Çocuklukta künt hepatik travmada cerrahi dışı tedavinin etkinliği

The efficacy of non-operative management in childhood blunt hepatic trauma*

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AMAÇ
Çocuklarda künt abdominal travma sonrası oluşan karaciğer hasarlanmasında morbidite/ mortalitenin yüksek olması nedeniyle daha önceleri cerrahi tedavi önerilmekteyken, son yıllarda, karaciğer yaralanmalarında nonoperatif tedavi güncel hale gelmiştir. Bu çalışmada, çocuklarda künt karaciğer hasarının nonoperatif tedavi sonuçları değerlendirilmiştir.

HASTALAR VE YÖNTEM
1998-2002 arasında başvuran 498 multitravma hastası retrospektif olarak yaş, cinsiyet, travma mekanizması açısından incelenmiştir. Karaciğer hasarı bilgisayarlı tomografi ile değerlendirilmiş ve Amerikan Travma Cerrahisi Birliği'nin Organ Hasarı Derecelendirme Sistemine göre sınıflandırılmıştır. Karaciğer fonksiyon testleri, transfüzyon miktarı, hastanede kalış süresi, komplikasyonlar ve operatif girişim kaydedilmiştir.

BULGULAR
Dört yüz doksan sekiz hastanın 75'inde karaciğer hasarı saptandı. Ortalama yaş 6.7 yıl, kız/erkek oranı: 2.5/1 idi. Başvuru ile stabilizasyon sonrası ortalama kan basıncı, kalp hızı, ve hemotokrit değerleri arasında anlamlı fark saptanmadı. Yaralanma derecesine göre hasta sayıları: I: 15, II: 26, III: 29, IV: 4, V: 1. Transfüzyon gereken 21 hastadan 3'ünde verilen miktar 40 ml/kg'ın üzerindeydi. Bunlardan iki tanesine operatif girişim uygulandı. Ortalama pediatrik travma skoru +2 olarak bulundu. Komplikasyon olarak sadece bir hastada biloma gelişti. Derece V yaralanması olan bir hasta operasyon sırasında kanamaya bağlı olarak eks oldu. Hastanede kalış süresi ortalama 8.6 gündü.

SONUÇ
Bulgularımız, künt batın travmalarına bağlı yüksek hasarlanma derecesi olan karaciğer yaralanmalarında komplikasyon ve ölüm oranlarının düşük, ayrıca hastanede kalış süresinin kısa olması nedeniyle nonoperatif tedavinin başarısını desteklemektedir.

Anahtar sözcükler: Hepatik travma, çocuk, nonoperatif tedavi.

BACKGROUND
In this study the results of non-operative management of pediatric hepatic injury after blunt abdominal trauma are evaluated.

METHODS
Multitrauma patients (n = 498) admitted between 1998 and 2002 were analysed as for mechanism of trauma retrospectively. Liver injuries were classified according to the American Association for the Surgery of Trauma's Organ Injury Scaling System. Liver function tests, transfusion status, duration of hospital stay, complications, and operative intervention needed were recorded.

RESULTS
Seventy-five patients had liver injuries. The mean age was 6.7 years and male/female was 2.5/1. Number of patients in means of injury grade: I: 15, II: 26, III: 29, IV: 4, V: 1. There was no significant difference between mean blood pressures, heart rates, and hematocrite values on admission and post-stabilisation. In three of 21 transfused patients, it exceeded 40 ml/kg and two of them were operated. The mean pediatric trauma score was +2. As a complication; biloma was encountered in one patient. One patient with grade V hepatic injury, died in the operating room because of heavy bleeding. The average hospital stay was 8.6 days.

CONCLUSION
Our results support the efficacy of non-operative management of any grade hepatic injuries due to blunt abdominal trauma, with resultant low complication and mortality rates and shorter hospital stays.

Key Words: Hepatic trauma, children, non-operative management.

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Trauma is known to be the leading cause of death in childhood beyond the first year of life.[1, 2] Liver injuries are the second most common solid organ injuries occurring after blunt trauma in children, exceeded only by splenic traumas.[3] After central nervous system injuries, it is the most common cause of fatality following injury in children with a mortality rate rising up to 20%, usually due to uncontrolled haemorrhage.[4,5] Since 1985, non-operative management of these injuries has gained a great acceptance especially in lower injury graded ones.[1, 3, 6-11] In this clinical trial, we analysed our hepatic trauma patients and compared our results with those of the literature.

