

## Original article:

# “Study of Burn Deaths with Special Reference to histopathology in India”

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### Abstract:

**Introduction:** Thermal burns and related injuries are major cause of death and disability. There are certain pathological changes such as lungs shows necrotising pneumonia, congestion of alveolar walls, capillary proliferation, intraalveolar oedema, giant epithelial cells. With this background in mind present study was planned to work out the histopathological examination of internal organs.

**Material & methods:** The present study was carried out in the Department of Forensic Medicine & Toxicology, during the period of 2 years from October 2006 to October 2008. Total 110 cases with burn injuries brought to the mortuary for autopsy used as material for study purpose and collection of tissues for histopathological examination.

**Observations & Results :** Histopathological changes in lungs showed bronchopneumonia was seen in 22 (20%) cases, pulmonary oedema in 61(55.45%) cases, atelectasis in 16(14.54%), emphysema in 19(17.27%), interstitial haemorrhage in 42(38.18%) , intra alveolar haemorrhage in 39(35.45%), interstitial pneumonitis in 30(27.27%), macrophages in 51(46.36%), congestion in 81(73.63%), haemorrhagic necrosis in 5(4.54%). Histopathological changes in kidneys showed cloudy degeneration in 17(15.45%) cases, tubular casts in 35(31.81%), acute pyelonephritis in 10(9.09%), regeneration of epithelium in 15(13.63%) & acute tubular necrosis in 18(16.36%).

**Conclusion:** Our work ruled out importance of histopathological study in burn cases in India.

**Keywords:** Histopathological changes, autopsy, burn cases

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### Introduction:

Thermal burns and related injuries are major cause of death and disability. Even in developed countries more than two million individuals annually are burned seriously and require medical treatment <sup>1</sup>. The magnitude of deaths due to burns is so large as India is the only country in the world where fire is classified among the fifteen leading causes of death in 1998 standing fourteenth in the list <sup>2</sup>.

There are certain pathological changes such as lungs shows necrotising pneumonia, congestion of alveolar walls, capillary proliferation, intraalveolar oedema, giant epithelial cells. Liver shows albuminoid

degeneration and hydropic ballooning, steatosis, necrosis of hepatic cells, kidneys shows changes of acute renal failure, cloudy swelling and infarction. Walls of stomach and duodenum may show ulcerations. Pleura may show petechial haemorrhages. With this background in mind present study was planned to work out the histopathological examination of internal organs i.e. brain, trachea, lungs, liver, spleen, kidneys, stomach and intestine has been done to see changes at terminal events and their utility to predict prognosis and betterment of treatment for patients in future <sup>3</sup>.

**Material & methods:** The present study was carried out in the Department of Forensic Medicine & Toxicology, during the period of 2 years from October 2006 to October 2008. Total 110 cases with burn injuries brought to the mortuary for autopsy used as material for study purpose and collection of

tissues for histopathological examination. Thorough and complete post mortem examination was conducted on all the bodies autopsied; including both external and internal findings with attempts made to establish the cause of death and circumstances leading to death.

**Observations & Results:**

**Table 1) Histopathological changes in trachea in relation to duration of survival.**

DURATION OF SURVIVAL	0 TO 24HRS	>24 TO 48HRS	>48 TO 72HRS	>72 TO 96HRS	>96 TO 120HRS	>120 TO 168HRS	>168 TO 336HRS	>336 HRS	TOTAL
CONGESTION	19	8	0	11	6	5	5	1	55
TRACHEOBRONCHITIS	6	3	0	11	5	4	3	3	35
BRONCHIOLITIS	20	7	3	14	8	10	9	5	76
SOOT PARTICLES	8	1	0	1	0	3	1	1	15

Histopathological changes in lungs showed bronchopneumonia was seen in 22(20%) cases, pulmonary oedema in 61(55.45%) cases, atelectasis in 16(14.54%), emphysema in 19(17.27%), interstitial haemorrhage in 42(38.18%) , intra alveolar

haemorrhage in 39(35.45%),interstitial pneumonitis in 30(27.27%),macrophages in 51(46.36%), congestion in 81(73.63%), ha-emorrhagic necrosis in 5(4.54%).

