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Reduction of fluoroscopic images by percutaneous anatomical marking with needles: A strategy for optimizing radiological safety in minimally invasive forefoot surgery

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Introduction: Percutaneous foot and ankle surgery relies heavily on fluoroscopy to guide osteotomies and fixations. Repeated use of radioscopy increases occupational exposure to ionizing radiation, especially during more complex procedures and the learning curve. We propose an anatomical marking technique that uses radiopaque needles to reduce the number of fluoroscopic images while maintaining three-dimensional accuracy and proper alignment.

Methods: After standard positioning and preparation, 25 x 7 mm needles are inserted percutaneously at anatomical points corresponding to osteotomies or screw paths. Radioscopy is performed with the team away to confirm positioning. After validation, the references are transferred onto the skin with methylene blue, and the enhancer is removed from the field. Osteotomies and fixations are performed under the guidance of previously confirmed markings, thereby avoiding repetitive dynamic fluoroscopy.

Results: The technique demonstrated high precision in the positioning of osteotomies and fixation paths. In percutaneous HV corrections, a mean of 6-8 images was required, while usual techniques often require 15-30 images throughout the procedure. In isolated metatarsal osteotomies, only two images were sufficient, a number significantly lower than the conventional standard. As the initial confirmation occurs with the away team, there is no direct exposure during the images, reducing the annual cumulative radiation load.

Conclusion: The technique is a simple, reproducible, and low-cost strategy to optimize surgical precision and significantly reduce occupational radiation exposure in percutaneous foot and ankle surgery.

Keywords: Fluoroscopy; Hallux valgus; Minimally invasive surgical procedures.

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