STUDY OF HISTOPATHOLOGICAL CHANGES IN LIVER AND ADRENALS FOLLOWING DEATH DUE TO BURNS AT VARYING PERIODS OF SURVIVAL

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ABSTRACT

BACKGROUND

The term ‘burn’ is applied more in lay than in medical circles to a variety of conditions, of which the local effects of dry heat described in restrictive terms as burns. Flame burns are characterized by singeing of hairs and show a geographic distribution. In the present study of the 60 cases, the death is due to the higher incidence of suicide by burns. The higher involvement of burn death in females are due to the fact that more burn cases are reported and medico-legal autopsies are done on these cases to meet the legal requirement. The two organs, liver and adrenals undergo marked histopathological changes. With this background, the present study was planned to work out the histopathological changes of liver and adrenals following death due to burns at varying periods of survival.

MATERIALS AND METHODS

The study was conducted at Government Medical College, Kozhikode, and during the period of one year, 60 cases of death due to burns from fire were studied.

RESULTS

In liver, the histopathological changes like portal oedema, portal haemorrhage and congestion, sinusoidal congestion, focal necrosis and inflammation and in adrenals, histopathological changes like cortical and medullary haemorrhage and oedema, focal necrosis, capsular haemorrhage and oedema were seen.

DISCUSSION AND CONCLUSION

Considering the histopathological changes of liver when the period of survival increases, liver undergoes moderate degree of changes and most of the people died along with early cirrhotic changes of liver, but when the period of survival increase adrenals undergo mild and moderate degree of changes and may lead to acute adrenal insufficiency and possible death. On conclusion from the study that liver and adrenals show constant histopathological changes in cases of death due to burns irrespective of the period of survival and these organs are more important in determining the cause of death.

KEYWORDS

Histopathological Changes, Survival, Severity, Burn.


INTRODUCTION

Throughout the history of man, fire has had a varied symbolic significance to him. Its use as a form of protest against the constraints and pressures of society has long been known.

The important aetiological factors behind the accidental burn death are careless handling of kerosene and cooking gas cylinders, bursting of stoves in kitchen, clothes accidentally catching fire while working in kitchen and rarely burns occurring during sleep in case of persons intoxicated by drug or alcohol, going to sleep with lighted cigarettes.

Copeland AR (1985), a study of self-immolation or suicidal fire deaths was performed on the case of files of the office of the Medical Examiner of Metropolitan Dade County in Miami, Florida. Majority of our day-to-day experiences are females.

Strain and stress of modern life and dowry problems account for more number of suicidal deaths in case of females. According to Mason S, Hillier VF (1993), the thermal injury, personal and social factors affecting the short-term outcome responses of thermally injured children under five years age and their mothers are reported. The study has been undertaken to investigate the histopathological changes of liver and adrenals at various survival period. A total of 60 cases were studied and 51 subjects died with deep burns and the rest with superficial burns. Of this 7 subjects died immediately and rest had varied period of survival from 1 to 28 days.

MATERIALS AND METHODS

The duration of study was 1 year and was conducted at Government Medical College, Kozhikode. In the study, 60 cases of death due to burns from fire was studied during the period. Histopathological changes occurred in the organs (Liver and adrenals) of all the 60 cases were noted, the changes noted in these organs in the case of immediate deaths and subsequent deaths were noted and grouped into 6 grades according to the period of survival. In cases in which death was not immediate and being admitted to the hospital, the details of treatment were also noted after perusal of their case sheets.
OBSERVATION AND RESULTS

During the period, 60 cases of burns deaths were studied. Of these 60 cases 39 deaths were suicidal comprising 65%, 20 accidental comprising 33.33% and 1 case was homicidal constituting 1.67% (Shown in Fig. 1).

Majority of subjects were females (46/60) comprising 76.67% of the subjects and rest were males (14/60) comprising 23.33% (Shown in Fig. 2).

Regarding period of survival, of these 60 cases 7 subjects died immediately (11.67%), i.e. brought dead cases, 17 subjects died within 1-hour to 24-hours (28.34%); 21 subjects died within 1 day to 7 days (35%), 11 subjects died within 8 days to 14 days (18.33%), 2 subjects died within 15 days to 21 days (3.33%) and 2 subjects died within 22 to 28 days (3.33%) as shown in Table 1.

Histopathological changes of internal organs, liver and adrenals were studied at various period of survival and grouped into VI groups, i.e. changes during immediate death, changes during 1-hour to 24-hours, changes during 1 day to 7 days, 8 days to 14 days, during 15 days to 21 days and changes during 22 to 28 days of survival.

Depending upon the severity of the histopathological changes of the organs, each organ changes were graded into Grade I (Mild degree changes), Grade II (Moderate degree of changes), Grade III (Severe degree of changes), Grade IV (Very severe degree of changes) shown in Table 2.

In the case of immediate death in Grade I, 1+ to 3+ were considered. In Grade II, 4+ to 6+ were considered. In Grade III, 7+ to 9+ and in Grade IV 10+ to 12+ and above are considered. In the case of other five groups in Grade I 1+ to 4+, in Grade II 5+ to 8+, in Grade III 9+ to 12+ and in Grade IV 13+ to 16+ and above were considered.

