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COMMENTARY

The use of radiopaque markers is medical dogma

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Paperclips or radiopaque markers (ROM) in cases of penetrating trauma has become embedded in medical practice based on expert opinion and has become dogma as standard practice for physicians to mark the injury site for imaging procedures in penetrating trauma. In this article, we question the justification of this practice beyond accurate injury site documentation and the risks of extrapolating clinical data.

To understand the rationale behind this practice, it is essential to explore its historical context. Brooks et al.[1] first described this method for limited advanced imaging options in military field settings. They emphasized using anteroposterior and lateral views on X-rays to document bullet injury sites, determine bullet trajectory, and triage patients. Peterson et al.[2,3] further developed the method in 2005 by introducing shaped markers of paperclips to more precisely delineate anterior and posterior wound location. In 2008, Ramasamy et al.[4] published on improvised bullet markers, exploring their role in predicting trajectory and creating surgical plans using helical three-dimensional (3D) reconstruction. Interestingly, the authors downplay the significance of markers in X-rays, again highlighting their primary use for site documentation. This suggests that markers have limited value beyond visually referencing the injury location in imaging studies, and alternative techniques such as helical 3D reconstruction may be more suitable for determining trajectory and aiding surgical planning.

Gunshot wounds are influenced by various factors that affect the trajectory of the bullet. These factors include the projectile's type, size, distance, velocity, the potential for ricocheting off bones or implanted hardware, and the possibility of the bullet continuing its movement even after coming to rest initially.[5,6] It is essential to consider these complexities when assessing the trajectory and final position of a bullet in gunshot injuries. Radiologists rely on internal tissue injury to identify trajectory in penetrating injuries. The addition of multiple radiopaque markers introduces artifacts that can impede accurate interpretation of CT images.

In cases of extremity penetrating trauma, clinical decision-making guides health care professionals regarding the appropriate course of action.[7] In this context, patients may be clinically unstable in time-sensitive conditions. Introducing a paperclip into a bloody field while dealing with a diaphoretic patient can pose challenges in the primary survey of trauma assessment.

Lastly, despite the absence of validating studies for gunshot wounds, the endorsement of paperclips in trauma literature for penetrating injuries, including stab wounds, persists even after two decades.[8] In the era of rapid and accurate CT scanning, using ROMs needs evidence to change practice.

To sum up, the routine use of paperclips or ROM in penetrating trauma lacks clinical evidence and is based on expert opinion, becoming a medical dogma. Prioritizing the clinical status of the patient and direct visualization of tissue damage on CT scans is more beneficial for accurate interpretation and planning disposition.[9] Markers serve the purpose of accurate documentation of the injury site and we advocate exercising caution when extrapolating clinically relevant data from plain X-rays in primary survey.

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AUTHOR CONTRIBUTIONS

Khurram Sarfaraz, Joe Nemeth, and Maryam Bahreini made substantial contributions to the conception and design of the work, drafting the work, and revising it critically for important intellectual content; gave final approval of the version to be published; and are in agreement to be accountable for all aspects of the work.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

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