The WCC Note™

WorldCare Clinical
A ProScan Imaging Company

www.wcclinical.com / +1 617-250-5143

A Weekly Guide To Harmonizing Clinical Trial Imaging

Volume 1, Number 2 – October 2, 2007

RADIOLOGY: THE BASIC MODALITIES

Part Two: Radiation Exposure

What it is, what it does. It's widely known today that radiation can be harmful to humans. The effects of large amounts of radiation, as seen in radiation therapy for cancer or among the fallout victims of Chernobyl or Hiroshima, are almost immediate and quite apparent. However, it can be difficult to quantify the amount of damage from the smaller amounts of radiation used in diagnostic radiology, as these are cumulative effects that are only seen many years after exposure and thus cannot be definitely linked to the radiographic study.

The documented effects of radiation have to do with the "ionization" of a cell. That is, when an x-ray hits a cell, it causes the electrons to displace, damaging the cell's function. Although the cell may repair itself, it may not do so completely, and thus loses its ability to function normally. The DNA within the cell also may be damaged, leading to cell death or other mutation.

How Is Radiation Measured?

Many units are used to measure radiation dosage. The unit used in the measurements below is called the "sievert," a measure of the amount of radiation absorbed by the human body.

Effective Radiation Dosage (in MilliSieverts):

Average background dose in the U.S.	3.6 mSv/year
Three-hour commercial airline flight	0.015 mSv
Chest X-ray (two views)	0.05 mSv
Head CT scan	1-2 mSv
Chest CT scan	5-7 mSv
Abdomen and pelvis CT scan	6-8 mSv
Selective diagnostic coronary angiography	3-6 mSv
Coronary CT angiography	8-13 mSv

Some Radiation Risk Factors

Although exact risk levels from radiation in diagnostic imaging are difficult to quantify, we now know that the impact of radiation on a live subject or patient depends on many factors, including:

- **Patient age**
  - – The younger the subject, the greater the risk to an exposed cell
- **The organ affected**
  - – The ovaries and eyes, for example, are very radiation-sensitive
  - – The heart and brain are very radiation-resistant
- **The body region imaged**
  - – A CT scan of the pelvis causes more damaging radiation than a CT scan of the head, because the pelvis contains many radiation-sensitive organs
- **Cumulative dose**
  - – A certain amount of radiation delivered all at once (an acute dose) is more damaging than spreading that radiation out over a longer time
  - – Even if small doses of radiation are delivered at different times (such as two abdominal x-rays done a week apart), the dose accumulates to cause an increased risk of adverse effects
  - – Less radiation is ALWAYS better
- **A patient's genetically inherent resistance to radiation**

WorldCare Clinical
A ProScan Imaging Company

THE WCC NOTE™: Volume 1, Number 2 – October 2, 2007
Contributing Editors: Resham R. Mendi, M.D. (newsletter@wcclinical.com) and Stephen J. Pomeranz, M.D. (newsletter@wcclinical.com)
Managing Editor: Rod Willis (newsletter@wcclinical.com)
Designer: Tom Anneken