

Histopathologic Changes in Liver and Kidney in Cases of Deaths due to Burn Injuries

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ABSTRACT

Background: The second leading cause of accidental injuries is burn. Burn injuries involve multiple organs. The most common causes of death among these patients are multi-organ failure and sepsis.

Aim: To analyze the histopathologic findings on autopsy among patients who died due to burn related complications

Study design: Cross-sectional study

Place and duration of study: Department of Forensic Medicine & Toxicology and Department of Pathology, Peoples University of Medical & Health Sciences for Women, Nawabshah Shaheed Benazirabad from 1st January 2016 to 31st December 2018.

Methods: One hundred and thirteen patients died in the hospital setting secondary of complications due to burn injuries were enrolled. Patients with death due to burns underwent biopsy of liver and kidney to evaluate the underlying histologic findings. Histologic specimens were taken from liver and kidney and stored in 10% formaldehyde solution.

Results: On autopsy of patients who died due to burn related complications 41(36.2%) had normal liver histology, 47(41.5%) had sinusoidal dilation and congestion, 7(6%) had fatty liver, 7(6%) had hemorrhage while 11(9.7%) had necrosis. On autopsy of kidney, 37(32.7%) had normal histologic findings, 42(37%) had cellular swelling and congestion whereas 34(30%) had tubular necrosis.

Conclusion: The management of patients with adequate fluid replacement, antibiotics to prevent infection, dietary modifications which involve replacing the lost protein and graded resistance exercises can improve the management of these patients

Keywords: Burn injuries, Histopathologic changes, Liver, Kidney

INTRODUCTION

After vehicle injuries, the second leading cause of accidental injuries is burn.¹ Burns can be further classified into three categories: thermal burn, chemical burn and electric burn. The most common cause of death in burn injuries is sepsis. Other causes are further complications of sepsis such as inhalational injury, infection and shock^{2,3}. The most commonly involved organs in burn patients are lungs, liver, kidney and the upper gastro-intestinal tracts⁴.

It has been calculated that there is around 50% reduction in the mortality rate of burn patients due to the effective management strategies of burn patients. These involve preventive strategies and multi-modal management strategies i.e., management of the ongoing decline in the function of multiple organs due to burns related dehydration⁵. The degree of multi-organ dysfunction is related to the degree of burns⁶.

The multi-organ function decline seen in burn patients is due to the presence of hypovolemia which is very evident in cases involving greater than 30% of total body surface burn. The release of inflammatory mediators also contributes to the process⁷. The hypovolemia associated with burns leads to ischemic changes resulting in acute tubular necrosis and in some cases renal failure⁸. The severe reduction in renal blood flow and GFR and the influence of endocrine system causing release of

angiotensin, aldosterone and inhibition of prostaglandins lead to severe decline in renal function. This explains the importance of fluid resuscitation among burn patients.

The reduction in hepatic function among burn patients accounts for a variety of manifestations. Increased consumption and decreased production of proteins by liver accounts for decreased wound healing and deterioration of patients' condition. Reduction in protein synthesis further declines the immunity and increases the risk for sepsis which is among the common causes of death among burn patients. Liver is responsible for transport of fatty acids and triglycerides however cessation of liver function leads to accumulation of free fatty acids and triglycerides⁹.

The body's response to shock like condition is a hypermetabolic state. This state accounts for a variety of conditions such as depressed immunity which leads to infection. This state also leads to secretion of various stress hormones such as catecholamines, cortisol, dopamine and glucagon¹⁰. These conditions can be reversed by pharmacologic and non-pharmacologic means.

Burn injuries involve multiple organs and an overview of the histologic conditions of different organs can help me improved management of these patients.

PATIENTS AND METHODS

This is a cross-sectional study conducted at the Department of Forensic Medicine & Toxicology and Department of Pathology, Peoples University of Medical and Health Sciences for Women, Shaheed Benazirabad

Received on 27-06-2019

Accepted on 12-12-2019

Sindh, Pakistan. A total of 113 patients died in the hospital setting secondary of complications due to burn injuries were enrolled. Patients with death due to burns underwent biopsy of liver and kidney to evaluate the underlying histologic findings. The study duration was 3 years from 1st January 2016 to 31st December 2018. In hospital deaths were included whereas deaths after discharge were not included. Histologic specimens were taken from liver and kidney and stored in 10% formaldehyde solution. Samples were sent for histologic analysis to the hospital's laboratory along with the history of patient and the sample was analyzed by pathologist. Reports were received and data was entered on SPSS-20.

RESULTS

Seventy three were males and 40 were females. The mean age was 54±12.56 years. Thirty six patients had hypertension, 20 patients had diabetes mellitus while 22 patients had hypertension with diabetes mellitus. T-test was applied between histologic findings and co-morbid conditions, p-value was found to be 0.007. 89 patients had thermal burn whereas 24 patients had chemical burn. The mean burn area was 45±8.7%.