MATERIAL AND METHODS

The records of 498 multitrauma patients who were hospitalised in our clinic from 1998 to 2002 were analysed retrospectively. The ones that have liver involvement were chosen to form the study group. Patient's demographic data including age and mechanism of trauma were questioned. All patients were admitted to the intensive care unit (ICU) on first admission. Initially, whole blood counts, biochemical values were recorded and urine output, blood pressure and heart rates were measured. Hemodynamic stabilisation was maintained with fluid and electrolyte replacement, and every four or six hours hematocrite values and urine output were recorded.

Computerised tomography to evaluate the injury was performed for all patients when they were stabilised. Classification of liver injuries was made according to the American Association for the Surgery of Trauma's Organ Injury Scaling System [12] and injury severity was evaluated with pediatric trauma scoring system. [13] On ward follow up, patients were kept under control with absolute bed rest, daily physical examination and hematocrite values until they were discharged from the hospital with control ultrasonography, which revealed disappearance of free abdominal fluid. Follow-up of the patients were performed by ultrasound and whole blood count in the first 10th day of discharge and then monthly for at least 6 months. Associated solid organ injuries, transfusion status, duration of hospital stay, complications, and requirement for surgical intervention were recorded.

Table 1. Classification of the patients according to the mechanism of liver injury

Mechanism	Number of patients
Motor vehicle accidents (pedestrians)	47
Motor vehicle accidents (passengers)	5
Falls	17
Blow to abdomen	3
Bicycle accidents	3
Total	75

RESULTS

Demographics and patient groups

Liver injury was present in 75 patients out of 498 (15%), and 22 (4.4%) of these were isolated. The mean age was 6.71 ± 2.94 years (ranging from 1 years to 14 years). Male to female ratio was 2.5/1 (54 males, 21 females) for overall hepatic trauma. Management of hepatic trauma was non-operative in 73 (97%) and operative only in two (3%) patients. When the mechanism of injury was taken into account (Table 1), majority of the injuries were detected as the result of a high-energy transfer mechanism due to motor vehicle accidents in 52 patients (69%) and falls in 17 patients (23%). Gra-

Table 2. Hemodynamic values of the patients with hepatic injuries on admission and after stabilisation.

N= 75	Hemoglobin (g/dl)	Hematocrite (%)	Systolic blood pressure (mmHg)	Diastolic blood pressure (mmHg)	Hearth rate (beats/min)
On Admission	10.78 ± 1.79	31.98 ± 5.01	103.22 ± 14.70	63.81 ± 11.51	111.84 ± 16.10
After stabilisation	10.67 ± 1.65	31.57 ± 4.55	104.34 ± 12.84	65.01 ± 10.77	109.18 ± 15.52
Significance (p)	0.257	0.347	0.420	0.055	0.223

