Procedural DAP can be used for Relative Dose Estimation for Staff Dose in Fluoroscopy-Guided Interventions.

L.W.M. Vergoossen, A.M. Sailer, L.E. Paulis, J.E. Wildberger, C.R.L.P.N. Jeukens

Max aantal woorden: 250

Aims and objectives

Only monitoring of effective staff doses does not allow for judgment whether individual and procedural radiation safety could be optimized. Therefore, the relative dose was introduced, which relates the personal staff dose to a reference measured by a personal dose meter (PDM). This reference PDM reflects the procedural dose and therefore complexity. Our aim was to investigate the correlation between dose-area-product (DAP) and reference PDM dose to answer the question whether relative staff dose can be estimated by using the DAP.

Methods and materials

Staff members (n=27) were equipped with PDMs and a reference PDM was mounted in a fixed position on the C-arm of the fluoroscopy system, thereby measuring scattered radiation. Clinical procedures (n=1082), grouped by procedure type were prospectively monitored. The median relative staff dose (Dose_staff/Dose_reference·100%) was calculated. The correlation between DAP and reference PDM dose was analyzed by comprehensive measurements with an Alderson anthropomorphic phantom for different scenarios of patient anatomy, operator height, acquisition techniques and C-arm angulations. Phantom measurements were compared to clinical data.

Results

DAP correlated strongly with reference PDM dose in clinical procedures (R^2=0.94, R^2=0.91, and R^2=0.93 for cerebral, thoracic and abdominal procedures, respectively). Phantom measurements indicated that this correlation was mainly depending on the spectrum, i.e. kVp (mean grouped by kVp R^2=0.97, all data-points R^2=0.93) and additional filtration, which is influenced by patient anatomy and acquisition technique.

Conclusion

We conclude that procedural DAP can be used as a reliable substitute to calculate a relative staff dose measure, increasing its applicability.

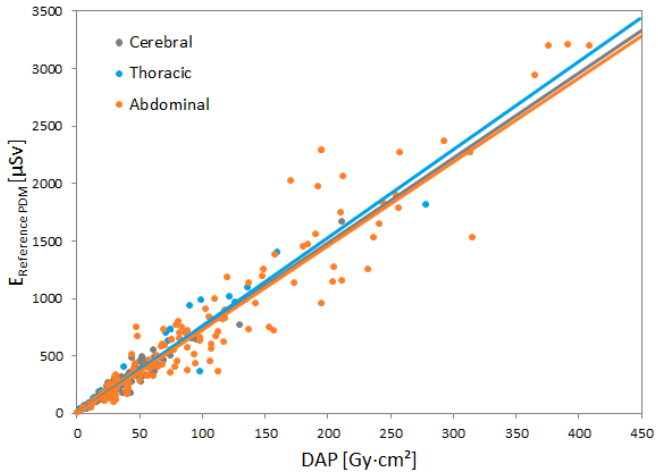

Figure 1: Correlation DAP with effective dose reference PDM for clinical procedures grouped by anatomy – head/thorax/abdomen.

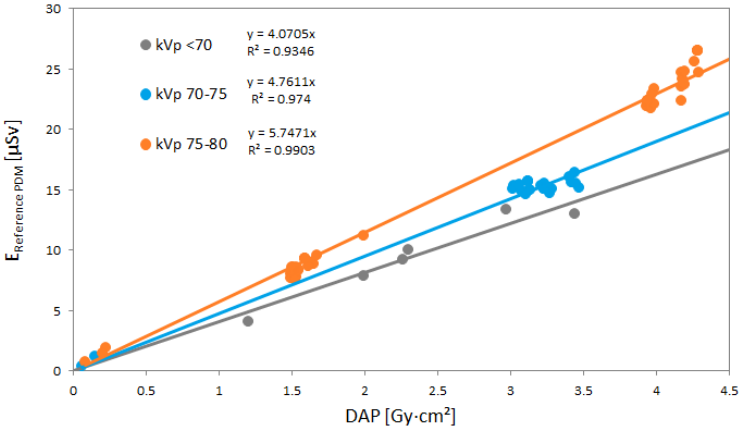

Figure 2: Correlation between procedural DAP and the effective reference PDM dose for phantom measurements grouped by kVp.