

## Consequences of Nail Gun Shot Injury to Small Bowel in Construction Worker

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### ABSTRACT

We report a case of a 33-year-old male who was accidentally shot by a nail gun. He had nail as forging body in the left femoral head with wound inlet in the left lumbar region about 0.5 cm. The Computed tomography showed metallic foreign body seen in the left femoral head. Exploratory laparotomy done which revealed multiple puncture in the jejunum at 25 cm, 35 cm, 50 cm. All were treated by suturing by extra mucosal stitches. The nail was removed by orthopedic and the patient was discharged home after 5 days. The occupational safety and preventive measure is important for all industrial workplaces.

**Keywords:** Nail gun; Jejunum; Abdominal Trauma, Occupational Health.

### INTRODUCTION

Small bowel injuries are rarely presented after blunt abdominal trauma and are mostly due to high energy deceleration injury, and can be due to different mechanism of injuries.<sup>1-3</sup> Diagnosis of abdominal injury especially in resource limited areas is challenging. Most patients who present with blunt abdominal trauma are hemodynamically stable and often a clinician may see no reason to investigate further.<sup>4</sup> Currently the investigation of choice in a hemodynamically stable patient with history of blunt abdominal trauma is a computed tomography scan.<sup>5,6</sup>

Pneumatic nail guns are efficient, readily available, and easy to use, making them a common tool employed in residential construction and wood-production industries.<sup>7</sup> There are large numbers of nail gun types used in the building industry. In addition; nail guns are frequently utilized by the nonprofessional consumer population for general construction. The nail gun is a mechanical device used to frame wooden structures, secure wood to concrete supports, and in multiple other construction and home improvement applications.<sup>8</sup> The majority of injuries involve retained nails with trauma limited to the surrounding soft tissues. Direct bony injuries to the digits, hand, and wrists as well as penetrating injuries to the inter-phalangeal and radio-carpal joints have been described.<sup>9-11</sup> It can also injure any part of the body according to the power and strength of the nail.<sup>12</sup>

We report on this case of jejunal repair by extra-mucosal suturing that occurred after nail gun shot. We must keep the possibility of occult intestinal injury in mind for all patients presenting with penetrating abdominal trauma, despite unremarkable vital and physical signs.

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### CASE PRESENTATION

33-year-old Pakistani male presented to the emergency department with lower abdomen trauma due to nail gun shot. He was complaining of abdominal pain in the left lower quadrant and pain in the left hip.

The abdomen was mildly rigid and there was inlet wound in the left lumbar region about 0.5 cm, round in shape and, regular edges, clean wound.

X-ray pelvis done to the patient and there was a foreign body (nail) in the left femoral head as shown in figure 1. After that the patient BP deteriorated and shifted to the RR.

The General Surgery specialist ordered for him CT-scan abdomen and pelvis with double contrast, which showed mild intraperitoneal free gas, likely transverse colon adjust to the left colonic flexure and metallic foreign body seen in the left femoral head figure 2.

His lab investigations were the following: WBCs: 17.88; RBCs: 6.27; HGB: 17; Creatinine: 0.68; BUN: 14; CK-MB: 69.

### DIAGNOSIS

Multiple Jejunal Penetration due to Nail Gun Shot.

### TREATMENT

After that the patient shifted to the OR. Exploratory laparotomy done by Dr. Antoine (General Surgery Consultant) mild incision, no free fluid or blood, multiple puncture in the jejunum at 25 cm, 35 cm, 50 cm, all are sutured by extra mucosal stitches (vicryl 3:0). He did Mobilization of the sigmoid because of small retroperitoneal hematoma. No sigmoid injury, but small mesenteric

injury. Ureter and spermatic cord was normal. Lavage with 2 liter normal saline was done.

Closure in layers was done. Post operation vital signs was: Temp: 34.2; BP: 130/70; RR: 20 breath/min; SpO<sub>2</sub>: 98% RA The patient is NPO, on IV fluids D5NS 120 ml/hr. NGT total 15 ml. The urine output 3600 ml. Perphelgan 1 gm IV PRN.

### OUTCOME AND FOLLOW UP

The second day: The vital signs are: Temp: 36.6; BP: 130/42; Pulse: 80 beat/min; RR: 20 breath/min. The patient had abdominal pain in the operation site 5/10, the abdomen was soft and lax, no discharges from the wound, he still NPO, on NGT, IVF D5NS 120 ml/hr, Folly's catheter was removed.

