

Correlation Of The Functional State Of The Liver And The Severity Of Patients In The Complex Treatment Of Combined Facial Bone Trauma

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Annotation

The study comprehensively assessed the relationship between the severity of patients' general condition and liver function in patients with concomitant facial bone injuries. Biochemical and oxidative parameters were analyzed in 122 patients using clinical data, international severity assessment scales (ISS, GCS, PTS, PELOD), and laboratory test results. It was found that the severity of systemic inflammation and cytolysis, decreased protein-synthetic function of the liver, and impaired coagulation status correlated with the severity of traumatic injury. Patients receiving hepatoprotective therapy demonstrated more favorable dynamics of these parameters and more rapid clinical improvement. The obtained data confirm the significance of liver markers as prognostic criteria and emphasize the role of liver function correction in the comprehensive treatment of concomitant facial bone injuries.

Key words: combined trauma; maxillofacial injuries; functional state of the liver; transaminases; bilirubin; albumin; prothrombin index; ISS; GCS; PELOD; systemic inflammation; oxidative stress; hepatoprotective therapy.

Literature review of this article

Combined facial bone injuries are considered severe forms of polytrauma and are accompanied by a pronounced systemic inflammatory response, leading to the development of metabolic disorders and dysfunction of vital organs. The liver plays a key role in the pathogenesis of traumatic diseases, as it performs key functions such as detoxification, regulation of protein metabolism, hemostasis, and carbohydrate and lipid metabolism. According to modern research, hepatocellular dysfunction in polytrauma occurs within the first hours after injury and worsens the patient's overall condition.

Decreases in total protein and albumin levels are associated with suppression of liver synthetic function under the influence of inflammatory and hypoxic factors. Transaminases (ALT , AST) and the prothrombin index are of additional diagnostic value, allowing one to assess the degree of cytolysis and coagulopathy .

Introduction

Combined facial bone injuries are among the most severe forms of traumatic pathology and are characterized by a high rate of systemic complications. Facial bone injuries are often associated with traumatic brain injury, chest trauma, abdominal trauma, and extremity trauma, which increases the severity of the systemic inflammatory response and determines the severity of the patient's overall condition.

The liver is a key organ responsible for detoxification, protein synthesis, and the maintenance of carbohydrate, lipid, and neurotransmitter metabolism. In cases of combined injuries, it is subjected to significant functional stress, leading to the development of cytolysis, hypoproteinemia , coagulation disorders, and severe oxidative stress.

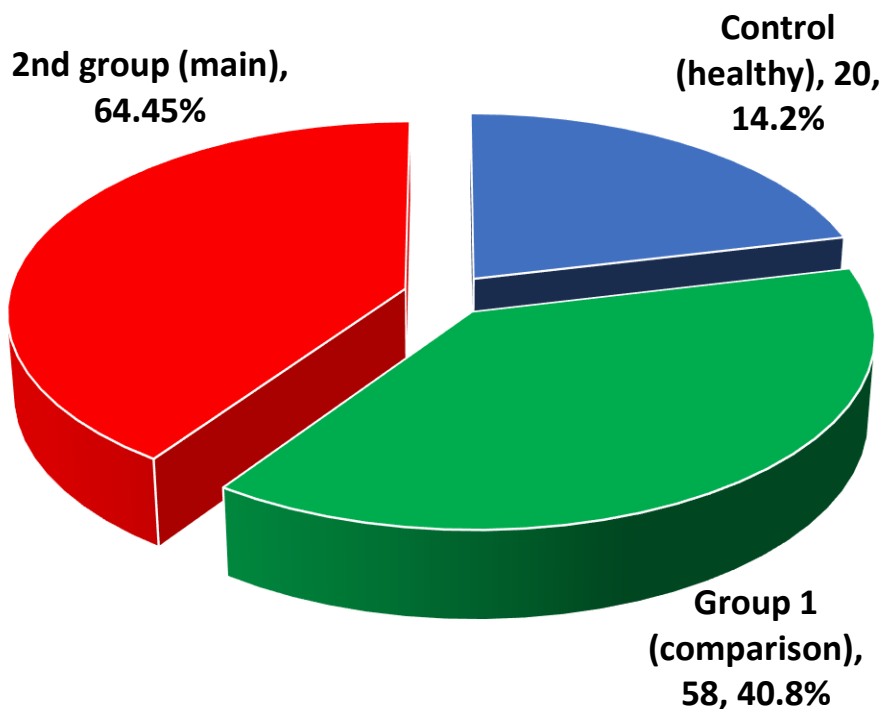
The study was conducted using clinical and laboratory data from 122 patients in the neurosurgery department of the Andijan branch of the Republican Scientific Center for Emergency Medicine from 2022 to 2024. Clinical data indicate a close correlation between the severity of the general condition in patients with combined trauma and laboratory parameters reflecting liver function. Procalcitonin levels , transaminase levels, albumin, and total protein levels allow one to assess the degree of systemic inflammation and the severity of traumatic injury.

