

Dramatic dose reduction in three-dimensional rotational angiography after implementation of a simple dose reduction protocol.

Minderhoud S.C.S. (1), Krings G.K. (1), Molenschot M.M.C. (1), Koster M.(2), Breur J.M.P.J.(1) Kinderhartcentrum, Wilhelmina Kinderziekenhuis, UMC Utrecht, The Netherlands (1); Nuclear Research and consultancy Group, Petten, The Netherlands (2)

Introduction:

Three-dimensional rotational angiography (3DRA) is a relatively new imaging modality in the paediatric catheterization laboratory (cathlab). Previously, we reported a mean effective radiation dose of 2.0 mSv per 3DRA run in children (normal dose cohort). The objective of this study was to evaluate the effect of implementation of a dose reduction protocol on effective radiation dose (ED) and image quality in 3DRA. Furthermore possible correlations between ED and readily available parameters at the cathlab were studied.

Methods:

The dose reduction protocol consisted of several dose reducing techniques: frame reduction (60 f/s to 30 f/s), active collimation of the X-ray beam, usage of a readily available low dosage program and a pre-3DRA run check. Biomedical data required for calculation was collected. ED's were calculated with Monte Carlo PCXMC 2.0. 3DRA Image quality of both the dose reduction cohort as well as our normal dose cohort was blindly assessed by one observer.

Results:

Between October 2014 and October 2015 84 patients (mean age 6.4 years) underwent a total of 105 3DRAs with a mean ED of 0.67 mSv \pm 0.45 SD using the dose reduction protocol. Mean ED in the normal dose cohort (17 3DRA's) was 2.0 \pm 1.4 SD. Image quality in the dose reduction cohort remained excellent. Correlations between ED and dose area product (DAP) and ED and dose (mGy) were found with a R² of 0.7936, and 0.76164 respectively.

Conclusions:

Introduction of a simple protocol led to 67% dose reduction in 3DRA. Mean ED in 3DRA in the dose reduction group was 0.67 mSv and image quality in this group remained excellent. In 3DRA ED correlates well to DAP and mGy, parameters readily available at the cathlab.