**Table 2 : Histopathological changes in lungs in relation to duration of survival.**

DURATION OF SURVIVAL	0 TO 24HRS	>24 TO 48HRS	>48 TO 72HRS	>72 TO 96HRS	>96 TO 120HRS	>120 TO 168HRS	>168 TO 336HRS	>336 HRS	TOTAL
CONGESTION	22	08	03	17	08	11	08	04	81
OEDEM	11	05	02	16	08	09	05	05	61
ATELECTASIS	03	02	01	03	02	02	02	01	16
BRONCHOPNEUMONIA	01	01	01	05	03	03	04	04	22
EMPHYSEMA	01	01	01	05	02	05	03	01	19
INTRAALVEOLAR HAEMORRHAGE	01	01	02	09	05	10	06	05	39
INTERSTITIAL HAEMORRHAGE	01	01	01	12	06	09	07	05	42
INTERSTITIAL PNEUMONITIS	01	01	01	13	03	10	01	00	30
MACROPHAGES	10	05	01	09	05	11	06	04	51

HAEMORRHAGIC NECROSIS	00	00	00	00	00	02	02	01	05
MICROTHROMBI	00	00	00	00	00	02	01	01	04

In our study histopathological changes in liver in relation to duration of injury showed congestion in 64(58.18%) cases, fatty change in 17(15.45%),-centrilobular necrosis in 39(35.45%), dilated and congested sinusoids in 42(38.18%),infarction in 16(14.54%), degenerative changes in 21(19.09%) focal necrosis in 21(19.09%),focal haemorrhage in

21(19.09%), portal inflammation in11(10%),fibrin deposition in 2(1.81%), periportal necrosis in 6(5.45%) On microscopic examination histopathological changes in spleen in relation to duration of injury showed congestion in 56(50.90%)cases, acute splenitis in20(18.18%), infarcts.

**Table 3: Histopathological changes in liver in relation to duration of survival.**

DURATION OF SURVIVAL	0 TO 24HRS	>24 TO 48HRS	>48 TO 72HRS	>72 TO 96HRS	>96 TO 120HRS	>120 TO 168HRS	>168 TO 336HRS	>336 HRS	TOTAL
CONGESTION	23	7	3	14	4	7	3	3	64
FATTY CHANGE	3	2	1	6	1	2	1	1	17
PORTAL INFLAMMATION	2	1	1	1	2	2	1	1	11
FOCAL HAEMORRHAGE	6	4	0	3	2	4	1	1	21
INFARCTION	2	1	2	3	2	2	1	3	16
DEGENERATIVE CHANGES	0	1	0	9	3	5	2	1	21
DILATED AND CONGESTED SINUSOIDS	20	6	2	13	1	0	0	0	42
CENTRILOBULAR NECROSIS	16	0	2	4	6	4	4	3	39
FOCAL NECROSIS	11	0	0	3	1	3	2	1	21
PERIPORTAL	0	0	0	1	0	2	2	1	6
FIBRIN DEPOSITION	0	0	0	0	0	0	0	2	2

28(25.45%),vascular fibrosis in 59(53.63%),enlarged lymphoid follicles in 27(24.54%),necrosis in 33(30%), amyloid like material in26(23.63%), arteriosclerosis in 5(4.54%), haemorrhages

in34(30.90%), hyalinization in9(8.18%), chronic inflammatory changes22(20%), haemosiderin laden macrophages in 29(26.36%).

**Table 4 : Histopathological changes in spleen in relation to duration of survival.**

DURATION OF SURVIVAL	0 TO 24HRS	>24 TO 48HRS	>48 TO 72HRS	>72 TO 96HRS	>96 TO 120HRS	>120 TO 168HRS	>168 TO 336HRS	>336 HRS	TOTAL
CONGESTION	23	06	02	13	03	03	04	02	56
ACUTE SPLENITIS	10	05	02	03	00	00	00	00	20
VASCULAR FIBROSIS	20	06	02	09	06	09	05	02	59
ENLARGED LYMPHOID FOLLICLES	11	02	01	10	02	01	00	00	27
PHAGOCYTES	02	01	01	13	00	05	04	02	28
INFARCTS	05	02	01	07	03	04	03	03	28
NECROSIS	04	02	01	08	04	09	03	02	33
ARTERIOSCLEROSIS	00	00	00	01	02	01	00	01	05
HAEMORRHAGES	06	03	02	08	03	07	03	02	34
CHRONIC INFLAMMATORY CHANGES	00	00	00	05	03	06	04	04	22
HYALINIZATION	00	00	00	01	02	02	02	02	09
AMYLOID LIKE MATERIAL	00	00	00	03	05	09	04	05	26
HAEMOSIDERINE LADEN MACROPHAGES	03	02	01	05	03	10	03	02	29

