

Experience with Surgical Treatment of Liver Injury

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Experience with surgical treatments in 65 patients with liver injuries was mainly reviewed with respect to influential factors on its prognosis.

- 1) Predominance of liver injuries was seen in younger patients of less than 30 years of age.
- 2) Moderate or severe injuries were encountered in almost one-half patients and a 38.5% mortality rates was yielded in moderate or severe injuries of the livers and 50.0% in triple concomitant injuries.
- 3) Peritoneal puncture gave easy access to making a correct diagnosis of liver injuries and 73% in this series was positive.
- 4) Suturing in ruptured liver tissue was the main operative procedure for the surgical treatment of liver injuries. Lobectomy was performed in 8, right lobectomy in 7 and partial resection in the right lobe in 1 including 3 of resectional debridement. Hepatic resection is needed for the treatment of severe liver injuries.
- 5) Postoperative complications of hepatitis, pleurisy, pneumohemothorax and ileus were encountered but these recovered with proper management. Mortality was 18.5%. These related to shock in 4, cardiac arrest in 2, renal failure in 1, rebleeding in 2, biliary peritonitis in 2 and pulmonary complication in 1. In attempt to obtain better cure results in the surgical treatment of liver injuries, proper treatments for multiple injuries and early treatments are necessary for prevention from occurring formidably lifethreatening complication and lobectomy or resectional debridement of choice are advocated as an operative procedure when liver injury is severe.

INTRDUCTION

Liver injuries have increased in number accompanying severity of blunt injuries. Recent reports, however, confirmed the decreased mortality from 60% in 1965 to 30% in

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1971.^{1,2)} The acceptable results obtained are mainly a consequence of improved surgical management and postoperative cares.

In this study, experiences with the treatment in 65 patients with liver injuries were reviewed and the unsolved pathophysiological aspects in liver injuries were attempted to clarify in view of surgical treatment.

MATERIAL and METHOD

Sixty-five patients with liver injuries were dealt with in our Department from 1963 to 1980. Patients with liver injuries were distributed with increasing number among 1966 to 1974. Since then, the number of liver injuries has reduced while damages to the liver were more serious as shown in Fig 1. The sources of liver injuries were penetrating wounds with knife in 6 and blunt trauma in the remaining 59.

Blunt trauma composed of traffic accident in 32 (52.4%), compression in 2, fall in 12, contusion in 6, birth injuries in 5 and others in 3. The distribution of ages in these patients was shown in Fig 2. High incidence was seen in younger patients including infants. According to the classification as to the modes of liver damage described by Moynihans,³⁾ 48 cases were true ruptures, 10 subcapsular ruptures and 1 central rupture. The degrees of liver damages were classified by Donovan and Makiya's method.⁴⁾ I degree of this classification indicates superficial and slight damage to the liver, III degree includes deeply extended damages and II degree is intermediate. Thirty-three were I degree of liver damage, 14, II degree and 12, III degree. Ten (31%) of 26 in II and III degree of liver damages did not survive operation.

The sites of damages in the livers were analyzed in terms of the surgical liver segments constructed by Cantlie line.

46 had liver damage in right lobe, 9 in left lobe, 2 in double lobes and 4 in three sites or more (multiple) as shown in Table 1. The right lobe was more susceptible

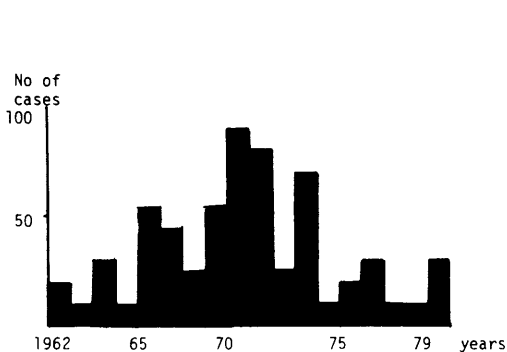


Fig 1. Distribution of patients undergoing surgery for the treatment of liver injuries according to age.

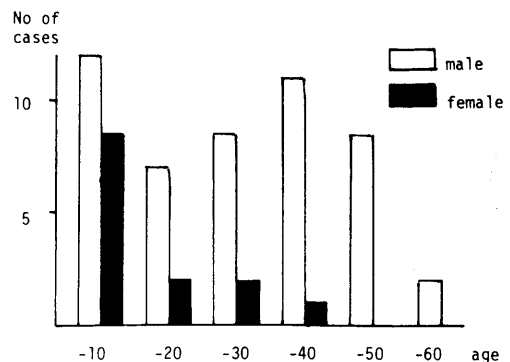


Fig 2. Distribution of surgical patients with liver injuries according to age.

to injury.