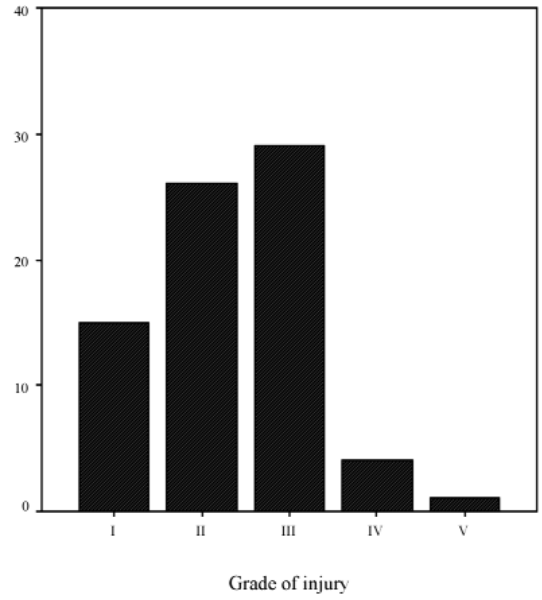

Figure 1. Grade of hepatic injury

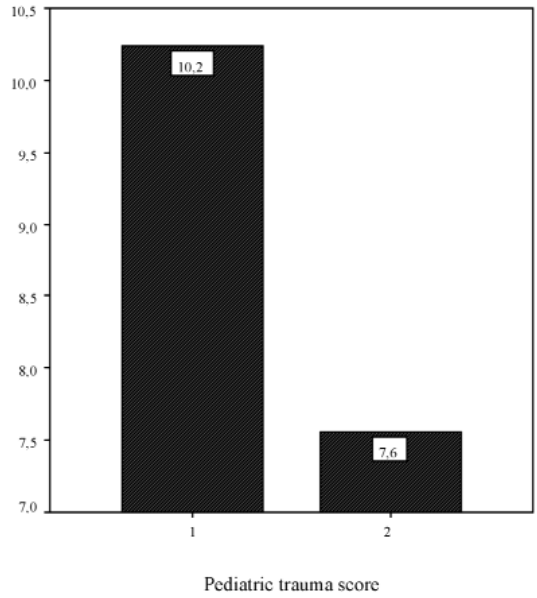

Figure 3. Comparison of duration of hospital stay and pediatric trauma score.

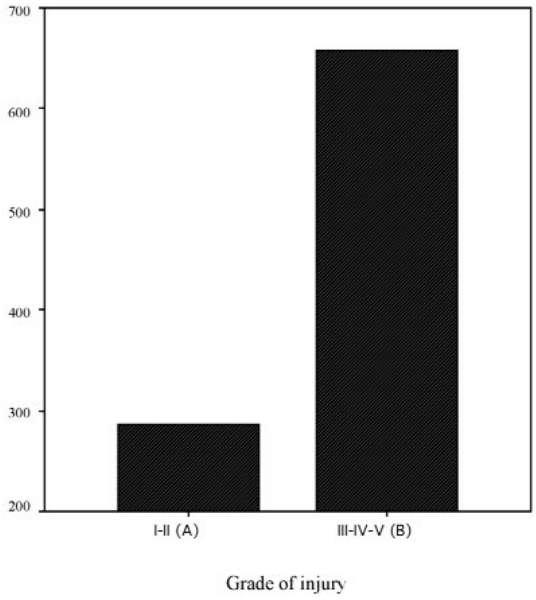

Figure 2. Comparison of SGPT values in group A and B.

des of liver injuries are shown in figure 1. According to the above-mentioned staging criteria, most of the patients were in grade II and III. [Grade I (n=15; 20%), II (n=26; 35%), III (n=29; 37%), IV (n=4; 5%), and, V (n=1; 1%)]. Patients with have grade I and II hepatic injuries according to CT findings, were regarded as grade A (low), while grade III, IV and V as grade B (high).

Physical and Diagnostic findings

In all grades of hepatic injuries, the most frequent physical findings were abdominal tenderness, diminished or absent bowel sounds, and abdominal distension. The mean serum glutamic pyruvic transaminase (SGPT) was 454 IU/L (range. 12- 1980 IU/L), which was approximately eleven times the upper limit of normal value (40 IU/L). SGPT values were significantly higher in patients with grade B injuries when compared to grade A injuries (p=0.001). (Fig 2)

The mean systolic blood pressure, heart rate, hematocrite, and haemoglobin value on admission and after stabilisation of the patients are summarised in Table 2. There was no significant difference between the admission and poststabilisation values (p>0.05) (paired-samples *t* test).

Evaluation of patients by pediatric trauma score (PTS)

Pediatric trauma scores were +1 for 30 patients (40%) and +2 for 45 patients (60%). The mean pediatric trauma score was +2 for overall hepatic injuries. There was no significant correlation between PTS and hepatic injury grade or transfusion frequency. However, patients with +1 score had a statistically shorter hospital stay (p=0,013) (Fig 3).

