

Bullet Markers - A Simple Technique To Assist In The Evaluation Of Penetrating Trauma

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ABSTRACT

Radio-opaque markers in penetrating trauma are useful in both the clinical evaluation of the injuries and in the permanent record of the location of the wounds. The use of an unfolded paperclip taped over the wound as a marker is recommended as a valuable adjunct in the radiological evaluation of penetrating trauma.

Key Words: *Gunshot wounds; trauma; penetrating injury; radio-opaque markers.*

Introduction

Clinical evaluation of the path of a blade, bullet or fragment after penetrating trauma can be difficult. Information gained from evaluation of the wound track allows an estimation to be made of possible injuries, determines the additional studies required and can guide the surgical approach (1). X-rays are a valuable part of this initial work-up and should include views in two planes in extremity injuries (2). In addition to supporting the initial clinical evaluation, radio-opaque markers allow the anatomical location of the wound(s) to be permanently recorded, thereby increasing the accuracy of emergency room documentation.

Technique

An unfolded paperclip (Figure 1) is taped over each wound before plain X-rays are taken. The radio-opaque markers are clearly visible on X-ray (Figure 2 and 3).

An estimation of the path of the wounding

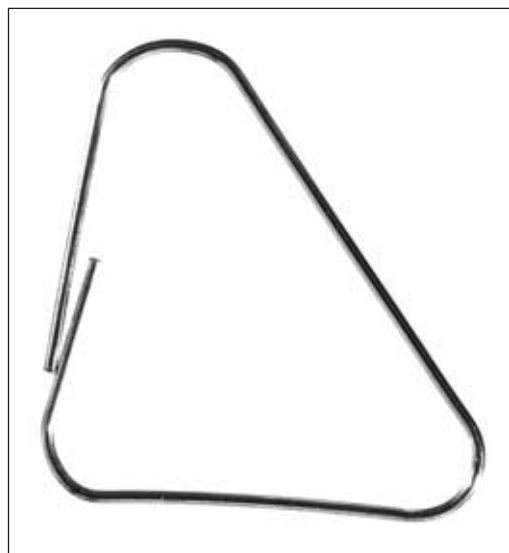


Fig 1. Radio-opaque marker.

agent between the markers is combined with clinical information and facilitates assessment of the likely injury pattern.

Discussion

Prediction of the direction of a wound track through the body is a valuable part of both clinical and forensic evaluation (3). Plain radiographs alone rarely provide sufficient information, as although bullet tracks in the chest may be visible in pulmonary parenchyma on X-ray, the path of a wound track through the body is seldom evident even if bone or bullet fragments are present (4).

Helical computer tomography scans can be used to augment the basic radiological assessment and have been shown to provide an accurate method for evaluating missile trajectories (5) and planning operative strategy (6), however, this technology is unlikely to be available in the field.

It is well recognised that projectiles tumble, deform and deflect off bony structures as they pass through body tissues. As a consequence, the path of the bullet through the body may not be straight (7). However, when resources and diagnostic facilities are limited any additional information that assists the clinical examination is valuable. The addition of radio-opaque markers over the wounds prior to imaging, facilitates recognition of the location of wounds on X-ray and will improve the initial evaluation of the missile trajectory from plain radiographs.

The accuracy of clinical notes in cases of penetrating injury has been shown to be poor. Shuman *et al* (8) reviewed 566 patients with 1259 gunshot wounds and determined that the number of injuries, location of wounds and direction the missile took through the tissues were rarely correctly recorded. Ross (9) showed that focusing clinician attention on the need to accurately record physical findings in cases of penetrating injury greatly improves the accuracy of documentation. Routine use of radio-opaque markers on admission X-rays adds valuable data to the permanent medical documentation by marking the number and location of penetrating injuries. This improves the quality of documentation that accompanies the patient as they are transferred and increases the ability to accurately reconstruct a potentially complex series of events in subsequent medicolegal testimony.

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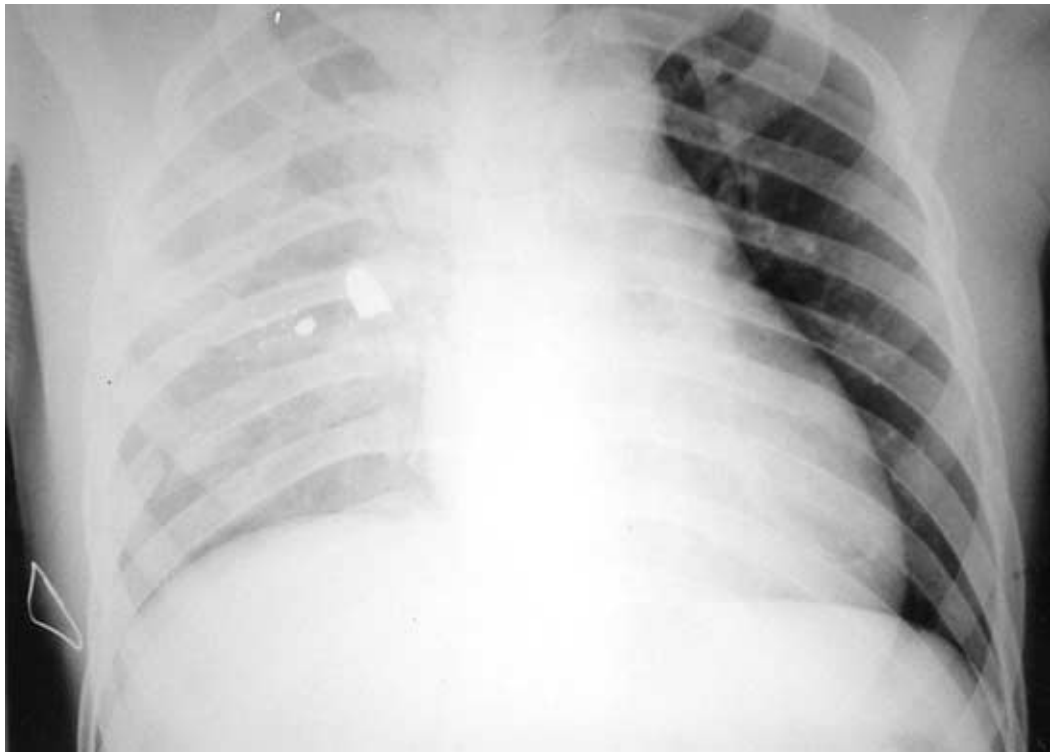


