Ask EuroSafe Imaging

Tips & Tricks

Interventional Radiology Working Group

Interventional Series - Episode 1: Radiation Dose Management

Annalisa Trianni (Udine University Hospital, IT)
Werner Jaschke (Medical University Innsbruck, AT)
Marion Maher (University College Dublin, IE)
Risks for patients

Interventional procedures are complex procedures, which can involve many risks for patients like:

- Hematoma
- Infections
- Reaction to Contrast Agents
- ...
- Death

Among these risks also the patient’s exposure to ionizing radiation has to be taken into account.
Absorbed dose and possible effects

STOCHASTIC EFFECTS

- Linear - No threshold
- Other models (non linear)
- Severity independent from the dose
- Examples: cancer, genetic disease
Stochastic effects

Stochastic effect – risk increases linearly with dose.

Risk depends on:
- Volume of irradiated tissue
- Type of irradiated tissue
- Total amount of dose
- Patient age
- Genetics

Stochastic risk can be controlled → i.e: use of devices to protect healthy radiosensitive tissues.

Lately increased by the introduction of 3D techniques.
Absorbed dose and possible effects

STOCHASTIC EFFECTS
- Linear - No threshold
- Other models (non linear)
- Severity independent from the dose
- Examples: cancer, genetic disease

DETERMINISTIC EFFECTS
- Threshold
- Severity depends on dose
- Examples: skin injuries
Deterministic effects

Radiation skin burns represent the main risk for patients in interventional procedures.

- Renal angioplasty
  Dandurand et al, Ann Derm Vener 1999; 126: 413-417

- Radiofrequency Ablation
  Vaño, Br J Radiol 1998; 71, 510 - 516

- TIPS placement
Deterministic effects

The threshold can vary with:

• Genetic conditions

• Previous exposure

• Simultaneous treatments

Fluoroscopically Guided Interventional Procedures: A Review of Radiation Effects on Patients’ Skin and Hair

Most advice currently available with regard to fluoroscopic skin reactions is based on a table published in 1994. Main caveats in that report were not included in later reproductions, and subsequent research has yielded additional insights. This review is a consensus report of current scientific data. Expected skin reactions for an average patient are presented in tabular form as a function of peak skin dose and time after irradiation. The text and table in
Management workflow

- **Reduce** stochastic risk
- **Prevent** tissue reactions
- **Recognize** situations (patients) at higher risk

Three steps approach:
- **1. Pre-procedure**
- **2. Intra-procedure**
- **3. Post-procedure**
Workflow

1. Pre-procedure
   • Identify risks and optimize the equipment

2. Intra-procedure
   • Optimize the procedure to reduce dose
   • Online dose monitoring
   • Use of alert levels

3. Post-procedure
   • Dose tracking
   • Follow-up