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A Study on the Cause of Death Due to Burn Cases and Histopathological Changes in North Indian Setting-A Cross Sectional Study

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Abstract

Background: Fatal burns and related injuries are major cause of death and disability. There are certain pathological changes such as lungs shows necrotizing pneumonia, congestion of alveolar walls, capillary proliferation, intra alveolar oedema, giant epithelial cells

Objective: To study on the cause of death due to burn cases and histopathological changes in north Indian setting.

Method: This was a cross-sectional study. All autopsies with history of burn injury were studied to find out the significant histopathological change in lung. Cases was thoroughly studied using specially designed proforma that included demographic profile of deceased, history from relatives, police & hospital records, autopsy findings.

Results: The most common cause of death due to burn injury was found to be Sepsis (48.2%) and neurogenic shock (29.5%). On histopathological examination, Congestion in trachea was present in majority 434 (78.9%) cases while Tracheal soot particles were present in only 40 (7.3%) cases. Specimens of 375 cases were available for histopathology out of which 52 (13.9%) specimens were autolyzed. Changes suggestive of Pneumonia (50.1%), Congestion (83.7%), alveolar and interstitial haemorrhage (63.2%) were present in majority of the cases while changes suggestive of alveolar interstitial edema (64.3%), alveolar wall disruption (66.1%), inflammatory cells (55.5%), hyaline membrane (79.7%) and Fibrin strands (79.7) were absent in majority of cases. Capillary dilatation was present in 39.2%.

Conclusion: In the present study, an important observation in burn deaths is the Sepsis and Neurogenic shock. Congestion in trachea was most common on histopathological change.

Key words: *Fatal burns, Cause of death, Histopathological change*

Introduction

A severe burn injury is the most devastating injury a person can sustain and yet hope to survive. Every year more than 2 million people sustained burns in India. Around 5 lakh people were treated as outdoor patients. About 2 lakh people admitted in hospital, of which 5000 people die each year1. Thermal burns are more common incidents, which stands next to road traffic accidents in India. On an average, 1/4th of the deaths constitute death due to burns among all postmortem examinations conducted. Mortality rate due to burns in India is much more than any other developed countries2 .Histopathological changes in various organs are noted

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in burn deaths. Lungs are usually congested and show marked edema3. Necrosis of alveolar epithelium and necrotic debris is present as a membrane in cases of shock lung. Gastric ulcers may occur within a day of burning. Curling's ulcers are produced in the duodenum in less than 10% of cases on 10th day in extensive burns. These ulcers are sharply punched out mucosal defects which may be superficial or deep. The liver shows cloudy swelling. The kidney shows cloudy swelling, capillary thrombosis and infarction. Presence of haem casts in medullary tubules is common. Renal obstruction leads to microcirculatory insufficiency and renal ischemia4. There is lack of information on the cause of death due to burns and histopathological changes from north Indian setting, hence this study was planned to study on the cause of death due to burn cases and histopathological changes in north Indian setting in a cross sectional study design.

Material and Method

This was a cross-sectional study conducted in the Department of Forensic Medicine and Toxicology in collaboration with Department of Pathology in a tertiary care hospital in north India over a period of one year.

All autopsies with history of burn injury were studied to find out the significant histopathological change in lung. The cases with time since death more than 24 hours were not to be included, as lungs undergo decomposition after 24 hour period of death were excluded from the study. Cases with previous history of lung diseases, anatomically distorted lungs were excluded were also excluded.

Cases was thoroughly studied using specially designed proforma that included demographic profile of deceased, history from relatives, police & hospital records, autopsy findings. Before taking the lung sample, proper consent was taken from the relatives after explaining the purpose of the study. After gross examination sections from different lobe were taken. These sections were sent to Department of Pathology for microscopic examination through a multi-step process. Routine Hematoxylin & Eosin stains done. The histopathological changes were seen under microscope.

Results

The most common cause of death due to burn injury was found to be Sepsis (48.2%), followed by Neurogenic shock (29.5%), Hypovolemic shock (14.0%), Asphyxia (3.1%), Multi-organ failure (2.7%) and Cardio-respiratory failure (2.2%). Other causes contributed to death in 0.4% burn victims only (Table-1).

