

# Role of Transesophageal Echocardiography in Assessment of Penetrating Heart Trauma

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## Abstract

We report the case of a 38 year old man who received a stab wound on his chest. After admission at a Cardiothoracic Centre, a transthoracic echocardiogram showed pericardial effusion and a small ventricular septal defect. Due to poor transthoracic window and lack of improvement of his hemodynamic parameters the patient was transferred for transesophageal echocardiography in our Paediatric Cardiac Centre. The transesophageal echocardiography showed a 12 mm ventricular septal defect. In this case, the transthoracic echocardiography had a guide role but the transesophageal echocardiography procedure was conclusive. The patient tolerated transportation and the procedure well. We conclude that performing transesophageal echocardiography in the assessment of penetrating heart trauma may be useful in assisting management and that this procedure be done as soon as medically possible.

## INTRODUCTION

Heart trauma due to road accidents or in connection with crime is a cause of large number of deaths, mainly in young adults.<sup>1</sup>

Penetrating injuries to the heart generally occur less often than blunt injuries,<sup>2</sup> but improvement in medical service to trauma patients, and improved emergency rescue services have made it possible for at least one third of penetrating heart trauma patients to arrive alive to the emergency services.<sup>3,4</sup>

The most frequent causes of penetrating trauma are gunshots and stab injuries<sup>2</sup>; the overall survival rate is about 50 % once patients are brought alive to the hospital. Survival rates are related to the specific cause of injury, with reports varying from 48%<sup>5</sup>, 52%<sup>6</sup> to 87 %<sup>7</sup> for stab wounds.

The right ventricle is injured in about half of the surviving patients and the ventricular septal defect (VSD) caused by penetration to the heart is found in 2–10% of survivors<sup>8</sup>

Even today, 110 years after the first heart repair surgery, cardiac injuries remain the most challenging in the field of trauma surgery. Once patients arrive at the hospital, the right diagnosis, the timing of intervention and the magnitude of the heart trauma by itself, seem to be the most important issues in relation with the post-operative outcome.<sup>4, 9</sup>

For more than 40 years the use of transthoracic echocardiography (TTE) has been the key to diagnosis of pericardial effusion<sup>10</sup>, later to the evaluation of blunt trauma chest<sup>11,12</sup> and more recently to the evaluation of penetrating trauma.<sup>13,14</sup> Transesophageal echocardiography (TEE) appears as an additional or an alternative diagnostic tool in several cases.<sup>15, 16</sup>

The aim of this paper is to emphasize or recommend the use of transesophageal echocardiography, in evaluating the magnitude of the heart trauma

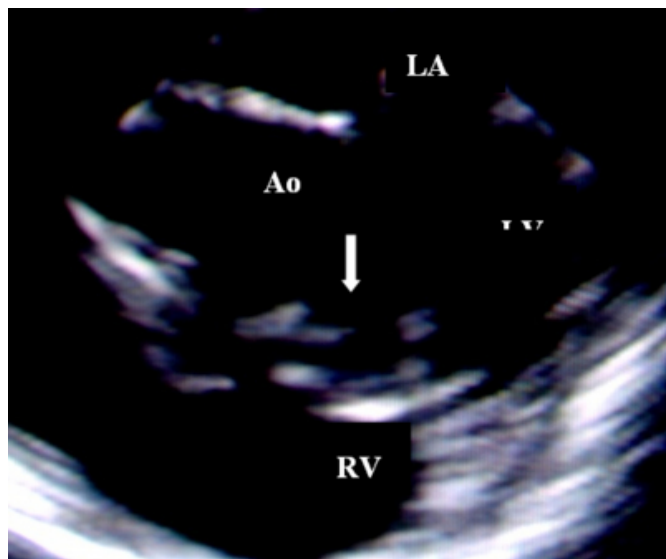
## CASE REPORT

Here we report the case of a 38 year old man who was admitted to the Emergency Department of a general hospital following an episode in which a tweezer penetrated the victim's chest to the right inferior parasternal area at the fifth intercostal space. He received the wound during an argument that elevated into a violent assault. On initial examination the patient only complained of chest pain and his condition was diagnosed as stable, but the patient was put under observation. Eighteen hours later, the patient began to show tachypnoea, gallop rhythm and crepitations in the chest. The patient was transferred immediately to a cardiothoracic centre. At that time the patient was tachypnoeic, with sinus tachycardia of 110 beats/min., blood pressure of 90/60 mmHg, jugular engorgement, precordial thrill and a parasternal, 5/6 systolic murmur. A chest X-ray showed