Third day: The patient complained of mild pain in the operation

site 4/10, the abdomen was soft and lax, not distended, he passed flatus, NGT removed, he started liquid and soft diet.

Fourth day: The patient was stable, vitally stable, complained of mild pain in the operation site, abdomen was soft and lax, the wound was clean no discharges. Discharge from orthopedics and GS side, orthopedics advice not to remove the nail, GS appointment after 2 weeks to remove the clips.

Discharge summary was: patient admitted with penetrating wound in the abdomen duo to nail gun passed to the left hip. Management: laparotomy with stitches the puncture wound in the intestine. Medication: velosef 500 mg TID, paracetamol 500 mg TID, omeprazole 20 mg BID. Patient was discharged in 5 days. After 2 weeks the patient was seen in the GS clinic, he was fine, doing well, the wound site was clean and the stitches removed.



Figure 1: Construction nail in the head of left femur.



Figure 2: Lower Abdominal Computed Tomography after nail gun shot.

### DISCUSSION

Injuries associated with the use of compression guns vary widely in site and severity.<sup>13</sup> The amount of energy required to cause serious injury is fairly low: penetration of the skin occurs with projectile velocities of 150 feet per second, whereas bony fractures may occur with projectile velocities of 195 feet per second.<sup>14,15</sup> A literature search yielded 103 articles relating to nail gun injuries in humans and reported injuries to the head, neck, thorax, pelvis and extremities. No articles describing major intra-abdominal injury were identified. The nail gun used was powered by a powder-actuated system. This type of nail gun found to be destructive easily for many parts of the body and can does multiple penetrations.<sup>16</sup> The destructive power in this injury was increased, because it was a ricochet and entered the body with a tumbling path allowing it to scythe through structures. Surgical removal of nails can be complicated by numerous barbs or glue placed along the length of the shaft, with serious iatrogenic damage to the surrounding structures.<sup>17,18</sup> They have been reported in various sites including head and neck, chest, abdomen, extremities, vertebral column and spinal cord.<sup>19-21</sup> The literature on penetrating injuries to the abdomen is fairly extensive.

The common causes are gunshots and stab wounds and it is usually diagnosed based on clinical signs, diagnosis of blunt abdominal trauma is more likely to be delayed or altogether missed because clinical signs are less obvious.<sup>22</sup> Blunt injuries predominate in rural areas, while penetrating ones are more frequent in urban settings.<sup>23</sup> Penetrating trauma is further subdivided into stab wounds and gunshot wounds, which require different methods of treatment.<sup>24</sup> Signs and symptoms of penetrating abdominal trauma depends on various factors, including the type of penetrating weapon or object, the range from which the injury occurred, which organs may be injured, and the location and number of wounds.

Close-range injuries transfer more kinetic energy than those sustained at a distance, although range is often difficult to ascertain when assessing gunshot wounds. A nail gunshot wound is caused by a missile propelled by combustion of powder. These wounds involve high-energy transfer and, consequently, can involve an unpredictable pattern of injuries. Secondary missiles, such as nail and bone fragments, can inflict additional damage. Stab wounds are caused by penetration of the abdominal wall by

a sharp object. This type of wound generally has a more predictable pattern of organ injury. However, occult injuries can be overlooked, resulting in devastating complications.<sup>22-24</sup> The standard management of penetrating abdominal trauma was for many years mandatory laparotomy. A greater understanding of mechanisms of injury, outcomes from surgery, improved imaging and interventional radiology has led to more conservative operative strategies being adopted.<sup>25</sup>

This injury occurred in Khamis Mushayte which is considered as trading and industrial city in Aseer Region and the patient had been treated in secondary health care setting Khamis Mushayte General Hospital which need to put in the plan preventive measures in such occupational accidents in collaboration with occupational health and safety.

This case demonstrates the wide range of injuries capable of being inflicted by a single penetrating injury, and emphasizes the need for proper training and safety measures in the use of nail guns. It illustrates the significant potential destruction from the ricochet injury, and the possibility of a severe occult venous injury despite no warning from a preoperative CT scan.

## CONCLUSION

Nail gun abdominal injuries are survivable and can cause multiple penetrations for multiple organs. Team approach and appropriate timely investigations in a nail gunshot patient could be all what is needed. Embolization does occur and embolectomy should be performed at the site of the nail to prevent further intimal injuries. Occupational preventive measure should be addressed in such industrial environments.

## CONSENT

Authors took the permission from the patient and the social affairs department to publish it as case report.

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