Lens dose to staff during ERCP-procedures

Charlotte Kile Larsen
Centre of Diagnostic Physics
Ullevål University Hospital

Background

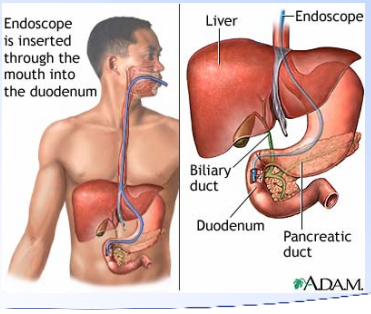
- The project was initiated to measure lens dose to staff during ERCP procedures on x-ray systems with over-couch tube, and compare the results with similar measurements from an under-couch system (KJ)
- ERCP – procedures involves both fluoroscopy and exposures
- The radiation dose to the patient is relatively high, thus the scattered radiation exposure to staff can be relatively high.
- Non-radiological staff

ERCP - Endoscopic Retrograde CholangioPancreatography

- Contrast enhanced imaging of intra- and extra-hepatic tubes, gallbladder, bile ducts and pancreas, in combination with an endoscope.
- Indications:
  - Inflammatory conditions in gallbladder, liver, bile ducts, stones, cancer (where CT and/or MR couldn't give a diagnosis)
  - In need of therapeutic procedures (e.g. removal of stones or stenting).

ERCP

- Fluoroscopy
  - confirm the position of the endoscope
  - using contrast-agents to look for objects in bile ducts



ERCP

- Fluoroscopy
  - confirm the position of the endoscope
  - using contrast-agents to look for objects in bile ducts

The x-ray equipment

- GE, Prestige VH
  - Old system
  - Over couch tube system
  - No pulsed fluoroscopy
- Siemens Polystar
  - Different hospital
  - Under couch tube system
  - Pulsed fluoroscopy

GE - Prestige VH

- 66 – 91 kVp,
- 3,09 - 6,33 mA
- Average time of fluoroscopy: 7,9 min
- 4 - 15 exposures per procedure
- The system calculates ESD (cGy) to the patient 70 cm from focus

Siemens Polystar

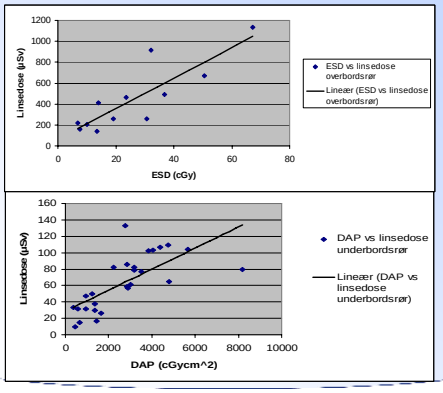
- The mA and kVp was not registered on this system
- Average time of fluoroscopy: 7,3 min
- 4 - 13 exposures per procedure
- The system measures DAP (cGycm2) to the patient.

Method

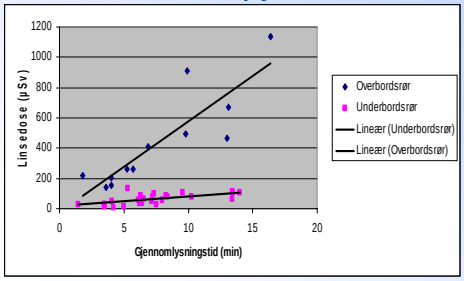
- An electronic dose-measurement system, Unfors EDD 30, was attached near the eye of the surgeon which was closest to the patient
- The detector was either taped to the temple or attached to the frame of the glasses

- The detector was attached to the surgeon or nurse during the whole procedure
- 57 measurements in total
- Lens dose, fluoroscopy time, practising physician, number of exposures, and total DAP/ESD was registered
- The nurses moves around more during the procedure, and are further away from the patient, thus the doses are much lower than to the physicians
- Only the lens doses to the doctors are shown in this presentation

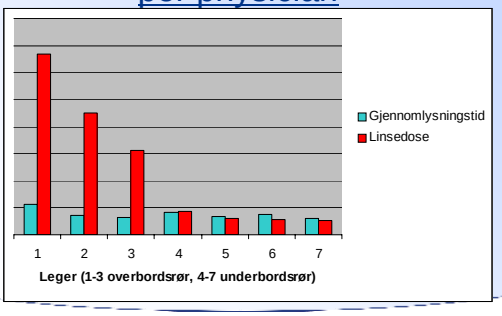
Results



Lens dose as a function of fluoroscopy time



Lens dose and fluoroscopy time per physician



Thoughts around the results

- Calculating average lens dose per minute:
  - 52,8 µSv with use of over-couch tube
  - 6 ERCPs a week, 47 weeks a year,

  ⟶ means the physician can be exposed to 120 mSv/year to the lens
- 8 average procedures a week
  - Lens dose > 150 mSv/year (recommended dose limit to lens, ICRP)

- Under-couch tube
  - average lens dose per minute: 8,71 µSv/min
  - 51 average procedures a week to exceed 150 mSv/year

Conclusion

- **Do not use over-couch tube systems for ERCP!**
- Important with **education in radiation protection** for all staff using ionising radiation
- **Know the system well!**
- Lead-protection available for everyone during the procedure

Side-effects of the project

- The head surgeon is more aware of radiation protection
- The GE system is no longer in use for ERCP at the respective hospital

Acknowledgement

- Staff at KDF, Radiological and Gastrological Department, Ullevaal University Hospital
- Staff at Radiological and Gastrological Department, Akershus University Hospital
- Staff at Radiological and Gastrological Department, Aker University Hospital