Regarding histopathological organs, i.e. liver and adrenals, in case of immediate death, liver showed 72.73% of Grade I and 27.27% of Grade II changes whereas adrenals showed 100% of Grade I changes (Table 3).

Table 1: Period of Survival

<table>
<thead>
<tr>
<th>Period of Survival</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immediate death</td>
<td>7</td>
<td>11.67</td>
</tr>
<tr>
<td>1 hour to 24 hours</td>
<td>17</td>
<td>28.34</td>
</tr>
<tr>
<td>1 day to 7 days</td>
<td>21</td>
<td>35</td>
</tr>
<tr>
<td>8 days to 14 days</td>
<td>11</td>
<td>18.33</td>
</tr>
<tr>
<td>15 days to 21 days</td>
<td>2</td>
<td>3.33</td>
</tr>
<tr>
<td>22 days to 28 days</td>
<td>2</td>
<td>3.33</td>
</tr>
</tbody>
</table>

Table 2: Histopathological Changes

<table>
<thead>
<tr>
<th>Organ</th>
<th>Histopathological Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liver</td>
<td>Portal oedema, Portal haemorrhage and congestion, Sinusoidal congestion, Focal necrosis, inflammation</td>
</tr>
<tr>
<td>Adrenals</td>
<td>Cortical and medullary haemorrhage and oedema, Focal necrosis, Capsular haemorrhage and oedema</td>
</tr>
</tbody>
</table>

In case of adrenals showed 88.24% of Grade I and 11.76% of Grade II changes (Table 4).

Considering the period of survival 1 day to 7 days, histopathological changes of liver showed 66.67% of Grade I changes and 33.33% of Grade II changes (Photo 2, Photo 3). While adrenals showed 80.95% of Grade I and 19.05% of Grade II changes (Photo 4) Table 5.

Regarding period of survival 8 to 14 days, histopathological changes of liver showed 72.73% of Grade I and 27.27% of Grade II changes, whereas adrenals showed 100% of Grade I changes (Table 6).

Histopathological changes of organs during the period of survival 15 to 21 days, liver showed 100% of Grade II changes and adrenals showed 50% of Grade I and 50% of Grade II changes (Table 7).

In case of histopathological changes of organs during the period of survival 22 to 28 days, liver showed 100% of Grade II changes, while adrenals showed 50% of Grade I and 50% of Grade II changes (Table 8).

Table 3: Histopathological Changes of Organs - Grading Immediate in Death

<table>
<thead>
<tr>
<th>Organs</th>
<th>Grade I 1+ to 3+ (Mild)</th>
<th>%</th>
<th>Grade II 4+ to 6+ (Moderate)</th>
<th>%</th>
<th>Grade III 7+ to 9+ (Severe)</th>
<th>%</th>
<th>Grade IV 10+ to 12+ &amp; Above (Very Severe)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liver</td>
<td>5</td>
<td>71.42</td>
<td>1</td>
<td>14.29</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>14.29</td>
</tr>
<tr>
<td>Adrenals</td>
<td>7</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 4: Histopathological Changes of Organs - Grading in Period of Survival 1 to 24 hrs.

<table>
<thead>
<tr>
<th>Organs</th>
<th>Grade I 1+ to 3+ (Mild)</th>
<th>%</th>
<th>Grade II 4+ to 6+ (Moderate)</th>
<th>%</th>
<th>Grade III 7+ to 9+ (Severe)</th>
<th>%</th>
<th>Grade IV 10+ to 12+ &amp; Above (Very Severe)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liver</td>
<td>10</td>
<td>58.82</td>
<td>7</td>
<td>41.18</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Adrenals</td>
<td>15</td>
<td>88.24</td>
<td>2</td>
<td>11.76</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 5: Histopathological Changes of Organs - Grading in Period of Survival 1 Day to 7 Days

<table>
<thead>
<tr>
<th>Organs</th>
<th>Grade I 1+ to 3+ (Mild)</th>
<th>%</th>
<th>Grade II 4+ to 6+ (Moderate)</th>
<th>%</th>
<th>Grade III 7+ to 9+ (Severe)</th>
<th>%</th>
<th>Grade IV 10+ to 12+ &amp; Above (Very Severe)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liver</td>
<td>14</td>
<td>66.67</td>
<td>7</td>
<td>33.33</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Adrenals</td>
<td>17</td>
<td>80.95</td>
<td>4</td>
<td>19.05</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
Organs | Grade I 1+ to 3+ (Mild) | % | Grade II 4+ to 6+ (Moderate) | % | Grade III 7+ to 9+ (Severe) | % | Grade IV 10+ to 12+ & Above (Very Severe) | %
---|---|---|---|---|---|---|---|---
Liver | 8 | 72.73 | 3 | 27.27 | 0 | 0 | 0 | 0
Adrenals | 11 | 100 | 0 | 0 | 0 | 0 | 0 | 0

