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RESEARCH ARTICLE

PENETRATING ABDOMINAL TRAUMA INDEX AS PREDICTIVE FACTOR AFFECTING MORTALITY AND MORBIDITY IN PENETRATING ABDOMINAL TRAUMA

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ABSTRACT

Background: Trauma remains a big health problem in every country. Regardless of the level of socioeconomic development, trauma is responsible for 25% of the death in the USA. It is also the leading cause of death in the people from 1 to 44 years of age. Penetrating trauma is still the most frequent cause of death in the first four decades of life, and the rate of trauma causing morbidity and mortality increase in war time and violent conditions. In order to minimize the morbidity and mortality rate associated with penetrating trauma, the factors affecting morbidity and mortality were evaluated to choose those patients who need more intensive care and put them in the suitable ward with high facility or refer them to better centers. Study of these predictive factors also gives an idea about the efficacy of surgical team and hospital facilities and help in comparison between different trauma centers.
Objectives: The aim of this study is to evaluate and analyze predictive factors for developing mortality and morbidity in penetrating abdominal trauma by using penetrating abdominal trauma index (PATI), number of intra abdominal organs injured, associated extra- abdominal injuries , age, sex, and type of injuring agent.
Patients and methods: In this study 96 patients managed at Hospital for a period of 2 years. Patient age, sex, causative agent, severity of injury according to PATI and number of intra abdominal injured organ, associated extra- abdominal injuries and time between injury and arrival to hospital were studied.
Results: Eighty Patients (83.3%) were males,16 (16.7%) were females. The male to females ratio was 5:1. The age of Patients were ranged from 1.5 to 60 years, with a mean age of 27.9 years ± SD 10.9 years, and the majority being in the third decade. Our study showed that the Injured intra-abdominal organs in decreasing frequency were large bowel (35.4%), liver (33.3%), small bowel (33.3%), diaphragm (22.9%), kidney (19.8%), stomach (19.8%), spleen (16.6%) and pancreas (7.3%). The extra- abdominal organ injured was chest (35.4%), upper limb (8.3%), lower limb (4.1%), head and neck (4.1%) and spinal cord (2.1 %). PATI was calculated in every operated Patient, the range of PATI was between (0 to 70) with a mean value (20.8 ± S.D 14). The study showed that PATI in dead Patients was the highest value while in morbid patients was more than 25, while patients with smooth post operative course was less than 25. Thirteen patients died (13.5%), 11 males (11.4%) and 2 females (2.1%) due to severe hemorrhage and consequences of dissaminating intravascular coagulation (DIC) and multiorgan failure (MOF). Seven (7.3%) of the dead Patients had extra- abdominal injuries. The morbidity rate was (37.5%) and the main cause of morbidity was wound sepsis (15.6%).
Conclusion: Patients with penetrating abdominal trauma index more than 20 have greater possibility for developing complications and may need admition to intensive care unit (ICU) or respiratory care unit (RCU).
Recommendation: 1. Efficient ambulance service, blood bank and regional trauma center are important to the reduction of the mortality and morbidity in trauma patients.
2. Increase the beds with good staff and equipments in ICU and RCU is important for decrease the mortality and morbidity in postoperative period.
3. Libral use of blood products is essential in management of penetrating abdominal trauma.
4. PATI is useful in planning management of patients with penetrating abdominal trauma.

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INTRODUCTION

Trauma remains a big health problem in every country, regardless of the level of socioeconomic development, trauma is responsible for 25% of the death in the USA. (Felliciano, 1996) It is also the leading cause of death in the people from 1 to 44 years of age. (Hoyt and Trauma, 1997) Penetrating trauma is still the most frequent cause of death in the first four decades of life. (Payne *et al*., 1993; Fiedler *et al*., 1986) The rate of trauma causing morbidity and mortality increase in war time and violent conditions, in order to minimize the morbidity and mortality rate associated with penetrating trauma, the factors affecting morbidity and mortality were evaluated to choose those patients who need more intensive care and put

