
Conference or Workshop Item:
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Does a novel X-ray imaging technology provide a substantial radiation dose reduction for trans-catheter aortic valve implantation (TAVI) patients?

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Introduction

Trans-catheter aortic valve implantation (TAVI) is a treatment for patients with symptomatic aortic stenosis, who are high risk or inoperable for conventional surgical aortic valve replacement. A dynamic interventional X-ray imaging system is used to visualize treatment in real time. The resulting patient radiation dose is amongst the highest from medical imaging procedures[1], and operator doses are the highest of all interventional cardiac procedures[2]. The X-ray system must minimise radiation dose whilst maintaining adequate image quality for the clinical task, as per the ALARP principle[3].

Modern interventional X-ray equipment employs image processing to permit such a reduction in radiation dose. 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, affected patient procedure dose and fluoroscopy duration in routine TAVI procedures.

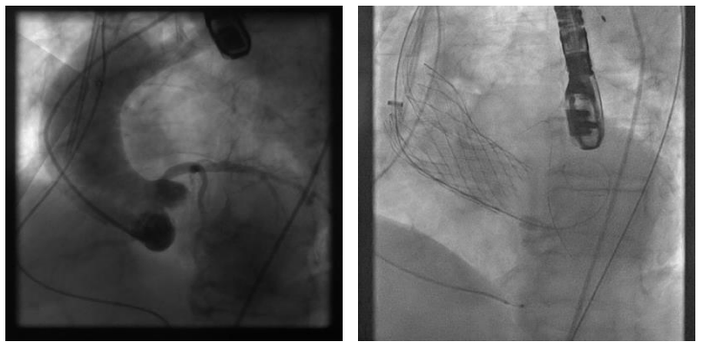


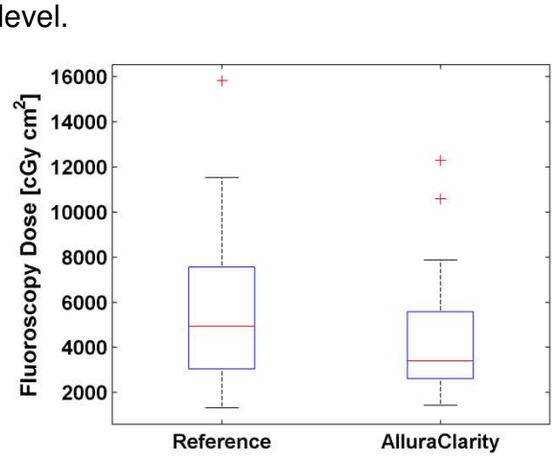
Image frame from (left) baseline aortagram and (right) fiinal release of valve

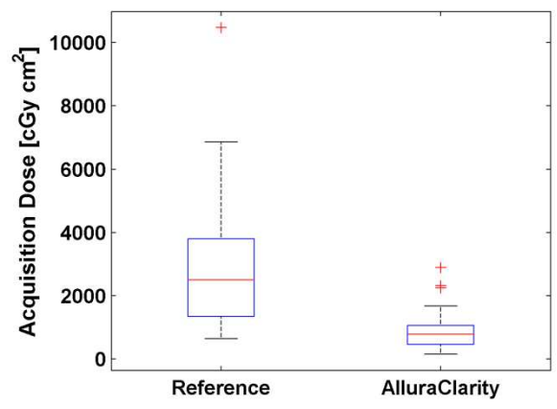
Methods

Procedures dose for 42 TAVI patients from the AlluraClarity cardiac catheter 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.

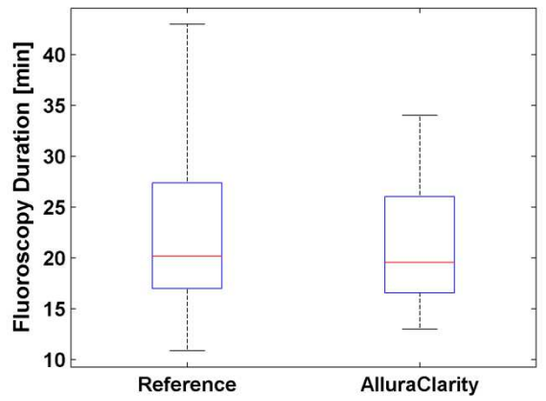
Results

Total procedure dose medians were 4016 and 7088 cGy cm^2 from the AlluraClarity and reference systems respectively. Fluoroscopy and digital image acquisition ('cine') contributions are shown in figures below with fluoroscopy duration. All differences in patient dose were significant at the 5% level.





Figures: red line is median, blue box is first and third quartiles, black is minimum and maximum values and red +'s are outliers.



Conclusions

The AlluraClarity cardiac catheter 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, with no statistically significant difference in fluoroscopy duration between the two labs.

Acknowledgements

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References

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[2]Drury-Smith M, Maher A, Douglas-Hill C, Singh R, Bhabra M, Cotton J, Khogali S, TAVI operators radiation dose compared to PCI and ICD operators: Do we need additional radiation protection for trans-catheter structural heart interventions, Heart 97, Suppl1 (2011).

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