A case study of death due to burn

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Abstract

Injuries due to burns are known to have a very high mortality rate. Burn injuries occur due to a variety of thermal, electrical, mechanical products and can be accidental, suicidal or even homicidal in nature. As the inquiry and research are limited to identifying patterns and causes for burns, the accurate originator and mechanisms are not clearly known. Herein we are going to discuss a case report of 18 years unmarried female was the victim of accidental burn in domestic affair when she was preparing morning meal in the kitchen for her family.

Introduction

Thermal death are those which result from the effect of systemic and/or localized exposure to excessive heat and cold.[1] Burn injuries have been a major cause of concern since prehistoric days to the present era of modern medicine.[2] The general belief that burn usually occur at the two extremes of age, indicating the accidental nature of infliction does not hold true as reported by Martin A Crore et al[3] and LPH Leenan et al[4] who described involvement of mean age of 30 and 28 years, respectively. [5] Fire and burn injuries are second only to motor vehicle accident as the leading cause of death in children of ages 1-4 years in US. Severe burns are considered the most catastrophic injury a person can survive, resulting in disfigurement, pain, emotional stress and tremendous economic cost Burn are injuries to the tissue caused by heat, friction, electricity, radiation or chemicals.[6] A scald is a type of burn injury caused by application of hot liquids or gases, i.e. moist heat. Application of water of 50^0C at vulnerable part will cause scald.[7, 8] The usual circumstances under which a person sustains burn injuries are catching of fire by clothes worn by victim while doing household chores like cooking on a gas stove or kerosene oil stoves.[9]

Etiological factors of fire injury

1. Faulty installation of fire suppression system in industry.
2. Careless throwing of un-burnt portion of a cigarette butt.
3. Carelessness in kitchen during cooking.
4. Playing with fire matches by children.
5. Faulty electric wiring in house and office building.
6. Stock piling flammable chemical materials in warehouses.
7. Faulty gas cylinder in CNG vehicles.
8. Household faulty LPG cylinders.
9. Carelessness in during job.
10. Enmity between rivals.

Classification of burn: Depuytrens classification

(a) 1st degree burn: In this burn, affected part is red and erythematous.

(b) 2nd Degree burn: The epidermis is involved. There is blister contain serous fluid, rich in protein and chloride. These are very painful and if extensive; also produce hypovolemic shock.

(c) 3rd Degree burn: The epidermis is completely destroyed with involvement of dermis. This variety is extremely painful.

(d) 4th Degree burn: Total destruction of true skin.

(e) 5th Degree burn: The depth of the lesion extends up to the subcutaneous tissue. These are less painful.

(f) 6th Degree Burn: The lesion extend deeper than the subcutaneous tissues, involving the muscles and bones. Painless due to destruction of nerve endings. Heals with much difficulty with contracture formation.

Modern[10] or Clinical[11] Classification:

a) Superficial burn: Involving epidermis
b) Deep burn: The lesion involves the whole depth of the true skin and deeper.

The estimation of body surface area involved: To estimate the body surface area involved, "Rule of Nines", given by Alexander Wallace, is practice clinically for calculating the amount of fluid. For calculating the approximate percentage of body surface area involved in children in practice "Rule of Five" is simpler. For calculating percentage in case of scattered burn injuries, 'Palm Rule' has been found handy.[12]

Mechanism of death in fires

Interference with respiration owing to a reduction in environmental oxygen &/or the production of CO and other toxic substances.

Inhalation of heat leading to laryngospasm, bronchospasm and so-called 'Vagal inhibition' and cardiac arrest.

Exposure to extreme heat and shock

Trauma

Exacerbation of pre-existing natural disease due to burns.[13]

Case presentation

The history was given by police and father of the deceased as follows:

The case was referred from Shahbagh Thana GD No- 635 dated 12/06/2017. The deceased Asma Akhter, 18 years age,daughter of Md. Shahbuddin Hawlader, Vill-Dalalpur, P/S Borhanuddin, Dist- Bhola.

According to the statement of deceased father she was working in kitchen to prepare breakfast on 11/05/2017 at 7.30 am, accidentally fire caught on her clothes of the body but she could not realize immediately due to extreme cold weather. When she felt, fire caught severely on her body. She started shouting. The house owner rushed there immediately and took her to the bathroom and poured water on her body then she was taken to Bhola Sadar hospital, was treated there primarily with intravenous fluid, analgesic, antibiotic, silver sulphadiazine, oxygen.

After some while her condition was deteriorated and then she was transferred to Dhaka Medical College Hospital and admitted at burn unit, bed no. F-06, Room No.-206, 1st floor. But she died at 06:45PM on 12/06/17. Sub-Inspector of police Mr. Azizur Rahman prepared her inquest report and the body was identified by Md. Ramzan Ali, constable no-11220 on 13/06/2017 at 9:30AM in DMC Morgue.

The body was received at 10:30AM and postmortem was performed at 11:05AM on 13/06/2017 after completing PM Examination the body was sutured and reconstructed properly and handed over to legal authority.

Figure 1: Photography of extensively burned body of the deceased female with whole body covered with surgical bandage.