them in the suitable ward with high facility or refer them to better centers, study of these predictive factors also gives an idea about the efficacy of surgical team and hospital facilities and help in comparison between different trauma centers. (Zalstein and Cameron, 1997; Cocanour *et al*., 1997) The development of efficient ambulance service, blood bank and regional trauma center has contributed to the reduction of mortality to 9.5% in the 1990. (Mccullough, 1993; West *et al*., 1983) Recent studies show that early death secondary to severe hemorrhage has been replaced by delayed death due to infection. (Haygood and Polk, 1976; Dellinger *et al*., 1984) The risk factors influencing mortality and morbidity in the violent conditions have been studied, prolonged pre-hospital time, inadequate supply of blood for transfusion and high rate of colonic injury contributing to relatively high incidence of post operative infective complication and death. (Dawidson *et al*., 1976; Nichols *et al*., 1984) It was determined that PATI score and number of intra-abdominal organs injured and presence of shock on admission were independently significant factors in predicting mortality in patients with penetrating abdominal trauma. (Adesanya *et al*., 2000; Adesanya *et al*., 1998)

Many other trauma scores also used in assessing penetrating trauma like (AIS, ISS, NISS) but in our study we choose the PATI for assessing severity of injury in our patients. (Moore *et al*., 1981) PATI score was calculated for each patient as described by Moore *et al*. (1981) The trauma score was calculated for each organ injured by multiplying assigned risk factor (1 to 5) by the severity of each injury estimated (1 to 5), the sum of individual organs injury score comprise the final PATI as showed in (Appendix 1).

The number of intra abdominal organs injured and associated extra-abdominal injuries were, and these association with mortality and morbidity mentioned. Age, sex and type of injuring agent are other predictive factors in the assessment of penetrating abdominal trauma. The frequency of abdominal injuries in war conditions has increased with the development of military technology 2% in WWI, 4% WWII. (Hardaway, 1978) 7% in Korea, 13.84% in Vietnam, 12% in Afghanistan. (Rautio and Paavolainen, 1988) And 11% in gulf war. (Rignault, 1992) These figures reflect the importance of the type of injuring agents and the development of war technology in the development of complications in the penetrating abdominal trauma.

PATIENTS AND METHODS

In this study 96 patients managed at Hospital for a period of 2 years. Resuscitation done for every case immediately in the causuality unit by IV fluid, transfusion of blood accordingly and all patients receive antibiotics in the pre-operative period according to the sensitivity of the patients. Diagnosis of penetrating abdominal injury was obvious in most of the cases, however lower chest injury or injury to the back without obvious exit from the abdomen and minimal signs or delayed signs of peritonism were the most challenging cases in diagnosis and most of them were investigated using CXR, abdominal U/S and abdominal CT scan when the patient was haemodynamicly stable.

RESULTS

Eighty Patients (83.3%) were males, 16 (16.7%) were females as showed in Figure 1. The male to females ratio was 5:1. The age of patients was ranged from 1.5 to 60 years, with a mean age of 27.9 years ± SD 10.9 years, and the majority being in the third decade (40.6%) as showed in Table 1. The causative agent was bullet in 65 patients (67.7%), multiple shells in 27 patients (28.1%) while penetrating knife injuries in 4 patients (4.2%) as showed in Table 2. Time from injury to reaching the hospital was less than 1 hour in 79 patients (82.2%) and more than 1 hour in 17 patients (17.8%) with a mean of 6 hours in those delay patients, average time between the accident till the patients reach the hospital was about 2 hours for all patients. Hospital stay period was between 7 to 24 days with a mean of 13 days. Our study showed that the Injured intra-abdominal organs in decreasing frequency were large bowel 34 (35.4%), liver 32 (33.3%), small bowel 32 (33.3%), diaphragm 22 (22.9%), kidney 19 (19.8%), stomach 19 (19.8%) and spleen 16 (16.6%) and pancreas 7 patients (7.3%) as showed in Table 3. All patients with penetrating abdominal trauma and positive abdominal signs underwent explorative laparotomy. Hepatic injury is managed by different technique according to the severity of injury, the superficial wound without any bleeding was left alone, most of hepatic wounds are managed by suturing using liver needle, when the bleeding continues and the injury is severe packing of the liver is done.