Histopathological changes in gastrointestinal tract showed ulceration in stomach in 21(19.09%) ,ulceration in duodenum in 25(22.72%) and ulceration in stomach & duodenum in 5(4.54%) cases. The Curling's ulcer were well circumscribed, sharply demarcated, punched out, lesions which

showed no surrounding or underlying induration or edema. While most of the ulcerations were superficial, some were quite deep, while the duodenal ulcers were round, larger in size and of greater depth,

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**Table 5: Histopathological changes in kidneys in relation to duration of survival.**

DURATION OF SURVIVAL	0 TO 24HRS	>24 TO 48HRS	>48 TO 72HRS	>72 TO 96HRS	>96 TO 120HRS	>120 TO 168HRS	>168 TO 336HRS	>336 HRS	TOTAL
CLOUDY DEGENERATION	02	03	02	05	00	02	03	00	17
TUBULAR CASTS	04	03	01	08	05	05	03	06	35
ACUTE PYELONEPHRITIS	01	03	01	03	01	00	01	00	10
REGENERATION OF EPITHELIUM	01	00	00	05	02	04	03	00	15
ACUTE TUBULAR NECROSIS	04	02	00	04	02	01	03	02	18

Gastric lesions were frequently irregular. Gastric lesions appeared with greater frequency in this series than did duodenal lesions, but the latter were characteristically single ulcerations.<sup>5</sup> Of the cases had both gastric and duodenal involvement, and in every instance the lesions were multiple in both locations.

**Table 6 : Histopathological changes in stomach & duodenum in relation to duration of survival.**

DURATION OF SURVIVAL	0 TO 24HRS	>24 TO 48HRS	>48 TO 72HRS	>72 TO 96HRS	>96 TO 120HRS	>120 TO 168HRS	>168 TO 336HRS	>336 HRS	TOTAL
ULCERATION IN STOMACH	01	02	01	03	01	03	04	06	21
ULCERATION IN DUODENUM	00	00	00	05	04	08	05	03	25
ULCERATION IN STOMACH & DUODENUM	00	00	00	00	01	01	01	02	05

**Discussion:** 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 <sup>4</sup>. 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. In the present study histopathology of brain, trachea, lungs, liver, spleen, kidneys, stomach and duodenum was carried out in all the 110 subjects.

The cellular and tissue changes are essentially those of hypoxic injury characterized by failure of multiple organ system. The evidence of

visceral changes in the form of bronchopneumonia, subcapsular pus pockets in the spleen and renal involvement were further substantiated by taking random tissue samples of cases for histopathology. Out of 110 cases of autopsy, 81 (73.63%) were attributed to respiratory pathology, either alone or in combination with some other causes. When these 81 (73.63%) cases were subjected to postmortem and histopathological study the following findings were observed.

Histopathology of trachea showed congestion in 55 (60%) cases, tracheobronchitis in 35 (31.81%) and bronchiolitis in 76 (69.09%) cases, soot particles in 15 (13.63%) cases. In cases where death occurred earlier and the patient had fumes inhalation, epithelial denudation and necrosis were prominent features seen. The carbon soots would have been present in many more cases, but it was not found as 64 (58.18%) of the cases were hospitalized and died after 72 hours hence there were reason for soot particles being washed out during suction.

**Naik R S et al (1998)**<sup>5</sup> in their study did not soot in naked eye examination in any case of sustaining less than 60% total body surface area (TBSA) burn.