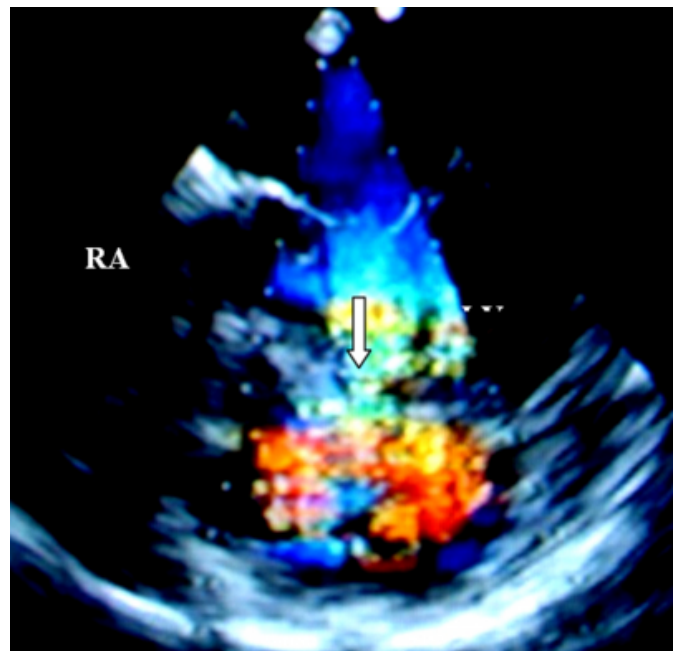
pulmonary congestion and ECG revealed right bundle branch block. Transthoracic echocardiography revealed 12 mm posterior pericardial effusion, hypermobility of the interventricular septum and a 4 mm. muscular VSD. The ejection fraction was found to be 71%. The hemodynamic status of the patient continued to deteriorate; so a TEE was performed to assess the condition in greater detail. We used a Aloka ProSound SSD – 5000 echocardiograph with 5 MHz biplane probe (model UST-5271S – 5; Aloka CO, Ltd; Tokyo, Japan). The TEE revealed normal chamber size and a 12 mm muscular VSD with very irregular rims, left to right shunt (Figure 1a and b and Movie clips 1a and b) and a Qp/Qs of 3: 1.

### Figure 1

Figure 1: (a) Transversal Plane. Mid esophageal five chamber view. Arrow showing ventricular septal defect (VSD). (b) Same view, arrow showing the flow through the VSD. LA= Left Atrium, Ao= Aorta, LV= Left Ventricle, RV= Right Ventricle



### Figure 2



No complications arose during the procedure. The patient was medicated with dopamine, furosemide, digoxin, and chlorthalidone. Thirty-five days after trauma the patient underwent surgery for the closure of the VSD. Six days later the patient was discharged from the hospital without the need for any further medication. At follow up after 4 years he was asymptomatic and in good health.

### DISCUSSION

There is a group of patients who suffer penetrating chest trauma with stable haemodynamic state in which there is enough time to perform diagnostic procedures<sup>17</sup>. On the other hand there are patients who need mandatory emergency surgery to keep them alive even without a complete battery of diagnostic procedures.<sup>18,19</sup> There is also another group of patients (including our patient), in which it is necessary to have the patients under treatment in order to keep them in a stable haemodynamical state but even under these circumstances it is important to obtain an early and correct diagnosis<sup>20</sup> in order to achieve a safer treatment algorithm for the patient.

In the case presented above was a good choice to perform a TEE since the patient did not suffer from additional hemodynamic deterioration during transportation or during the procedure. The TEE procedure permitted us to have a better picture of the extent of heart trauma and damage and allowed us to have a comprehensive understanding of the problem, leading with certainty to the decision of having a delayed surgery described in prior experiences (2) probably

with better outcome due to healing of the tissues. In our case the TTE played a guide role, but early TEE was conclusive for the diagnosis and definitive management, avoiding on the other hand delaying diagnosis reported in the reviewed literature. (9)

We are in agreement with authors whose previous studies have been in favour of performing TEE in the assessment of penetrated heart trauma and we propose that this procedure be done as soon as medically possible.

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