








Effectiveness of clinical examination and radiological investigations in the success of selective non-operative management of abdominal gunshot injuries

Salah Mansor^{1,2} , Naman Ziu¹ , Ayoub Bujazia³ , Ahmed Eltarhoni⁴ , Jamal Alsharif⁵ 

¹ Al-Jalaa Teaching Hospital, Department of General Surgery, Benghazi University Faculty of Medicine, Benghazi, Libya

² Department of Surgery, Libyan International Medical University, Benghazi, Libya

³ Benghazi Medical Center, Department of Diagnostic Radiology, Benghazi University Faculty of Medicine, Benghazi, Libya

⁴ Department of Family and Community Medicine, Benghazi University Faculty of Medicine, Benghazi, Libya

⁵ Ajdabiya Teaching Hospital, Department of General Surgery, Ajdabiya University Faculty of Medicine, Ajdabiya, Libya

ABSTRACT

Objective: Non-operative management of abdominal gunshot injuries has become the standard care in the selected cases of modern surgery with an acceptable success rate to reduce the incidence of unnecessary laparotomies. In this study, an assessment was conducted to determine how the success of this form of management was impacted by physical examination and radiological investigation.

Material and Methods: This is a retrospective study that includes all consecutive penetrating abdominal gunshot wound patients who were admitted to the emergency department between February 2011 and December 2018. All patients with superficial gunshot wounds were excluded. The decision to perform a laparotomy on injured patients was the study's primary endpoint while the discharge of patients without surgery was its secondary endpoint.

Results: Of 429 torso gunshot wound patients, 411 were males. Average age was 29.5 years. Forty-one (9.5%) were initially treated by selective non-operative management. Five selective non-operative management patients underwent delayed laparotomy within 12 hours after admission without complication. In the end, 36 (88%) of the 41 patients were successfully treated without undergoing surgery, with only one patient developing pleural effusion and no mortality attributed to it. Of all injured patients, 45 (10.5%) patients had a negative laparotomy, with two of them subsequently developing an incisional hernia.

Conclusion: The success rate of non-operative management of torso gunshot injuries can be increased significantly in stable patients by adopting the strategy of repeated physical examinations alone or in conjunction with simultaneous radiological imaging.

Keywords: Gunshot, non-operative, abdomen, pelvis, torso

INTRODUCTION

Since the end of World War II in 1945 all Libyan government administrations have secured the state's monopoly on weapons, as well as the prohibition and criminalisation of arms trade, which has been reflected in the scarcity of the prevalence of gunshot injuries that were uncommon in the nation. This state of calm during the last sixty years in Libya has resulted in recent decades, in generations of surgeons lacking sufficient experience to deal with the casualties of war and gunshot injuries. Following that, the sudden change that occurred during the Libyan conflict after 2011 led to the widespread availability of weapons in the community and inexperienced hands in dealing with weapons, leading to an increased incidence of firearm-related violence (1).

Prior to 2011, abdominal blunt trauma in traffic accidents and abdominal penetrating injuries from stab wounds were common in the Libyan community. Therefore, good management of these cases has been advanced, whether by operative or later selective non-operative management in hemodynamically stable patients, and the absence of signs of peritonitis with a high success rate. The widespread use of weapons in the Libyan society led to the quick appearance of a new type of penetrating abdominal trauma, and a huge volume of abdominal gunshot cases started to become prevalent although limited experience in managing mass casualties such as in these cases was evident. Therefore,

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Corresponding Author

Salah Mansor

E-mail: salah.mansor@uob.edu.ly

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a clear effort has been made to improve the nation's capabilities and experience. Moreover, depending on the advice of experts and the conclusion of updated international literature, as well as in the present time, many studies have confirmed that gunshot injuries are common surgical cases, which have become a major and serious problem globally (2). Mandatory laparotomies have historically been the standard treatment for abdominal gunshot wounds. Therefore, explorative laparotomies were initially performed to treat all abdominal gunshot wounds. It was previously believed that the majority of abdominal gunshot wounds were accompanied by serious organ injuries due to the fact that gunshots cause a significant amount of energy to be transmitted when they pass through body tissue (3). Later, because of the expansion of experiences due to exposure to a large volume of cases, it was discovered that not all abdominal gunshot wounds require surgical intervention. Correspondingly, in the late 1960s, Shaftan and McAlvanah proposed selective conservatism as an alternative option for treatment in selected patient (4,5). Recently, many studies have confirmed the effectiveness and safety of selective non-operative management in a large series of patients with gunshot abdominal injuries evaluated retrospectively and prospectively (6,7).