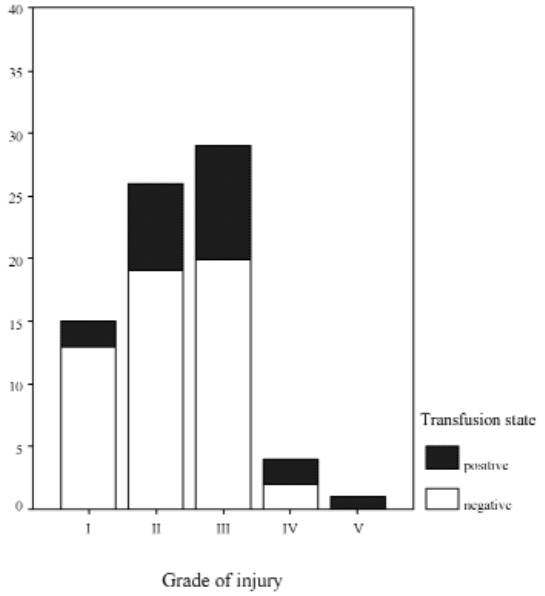

Figure 4. Transfusion state of patients according to the grade of injury

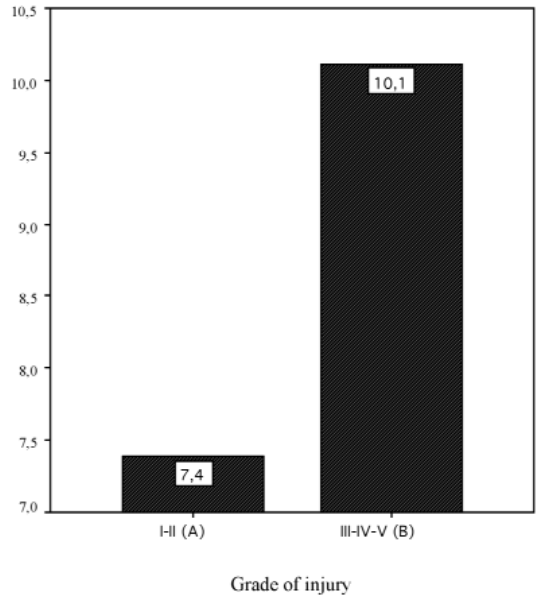

Figure 5. Comparison of hepatic injury grade and duration of hospital stay

Management

Blood transfusion was required in 21 patients, and only in three of them, it exceeded 40 ml/kg. Figure 4 shows the transfusion status of patients compared with the grade of injury. No significant correlation was observed between transfusion frequency and hepatic injury grade. Two of the three patients who received 40 ml/kg of transfusion underwent surgical intervention.

Complications

Biloma, as a complication of hepatic trauma was detected only in one patient treated non-operatively. The treatment was performed by percutaneous drainage; the catheter was removed after cessation of bile leak after 5 days. Follow-up of the patient was uneventful.

Outcomes and follow-up

The mean duration of hospital stay for all patients was 8, 62 ± 4.64 days (ranging from 2 days to 39 days). This duration was significantly shorter in grade A (7.39 ± 2.45 days) when compared to grade B (10.11 ± 6.07 days) (p=0.010) (Fig 5). Only one patient, with grade V hepatic injury, died at the operation theatre due to uncontrollable hemodynamic insufficiency. At least 6 months of follow-up period of discharged patients passed uneventful. Late haemorrhage or any other complications due to hepatic injury were not detected.

Discussion

Starting from the mid-1980s, non-operative management of blunt hepatic injuries of children has been popular for the last two decades, especially for selected and lower graded ones. In our study, we found that non-operative management seems to be efficient also in high-grade hepatic injuries.

History, physical examination and laboratory findings are preliminary criteria in the assessment of blunt hepatic injuries (HIs). Most HIs are due to motor vehicle accidents or falls, which have high-energy transfer effects on solid organs. [3,15] In our series, hepatic injuries were due to motor vehicle accidents in a frequency of 69% for both pedestrians and passengers; whereas falls accounted 23% as being the second most frequent cause. Although it can be estimated that the mechanism of the injury may be in relation with the severity of the injury,[1] it did not correlate, either with the grade of hepatic injuries, or blood transfusion requirements in our study. The mechanism of injury did not also correlate with the duration of the hospital stay.