Table-1: Distribution of Burn Cases according to Cause of Death (N=550)

Cause of death	No. of cases	Percentage
Sepsis	265	48.2
Neurogenic Shock	162	29.5
Hypovolemic Shock	77	14.0
Asphyxia	17	3.1
Multi-organ Failure	15	2.7
Cardio-respiratory failure	12	2.2
Others	2	0.4
Total	550	100.00

On histopathological examination, Congestion in trachea was present in majority 434 (78.9%) cases while Tracheal soot particles were present in only 40 (7.3%) cases. Specimens of 375 cases were available for histopathology out of which 52 (13.9%) specimens were autolyzed. Changes suggestive of Pneumonia (50.1%), Congestion (83.7%), alveolar and interstitial haemorrhage (63.2%) were present in majority of the cases while changes suggestive of alveolar interstitial edema (64.3%), alveolar wall disruption (66.1%), inflammatory cells (55.5%), hyaline membrane (79.7%) and Fibrin strands (79.7) were absent in majority of cases. Capillary dilatation was present in 39.2% (Table-2).

Table-2: Histopathological Changes in Trachea and Lungs

Variables	Total	Absent		Present		Autolyzed	
		No.	%	No.	%	No.	%
Traches							
Congestion	550	116	21.1	434	78.9	0	0.0
Soot particle	550	510	92.7	40	7.3	0	0.0
Lung							
Pneumonia	375	135	36.0	188	50.1	52	13.9
Congestion	375	9	2.4	314	83.7	52	13.9
Capillary dilatation	375	176	46.9	147	39.2	52	13.9
Alveolar and interstitial edema	375	241	64.3	82	21.9	52	13.9
Alveolar and interstitial hemorrhage	375	86	22.9	237	63.2	52	13.9
Alveolar wall disruption	375	248	66.1	75	20.0	52	13.9
Inflammatory cells	375	208	55.5	115	30.7	52	13.9
Hyaline membrane	375	299	79.7	24	6.4	52	13.9
Fibrin strands	375	299	79.7	24	6.4	52	13.9

Discussion

Burn injuries are one of the most devastating injuries and constitute a major global public health hazard. Burns are the fourth most common type of injury worldwide after road traffic accidents, falls and interpersonal violence*5* (World Health Organisation, 2018). Extensive development and growth of Information technology has made vast changes in recent years in medical education system in India at both the teaching level as well as research level*6* (Tayade and Kulkarni, 2011).

There are numerous cases in which there was no soot in the larynx or trachea, yet analysis of blood for carbon monoxide revealed lethal levels*7* (DiMaio, 2001). Introduction of soot into the trachea, either during incision on the charred neck at autopsy or by disintegration from burning, gives the false impression of smoke inhalation*8* (Shkrum et al, 2007).

In this study, the most common cause of death due to burn injury was found to be Sepsis (48.2%), followed by Neurogenic shock (29.5%), Hypovolemic shock (14.0%), Asphyxia (3.1%), Multi-organ failure (2.7%) and Cardio-respiratory failure (2.2%).

Burn injury affects kidney by creating hypovolemic and intense pro-inflammatory states in the earlier phases of survival whereas in the later days systemic sepsis takes the upper hand for the development of the organ dysfunction. Congestion in trachea was present in majority 434 (78.9%) cases while Tracheal soot particles were present in only 40 (7.3%) cases. Specimens of 375 cases were available for histopathology out of which 52 (13.9%) specimens were autolyzed. Changes suggestive of Pneumonia (50.1%), Congestion (83.7%), alveolar and interstitial haemorrhage (63.2%) were present in majority of the cases while changes suggestive of alveolar interstitial edema (64.3%), alveolar wall disruption

(66.1%), inflammatory cells (55.5%), hyaline membrane (79.7%) and Fibrin strands (79.7) were absent in majority of cases. Capillary dilatation was present in 39.2% are the histopathological findings in the present study that is close to the studies of Sevitt (1956), Argamaso (1967), Rathod et al (2014) and Schrier et al (2004) *,9,10,11,12*. Naik et al (1998) in their study did not find soot in naked eye examination in any case of sustaining less than 60% total body surface area (TBSA) of burn*13*. Gupta and Srivastava (1988) found soot particles in trachea in total 38 cases (21.11%)*14*.

The emerging techniques, development of study of histopathological techniques plays a vital role in autopsy. Burn deaths are an important public health & social problem in India. There should be urgent need to implement burn prevention programme in India which should aim at attending the incidence of burn injuries and mortality among young generation, especially in females. Burn has been reported to be the second most common cause of death in all medicolegal cases.

Conclusion

In the present study, an important observation in burn deaths is the Sepsis and Neurogenic shock. Congestion in trachea was most common on histopathological change.

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