# Non-Operative Management of Solid Organ Injuries due to Blunt Abdominal Trauma (NOMAT): Seven-year experience in a Teaching District General Hospital. A Prospective Study

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**Citation**

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**Abstract**

Over the past several years, non-operative management has been increasingly recommended for the care of selected blunt abdominal trauma patients with solid organ injuries. This prospective study was designed to assess the outcomes of operative and non-operative treatments for blunt hepatic and splenic injuries. The injuries were graded based on the American Association for the Surgery of Trauma organ injury scale. The patients were assigned into operative and non-operative groups and compared for variables such as length of hospital stay, blood transfusion, age, morbidity and mortality rates. In conclusion, appropriate non-operative management reduces the risks of blood transfusion, length of hospital stay and morbidity of the patients.

## INTRODUCTION

Over the past fifteen years, there has been a major shift from operative to selective non-operative management (NOM) of solid organ injuries in blunt abdominal trauma (BAT). The non-operative approach relies heavily on the availability of trauma surgeons, modern radiographic imaging, accurate interpretation of such imaging, presence of appropriate supporting infrastructure and ancillary services. [13]

## HYPOTHESIS

Selective non-operative management of injuries to liver and spleen in blunt abdominal trauma is highly successful.

## MATERIAL AND METHODS

This prospective observational study was conducted over a period of seven years (June 1997 to May 2004) in an academic level-1 trauma centre at a teaching district general hospital. Fifty-six patients with injuries to liver, spleen or both liver and spleen were included in the study. Patients from all age groups and both sexes were considered.

On admission, all patients were assessed and resuscitated according to the ABCDE approach of the Advanced Trauma Life Support (ATLS) protocol. History of the mechanism of injury was obtained in all patients. All patients underwent abdominal ultrasonography and 63% of patients went for subsequent CT scan of abdomen and pelvis.

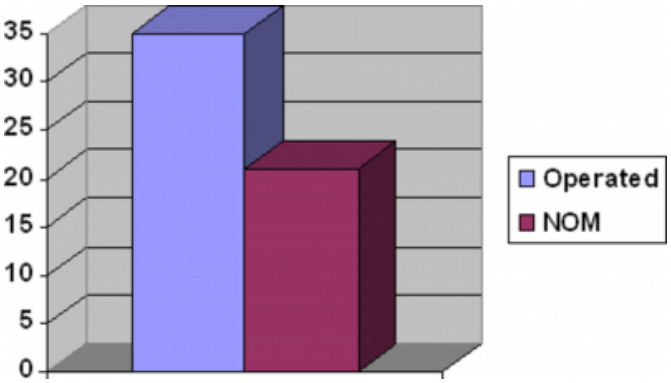
All patients who were alert and haemodynamically stable without or with minimal peritoneal irritation on abdominal examination, with AAST (American Association for the Surgery of Trauma) organ injury scale 1-3 on CT scan and absence of other clear indication for laparotomy were chosen for NOM. A decision for laparotomy was taken when the patient deteriorated either clinically or haemodynamically. All NOM-group patients were admitted to the surgical intensive care unit and had regular physical examination, haematocrit check and imaging when in doubt. The rest of the patients underwent laparotomy for their injuries.

## RESULTS

The total number of patients included in the study was fifty-six comprising injuries of the liver (n=29), the spleen (n=25) and of both liver and spleen (n=2). Thirty-five patients had laparotomy and twenty-one were considered suitable for NOM.

**Figure 1**

Figure 1




Thirty-five patients underwent laparotomy because they were either haemodynamically unstable (63%) or had associated injuries (37%) that needed laparotomy. Of twenty-nine patients who had liver injuries, nine (31%) patients were treated conservatively and all of them successfully. Of twenty-five splenic injury patients, eleven (44%) were treated conservatively. But two (18%) clinically deteriorated between eight to twelve hours after the injury and ended up in splenectomy. There were five paediatric patients who had splenic injury and four of them (80%) were treated successfully by NOM. Two patients had both liver and spleen injuries and one of them was haemodynamically stable and also HIV positive. He was treated by NOM and the other patient died (2.7%) preoperatively due to uncontrollable bleeding.

**Figure 2**

Table 1

| Organ injured | Operated | NOM | Success NOM |
|---|---|---|---|
| Liver | 29 | 9 | 100% |
| Spleen | 25 | 11 | 82% |
| Both | 1 | 1 | 100% |

Interestingly, during the first four-year period of the study only 23% of patients were assigned to the NOM group and this percentage increased to 54% during the last three years. The median length of stay for the NOM group was 6.5 days and for the operated group it was 8.8 days. Compared to the NOM group, the operated group had higher amounts of blood transfusion.

## DISCUSSION

Blunt Abdominal Trauma (BAT) has often proved to be the trauma surgeon's nemesis due to the multitude of its manifestations [2]. Physical examination remains the cornerstone of trauma triage [2]. The most common presenting features of intra-abdominal injury are pain, tenderness, guarding and distension [9,11]. The findings of significant traumatic injury can be subtle and the diagnosis of intra-abdominal injury uncertain. Upon initial assessment, between 20% and 40% of patients with significant haemoperitoneum have a normal abdominal examination [5,6]. Young patients and patients on beta-blockers may not manifest the signs of early shock [14]. The masking effect of concurrent-extra abdominal injuries and altered sensorium due to hypotensive shock, head injury and alcohol intoxication further compound the problem [7,8,12].