The initial symptoms were mainly circulatory shock and it was particularly serious in patients with severe damage to the liver and prolonged interval between onset and start of treatment. It was possible to distinguish neurogenic shock from hemorrhagic shock due to liver damage. Main symptoms in neurogenic shock were the signs of dilation of the peripheral vessels and no decrease in Hb and Ht levels.

The objective findings on admission were shown in Fig 3. Most of them (92.1%) had abdominal tenderness in the epigastric region. Thirty-three of the 65 patients complained of the symptom of shock. The other symptoms were abdominal enlargement, intestinal paralysis, meteorism, subcutaneous bleeding in the abdomen, palpable tumorous mass and subcutaneous emphysema. The liver injuries were more frequently seen in trauma to the right thorax and right upper abdomen. Only a localized liver damage was a very few. Most of them had the combined damages to another organs as shown in Table 2. Abdominal organs were concomitantly damaged in 31 of the 56 cases (52.5%) and thoracic injuries followed with a 25.4% rate in frequency. Multiple injuries to another organs also occurred in 20 of the 65 cases. The injuries to the liver and 1 organ were seen in 7, the liver and two organs in 11 and the liver and three organs in 2. The mortality rate was high in the concomitant injuries to another organs as indicated in Table 2. It numbered 14.3% among injuries of the liver and one organ, 27.3% in

Table 1. Location of the affected sites of the liver.

affected site	No of cases
right lobe	46
left lobe	9
both lobes	2
ligamentum teres	2
quadrant lobe	1
hepatic hilum	1
multiple	4
total	65

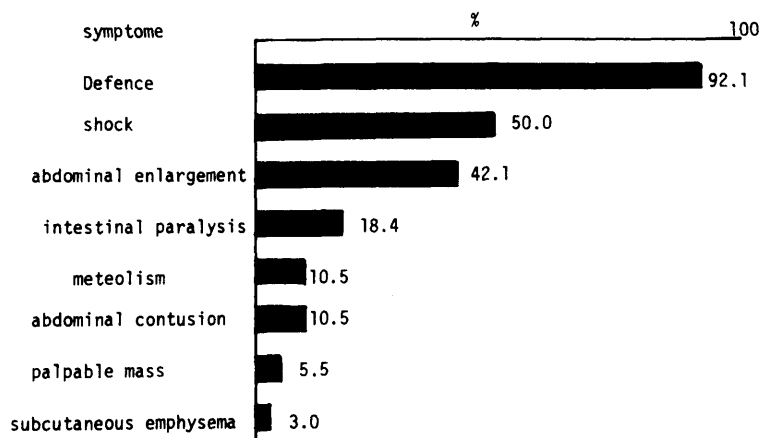


Fig 3. Initial symptom on admission.

the liver and two organs and increased to 50.0 % in the liver and three organs. Anemia and leucocytosis in blood analysis were prominent in the majority of cases with liver injuries and the elevation of serum GOT, GPT and LDH levels were also noted. These findings did not closely correlate with the severity of liver injuries. The most useful clue in a correct diagnosis existed in radiological findings. The disappearance of liver angle shadow, enlargement of paracolic sinus and flanke stripe and fluid storage sign in the pelvic region on the abdominal roentgenogram were beneficial in the diagnosis of liver injuries. Abdominal puncture was also helpful to determine as to whether abdominal bleeding developed or not. It was a positive in 17 of the 22 cases (77.3%) received this test. Surgery for the treatment of liver injuries is required as soon as possible if necessary. Our criteria of surgical indication were as follows, uncontrollable hypotension and circulatory collapse, apparent peritoneal sign and increasing anemia. In 7 cases (10.8 %), no bleeding sites was detected at laparotomy. The other 49 cases were benefited from operative intervention. Even in 7 cases who have not bleeding sites at surgery, operation was beneficial in confirming precise diagnosis and cleaning the abdominal cavity from hamatoma. Operative methods used for liver injuries were indicated in Table 3. Simple laparotomy was employed in 6 cases, 4 of them have not a bleeding site at laparotomy and 2 died immediately after start of laparotomy because of severe injuries of the liver. The common operative method used was suturing at the site of liver damage. According to the severity of liver injuries, operative techniques have become complicated and lobectomy and resectional debridement were used in increasing order of frequency

Table 2. Relationship of associated injuries to mortality.

	No of cases	%
liver only	45(7)	15.6
liver and 1 organ	7(1)	14.3
liver and 2 organs	11(3)	27.3
liver and 3 organs	2(1)	50.0

() death

Table 3. Relationship between the degree of liver damage and operative procedure.