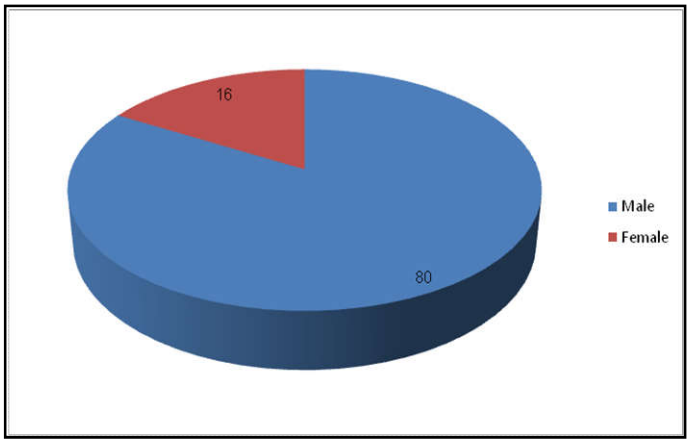

Figure 1. Distribution of patients according to sex

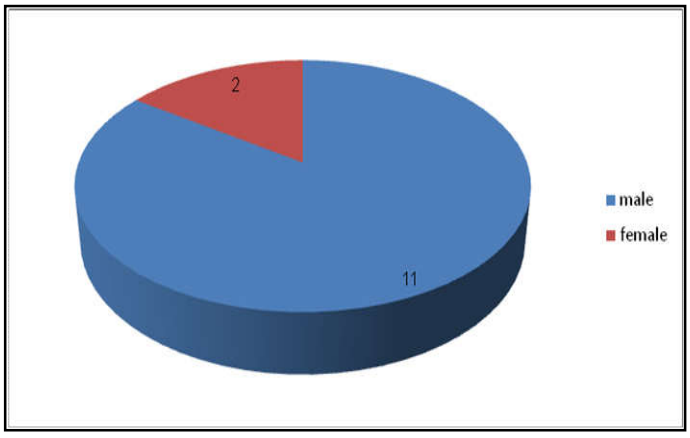

Figure 2. Distribution of mortality according to sex

Table 1. Age group of the patients in decades

Age in years	Number of patients	Percentage
0-10	5	5.2%
11-20	22	22.9%
21-30	39	40.6%
31-40	18	18.7%
40-50	9	9.4%
≥ 50	3	3.1%
Total	96	100%

Table 2. Type of injuring agent

Type of injuring agent	Number	Percentage
Gunshot	65	67.7%
Shell	27	28.1%
Knife	4	4.2%
Total	96	100%

Table 3. Frequency of the injured intra-abdominal organs

Injured intra abdominal organ	Number	Percentage
Large bowel	**34**	**35.4%**
Liver	**32**	**33.3%**
Small Bowel	**32**	**33.3%**
Diaphragm	**22**	**22.9%**
Kidney	**19**	**19.8%**
Stomach	**19**	**19.8%**
Spleen	**16**	**16.7%**
Pancreas	**7**	**7.3%**
Duodenum	**3**	**3.1%**
Gallbladder	**3**	**3.1%**
Urinary bladder	**2**	**2.1%**

Table 4. Frequency of extra-abdominal organs injured

Injured organ	Number	Percentage
Chest	**34**	**35.4%**
Upper limb	**8**	**8.3%**
Lower limb	**4**	**4.2%**
Head& neck	**4**	**4.2%**
Spinal cord	**2**	**2.1%**
Total	**52**	**54.2%**

Table 5. Morbidity rate

Complication	Number of patient	Percentage
Wound infection	15	15.6%
Bleeding tendency	14	14.6%
Chest complication	14	14.6%
Intestinal fistula	5	5.2%
septicemia	4	4.1%
Burst abdomen	2	2.1%
Renal failure	2	2.1%
Pulmonary embolism	1	1.5%

Table 6. The relation of intra abdominal organ injured and mortality and morbidity

Number of intra abdominal organs injured	Number of patients	Number of dead patients	Number of patients with complication
0	**6**	**0**	**2**
1	**30**	**1**	**9**
2	**24**	**2**	**9**
3	**26**	**7**	**12**
4	**5**	**1**	**2**
5	**3**	**1**	**1**
6	**2**	**1**	**1**