Non-therapeutic laparotomy (NTL) for trauma patients varies from 1.7% to 38% depending on the experience and practice patterns of the individual trauma centre [14]. In one prospective study of 938 laparotomies for abdominal injury, 27% were deemed unnecessary [15]. NTL is associated with significant morbidity and cost to the health system. The reported incidence of complications varies between 8.6% and 25.6% [14,19]. The frequency of late complications such as adhesive obstruction and incisional hernia varies between 2.4% and 5% [16,19]. In one review of abdominal trauma, the overall incidence of delayed diagnosis was 3.4% with no mortality attributed to delayed diagnosis and treatment [14,17]. The morbidity was comparable to that of patients receiving an early intervention [14]. When the time delay is beyond twelve hours, the morbidity increases [19].

NOM of blunt abdominal injuries is well established and strategies based on haemodynamic stability and CT scan findings are now being widely used in the treatment of solid organ injuries including liver, spleen, kidneys, pancreas and pelvic injuries [19]. In BAT including severe solid organ injuries, selective NOM has been the standard of care [13]. NOM rates were increased in trauma centres as compared to non-trauma centres. In a prospective study, the rate of NOM failure for solid abdominal organ injuries is higher than the rates reported in retrospective studies [1]. Appropriate NOM of injured children reduces the risks of blood transfusion and length of hospital stay compared with the surgical group [3]. If the decision has been made to observe the patient by NOM, the patient should be admitted to higher level of care for at least 48-72 hours with close monitoring on vital signs, haemotocrit and repeated clinical examination. Serum lactic acid and base deficit can also help to determine if NOM is

failing [19] .

The general principles [19] of NOM are:

- Always keep the mechanism of injury in mind.
- The patient should be in alert, awake and responsive.
- The patient should be examined repeatedly.
- The patient should be haemodynamically stable and have no coagulation disorders.
- There should be no other clear indication for laparotomy.
- Maintain high index of clinical suspicion.
- Be very cautious in multiple injured patients.
- Higher level of care with round-the-clock availability of laborotory, radiology and operation theatre.

NOM to be abandoned [2] when there is

a) Deterioration of vital signs.
b) Development of new peritoneal signs.
c) Continued need for blood transfusion.
d) Falling haemotocrit or progressing haematoma.

The risks [2] associated with NOM are:

- Missed injuries.
- Delayed diagnosis and treatment.
- Retained hematoma, sepsis and/or abscess.
- Bowel/biliary/pancreatic/urinary leaks.
- Pseudoaneurysm formation and delayed rupture.
- Delayed treatment of vascular injuries and their complications.
- Risks involved in blood transfusion.

In the operated group, infections (9% in our study) prevail as the most common cause of morbidity and the mortality is higher due to greater severity of the injury. The choice between the two modalities of treatment should be guided by haemodynamic considerations rather than by the severity of organ injury [6] .

## IMAGING IN TRAUMA PATIENTS

In our era, the trauma surgeon has good accessibility to plain radiograms, ultrasound, CAT scans and MRI scans. Imaging is essential in early decision making. Few centres have interventional radiologists available round the clock. Focussed Assessment with Sonography in Trauma (FAST) examination of pericardial, perihepatic, perisplenic and pelvic areas help in early detection of clinically significant abdominal injury [18] . FAST examination can be performed repeatedly and is an excellent adjuvant to physical examination in NOM. A trial revealed that a FAST-based algorithm for BAT was more rapid, less expensive and as accurate as an algorithm that employed CT or diagnostic peritoneal lavage (DPL) [10] .

Computed tomography (CT) can provide reliable information on haemoperitoneum, extent of solid organ injuries, retroperitoneal organ injuries, most cases of hollow viscus perforation and ongoing bleeding by means of radiographic blush [19] . Some studies have challenged the role of CT scan as primary triage in trauma patients and the lack of availability of technicians and radiologist out of hours [4,7] .

Though hepato-splenic injuries still remain the most common solid organ injuries in BAT, liberal use of high resolution imaging techniques such as CT scan revealed that the liver is the commonest solid organ injured and not the spleen as popularly believed [511] . In the modern setup, the worldwide laparotomy rate for BAT is only about 20% [12] .

## CONCLUSION

Non-operative management in blunt abdominal trauma is challenging owing to the diversity of presentation and wide range of visceral injuries. However, it is quite satisfying to manage them by conservative approach which is highly successful in selective cases. The advent of sophisticated imaging and the availability of interventional radiologists has somewhat lightened the trauma surgeons' operative burden. However, even today, nothing surpasses the value of repeated clinical examination by an experienced surgeon in guiding the ultimate therapeutic decision. “When in doubt it is better to open and see than to wait and watch”- Grey Turner.

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