Abdominal gunshot injuries in patients who have a stable hemodynamic state without signs of peritonitis can be challenging to determine whether a patient needs an exploratory laparotomy or can wait while being closely monitored for conservative treatment. This is because all clinical signs are currently distorted, and many of these patients may still have tachycardia, even in the absence of bleeding due to anxiety and fear; they may have tenderness around the wound site, even in non-penetration of the peritoneal cavity. As with this particular case, there are several possible diagnostic options for the evaluation of the injured patient with the aim of confirming whether he requires explorative laparotomy or whether he is able to stay under conservative management to avoid unnecessary laparotomy, together with its complications (8-10). Additionally, the diagnostic modalities recognised that in order to improve the sensitivity and specificity of clinical judgment, it is important to include a series of physical examination, local wound exploration, diagnostic peritoneal lavage, ultrasound, computerized tomography, intravenous urography, and cystography in case of renal injury. Indeed, all these modalities can be used to carefully select patients for the selective non-operative management of abdominal gunshot injury.

In this study, an assessment was conducted to determine how the success of non-operative management of abdominal gunshot injuries was impacted by a series of physical examination and radiological investigation.

MATERIAL and METHODS

This is a retrospective study, which includes all consecutive patients who were admitted to the emergency room and had gunshot wounds to the anterior, posterior abdominal wall, flank, or pelvic walls in the period from February 2011 to December 2018. All unconscious patients and others with superficial non-penetrating gunshot wounds were excluded when they were confirmed by local wound exploration conducted under local anaesthetic (Table 1). The decision to perform a laparotomy on injured patients was the study's primary endpoint while the discharge of patients without surgery was its secondary endpoint. The strategy for applying a non-operative management group in fully conscious patients was based on a clinical examination backed by emergency bedside investigations, such as blood tests and abdominal ultrasounds at the time of admission. During this stage, patients are placed under careful observation for a minimum of 24 hours; the same team conducts clinical evaluations periodically over this time. After repeating the blood tests and abdominal ultrasound after 12 hours as part of a series of investigation, an abdominal computed tomography scan is requested before discharging or transferring patients to another specialty for further care.

Further, age, sex, blood pressure and heart rate at admission, initial signs of peritonitis, first haemoglobin, focused abdominal sonography in trauma scan, chest x-ray, computed tomography (CT) scan, time from admission to laparotomy, operative findings, type of surgical procedures, blood transfusion, intensive care unit, and hospital stay, and postoperative complication were the data collected for the study.

In statistical analysis, all continuous variables were expressed as mean \pm standard deviation (SD) to evaluate the distribution of data; categorical data were expressed as frequency and percentage. Comparisons between the groups were made using the X^2 test or Fisher's exact test for categorical variables as appropriate. Statistical analyses were performed using the

Table 1. Inclusion and exclusion criteria

Inclusion Criteria	
1	Penetrating abdominal gunshot wounds
2	Hemodynamically stable patients at admission time
3	Non peritonitis patients
Exclusion Criteria	
1	Polytrauma patients (Head injury, limb fractures)
2	Superficial non-penetrating gunshot wounds
3	Delayed admission (After 12 hours from injury)

SPSS v21 statistical software, and P values of less than 0.05 were considered statistically significant. Moreover, both unadjusted and adjusted logistic regression analyses were conducted to determine variables associated with a statistically significant study result. Initially, univariable analyses were conducted to identify factors.

In addition, informed consent was obtained, as the hospital is a teaching university hospital, and thus, written informed

consent was routinely signed by all admitted patients or legally authorised representatives during the hospital stay and prior to the studies. This is imperative for all research in order to use patients' data and to be published in academic activities and research. Ethics approval was also received as the current study was approved by the Al-Jalaa Teaching Hospital, Benghazi University Institutional Review Board (IRB No. 264/2023).