**Gupta R K et al (1988)**<sup>6</sup> found soot particles in trachea in total 38 cases (21.11%). Similarly **Virendra**

**Kumar et al (2004)**<sup>7</sup> reported soot particles in 26% of cases studied. Bronchopneumonia was seen in 22 (20%) cases, pulmonary edema in 61 (55.45%) cases, atelectasis in 16 (14.54%) cases, emphysema in 19 (17.27%) cases, interstitial haemorrhage in 42 (38.18%) cases, intraalveolar haemorrhage in 39 (35.45%) cases, interstitial pneumonitis in 36 (72.72%) cases, macrophages in 51 (46.36%) cases, congestion in 81 (73.63%) cases, haemorrhagic necrosis in 5 (4.54%). In first 48 hours there was congestion of the alveolar walls, capillary

proliferation, interstitial and intraalveolar oedema and intra alveolar haemorrhage. Acute pneumonia is more prevalent in short term survivors, whereas necrotizing pneumonia was dominant in those with prolonged survival. Pulmonary lesions which included respiratory burns, adult respiratory distress syndrome, broncho-pneumonia and pulmonary edema either singly or in combination with other causes consisted 61% deaths in the present study.

Intraalveolar & interstitial hemorrhage in the present study were observed in 39 (35.45%) and 42 (38.18%) cases. Pulmonary pathologic changes including alveolar and interstitial edema observed in 61 cases, Platelet and fibrin thrombin observed in 4 cases, interstitial pneumonitis in 30 cases. Bronchopneumonia was observed in 20% cases in present study, while hemorrhagic necrosis in 5 cases and intraalveolar hemorrhages in 39 cases. In most of the cases these changes observed more frequently after 72 hours of survival.

In our study the histopathological changes as observed on postmortem examination were found to be related with duration of injury and the most commonly observed were as follows, in 64 cases (58.18%) showed congestion of the liver. It was associated with generalized congestion of all internal organs and the cause of death is shock due to burns and death within 24 hours (31 cases). Fatty changes in the liver were observed in 17 cases (15.45%). Cloudy swelling and loose cytoplasm was observed in hepatic cells. Varying amount of fat present in hepatic cells. Fatty changes were centrilobular or perilobular and were scattered or diffused in distribution. Extent of fatty changes was related with higher extent of burnt body surface area.

On microscopic examination histopathological changes in spleen in relation to duration of

injury showed congestion in 56(50.90%)cases, acute splenitis in 20(18.18%), infarcts in 28-(25.45%),vascular fibrosis in 59(53.63%),enlarged lymphoid follicles in 27(24.54%), necrosis in 33(30%), amyloid like material in26(23.63%), arteriosclerosis in 5(4.54%), haemorrhages in 34 (30.90%), hyalinization in 9 (8.18%) , chronic inflammatory changes 22 (20%) , haemosiderin laden macrophages in29(26.36%). The most marked histopathological change in spleen tissue was considerable congestion with less marked cellular infiltration. The spleen showed marked congestion and in some cases evidence of infection and degenerative changes was present. The gastrointestinal tract may suffer patchy mucosal haemorrhages and necrosis referred to as haemorrhagic enteropathy<sup>8</sup>.

Histopathological changes in gastrointestinal tract showed ulceration in stomach in 21(19.09%)

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,ulceration in duodenum in 25(22.72%) and ulceration in stomach & duodenum in 5(4.54%) cases.13 out of 21 cases having gastric ulcers and 16 out of 25 cases survived for more than 120 hours. Reason for variations might be due to variations in number of subjects examined or delay in postmortem examinations or no special attention towards GIT changes.In our study acute tubular necrosis was present in 18 of 110 cases and in 12 cases it was observed in death within first 5 days, .Tubular casts was present in 35 of 110 cases and in 21 cases it was observed in death within first 5 days, Cloudy degeneration was present in 17 of 110 cases and in 12 cases it was observed in death within first 5 days.

**Conclusion:** Our study underlined prime importance concerned with cause, of histopathological studies in burn cases.

Date of submission: 12 June 2013

Date of Provisional acceptance: 02 July 2013

Date of Final acceptance: 28 Aug 2013

Date of Publication: 04 September 2013

Source of support: Nil

Conflict of Interest: Nil