Table 7. The relationship between PATI and mortality and morbidity

PATI	Number of patient	Percentage	Number of death	Percentage	Number of complication	Percentage
Less than 10	**21**	**21.9%**	**0**	**0**	**2**	**2.1%**
11-20	**33**	**34.4%**	**0**	**0**	**11**	**11.6%**
21-30	**24**	**25%**	**3**	**3.1%**	**16**	**16.7%**
31-40	**9**	**9.3%**	**5**	**5.2%**	**3**	**3.1%**
41-50	**6**	**6.3%**	**3**	**3.1%**	**3**	**3.1%**
More than 50	**3**	**3.1%**	**2**	**2.1%**	**1**	**1%**
Total	**96**	**100%**	**13**	**13.5%**	**36**	**37.5%**

Table 8. Collective table mortality rate relative to sex, age, etiology and PATI

Title	Number	Percentage
Male	**11**	**11.6%**
Female	**2**	**2.1%**
Gunshot	**11**	**11.6%**
Shell	**2**	**2.1%**
Mean PATI	**40**	
Mean of age	**27.3 years**	
Mean of intra abdomen organ injured	**3**	
Intra-operative death	**3 patients**	**3.1%**
Death within 1st 24 hour	**6 patients**	**6.3%**
Death with more than 7days	**4 patients**	**4.2%**
Total	**13**	**13.5%**

Pancreatic injury not involving the major duct is treated by haemostasis of bleeding and tube drainage for 7 to 10 days, or by distal pancreatectomy in some cases. Duodenal injury is treated by simple suturing with decompresion jejunostomy tube in certain cases with simple injures, in severe cases pyloric exclusion with gastrojejunostomy was done. Small bowel injury is managed according to the severity of the injury either by two layers suturing or by resection and end to end anastomosis. Colonic injury was treated according to the severity either by colostomy in (60%) of the cases, or primary repair in (40%) of the cases according to the condition of the patient. Splenectomy was done in 10 patients. Splenorrhaphy in 6 patients according to the severity of splenic injury. Post-operatively all patients were either admitted to the surgical ward or to the ICU or RCU when these patients have high level of PATI and associated extra-abdominal injuries.

Ten patients (10.4%) were admitted to the ICU and RCU. Negative laparotomy in 6 patients (6.2%), all of them had multiple shell injury in the back and chest. The extra-abdominal organ injured were chest 34 (35.4%), upper limb 8 (8.3%), lower limb 4 (4.1%), head and neck 4 (4.1%) and spinal cord 2 (2.1 %) as showed in Table 4. The morbidity occurred in 36 patients (37.5%). Most causes of the morbidity were wound infection in 15 patients (15.6%), bleeding and DIC in 14 patients (14.5%), chest complications in 14 patients (14.5%), intestinal fistula in 5 patients (5.2%), septicemia in 4 patients (4.1 %), burst abdomen in 2 patients (2 1%), renal failure in 2 patients (2.1 %) and pulmonary embolism in 1 patient (1.5%) as showed in Table 5. Ten patients (10.4%) were admitted to the ICU and RCU where 5 (5.2%) of them died in whom the PATI was 45. The mean of intra-abdominal organs injured is 4 organs, while those who stayed alive the PATI was less than 30, and the mean of intra-abdominal organs injured was 3. Thirteen patients died (13.5%), 11 males (11.4%) and 2 females (2.1%) as showed in Figure 2, due to severe hemorrhage and consequences of disseminating intravascular coagulation (DIC) and multiorgan failure (MOF). Seven (7.3%) of the dead Patients had extra- abdominal injuries. The type of injury was gunshot in 11 patients (11.45%) and shell injury in 2 patients (2.1%), with a mean PATI of 40 and mean age of 27.3 years. Mean number of intra-abdominal organs was 3. Three patients (3.1%) died intra-operatively due to severe bleeding and shock, and 6 patients (6.2%) within the first 24 hours due to bleeding tendency and 4 (4.1%) patients after first postoperative week due to septicemia and MOF as showed in Table 6,7,8. Seven (7.3%) of dead patients have extra-abdominal injured organs, 4 (4.1%) Patients with chest injury, 2 patients (2.1%) with pelvic fracture and one upper limb fracture. PATI was calculated in every operated Patient, the range of PATI was between (0 to 70) with a mean value (20.8 ± S.D 14). The study showed that PATI in dead Patients was the highest value while in morbid Patients was more than 25, while Patients with smooth post operative course was less than 25.

