Use of transoesophageal echocardiography in management of penetrating cardiac injury

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A 53-year-old man who sustained an accidental cardiac nail gun injury presented to us in haemodynamically stable condition. He had an urgent plain radiograph film and contrast CT scan to determine the exact position of the nail. CT showed the nail to be in juxtacardiac position but did not give any conclusive information about breach of pericardium or myocardial wall. An intra-operative transoesophageal echocardiography was done to determine the exact position of the nail. It clearly delineated the position of the nail and guided us towards median sternotomy and removal of nail under direct vision safely.

KEYWORDS
Cardiac nail gun injury; Penetrating cardiac injury

Introduction
Penetrating cardiac injuries are not uncommon; most of these patients are too unstable to be transferred to CT or MR imaging. Most often the patient’s circulatory status is compromised to an extent that an expeditious salvage procedure is the only option. We present here how we used intra-operative transoesophageal echocardiography (TOE) in assessing the extent of injury and deciding upon the surgical approach in managing a case of nail gun cardiac injury.

Case report
A 53-year-old man who sustained injuries while handling a pneumatic nail gun at home presented to the accident and emergency department. Examination revealed a gun-shot wound over precordium in the 5th intercostal space with surrounding charring of the skin. He was tachypnoeic but circulatory parameters were adequately stable. A plain PA and lateral radiograph of the chest showed the nail to be in juxtacardiac position (see Figure 1) and there was a small pneumothorax on left that was managed with a chest tube.

A contrast CT scan was performed to assess the extent of the injury. Though the CT scan confirmed the juxtacardiac position of the nail it could not confirm whether it was penetrating through the pericardium (see Figure 2). The patient was transferred over to our cardiothoracic unit for further management. In view of the central position of the wound, and uncertainty over its deeper extension we decided to explore the wound under general anaesthesia. The wound on the chest was extended along the direction of the rib spaces anterolaterally. We found that the lingula of the left lung was riveted to the pericardium by the nail and it was difficult to assess whether the nail was penetrating into the myocardium. An intra-operative TOE examination (see Figure 3) showed the nail to be penetrating into the myocardium, but there was no evidence of associated valvular, septal or visceral injury (see Movie 1). Based on this information a decision to perform median sternotomy was made to gain better access to the heart. The pericardial cavity contained about 50 ml of blood stained fluid and nail was seen penetrating into the myocardium. The nail was pulled out under direct vision in a controlled fashion and the defect in the myocardium was closed.

Patient’s post-operative recovery was uneventful and he was discharged home on the 5th postoperative day.

Discussion
Penetrating cardiac injury with a nail gun is sparsely reported in the literature. Such an injury is generally classified as a low velocity injury and has same mortality figures as stab injuries to the chest.1,2

In patients with penetrating cardiac nail gun injury the spectrum of presentation can vary from unstable patients requiring urgent intervention to haemodynamically stable patients. In stable patients there is time to assess the extent of injury. CT scans can be used to confirm the position of the nail in central chest nail gun injury.3 Use of
transthoracic echocardiography (TTE) has been reported to be useful in patients with penetrating precordial injuries.\textsuperscript{4,5} Usefulness of TOE has been documented for blunt trauma to chest.\textsuperscript{6} Similarly intra-operative TOE for removal of a migrated acupuncture needle in a patient with cardiac tamponade has also been reported.\textsuperscript{7} These patients were haemodynamically unstable at presentation and cardiac injury was obvious. Practice guidelines for perioperative TOE by the American Society of Anesthesiologists and Society of Cardiovascular Anesthesiologists describe intra-operative TOE as a category II indication i.e. indication that is supported by weaker evidence or expert opinion.\textsuperscript{8}

In our case TOE assisted us in confirming and localizing the position of the nail and directed us to go for median sternotomy for wider access to the pericardium and the heart. In the light of the knowledge of the accurate position of the nail we could safely remove the nail avoiding cardiopulmonary bypass.

**Supplementary data.**

Supplementary data are available at European Journal of Echocardiography online.

**References**