General examinations

Body-built-average
Body length (crown-heel) – 150 cm;
Rigor Mortis- was full blown & found all over the body
Mouth was closed
Eyes were closed

External injury Burn of various degrees was present from face to toe on both sides covering anterior and posterior aspects. According to the "Rule of Nines" about 80% of the total body surface area was found burnt. Here, calculation of "Rule of Nines"- Head and neck 9%; each upper limb 9%; front of each lower limb 9%;back of each lower limb 9%; front of chest 9%;back of chest 9%;front of abdomen9%;and back of abdomen9%,99% of the body. The remaining one percent is for the external genitalia.

Internal examination

Head:-

- Scalp - Normal
- Skull - Intact
- Meninges - were healthy
- Brain – was edematous and congested
- Mouth and Tongue - Oral mucosa was congested.

The victim had got 32 teeth, 16 in each jaw.

Neck:-

• Larynx and Trachea were congested contain carbon soot particles.

Chest:-

• Lungs were edematous, congested and on cut section-serosanguinous fluid came out.

Pericardium, Heart and Blood vessels: - The pericardium was healthy, the coronary arteries were patent. Myocardium was unremarkable. There was no incompetency of the heart valves. There were post mortem clots in all heart chambers.

Abdomen:-

• Stomach – Congested and contained liquid food materials.
• Liver – Liver was congested and the gall bladder
• Kidneys - Were congested
• Pancreas - Congested
• Spleen - Was soft and flabby
• Urinary bladder - was healthy and empty

Organs of generation-Uterus was non pregnant

Cause of death

In my opinion death was due to hypovolemic shock followed by burn wound (80%) which was ante mortem.

Discussion

Prior to given opinion about the cause of death we have to consider the following factors:

i) Identification of the deceased
ii) The cause and mechanism of death
iii) Circumstances of death.
iv) Interpretation of spurious wounds in burns
v) Volitional activities of the victim
vi) Category of hurt

Identification of the deceased

The question of identification may arises when the identification of the deceased may not be possible by simple procedure like finger print, then the others laboratory procedure could be considered, like DNA profiling from denture, bones etc. In this case identification of the deceased was not problem because body was not disfigured. The deceased was identified by her father.

The cause and mechanism of death

The deceased had not any natural disease nor any injury supporting assault. Therefore death was not due to natural disease or other method of violence.

The victim did not die immediately following burn. Therefore, death was not due to neurogenic shock resulting intense pain.

There was no edema of the larynx or epiglottis to such a level that may cause air way obstruction.

Following extensive burn, there was profuse plasma loss from the burnt surface which may lead to hypovolemic shock. In such a case the victim may die within 48 hours. As a complication of burn, sepsis is the most important factor in deaths occurring four to five days or longer after burning.

Circumstances of death

In this case no motive was found because victim had not any domestic worries, disappointment in love or suffering from any form of acute or chronic disease

In this case, there was no history of threatened to victim by anyone or throwing of petrol on the body of victim. So homicidal burn injury was excluded.

Accidental burn are common in cases like epileptic patient and children and very old person.

In this case, clothes catches fired when the victim was preparing her family breakfast.

Interpretation of spurious wounds in burns

Heated skin contracts markedly and splits often appear. This may lead inexperienced observers to suspect that ante mortem wound have been inflicted, the fire being used to cover up a criminal offence.[14] In this case no such heat rupture wound was found. This case was clean cut burn.

Volitional activities of the victim

With the clothes and the body surface burning, the victim could shout and run to some distance. She could have talked as her vocal apparatus was not damaged and she was not unconscious.

Category of hurt

This victim had 80% (approx.) of total body surface burnt. It is considered necessarily fatal injury

Conclusion

Here in this case as per inquest report I found that the victim was burned when she was working at kitchen. She was under treatment at burn unit in the hospital. According to the circumstantial evidence there was not any reason of suicide and no history of previous attempt of self-harm. So, from post-mortem findings and circumstantial evidences I suggest that death was due to hypovolemic shock as a result of burn which was ante mortem.

References

1. Narayan Reddy KS. The essential of Forensic Medicine and Toxicology, 34th ed. (2017).pp.295
2. Mahanta P. Fatal burn injuries in accidental vehicular crush: A medico legal study. J Indian Acad Forensic Med. 2010; 32(1):66-9.
3. Crore MA, et al. Epidemiology of motor vehicular accident, JAMA. 1992; 981:210.
4. Leenan LPH, et al. Internal Fixation of open unstable pelvic fractures. J Trauma. 1993; 35(2):220-25.
5. Herndon DN. Total Burn Care. London, WB Saunders.1996.
6. Mahanta P. Modern text Book of Forensic Med. & Toxicology, 1st ed. (2014).pp.309.
7. Bull JP. Burns. Postgrad Med J.1963; 39:717-25.
8. Polson CJ, Gee DS, Knight B. The Essential of Forensic Medicine, 4th ed. Pergamon Press, UK. 1985. pp.271-350.
9. Narayan Reddy KS. The essential of Forensic Medicine and Toxicology, 34th ed. (2017). pp. 309-10.
10. Nandy A. Nandy's Hand Book of Forensic Med & Toxicology, 1st ed. (2013). pp.264.
11. Narayan Reddy KS. The essential of Forensic Medicine and Toxicology, 34th ed. (2017). pp.298
12. Mahanta P. Modern text Book of Forensic Med. & Toxicology, 1st ed. (2014).pp.311.
13. James JP, et al. Simpson's Forensic Medicine 13th ed. (2011). pp.174.
14. Knight B. Forensic Pathology, 1st ed. (1991).pp. 286.