DISCUSSION

The evaluation of the management of abdominal war wounds have been a great advance over the past century. In 1882 Simms emphasized the need of laparotomy in abdominal wound, but the mortality rate remained 72%. It was not until end of WW1 that operative management replaced expectant therapy and reduced the mortality rate to 53% since then the mortality rate from abdominal wound dropped to 25% in WW2 and 12% in the Korean war reaching 8% at present. (Feliciano, 1989) In our study done at al-yarmouk teaching hospital during special circumstances in Baghdad city, during a period of violence the mortality rate reached 13.5%. The aim of the study was to find predictive factors to reduce mortality and morbidity in penetrating abdominal trauma by studying circumstances of patients transfer to the hospital, age, sex, causative agent, PATI, number of intra-abdominal organ injured, associated extra-abdominal injuries and discussing the

hospital facilities. Usually we receive these patients as part of massive causality, of course the patients who is received dead have been excluded from the study also we dont know the nature of intra abdominal injuries in there patients received dead because we dont do post-morten study. That probably we can say that most of the death was because of severe bleeding and probably major blood vessels injuries, because we have not operated on major blood vessels injuries mostly because of delay in transfer and inadequacy of first aid measures during transfering patients to hospital because the roads are very buisy to allow rapid evacuation of patients to hospital. From Discussing mortality cases, most of them were injured by bullet injury (11 from 13), with PATI of more than 40, and number of intra-abdominal organ injury is more than three, nine of them dying either intra-operatively or within 24 hours, which reflect the great association between these predictive factors and development of mortality. But we observe the incidence of mortality was increased with increase in the means of PATI as shown in the Table 8. Although the mortality rate increase by increase of the number of intra-abdominal organs injured, but this value does not reflect accurately the severity of injury alone. From our results table 7, we will see about 30% with 3 organ injury died, and nearly the same percentage of patients (30%) died with number of more than 3 organs injured. This probably could be explained by the fact that patients with an isolated 3 cm superficial liver injury is not severely injured as another patient with extensive liver parenchymal destruction, but both of them are regarded as having one organ injured. The morbidity rate also have relation to the increase in PATI. With PATI more than 20 there is an increase in the morbidity rate, but the number of the organs injured is less associated with morbidity rate as shown in table 7,8. In our studies only 10 patients admitted to ICU and RCU because of limited beds and order for admission depended on the vacancies in that unit and probably this was reflected on mortality and morbidity, although other studies showed the mortality in General hospital karlovac in croata study of (10.8%). (Sikic *et al*., 2001) In Dicle university hospital in Turkey was (8.6%). (Aldemir *et al*., 2004) The large bowel, liver, small bowel and diaphragm have been the most commonly injured organs, the most devastating and difficult injuries were those produced by high velocity missile. (Bulger *et al*., 2003) The most common complication was wound infection (15.6%) and bleeding tendency with percentage of (14.5%). The PATI is a more accurate method of quantifying the extent of damage to different organs and more valid index of the overall severity of injury. (O'Neill *et al*., 2004) In this study, patients with PATI more than 20 developed complications, mortality rate more with patients with PATI is more than 30. We thought that the age of the patient, efficient transport, rapid surgical intervention and use of fresh blood for transfusion is all important factors in minimizing the morbidity and mortality rates. In such massive causality treated in routinely working in general hospital presenting in many difficulties in resuscitation and operating on those seriously traumatized patients. So our study should not be compared to a study done in a military hospital specialized in treating trauma patients.

Conclusion

The analysis of 96 cases of laparotomised penetrating abdominal injuries observed for the development of morbidity and mortality show that PATI and number of intra-abdominal organs injured are acceptable prognostic factors such approach helps to recognize at an early stage patient with possible complication development plus making the decision on evacuation the patient to other center of equipment ICU as early as possible Patients with PATI more than 20, and number of intra-abdominal organs injured more than 3 has greater possibility for developing complications, so in unsafe conditions and limited facilities in the hospital, their evacuation in an early stage can be recommended to other centers with an ICU or RCU.

