



# Selective non-operative management of solid organ injury following abdominal gunshot wounds<sup>☆</sup>

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## KEYWORDS

Penetrating;  
Injury;  
Wounds and injuries;  
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Gunshot wounds;  
Abdominal trauma;  
Hepatic injury;  
Renal injury;  
Splenic injury

## Summary

**Background:** The objective of this study was to evaluate the outcome of patients sustaining a torso gunshot wound with documented solid organ injury. Our hypothesis was that the non-operative management of isolated solid organ injuries is a safe management option for a select group of patients.

**Methods:** A retrospective review of a prospectively collected database was conducted to identify all patients sustaining a torso gunshot resulting in a solid organ injury undergoing non-operative management over a 5-year period (12/1999–01/2005). Patient demographics, injury details, diagnostic imaging, outcome and follow-up were reviewed.

**Results:** Of 644 gunshot wounds to the torso, 144 (22%) underwent non-operative management. Thirteen of these patients (9%) had 16 solid organ injuries (10 liver, 4 kidney and 2 spleen). CT characterisation of the isolated solid organ injury ranged from AAST Grade I–IV. One of 13 patients failed non-operative management and subsequently underwent laparotomy, which was non-therapeutic. Clinical follow-up was available in all patients for an average of 101 days (median 27, range 6–473). The organ salvage rate was 100%.

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*Summary:* In select haemodynamically stable patients without peritonitis able to undergo serial clinical examination, solid organ injury is not a contra-indication to non-operative management. In the appropriate setting, non-operative management of solid organ injury after gunshot wounding is associated with a high rate of success and organ salvage.

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## Introduction

For patients sustaining penetrating abdominal trauma, selective non-operative management has been used with increasing frequency over the past 2 decades. Widely practiced for stab wounds, evidence is accumulating that the non-operative management of gunshot wounds is also a safe and cost-effective management option.<sup>2,5–8,10,11,15–17,20,22,25–28,31,33–35</sup>

In these patients, detailed trajectory imaging and serial clinical examination are used to exclude intra-abdominal injuries. With advances in imaging technology, the identification of patients with isolated solid organ injury after gunshot wounding has also become possible. At this time however, there is very little evidence to support this non-operative management strategy for gunshot injuries when there is a known solid organ injury.

The objective of this study was to evaluate the non-operative management of patients sustaining a torso gunshot wound with documented solid organ injury. Our hypothesis was that the non-operative management of isolated solid organ injuries is a safe management option for a select group of patients.

## Methods

After IRB approval a retrospective review of the trauma registry at the Ryder Trauma Centre was used to identify all patients sustaining a gunshot wound to the anterior abdomen, flank, back and buttock during a 5-year period (12/1999–2001/2005) at this high-volume urban level I trauma centre. Patients that died during transport or during the immediate resuscitative phase were excluded (Fig. 1).

All patients were evaluated by an attending trauma surgeon on presentation to the resuscitation area. The decision to undergo non-operative management and all subsequent imaging and treatment decisions were made by the attending trauma surgeon. All patients selected for non-operative management were clinically evaluable, haemodynamically normal, without peritonitis. Patients undergoing non-operative management underwent haemodynamic and laboratory monitoring in a

dedicated resuscitation observation area prior to admission or discharge.

All patients who did not undergo operative intervention within the first 6 h after admission had a detailed review of their medical records to delineate their demographics, injury details, hospital course, outcome and clinical follow-up. All imaging used in the non-operative management of these patients was reviewed and their results were documented. All endovascular and percutaneous interventional image guided procedures were also reviewed and documented. From this subset of patients undergoing non-operative management, the initial CT scan was used to identify patients with liver, kidney or splenic injuries undergoing non-operative management.

A delayed laparotomy, indicating failure of non-operative management, was defined as any laparotomy during the hospital course or clinical follow-up. The decision to undergo delayed laparotomy was at the discretion of the attending trauma surgeon. The indication, operative findings and procedures performed during each delayed laparotomy were documented. Descriptive statistics included mean, standard deviation, median and range.

## Results

Six hundred and forty-four patients with gunshot wounds to the abdomen were assessed at the Ryder Trauma Centre over the 5-year study period (Fig. 1). Five hundred patients went directly to the operating room for exploration. The remaining 144 (22%) patients were selected for non-operative management.

Of the 144 patients undergoing non-operative management of their abdominal gunshot wounds, 13 (9%) patients had peritoneal violation and an intra-abdominal solid organ injury shown on CT (Table 1). Three (23%) of these patients had a positive FAST. Overall, there were 8 isolated liver, 2 combined liver and kidney, 1 isolated kidney, 1 isolated spleen and 1 combined spleen and kidney injury.

The mean age of the patients with solid organ injury was 28 years old (range 18–48) and all were male. Injury Severity Scores (ISS) were available in

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