OP. procedure	the degree of liver damage			
	I	II	III	total
laparotomy	1		2(2)	6(2)
drainage	4			3
packing	3			10(1)
suture	8	2(1)		27(5)
suture d packing	16(1)	11(4)		2(1)
suture d dabridement	2(1)		2(1)	2(1)
partial hepatectomy			1	1
right lobectomy			7(2)	7(2)
total	33(2)	14(5)	12(5)	59(12)

Table 4. Postoperative complicaion

	non liver resection	liver resection	total	%
hepatitis	5	3	8	12.3
pneumo-hemothorax	2(1)	5	7(1)	10.8
pleural effusion	5(1)	2	7(1)	10.8
shock	6(6)		6(6)	9.2
biliary peritonitis	3(2)		3(2)	4.6
acute renal failure	1(1)	1(1)	2(2)	3.1
ileus	2	1	3	4.6
subphrenic abscess	2		2	3.1
pancreatitis		1	1	1.5
tracheal obstruction	1		1	1.5
wound abscess	4		4	6.2

() death

as an operative procedures of choice. Postoperative complications were indicated in Table 4. The common complications were as follows, hepatitis (non-A, non-B), hemopneumothorax, postoperative pleurisy and shock. Complications directly related to death were circularoty collapse, biliary peritonitis and acute renal failure. The operative deaths were encountered in 12 of the 65 cases (18.5%). Based on findings regarding the severity of liver injuries, operative deaths were seen in 2 of the 33 (6.1%) with I degree of injury, in 5 of the 14 of II degree (35.7%) and in 5 of the 12 of III degree (41.8%). The mortality rate coincided with the severity of liver injuries. The causes of deaths were irreversible shock occurring immediately after start of laparotomy in 2, postoperative shock in 4, biliary peritonitis in 2, acute renal failure in 2, postoperative pleurisy in 1 and pneumohemothorax in 1. Complications of postoperative shock, biliary peritonitis and acute renal failure were seriously detrimental to their prognosis. They associated in part with inferiority of the operative techniques of hemostasis and debridement, and/or ineffective drainage.

DISCUSSION

Liver injuries has recently become severe although it decreases in number. Most of them in this series were caused by blunt trauma, reflecting that trauma itself had become serious. Based on findings of the degrees of liver injuries classified by Donovan et al,⁴⁾ superficial damage to the liver of I degree was almost half in occurrence and moderate and/or severe damages of II and III degrees occupied in half in this series. The affected side in the majority of cases with liver injuries was on the right side. The treatment for liver injuries should be aimed at improvement of hypovolemia and early surgery, if necessary, is helpful for salvage of patients seriously damaged. To improve the cure rate of liver injuries, postoperative complications such as acute renal failure, biliary peritonitis and circulatory collapse should be obviated because they closely associate with postoperative death. Preoperatively suitable management, which may be greatly contributory to the occurrence of postoperative complication, are capable of significantly lowering the mortality. With regard to operative technique, sufficient debridement, accurate suturing and adequate drainage were required to avoid occurring the postoperative biliary peritonitis and liver abscess formation. The severely damaged liver tissue should be removed extensively and care must be paid not to leave necrosis of liver tissue, haemorrhage from the liver and bile leakage. Even in II degree of liver injuries, inadequate suturing technique including debridement is thought of being one of the causes of postoperative deaths. In these cases, resectional debridement should be contemplated.¹⁾²⁾ When single suture technique was used, four of the 11 cases with the II degree of injury were died from the ensuing biliary peritonitis in 2 and renal failures in 2. It is necessary to remove devitalized liver tissue completely and facilitate drainage effect adequately even if single suture method is used.

Suture materials of Cutgut or Dexon must be used to obviate foreign body reaction

and absorbable hemostatic agents such as oxycel or gelform are hesitate to use in avoidnce of the eventual infection.⁵⁾ One of the two cases using the spongel for bleeding control, liver abscess and bile leak ensued. To control massive bleeding from damaged liver tissue, ligation of the hepatic artery is uncommonly advocated⁶⁾⁷⁾ but it has restricted for its use. It seems to be indicative for only localized and deeply lying damage with uncontrollable bleeding. The concomitant injuries also were influenced on their prognosis. Nine of the 12 cases who did not survived surgery had the combined injuries with liver damage. The existence and the number of the concomitant injuries were also directly related to survival rate. The concomitant injuries with liver injuries were bone fractures in 2, renal injuries in 2 and pancrease injuries in 4. One must always keep in mind the presence of other organ injuries for the treatment of liver injury. When three organs with the liver were damaged, mortality has become high by a 50%.

Further intensively perioperative cares are needed for enhancing surgical salvage to improve the mortality in the treatment of liver injury.⁷⁾

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