Table 2. Types and numbers of organ injuries and performed operative procedures

	Organ	Procedure	No	Percent %
1	Diaphragm	Diaphragm primary repair with chest tube insertion	32	9.3%
2	Spleen	Splenectomy	33	9.6%
3	Stomach	Gastric wall primary repair	42	12.2%
4	Duodenum	Duodenal primary repair	8	2.3%
5	Liver	Topical liver parenchymal hemostasis	19	24.1%
		Liver parenchymal primary repair	29	
		Direct blood vessel ligation	17	
		Perihepatic packing	24	
		Non-anatomic liver resection	4	
6	Gall bladder	Cholecystectomy	12	3.4%
7	Pancreas	Pancreatic debridement	12	4.3%
		Distal pancreatectomy	3	
8	Small bowel	Small bowel primary repair	90	37.3%
		Small bowel resection and anastomosis	38	
9	Large bowel	Ascending colon primary repair	16	49.2%
		Ileocecal resection	2	
		Right hemicolectomy	40	
		Transverse colon primary repair	44	
		Transverse colon resection and anastomosis	9	
		Transvers loop colostomy	13	
		Descending colon primary repair	8	
		Sigmoid colon primary repair	14	
		Sigmoid colon resection and anastomosis	2	
		Sigmoid loop colostomy	10	
		Hartmann operation	11	
10	Kidney	Kidney primary repair	6	7.8%
		Nephrectomy	21	
11	Ureter	Ureter primary repair	2	2%
		Ureter anastomosis with DJ stent	5	
12	Abdominal blood vessels	Aorta primary repair	1	3.3%
		IVC primary repair	5	
		Superior mesenteric artery primary repair	3	
		Inferior mesenteric artery ligation	1	
		Inferior epigastric artery ligation	2	

Table 2. Types and numbers of organ injuries and performed operative procedures (continue)

	Organ	Procedure	No	Percent %
13	Rectum	Rectal primary repair	9	44.4%
		Rectal primary repair with proximal loop colostomy	19	
14	Urinary bladder	Urinary bladder primary repair	24	38%
15	Urethra	Urethral primary repair with suprapubic catheter insertion	5	7.9%
16	Anal canal	Anal canal debridement with proximal loop colostomy	7	11%
17	Pelvic blood vessels	External iliac artery primary repair	3	17.4%
		External iliac artery graft placement	2	
		External iliac artery end-to-end anastomosis	1	
		External iliac vein ligation	3	
		Internal iliac artery primary repair	1	
		Internal iliac artery ligation	2	
		Internal iliac vein ligation	1	

DJ: Double-J ureter stent, IVC: Inferior vena cava.

Table 3. Characteristics of delayed laparotomy patients

No	Age	Sex	Indication	Laparotomy Findings	Operation	Hospital Stays	Complication
1	22	Male	Late shock	Liver tear	Explorative laparotomy with primary repair	3 days	No
2	23	Male	Peritonitis	Small bowel sealed perforation	Explorative laparotomy with primary repair	5 days	No
3	34	Male	Peritonitis	Small bowel sealed perforation	Explorative laparotomy with primary repair	5 days	No
4	38	Male	Abdominal tenderness	Negative laparotomy	Explorative laparotomy	3 days	No
5	22	Male	Peritonitis	Liver tear & small bowel perforation	Explorative laparotomy with primary repair	6 days	No

RESULTS

During the study period from January 2011 to December 2018, 429 patients were admitted to the emergency department with abdominal gunshot injuries: 414 (96.5%) were males and 15 (3.5%) were females. Mean age was 28.7 years (range= 18-70 years). Three hundred and eighty-eight (90.4%) patients were treated by urgent explorative laparotomy, 343 were therapeutic and 45 were negative laparotomy. Table 2 shows details of the organ injuries and actual operative interventions performed. Negative laparotomy patients underwent the surgical procedure without a scan due to hemodynamic instability and abdominal tenderness that were associated with high suspicion of intra-abdominal organ injury, or omental evisceration; two patients suffering from these had an incisional hernia later. What is more, 41 (9.5%) patients who sustained penetrating abdominal gunshot wounds were included in the study.



Figure 1. Successful non-operative treatment for a patient with abdominal gunshot. Dr. Salah Mansor, Al-Jalaa Hospital, Benghazi, Libya 2016.

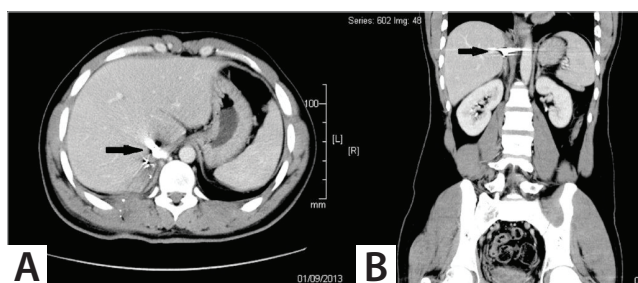


Figure 2. A. Axial and coronal **B.** Abdominal CT shows a gunshot bullet within the liver tissue.

