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Peer Review

Review of: "Dose Reduction in Medical Radiography: Advancing Veterinary Diagnostic Solutions"

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This manuscript presents an innovative and technically detailed investigation into dose reduction strategies in veterinary radiography through the implementation of a linear array detector (LAD) system as an alternative to conventional flat panel detector (FPD) systems. The study addresses an important clinical and technological challenge, namely reducing radiation exposure while maintaining diagnostic image quality, particularly in veterinary imaging of large animals where tissue thickness significantly increases radiation dose requirements. The experimental design, incorporating anthropomorphic phantoms, water phantom modeling, and preliminary in vivo veterinary imaging, provides a comprehensive and multi-layered evaluation of the proposed system. The reported entrance skin dose (ESD) reduction, especially at increased tissue thickness, is a meaningful finding with potential translational implications for both veterinary and human radiographic imaging.

The manuscript is strengthened by its clear technical description of the LAD mechanical design, detector configuration, beam geometry, and dosimetry methodology. The use of MOSFET dosimetry, comparison across multiple anatomical regions, and stepwise phantom modeling enhance methodological rigor. Additionally, the discussion effectively explains the physics underlying photon attenuation differences between fan beam and cone beam geometries and highlights potential clinical applications, including imaging of large animals and mobile diagnostic imaging systems.

However, several limitations should be addressed to strengthen the validity and clinical relevance of the study. First, image quality evaluation relies primarily on grayscale assessment and subjective diagnostic visibility, without incorporation of standardized image quality metrics such as signal-to-noise ratio (SNR), contrast-to-noise ratio (CNR), or modulation transfer function (MTF). Including these parameters would allow a more objective comparison between LAD and FPD systems. Second, the in vivo veterinary

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validation is limited to a single animal case, which restricts generalizability and prevents assessment of motion artifacts, workflow feasibility, and clinical diagnostic performance across different species and anatomical regions. Third, the absence of automatic exposure control (AEC) in the LAD system introduces variability in exposure parameter selection, which could influence dose comparisons and requires further standardization.

Furthermore, while the mechanical design is innovative, the presence of vibration and motion-related artifacts is acknowledged but not quantitatively evaluated. Future studies should incorporate motion analysis and mechanical optimization to ensure reproducibility in clinical environments. Additional evaluation of operator workflow, scan duration, and cost-effectiveness would also enhance the translational value of the proposed technology.

Overall, this study provides promising preliminary evidence supporting LAD-based radiographic systems as a potential strategy for reducing radiation dose in veterinary imaging, particularly for large animals. Further validation through larger in vivo studies, objective image quality assessment, and system optimization is necessary before routine clinical implementation can be recommended.

Declarations

Potential competing interests: No potential competing interests to declare.