Fig 2. Chest X-ray with radio-opaque marker visible over the right lower chest. Note also the retained bullet.

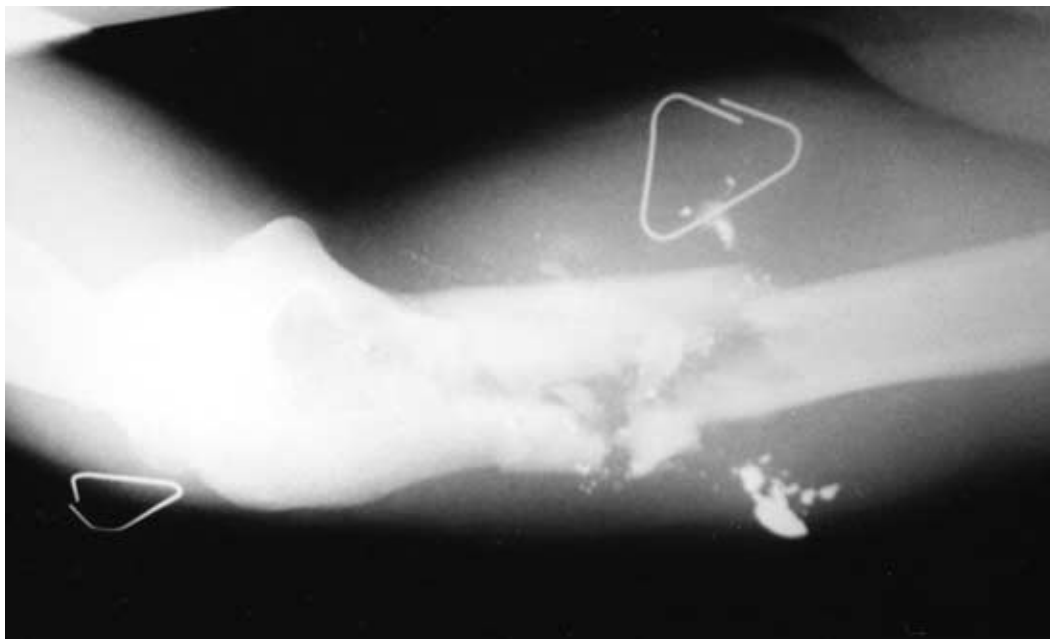


Fig 3. Gunshot wound of the humerus. The patient had a palpable pulse, and vascular injury was not suspected initially. X-ray with the use of radio-opaque markers demonstrated an increased likelihood of vascular injury, which was confirmed on subsequent angiography.

the incidence of penetrating trauma approaches 4000 patients annually, this practice has proven to be a valuable addition to the clinical assessment of all wounded patients in the resuscitation room.

Although we make no claim to the originality of this technique, we have not found it described elsewhere. The method is simple, fast and utilises the ubiquitous paperclip which is likely to be available even in the most austere location. We recommend this technique as a valuable adjunct to all those involved in the assessment of patients with penetrating trauma.

References

1. Wilson AJ. Gunshot Injuries: What Does a Radiologist Need to Know? *Radiographics* 1999; **19**: 1358-1368.
2. Phillips CD. Emergent radiologic evaluation of the gunshot wound victim. *Radiol Clin N Am* 1990; **30**: (307-324).
3. Choi CH, Richard J. Path of bullet and injuries determined by radiography. *Am J Forensic Med Pathol* 1990; **1**(3): 244-5.
4. George PY. Radiographic appearance of bullet tracks in the lung. *Am J Roentgenol* 1992; **159**(5): 967-70.
5. Hanpeter DE, Asensio JA, Berne TV, Velmahos G, Murray J. Helical computed tomographic scan in the evaluation of mediastinal gunshot wounds. *J Trauma* 2000; **49**(4): 689-94.

6. Grossman AD, Schwab W, Reilly PM, McMahon DJ, Rotondo M. Determining Anatomic injury with computed tomography in selected torso gunshot wounds. *J Trauma* 1998; **45**: 446-456.
7. Swan KG. Principles of ballistics applicable to the treatment of gunshot wounds. *Surg Clin N Am* 1991; **71**: 221-239.
8. Shuman M. Evaluation of clinician accuracy in describing gunshot wound injuries. *J Forensic Sci* 1999; **44**(2): 339-42.
9. Ross RT, Frantz EI, Paré LE, Boyd CR. Gunshot wounds: evaluating the adequacy of documentation at a level 1 trauma center. *J Trauma* 1998; **45**(1): 151-2.