Dr. Salah Mansor, Al-Jalaa Hospital, Benghazi, Libya 2013



Figure 3. A. Axial and coronal **B.** Abdominal CT shows a pelvic gunshot bullet.

Dr. Salah Mansor, Al-Jalaa Hospital, Benghazi, Libya 2014

Thirty-nine (95%) were males and two (5%) were females. The average age was 30 years, with a range of 19 to 55 years, all of whom were treated by selective non-operative management; 36 of them were discharged home without complications, and only one patient who developed pleural effusion was treated conservatively; with no mortality was attributed to it. Further, five patients underwent delayed explorative laparotomy within twelve hours following admission due to the worsening of abdominal signs or in the presence of suspicious CT scan findings. Two patients had a delayed laparotomy because of hemodynamic instability brought on by continuous bleeding from a liver tear while three other patients had a CT scan that revealed small bowel perforation. The last patient underwent a negative laparotomy, and all patients without postoperative complications (Table 3).

DISCUSSION

Depending on the clinical presentation at the time of admission, gunshot injuries might present in three different scenarios. In the first scenario, patients require an immediate life-saving operation when they arrive at the emergency room. In this case, mortality rate can reach up to 90% due to massive bleeding from major blood vessel damage (11). Patients in the second scenario, who exhibit hypotension and peritonitis signs that are evident or evisceration, require an urgent exploratory laparotomy as a role of the golden hour in the management of trauma patients. The third scenario,

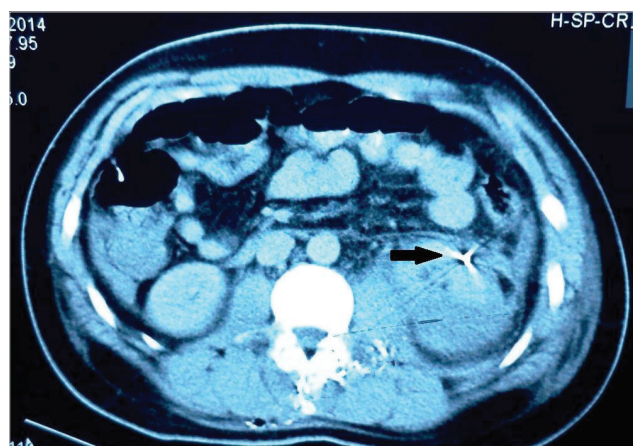


Figure 4. Axial Abdominal CT shows a gunshot bullet within the renal parenchyma.

Dr. Salah Mansor, Al-Jalaa Hospital, Benghazi, Libya 2014.

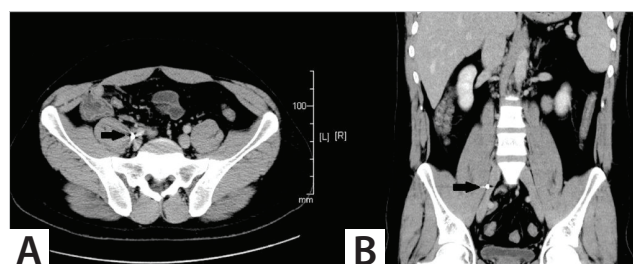


Figure 5. A. Axial and coronal **B.** Abdominal CT shows a posterior abdominal wall gunshot.

Dr. Salah Mansor, Al-Jalaa Hospital, Benghazi, Libya 2017.

which is the focus of the current study, consists of patients with abdominal gunshot injuries admitted with hemodynamic stability and blurred signs in abdominal examination, and such patients are good candidates for selective non-operative management (Figure 1).

Laparotomy is defined as therapeutic when there are intra-abdominal injuries that require to be repaired, while it is defined as negative or unnecessary when there are either no intra-abdominal injuries identified or those that require no repair, for example, non-expanding retroperitoneal hematoma. Comparatively, delayed laparotomy is laparotomy on a patient who has been initially selected for observation that subsequently presents a clear indication for surgery later, signalling a failure of non-operative management. Failure is caused by the progression of mild tenderness to more generalised abdominal pain accompanied by rises in white blood cell count and temperature, and an unexplained decrease in haematocrit or blood pressure is also taken into account in the context of the overall clinical picture. Overall, the management of patients suffering from penetrating abdominal wounds has undergone significant improvements in the last few decades in terms of both experience and procedures.

