Does a novel X-ray imaging technology provide a substantial radiation dose reduction for patients in trans-catheter aortic valve implantation procedures?

A.J. Gislason-Lee, Daniel Blackman* and A.G. Davies

Division of Medical Physics, University of Leeds, Leeds, UK

*Cardiology Department, Leeds General Infirmary, Leeds, UK

Purpose

Modern interventional X-ray equipment employs image processing to permit reduction in radiation whilst retaining sufficient image quality. The aim of this study was to investigate whether our recently-installed system (AlluraClarity, Philips Healthcare) which contains advanced real-time image noise reduction algorithms and anatomy-specific X-ray optimization (beam filtering, grid switch, pulse width, spot size, detector and image processing engine), affected patient procedure dose and overall procedure duration in routine trans-catheter aortic valve implantation (TAVI) procedures.

Methods

Patient dose for 42 TAVI patients from the AlluraClarity cardiac catheterisation lab and from a reference system (Axiom Artis, Siemens Healthcare) in the same cardiology department was recorded. Median values from the two X-ray systems were compared using the Wilcoxon statistical test.

Results

Total patient procedure dose medians were 4016 and 7088 cGy cm^2 from the AlluraClarity and reference systems respectively. AlluraClarity median patient doses were 3405 cGy cm^2 and 783.5 cGy cm^2 from fluoroscopy and digital image acquisition respectively. Reference median patient doses were 4928 cGy cm^2 and 2511 cGy cm^2 from fluoroscopy and digital image acquisition respectively. All differences in patient dose were significant at the 5% level. Median total fluoroscopy times [min:sec] were 19:57 and 20:20 for the AlluraClarity and reference systems respectively.

Conclusion

The AlluraClarity cardiac catheterisation lab had 43% lower total patient procedure dose for TAVI patients than the reference lab; fluoroscopy and digital image acquisition doses were 31% and 69% lower respectively. In terms of total fluoroscopy time, there was no statistically significant difference between the two labs.