Despite the existence of individual studies, a comprehensive assessment of the relationship between the general condition of the patient and the functional state of the liver in combined facial skeletal injuries has not been sufficiently studied, which determines the relevance of this work.

Purpose of the study

To establish correlation relationships between the severity of the general condition of patients and the functional state of the liver in combined trauma of the facial bones based on the analysis of biochemical and oxidative parameters during the period of complex treatment of traumatic disease.

Materials and methods



The study included patients from the neurosurgery department of the Andijan branch of the Republican Scientific Center for Emergency Medical Care from 2022 to 2024. All patients were divided into three groups: the main group (64 patients), the comparison group (58 patients), and the control group (20 healthy individuals).

For an objective assessment of the general condition of patients with combined facial bone injuries, the international ISS (Injury Severity Score) and GCS (Glasgow Coma Scale), as well as additional assessment systems, such as PTS and PELOD. The use of these tools provided a comprehensive analysis of the extent of damage and the nature of developing organ dysfunction.

Laboratory examination included:

- procalcitonin ;
- ALT and AsAT ;
- total protein and albumin;
- total bilirubin;
- prothrombin index (PTI)

Results

Correlations between laboratory parameters and clinical outcomes.

Indicator	Norm	Group 1 (traditional treatment)	2nd group (with hepatoprotectors)
ALT (U /L)	<40	1st day: ↑ 3.2 times; 7th day: ↑ 2.5 times; Day 14: ↑ 1.6 times	1st day: ↑ 3.1 times; 7th day: ↑ 1.7 times; Day 14: close to normal

AST (U /L)	<40	1st day: ↑ 2.8 times; 7th day: ↑ 2.2 times; 14th day: ↑ 1.5 times	1st day: ↑ 2.9 times; 7th day: ↑ 1.6 times; Day 14: Normalization
Total bilirubin (μmol /l)	5–21	1st day: 45; 7th day: 38; Day 14: 32	1st day: 46; 7th day: 28; Day 14: 19
Albumin (g/l)	35–50	1st day: 28; 7th day: 30; Day 14: 32	1st day: 29; 7th day: 34; Day 14: 42
Prothrombin index (PTI, %)	90–105	1st day: 65; 7th day: 72; Day 14: 78	1st day: 68; 7th day: 84; Day 14: 95

The table contains a comparative analysis of liver function laboratory parameters in two groups of patients: those receiving conventional therapy and those receiving treatment with hepatoprotective drugs. Normal values and their dynamics during early, intermediate, and late follow-up periods are provided for each parameter.

The first line reflects the dynamics of alanine aminotransferase activity . In patients receiving standard treatment, the increase in this enzyme remains significant throughout the entire observation period, gradually decreasing but continuing to exceed normal limits. In the group receiving hepatoprotectors, an increase is also recorded early in the observation period, but the decrease is more rapid, and by the final stage, the indicator almost corresponds to normal values.

Aspartate aminotransferase activity was elevated in both groups upon admission. In patients receiving conventional treatment, its decline was slower, and the level remained above normal. In patients receiving hepatoprotective therapy, the dynamics were more favorable: values decreased more quickly and reached reference levels by the end of the observation period.