Recommendation

1. Efficient ambulance service, blood bank and regional trauma center are important to the reduction of the mortality and morbidity in trauma patients.
2. Increase the beds with good staff and equipments in RCU is important for decrease the mortality and morbidity in postoperative period.
3. Libral use of blood products is essential in management of penetrating abdominal trauma.
4. PATI is useful in planning management of patients with penetrating abdominal trauma.

Abbreviation:-

AIS	Abbreviated injury score
CT	Computerize tomography
CXR	Chest x-ray
DIC	Dissaminating intravascular coagulation
ICU	Intensive care unit
ISS	Injury severity score
MOF	Multiorgan failure
NISS	New Injury severity score
PAT	Penetrating abdominal trauma
PATI	Penetrating abdominal trauma score
RCU	Respiratory care unit
S.D	Standard deviation
US	Ultra sound
WWI	First world war
WWII	Second world war

Appendix 1

The Penetrating Abdominal Trauma Index (PATI) can be used to assess the severity of injury in patients with knife, gunshot or other penetrating wounds to the abdomen. The index can be used to compare performance of different emergency care settings.

Patient evaluation

A- 14 organs are examined
B- The risk associated with injury to each organ is graded from 1 to 5.
C- The estimated severity of each type of injury is graded from 1 to 5.

REFERENCES

Adesanya A. A. Afolabi I. R. Darocha-Afodu J. T. 1998. Civilian abdominal gunshot wounds in Lagos. *J R Coll Surg Edinb*., 434 : 230- 4.

Adesanya A. A. da Rocha-Afodu J. T. Ekamen E. E. Afolabi I. R. 2000. Factors affecting mortality and morbidity in patients with abdominal gunshot wounds. *Injury*, 31 : 397- 404.

Aldemir M. Tacyildiz I. Girgin S. 2004. Predicting factors for mortality in the penetrating abd. trauma. *Acta Chir Belg.*, 104: 429- 434

Bulger EM, Mcmahan K, Jurkovich GJ, 2003. Injury, the morbidity of penetrating colon injury. *Injury J.*,34: 41- 6.

Cocanour C. S. Ficher R. P. Ursic C. M. 1997. Are scene flights for penetrating trauma justified. *J Trauma*, 43:83- 5.

Dawidson I. Miller E. Litwin M. S. 1976. Gunshot wounds of the abdomen. A review of 277 cases. *Arch Surg.*, 111 : 862- 5.

Dellinger E. P. Oreskovich M. R. Wertz M. J. HamasakiV. Lennard E. S. 1984. Risk of infection following laparotomy for penetrating abdominal injury. *Arch Surg.*, 119 : 20- 7.

Feliciano D.V. 1989. Abdominal Trauma. Maingot's Abdominal Operations, vol 1, ed 9. New York: Appleton and Lange, p. 457-512.

Felliciano D. V. 1996. Pattern of surgery, In : Felliciano D. V. Moore E. E. Mattox K.L.(eds.). Trauma.Stamford, p. 85- 105.

Fiedler M. D. Jones L. M. Miller S. F. Finley R. K. 1986. A correlationof response time and results of abdominal gunshot wounds. *Arch Surg.*, 121 : 902- 4.

Hardaway RM 1978. III Vietnam wound analysis. *J Trauma*, 18: 635- 43.

Haygood F. D. PolkH. C. Jr. 1976. Gunshot wounds of the colon. A review of 100 consecutive patients, with emphasis on complicationsand their causes. *Am J Surg.*, 131 : 213- 8.

Hoyt D. B. Trauma. 1997. In : Greenfield L. J. Mulholland M. W. Oldham K. T. Zelenock G. B. Lillemoe K. D. (eds.). Surgery:scientific principles and practice. 2nd ed. Philadelphia :Lippincott-Raven, p. 267- 79.

Mccullough J. 1993. The nation's changing blood supply system. *JAMA*, 269 : 2239- 45.

Moore E. E. Dunn E. L., Moore J. B., Thompson J. S. 1981. Penetratingabdominal trauma index. *J Trauma*, 21:439- 45.