During the 20th century, routine laparotomy was mandatory for all patients with penetrating wounds of the abdomen, while exploratory laparotomies were a common surgical treatment used by most emergency surgeons worldwide to treat abdominal gunshot wounds (3,12). This was because they believed that there was a considerable intra-abdominal injury following abdominal gunshot wounds, and it is preferred to perform an explorative laparotomy to confirm or to roll out organ injury, due to blurred clinical indications, especially at the early period of injury (3,13,14). In accordance, Shaftan has concluded that some patients with penetrating abdominal trauma have no clear indication of explorative laparotomy and can be managed effectively and safely through close observation (4). This conclusion has been accepted and implemented quickly and smoothly in the abdominal stab wound cases and then established as the standard of care, while in regard to a gunshot injury, applying this conclusion is more challenging, as it requires great caution.

As routine, when a patient is received with an abdominal gunshot injury, after initial assessment and urgent resuscitation, if the patient is hemodynamically stable, clear urgent laparotomy indications are routinely ruled out, such as active bleeding, diffuse or localised abdominal tenderness, evisceration of intra-abdominal organs, leakage of intestinal content through the wound, shock with frank haematuria, hematemesis, and blood on rectal examination. If the patient exhibits none of these signs, he/she is placed under rigorous serial observation, before finishing the workup by requesting diagnostic tests, such as serial full blood counts, chest and abdomen x-rays, urgent abdominal ultrasound scan, and computed tomography scans if the ultrasound examination reveals a strong indication or suspicion. Other than avoiding an unnecessary operation, the conservative approach to managing abdominal gunshot injuries also aims to decrease post-operative complication rates, as well as shorten hospital stays (15,16).

There is no doubt that urgent exploratory laparotomies should be performed on patients with penetrating abdominal gunshot wounds if there are clear indications of hemodynamic instability, or if there is significant abdominal wall tenderness and guarding, even without performing additional diagnostic testing. The major challenge for surgeons is to make the right decision for patients who have none or who have minimal signs after penetrating abdominal gunshot injuries. Surgeons should use their own clinical experience and diagnostic modalities to decide which patients need explorative laparotomy and when patients should be operated on. As a gunshot injury can occur at any time of the day or night, and the patient will be received by an emergency team on duty,

this situation may affect the success of the selective non-operative strategy in gunshot abdomen and may increase the rate of unnecessary laparotomies, while the goal of management strategy is to avoid these types of procedures. Also, as well as its complications, some international literature has concluded that the morbidity and mortality of unnecessary laparotomy for trauma patients have a significant rate (17).

In the assessment of abdominal gunshot victims who have hemodynamic stability, plain film radiographs have a limited role. X-rays of the chest and pelvis are frequently used to check for concomitant damage, which usually aids in determining exactly where the bullets were fired. If a mechanism for multisystem trauma is present then common findings include pneumoperitoneum, pneumothorax, haemothorax, and rib fractures. The sensitivity of the diagnostic peritoneal lavage (DPL) test for detecting injury in penetrating abdominal injury reaches 96% (18). Recently, the impact of new technology on the surgical field has been determined as the presence of modern computed tomography scanners providing high-resolution images with speed assessment of abdominal gunshots has led to the reduced frequency of DPL utilisation, and it has become very limited in very special situations.

The role of ultrasound scans in blunt abdominal injuries has been established with a high sensitivity of 81-88% and a specificity of 97-100% (19). It has also been possible to make use of its certain advantages in penetrating abdominal injuries, as during the initial assessment of a trauma patient, ultrasound waves can quickly identify and demonstrate the damage to solid organs, and easily detect free fluid in the peritoneal cavity (20,21). Ultrasound scan is known as a simple, fast, safe, cheap, and bedside non-invasive procedure although comparatively, it has a disadvantage because it is operator dependent, providing results based on the radiologist's skill, and is unable to rule out hollow viscus injury. What is more, Udobi et al. have confirmed that ultrasound scan is not as reliable as in blunt trauma and has a 15% negative laparotomy rate (21). Therefore, it should be combined with other diagnostic modalities to select the penetrating abdominal injury patients for the selective non-operative management group.