Histologic findings in liver on autopsy are shown in table 1. 41(36.2%) had normal liver histology. 47(41.5%) had sinusoidal dilation and congestion, 7(6%) had fatty liver, 7(6%) had hemorrhage while 11(9.7%) had necrosis.

Histologic finding in kidney on autopsy are shown in table 2. 37(32.7%) had normal histologic findings, 42(37%) had cellular swelling and congestion whereas 34(30%) had tubular necrosis.

Fig. 1: Co-morbid conditions in our study population

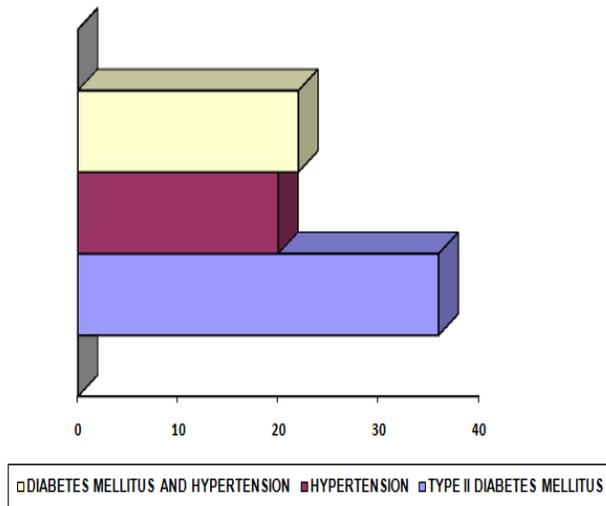


Table 1: Histopathologic findings in liver on autopsy of patients died due to burn (n=113)

Variable	No.	%
Normal histology	41	36.2
Sinusoidal dilation & congestion	47	41.5
Fatty liver	7	6.0
Hemorrhage	7	6.0
Centrilobular necrosis	11	9.2

Table 2: Histopathologic findings in kidney on autopsy of patients died due to burn (n=113)

Variable	No.	%
Normal histology	37	32.7
Cellular swelling & congestion	42	37.1
Tubular necrosis	34	30.0

DISCUSSION

The most common histologic finding on autopsy of liver in our study was sinusoidal dilation and infiltration seen in 41% of study subjects whereas the most common histologic finding in kidney was cellular swelling and congestion which was seen in 42% of study subjects. Umesh et al⁴ showed that acute tubular necrosis among majority of burns patients from his study. Among his study subjects, the most common finding in liver was necrosis, congestion and fatty changes. In the gastro-intestinal tract, Curling ulcers were a late complication and in initial stages, superficial ulcers were found.

Talewad et al⁸ reported that most common histopathologic finding in liver among burn patients was venous congestion and infiltration which was evident in 41.6% of cases. Argamaso et al¹¹ also showed that liver necrosis in 23% of his study subjects. In another study, Talewad et al⁸ reported that majority of burn patients had normal kidney histology followed by acute tubular necrosis and cellular swelling. Baker et al¹² noticed that 23% of his patients with hepatic congestion and infiltration. Cerenca et al¹³ reported that 64% patients with renal tubular necrosis. Sevitt et al¹⁴ showed that 59% patients with renal tubular necrosis. Barret et al¹⁵ conducted his study on pediatric patients between ages 3-5 years. He concluded that 80% of his study subjects had fatty infiltration of liver. They further concluded that the pathophysiology behind fatty liver is unknown. Fatty liver has increased incidence of sepsis in burn patients. It has been seen that patients with ongoing liver disease are more prone to developing hepatic dysfunction. Liver is responsible for the production of acute phase cytokines. These cytokines mediate inflammatory response and wound healing. Patients with compromised liver function have increased mortality and morbidity due to compromised response¹⁶.

Schneider et al¹⁷ analyzed early, late and progressive acute kidney disease among burn injury 220 patients. They concluded that 22.2% developed acute kidney injury, 17.7% developed late acute kidney injury whereas 7.2% of his study subjects developed progressive acute kidney injury. They further concluded that old age patients with multiple co-morbid conditions are prone to developing acute kidney injury. Steven et al¹⁸ also concluded that 26.6% subjects have acute kidney injury.

The limitations of this study include a small sample size and unable to conclude the autopsy findings of other organs such as gastro-intestinal tract, brain, adrenal glands and heart. Burns involve multiple organs and the histopathologic findings in all organs can guide us in managing and decreasing the morbidity and mortality of these patients.

CONCLUSION

Multi-organ failure and sepsis are the most common causes of death among burn patients. The management of patients with adequate fluid replacement, antibiotics to prevent infection, dietary modifications which involve replacing the lost protein and graded resistance exercises can improve the management of these patients.

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