Table 6: Histopathological Changes of Organs - Grading in Period of Survival 8 to 14 Days

Organs | Grade I 1+ to 3+ (Mild) | % | Grade II 4+ to 6+ (Moderate) | % | Grade III 7+ to 9+ (Severe) | % | Grade IV 10+ to 12+ & Above (Very Severe) | %
---|---|---|---|---|---|---|---|---
Liver | 0 | 0 | 2 | 100 | 0 | 0 | 0 | 0
Adrenals | 1 | 50 | 1 | 50 | 0 | 0 | 0 | 0

Table 7: Histopathological Changes of Organs - Grading in Period of Survival 15 to 21 Days

Organs | Grade I 1+ to 3+ (Mild) | % | Grade II 4+ to 6+ (Moderate) | % | Grade III 7+ to 9+ (Severe) | % | Grade IV 10+ to12+ & Above (Very Severe) | %
---|---|---|---|---|---|---|---|---
Liver | 0 | 0 | 2 | 100 | 0 | 0 | 0 | 0
Adrenals | 1 | 50 | 1 | 50 | 0 | 0 | 0 | 0

Table 8: Histopathological Changes of Organs - Grading in Period of Survival 22 Days to 28 Days
DISCUSSION

In this study, histopathological changes of various internal organs like liver and adrenals in burn deaths during different period of survival were studied. Of these sixty cases, seven subjects died immediately. Histopathological study of liver showed 71.42% of Grade I, i.e. mild degree changes of portal oedema and haemorrhage, necrosis and sinusoidal congestion and the rest of the percentage showed 14.29% of Grade II (Moderate degree) and 14.29% of Grade IV of liver changes, i.e. Very severe degree changes of portal oedema, haemorrhage and sinusoidal congestion. According to Rink RD et al (1985),3 stagnant hypoxia has been suggested as a significant factor underlying acute liver disease following thermal injury; whereas adrenals showed 100% changes of Grade I, i.e. mild degree of cortical and medullary haemorrhage, oedema, focal necrosis and capsular haemorrhage. These findings are due to acute adrenal insufficiency as stated by Murphy JF et al (1993).4

During the period of survival, 1 hour to 24 hours, liver show 58.82% of Grade I histopathological changes and the rest of the percentage showed Grade II changes. These findings are similar to the study of Czaja et al (1975), and states that hepatic dysfunction occurs early during the post injury curve in approximately 60% of burn patients. Zaets TL (1983),5 studied the structural and enzymatic disorganization of biological membranes in rat liver cells in thermal burns and found that permeability of cell and lysosomal membranes was demonstrated to be disordered within the first hours after burn.

Adrenal changes include 82.24% of Grade I and rest of the percentage showed Grade II changes, i.e. mild and moderate degree of cortical medullary haemorrhage and oedema and capsular haemorrhage.

Similar to study of J. B. Walter and L. C. Talbot (1996), adrenal necrosis sometimes accompanied by haemorrhage may complicate shock and acute adrenal insufficiency may contribute to death.

During the period of survival 1 day to 7 days of burns death, liver showed 66.67% of Grade I mild degree changes like portal haemorrhage, congestion and sinusoidal congestion. Similar to study of Chen YS, Li N et al (1985).6 The rest of the percentage includes Grade II changes. Here adrenals showed 80.95% of Grade I and rest of the percentage showed Grade II changes, i.e. more percentage of mild degree cortical and medullary haemorrhage oedema and capsular haemorrhage. Vijay Kumar et al found adrenal haemorrhage in 27.5% of cases of death due to burn.

Regarding period of survival, 8 days to 14 days, histopathological study of liver showed 72.73% of Grade I changes slightly higher than the period of study of 1 to 7 days, rest of the changes belongs to Grade II changes. These findings are similar to study of Lamlinais PC, Panke TW (1979).8 In case of adrenals showed 100% of Grade I mild degree changes.

During the period of survival, 15 days to 21 days, histopathological changes of liver undergoes 100% of Grade II (Moderate degree changes). But adrenal changes are 50% each of Grade I and Grade II changes. Findings as stated Saakov BA, Bardakhch’ian EA (1978).9

Lastly during the period of survival, 22 days to 28 days, histopathological study of liver showed 100% of Grade II changes (Moderate degree) and adrenals showed 50% each of Grade I and Grade II. These findings are due to adrenal insufficiency as stated by Murphy JF et al (1993) and Hesman Y, Rentzhog L et al (1976).10

From this study the histopathological changes of liver Grade I, i.e. mild degree changes are more prominent in the early period of survival and during the immediate death; whereas when the period of survival increased from above two weeks, liver undergoes moderate degree of changes and most of the people died along with early cirrhotic changes of liver.

At various period of survival, adrenal changes are limited to mild and moderate degree. In immediate death and at early period of survival, adrenal undergoes mild degree changes. But when period of survival increased, adrenals undergoes mild and moderate degree of changes. Thus when the period of survival increased the intensity and degree of changes of adrenals varied in burns and people died due to acute adrenal insufficiency.

REFERENCES