CT scan is one of the most important diagnostic modalities of investigation in gunshot patients. CT scans with intravenous and oral contrast are used to detect both solid and hollow viscus injuries. In hemodynamically stable patients, CT is considered a non-invasive rapid, and accurate diagnostic tool that helps to identify patients who might benefit from selective non-operative management with a high success rate as in patients suffering from isolated liver injury without active bleeding and no signs of bowel injury (Figure 2) (22-24). Some research on hemodynamically stable gunshot-injured patients concluded that abdominal CT with intravenous contrast has a

high sensitivity and specificity that reach 90.5% and 96%, respectively (25). This finding enables the possibility to believe that it is safe and feasible to observe stable abdominal gunshot patients using both serial physical examination and CT (Figure 2,3). In addition, if a patient with an abdominal gunshot injury, with the presence of gross haematuria, appears to correlate with the presence of significant urological injuries, intravenous pyelograms continue to be the gold standard for assessing hemodynamically stable patients who are suspected of having urological injuries (26).

In comparison, Ramirez RM et al. have concluded that single contrast computed tomography successfully determined the need for operative intervention in hemodynamically stable patients with renal injury (Figure 4) (27). Indeed, it can quickly and accurately demonstrate the degree of injury, and shows the signs of per renal haemorrhage, as well as the extravasation of urine and vascular injuries. Moreover, it can detect any other adjacent organ injury in both the peritoneal cavity and retroperitoneal space (28). Due to the robust posterior abdominal wall muscles, back penetrating injuries have a less severe clinical outcome than the anterior abdominal wall, and as a result, in this instance, the contrast CT abdomen will aid in determining the location and severity of the injury (Figure 5) (29). In particular, one patient in the current study had a posterior abdominal wall gunshot injury that later developed into a low-output colo-cutaneous fistula. A contrast abdominal CT study confirmed this diagnosis, and the patient was then treated conservatively.

Finally, since gunshot injuries can happen at any time and the patients will be cared for by surgeons on duty, this scenario could have an impact on the effectiveness and success of the non-operative approach and raise the rate of unnecessary laparotomies. Therefore, surgeons have to make vital decisions for the appropriate selection among various diagnostic techniques for success in non-operative management and decreased rate of unnecessary laparotomy and its complication in torso gunshot wounds.

CONCLUSION

The success rate of non-operative management of abdominal gunshot injuries can be increased significantly in stable patients by adopting the strategy of repeated physical examinations alone or in conjunction with simultaneous radiological imaging.

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REFERENCES

1. Bodalal Z, Mansor S. Gunshot injuries in Benghazi, Libya in 2011: The Libyan conflict and beyond. *The Surgeon* 2013; 11(5): 258-63. <https://doi.org/10.1016/j.surge.2013.05.004>
2. Maxwell RA, Fabian TC. Current management of colon trauma. *World J Surg* 2003; 27: 632-9. <https://doi.org/10.1007/s00268-003-6762-9>
3. Liebenberg ND, Maasch AJ. Penetrating abdominal wounds: A prospective trial of conservative treatment based on physical signs. *S Afr Med J* 1988; 74: 231-3.
4. Shaftan GW. Selective conservatism in penetrating abdominal trauma. *J Trauma* 1969; 9(12): 1026-8. <https://doi.org/10.1097/00005373-196912000-00014>
5. McAlvanah MJ, Shaftan GW. Selective conservatism in penetrating abdominal Wounds: A continuing reappraisal. *J Trauma* 1978; 18(3): 206-12. <https://doi.org/10.1097/00005373-197803000-00010>
6. Velmahos GC, Demetriades D, Toutouzas KG, Sarkisyan G, Chan LS, Ishak R, et al. Selective non operative management in 1,856 patients with abdominal gunshot wounds: Should routine laparotomy still be the standard of care? *Ann Surg* 2001; 234(3): 395-403. <https://doi.org/10.1097/00000658-200109000-00013>
7. Demetriades D, Hadjizacharia P, Constantinou C, Brown C, Inaba K, Rhee P, et al. Selective non-operative management of penetrating abdominal solid organ injuries. *Ann Surg* 2006; 244 (4): 620-8. <https://doi.org/10.1097/01.sla.0000237743.22633.01>
8. Beekley AC, Blackburne LH, Sebesta JA, McMullin N, Mullenix PS, Holcomb JB. Selective non-operative management of penetrating torso injury from combat fragmentation wounds. *J Trauma* 2008; 64(2 Suppl): S108-16. <https://doi.org/10.1097/TA.0b013e31816093d0>
9. Morrison JJ, Dickson EJ, Jansen JO, Midwinter MJ. Utility of admission physiology in the surgical triage of isolated ballistic battlefield torso trauma. *J Emerg Trauma Shock* 2012; 5(3): 233-7. <https://doi.org/10.4103/0974-2700.99690>
10. Shan CX, Ni C, Qiu M, Jiang DZ. Is laparoscopy equal to laparotomy in detecting and treating small bowel injuries in a porcine model? *World J Gastroenterol* 2012; 18 (46): 6850-5. <https://doi.org/10.3748/wjg.v18.i46.6850>
11. Salim A, Velmahos GC. When to operate on abdominal gunshot wounds. *Scand J Surg* 2002; 91(1): 62-6. <https://doi.org/10.1177/145749690209100110>
12. Saadia R, Degiannis E. Non-operative treatment of abdominal gunshot injuries. *Br J Surg* 2000; 87: 393-7. <https://doi.org/10.1046/j.1365-2168.2000.01414.x>