Nichols R. L. Smith J. W. Klein D. B. *et al*. 1984. Risk of infection after penetrating abdominal trauma. *N Engl J Med.*, 311 :1065- 70.

O,Neill PA, Kirton O C, Dresner L S, Tortella B. 2004. Analysis of 162 colon injuries in patients with penetrating abdominal trauma: concomitant stomach injury results in a higher rate of infection. *J Trauma*, 56: 304- 12.

Payne J. E. Berne T. V. Kaufman R. L. Dubrowskij R. 1993. Outcome of treatment of 686 gunshot wounds of the trunk at Los Angeles County-USC Medical Center : implications for the community. *J Trauma*, 34: 276- 81.

Rautio J, Paavolainen P. 1988. Afghan war wounde: Experience with 200 cases. *J Trauma*, 523- 5.

Rignault Dp. 1992. Abdominal trauma in war. *World J Surg.*, 16: 940- 6.

Sikic N, Korac Z, Krajacic I, Zunic J. 2001. Penetrating abdominal trauma index, ISS, number of injured abdominal organ as predictive factor. *MIL Med.*, mar, 166 (3) 226- 30.

West J. G. Cales R. H. Gazzaning A. B. 1983. Impact of regionalization. The Orange County experience. *Arch Surg.*, 118 : 740- 4.

Zalstein S. Cameron P. A. 1997. Helicopter emergency medical services: their role in integrated trauma care. *Aust N Z J Surg.*, 67 : 593- 8.

Appendix 1:-

The Penetrating Abdominal Trauma Index (PATI) can be used to assess the severity of injury in patients with knife, gunshot or other penetrating wounds to the abdomen. The index can be used to compare performance of different emergency care settings.

Patient evaluation:-

A- 14 organs are examined
B- The risk associated with injury to each organ is graded from 1 to 5.
C- The estimated severity of each type of injury is graded from 1 to 5.

Organ injured	Risk Factor	Injury	Injury Estimate
Duodenum	5	single wall	1
		<= 25% wall	2
		> 25% wall	3
		duodenal wall and blood supply	4
		pancreaticoduodenectomy	5
Pancreas	5	tangential	1
		through-and-through (duct intact)	2
		major debridement or distal duct injury	3
		proximal duct injury	4
		pancreaticoduodenectomy	5
Liver	4	nonbleeding peripheral	1
		bleeding central or minor debridement	2
		major debridement or hepatic artery ligation	3
		lobectomy	4
		lobectomy with caval repair or extensive bilobar debridement	5
Large intestine	4	serosal	1
		single wall	2
		<= 25% wall	3
		> 25% wall	4
		colon wall and blood supply	5

Continue……..

Major vascular	4	<= 25% wall	1
		> 25% wall	2
		complete transection	3
		interposition grafting or bypass	4
		ligation	5
Spleen	3	nonbleeding	1
		cautery or hemostatic agent	2
		minor debridement or suturing	3
		partial resection	4
		splenectomy	5
Kidney	3	nonbleeding	1
		minor debridement or suturing	2
		major debridement	3
		pedicle or major calyceal	4
		nephrectomy	5
Extrahepatic biliary	2	contusion	1
		cholecystectomy	2
		<= 25% common duct wall	3
		> 25% common duct wall	4
		biliary enteric reconstruction	5
Small bowel	2	single wall	1
		through-and-through	2
		<= 25% wall or 2-3 injuries	3
		> 25% wall or 4-5 injuries	4
		wall and blood supply or > 5 injuries	5
Stomach	2	single wall	1
		through-and-through	2
		minor debridement	3
		wedge resection	4
		> 35% resection	5
Ureter	2	contusion	1
		laceration	2
		minor debridement	3
		segmental resection	4
		reconstruction	5
Bladder	1	single wall	1
		through-and-through	2
		debridement	3
		wedge resection	4
		reconstruction	5
Bone	1	periosteum	1
		cortex	2
		through-and-through	3
		intra-articular	4
		major bone loss	5
Minor vascular	1	nonbleeding small hematoma	1
		nonbleeding large hematoma	2
		suturing	3
		ligation of isolated vessels	4
		ligation of named vessels	5

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