Physical examination findings such as abdominal tenderness and distension, diminished bowel sounds are valuable as much as abnormal laboratory findings like elevation in SGPT values in the diagnosis of multisystem and isolated hepatic

injuries. [3] The eleven fold increases in SGPT values were highly predictive of hepatic injury especially in patients with grade B injuries.

Since 1980s, computed tomography is routinely used for the diagnosis of abdominal blunt trauma and solid organ injuries. Vock et al, have summarised the effectiveness of CT in hepatic injuries and they have also mentioned that this diagnostic method is beneficial in the follow-up of such patients. [16] After 1990s, this non-invasive method has become the cornerstone for the evaluation of solid organ injuries. [5] In our series, all patients were evaluated by computerised tomography and the hepatic injuries are classified according to the staging criteria mentioned above. [12]

As an accepted therapeutic approach in blunt hepatic injuries, nonoperative treatment has a main advantage, i.e to prevent postoperative complications like intraabdominal or wound infections. Most of the hepatic injuries are found to be self-limiting without bleeding. [10, 11, 14, 17, 18] Especially grade II and III injuries can be managed with careful hemodynamic monitoring without any need of operative intervention. Hemodynamic monitoring and stabilisation if needed, is well performed by fluid and electrolyte resuscitation and some times by blood transfusions. Heart rate, blood pressure and hematocrite values are primary significant criteria to observe hemodynamic condition of patients with general trauma or decide that they are stabilised enough. In our series, although nearly one third of the patients had blood transfusions, no significant difference was observed between admission and post stabilisation values. It might be due to their borderline dehydration which is quenched by initial fluid and electrolyte resuscitation. Most of the patients have low haemoglobin levels due to either iron deficiency or poor nutritional status and high levels of hematocrite due to dehydration. Replacement by appropriate amounts of fluid decreases hematocrite values and it can be estimated that these groups of patients are already hemodynamically stable. Blood transfusions were performed in these patients either to keep hemoglobin levels over 10 mg/dl or to control minimal bleeding. It is well known that hemodynamic instability which cannot be managed by fluid resuscitation and total blood transfusion requirement exceeding 40 ml/kg are significant indications for laparotomy. In our series, blood transfusion was needed in 21 patients and the average requirement was 25 ml/kg/patient. Two patients required 40 ml/kg and one patient necessitated 100 ml/kg. Although one of the patients who needed 40-ml/kg blood transfusion had undergone laparotomy, the other one could be stabilised without any surgical intervention. The patient who needed 100 ml/kg of blood transfusion, because of grade V hepatic injury, died during explorative laparotomy.

Although non-operative treatment has been considered as beneficial, there are still some points of major concern. First major problem with non-operative management is regarded as the risk of bloodborne diseases due to excessive transfusion. [8, 19, 20] The second major issue is delayed hemorrhage. Shilyansky et al have reported two such patients suffering from delayed bleeding of the injured liver after discharge from the hospital. [21] None of the patients treated non-operatively had problems due to blood transfusion in our series. No delayed hemorrhage was detected during hospital stay or follow-up period of at least 6 months.

Duration of hospital stay is assumed to be another problem of concern. The authors who are against non-operative treatment in blunt hepatic injuries suggest that one of the major disadvantages is lengthening of hospital stay and this treatment modality should be reserved for only low grade injuries. In a previous study, although Leone et al supported non-operative treatment of hepatic injuries, [6] the duration of hospital stay as long as 20 days mentioned by them can be presumed as a limiting criterion for non-operative treatment. [1, 6] However, the mean duration of hospital stay for all hepatic injuries is 8.62 ± 4.64 days in our study and it is a reasonable time of duration when compared with the literature.

Biliary tract injuries as complications of late outcomes of the conservative treatment of blunt hepatic injury are rare but significantly risky conditions. Sharif et al have reported 7 such cases consisting of 4 bile leaks, 3 intrahepatic bilomas. [22] In our series, intrahepatic biloma was detected in one patient with grade IV hepatic injury and it was successfully treated with percutaneous drainage.

In summary, our results showed that the majority of blunt hepatic injuries in pediatric population could be managed efficiently by means of supportive treatment and blood transfusions if necessary, with low rates of mortality and shorter hospital stays.

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