13. Lowe RJ, Saletta JD, Read DR, Radhakrishnan J, Moss GS. Should laparotomy be mandatory or selective in gunshot wounds of the abdomen? *J Trauma* 1977; 17(12): 903-7. <https://doi.org/10.1097/00005373-197712000-00003>
14. Thal ER, May RA, Beesinger D. Peritoneal lavage: Its unreliability in gunshot wounds of the lower chest and abdomen. *Arch Surg* 1980; 115: 430-3. <https://doi.org/10.1001/archsurg.1980.01380040058010>
15. Renz BM, Feliciano DV. Unnecessary laparotomies for trauma: A prospective review of morbidity. *J Trauma* 1995; 38: 350-6. <https://doi.org/10.1097/00005373-199503000-00007>
16. Renz BM, Feliciano DV. The length of hospital stay after an unnecessary laparotomy for trauma: A prospective study. *J Trauma* 1996; 40: 187-90. <https://doi.org/10.1097/00005373-199602000-00002>
17. Leppaniemi A, Salo J, Haapiainen R. Complications of negative laparotomy for truncal stab wounds. *J Trauma* 1995; 38: 54-8. <https://doi.org/10.1097/00005373-199501000-00016>
18. Brakenridge SC, Nagy KK, Joseph KT, An GC, Bokhari F, Barrett J. Detection of intraabdominal injury using diagnostic peritoneal lavage after shotgun wound to the abdomen. *J Trauma* 2003; 54: 329-31. <https://doi.org/10.1097/01.TA.0000037292.17482.69>
19. McKenney MG, Martin L, Lentz K, Lopez C, Sleeman D, Aristide G, et al. 1,000 consecutive ultrasounds for blunt abdominal trauma. *J Trauma* 1996; 40(4): 607-10; discussion 611-2. <https://doi.org/10.1097/00005373-199604000-00015>
20. Boulanger BR, Kearney PA, Tsuei B, Ochoa JB. The routine use of sonography in penetrating torso injury is beneficial. *J Trauma* 2001; 51(2): 320-5. <https://doi.org/10.1097/00005373-200108000-00015>
21. Udobi KF, Rodriguez A, Chiu WC, Scalea TM. Role of ultrasonography in penetrating abdominal trauma: A prospective clinical study. *J Trauma* 2001; 50(3): 475-9. <https://doi.org/10.1097/00005373-200103000-00011>
22. Melo EL, de Menezes MR, Cerri GG. Abdominal gunshot wounds: Multi-detector-row CT findings compared with laparotomy: A prospective study. *Emerg Radiol* 2012; 19: 35-41. <https://doi.org/10.1007/s10140-011-1004-1>
23. Navsaria PH, Nicol AJ, Edu S, Gandhi R, Ball CG. Selective non-operative management in 1106 patients with abdominal gunshot wounds: conclusions on safety, efficacy, and the role of selective CT imaging in a prospective single-center study. *Ann Surg* 2015; 261(4): 760-4. <https://doi.org/10.1097/SLA.0000000000000879>
24. Navsaria P, Nicol A, Krige J, Edu S, Chowdhury S. Selective non-operative management of liver gunshot injuries. *Eur J Trauma Emerg Surg* 2019; 45(2): 323-8. <https://doi.org/10.1007/s00068-018-0913-z>
25. Velmahos GC, Constantinou C, Tillou A, Brown CV, Salim A, Demetriades D. Abdominal computed tomographic scan for patients with gunshot wounds to the abdomen selected for non-operative management. *J Trauma* 2005; 59: 1155-60. <https://doi.org/10.1097/01.ta.0000196435.18073.6d>
26. Patel VG1, Walker ML. The role of "one-shot" intravenous pyelogram in evaluation of penetrating abdominal trauma. *Am Surg* 1997; 63(4): 350-3.
27. Ramirez RM, Cureton EL, Ereso AQ, Kwan RO, Dozier KC, Sadjadi J, et al. Single contrast computed tomography for the triage of patients with penetrating torso trauma. *J Trauma* 2009; 67(3): 583-8. <https://doi.org/10.1097/TA.0b013e3181a39330>
28. Sica G, Bocchini G, Guida F, Tanga M, Guaglione M, Scaglione M. Multidetector computed tomography in the diagnosis and management of renal trauma. *Radiol Med* 2010; 115: 936-49. <https://doi.org/10.1007/s11547-010-0565-5>
29. Simon RJ, Ivatury RR. Current concepts in the use of cavity endoscopy in the evaluation and treatment of blunt and penetrating truncal injuries. *Surg Clin North Am* 1995; 75: 157-74. [https://doi.org/10.1016/S0039-6109\(16\)46581-3](https://doi.org/10.1016/S0039-6109(16)46581-3)

