
 - HPS project
 - dated information(?)
- Is this what the patient wants to know?
- Dose needs to be put in perspective

What can be said about does and risk

- Communicate believable risk
 - Compare to background
 - Comparisons with other procedures or risks
 - Effective dose or organ dose
 - Increase risk of cancer death
 - No demonstrated effects below 10 rem
- “Your dose was . . .” problem
 - Based on models and measurements
 - Risk not to individual but populations

Not really new issues but need to consider in the future

- Effective dose vs. organ doses (Brenner)
 - What is more believable?
- Cite cancer incidence or death rates
- Should age specific risks be considered
- Procedures you have never heard of
 - Dental CBCT, cardiac CT doses
- Current information on reference doses

So, why do I
(or any of us)
do this?

References

- ICRP PUBLICATION 73: RADIOLOGICAL PROTECTION AND SAFETY IN MEDICINE, Annals of the ICRP Volume 26/2
- NEXT Tabulation and Graphical Summary of 2000 Survey of Computed Tomography, CRCPD Publication E-07-2
- Martin, CJ, “Effective dose: should it be applied to medical exposures?” BJR, 80 (2007), 639-647
- Larson, et al., “Informing Patients about CT Radiation Exposure in Children: It’s OK to Tell Them,” AJR:189, August 2007, 271-275
- Brenner, and Hall, “Computed Tomography — An Increasing Source of Radiation Exposure,” N Engl J Med 2007;357:2277-84