Total bilirubin levels were elevated at baseline in both groups. In patients receiving standard therapy, levels remained above normal throughout the observation period, although they gradually decreased. In the hepatoprotector group, bilirubin levels decreased more significantly and eventually reached the normal range.

Albumin levels in both groups were below normal upon admission. In the conventional treatment group, the increase was slow and remained low. In the hepatoprotector group, albumin levels increased more rapidly and reached reference values by the end of the observation period.

The prothrombin index was reduced in both groups at the start of the study. In the standard treatment group, recovery was incomplete, and the index remained below normal. In the hepatoprotector group, recovery was more complete, and by the final follow-up, the index had reached normal levels.

Dynamics of changes in the severity scale of the general condition of patients.

Scale / group	Initially	Day 7	Day 14
GCS (1st group)	8–13	13.2 ± 0.5	14.1 ± 0.4
GCS (2nd group)	8–13	14.2 ± 0.4	14.9 ± 0.2
ISS (1st group)	20–50	21.9 ± 1.6	17–18
ISS (2nd group)	20–50	18.7 ± 1.5	12–14
PTS (1st group)	0–8	6–7	8–9
PTS (2nd group)	0–8	8–10	10–12
PELOD (1st group)	10–15	12–14	10–11
PELOD (2nd group)	10–15	8–9	4–5

The table shows the dynamics of the general condition severity indicators for patients in two groups using four international assessment scales: GCS, ISS, PTS, and PELOD. For each scale, the indicators at admission, as well as the values on the seventh and fourteenth days, are presented.

The rows reflecting the GCS scores show that both groups had similar scores upon admission. Subsequently, both groups showed improvement in their condition, resulting in increased scores, with more pronounced improvements observed in the second group.

For the ISS scale, initial values in both groups indicate significant injury severity. By day seven, scores in the first group remain similar, while in the second group, a decrease in injury severity is observed. By day fourteen, the reduction in severity is more noticeable in the second group than in the first.

According to the PTS scale, the baseline scores for both groups reflect the presence of traumatic exposure. In the first group, the improvement was moderate, while in the second group, a more significant increase in scores was observed at each subsequent follow-up period.

The PELOD scale, which assesses the severity of organ dysfunction, was similar in both groups at the start of the study. In the first group, a slight deterioration was recorded by the seventh day, while in the second group, an improvement was observed. By the fourteenth day, the first group's scores stabilized, while in the second group, a more pronounced recovery continued.

Discussion

The data obtained in the study confirm that patients with concomitant facial bone trauma experience significant liver dysfunction early after injury. Elevated transaminase activity, a significant increase in bilirubin, and decreased albumin and prothrombin index levels indicate the development of cytolytic and hypoproteinemic syndromes, reflecting the extent of hepatocellular damage.

A comparison of the two patient groups revealed significant differences in laboratory parameter dynamics. In patients receiving hepatoprotective therapy, transaminases normalized more rapidly, liver synthetic function parameters recovered more significantly, and bilirubin decreased to normal values more quickly. This indicates a positive effect of hepatotropic therapy on stabilizing metabolic processes and reducing the severity of cytolysis.

The obtained results are confirmed by the dynamics of changes in clinical status. According to the ISS, GCS, PTS, and PELOD scales, a more pronounced improvement was observed in patients in the second group. Parameters in this category more quickly approached values corresponding to a milder course of injury and reduced organ dysfunction, reflecting a correlation between improved laboratory data and clinical recovery.

Conclusion

In patients with combined facial bone injuries, severe disturbances in the functional state of the liver are observed, caused by systemic inflammation, cytolysis and metabolic disorders.

Biochemical parameters (ALT, AST, bilirubin, albumin, prothrombin index) demonstrate a direct relationship with the severity of the general condition according to the ISS, GCS, PTS and PELOD scales.

Hepatoprotective therapy promotes faster restoration of liver function, improvement of coagulation status and normalization of inflammatory markers.

Patients receiving hepatoprotectors show more pronounced positive dynamics on clinical scales, which confirms the correlation between stabilization of liver function and general improvement of condition.

Laboratory markers of the liver can serve as significant prognostic criteria for the course of traumatic disease and the effectiveness of complex treatment of combined facial injuries.

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