**ORIJİNAL ÇALIŞMA-ÖZET**

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Abdominal ateşli silah yaralanmalarında seçici ameliyatsız tedavinin başarısında klinik muayene ve radyolojik incelemelerin etkinliğiSalah Mansor¹, Naman Ziu¹, Ayoub Bujazia³, Ahmed Eltarhoni⁴, Jamal Alsharif⁵¹ Bingazi Üniversitesi Tıp Fakültesi, Genel Cerrahi Anabilim Dalı, Al-Jalaa Eğitim Hastanesi, Bingazi, Libya² Libya Uluslararası Tıp Üniversitesi, Cerrahi Anabilim Dalı, Bingazi, Libya³ Bingazi Üniversitesi Tıp Fakültesi, Tanısal Radyoloji Anabilim Dalı, Bingazi Tıp Merkezi, Bingazi, Libya⁴ Bingazi Üniversitesi Tıp Fakültesi, Aile ve Toplum Hekimliği Anabilim Dalı, Bingazi, Libya⁵ Ajdabiya Üniversitesi Tıp Fakültesi, Genel Cerrahi Anabilim Dalı, Ajdabiya Eğitim Hastanesi, Ajdabiya, Libya**ÖZET**

Giriş ve Amaç: Karın içi ateşli silah yaralanmalarının cerrahi olmayan yönetimi, gereksiz laparotomilerin sıklığını azaltmak için kabul edilebilir bir başarı oranıyla modern cerrahinin seçilmiş vakalarında bakım standardı haline gelmiştir. Bu çalışmada, bu yönetim biçiminin başarısının fiziksel muayene ve radyolojik incelemeden nasıl etkilendiğini belirlemek için bir değerlendirme yapılmıştır.

Gereç ve Yöntemler: Bu, Şubat 2011 ile Aralık 2018 arasında acil servise yatırılan ardışık tüm penetran abdominal ateşli silah yaralanması hastalarını içeren retrospektif bir çalışmadır. Yüzeysel ateşli silah yaralanması olan tüm hastalar hariç tutulmuştur. Yaralı hastalara laparotomi yapma kararı çalışmanın birincil son noktasıyken, hastaların ameliyat olmadan taburcu edilmesi ikincil son noktasıydı.

Bulgular: Dört yüz yirmi dokuz gövde ateşli silah yaralanması hastasından 411'i erkekti. Ortalama yaş 29,5'ti. Kırk bir'i (%9,5) başlangıçta seçici cerrahi olmayan tedavi ile tedavi edildi. Seçici cerrahi olmayan tedavi ile tedavi edilen beş hasta, komplikasyonsuz olarak hastaneye yatıştan sonraki 12 saat içinde gecikmiş laparotomiye girdi. Sonunda, 41 hastanın 36'sı (%88) ameliyata alınmadan başarılı bir şekilde tedavi edildi, sadece bir hastada plevral efüzyon gelişti ve buna bağlı ölüm olmadı. Yaralanan tüm hastalardan 45'inde (%10,5) negatif laparotomi yapıldı ve bunlardan ikisinde daha sonra insizyonel herni gelişti.

Sonuç: Gövde kurşun yaralanmalarının cerrahi olmayan tedavisinin başarı oranı, stabil hastalarda tek başına veya eş zamanlı radyolojik görüntülemeyle birlikte tekrarlanan fiziksel muayene stratejisinin benimsenmesiyle önemli ölçüde artırılabilir.

Anahtar Kelimeler: Ateşli silah yaralanması, ameliyatsız, karın, pelvis, gövde

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