

## A Case of Death with 100% Burn Injury Due to Blast of Furnace in a Metal Industry from Raigarh, (C.G.)

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### Abstract

Autopsy examination of 100% burn is one of the most critical case that is encountered in medico-legal practice. At the same time burden to fix the identity of the victim lies on the autopsy surgeon in such cases. To exonerate any false positive or false negative inference, the concerned autopsy surgeon must be very cautious during examination. Preservation of articles during autopsy is very essential to avoid future disputes.

**Keywords:** Burn; Medico-Legal Practice; Autopsy; Identity; Articles.

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### Brief History

An average built male aged around 34 years, while working in a metal industry died due to 100% burn injury caused by furnace blast on 02-09-2017 at Raigarh, Chhattisgarh. As per police inquest report the above mentioned incident had happened when the deceased was working in Metal Industry (Iron) furnace plant around 3.40PM. The body of the deceased was brought to K.G.H. mortuary and Post-Mortem examination was conducted at 7.30 P.M. on same day after receiving written approval of S.D.M. Raigarh (C.G.).

### External Autopsy Findings:

1. Remnants of burnt clothings with metallic buttons were present at places, body smudged with dust and soil at places all over, multiple fine metallic particles were found at places all over the body. One rubber glove smudged with dust and metallic particles found in right hand.

2. Whole body was burnt and greyish blackish in appearance.
3. Eyes were closed, cornea hazy.
4. Mouth was open, tongue visible, protruded and clenched between teeth.
5. Teeth were visible and inside the mouth.
6. Face was swollen, burnt, distorted and not identifiable, face smudged with dust and fine metallic particles.
7. Body was in typical pugilistic attitude (upper limbs held out in front of body and flexed at elbow and wrists, fingers of both hands flexed in claw like position, lower limbs flexed at knee and hip, arching of body backwards).
8. Reddish fluid was coming out from mouth.
9. Both nostrils were filled with greyish blackish dust and metallic particles.
10. Dermo-epidermal to deep burns present all over the body.
11. Peeling of skin present at places all over the body.
12. Multiple small blisters were present at places all over the body.
13. Scalp hairs present at places all over the scalp.
14. Scalp, axillary and pubic hairs were singed and blackish.
15. Gloving and stocking of skin of hand and feet present.
16. Penis and scrotum were burnt and swollen.

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A[1]  
A[2]  
(A[1]= Scene of accident from long range, A[2] = Position of the dead body at accident scene)

Fig. 1: Pictorial Description of Scene of Accident

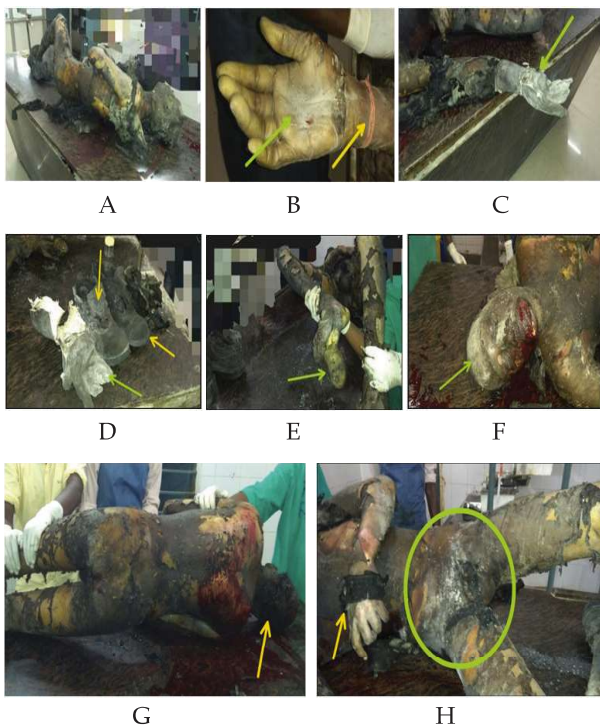


Fig. 2: Pictorial Depiction of External Autopsy Findings

A= Body showing 100% burn with typical pugilistic attitude, B= Palm of the hand contains deposition of metallic particles and red thread in wrist, which helps in identification, C=Shining metallic particles deposition on safety gloves, D=Deposition of metallic particles on shoes and gloves, E= Degloving of skin of foot, F= Diagram showing destructed facial structures along with deposition of metallic particles on head and face, G= Diagram showing back of the body with singed scalp hair and peeled off skin all over, H= Pubic region showing deposition of metallic particles along with burnt penis and scrotum, arrow mark showing remnants of burnt clothings in left hand.



I= Arrow mark showing congested scalp, J= Deposition of carbonaceous soot particles in trachea and larynx.

Fig. 3: Pictorial Depiction of Internal Autopsy Findings

#### Internal Autopsy Findings-

All the internal organs were-

1. Intact.
2. Congested.
3. Stomach contains undigested semisolid food material about 500 gms with acidic smell.

#### Preservation

1. Blood preserved for-
  - a. Blood grouping (2 ml. in a EDTA vial).
  - b. Chemical analysis (25 ml. in a small bottle).
2. One molar teeth preserved for DNA analysis (if required)

#### Discussion

Thermal injury is injury to body resulting from localized or generalized exposure to extremes of temperature resulting in tissue destruction. In India there are several thousands of deaths occurring due to fire/burns and vast majority of these cases occur in the live. Burns may be divided pathologically or clinically. However most popular classification was by a French Surgeon Dupuytren Guillaume in 1832, who classified them in six degrees. Later Wilson and Von Hebra merged them into three degrees. To some extent the degree of burns can be estimated by clinical assessment i.e. naked eye examination. More precisely degree (depth) of burn can be measured by a high frequency ultrasound device. Other techniques include biopsy and microscopy, dye differentiation and fluorescence, fluorescent fluorometry, LASER doppler flow metry (Micro Radiography), light reflectance, MRI, Radioactive isotopes and thermography but each has severe limitations for practical application.

Thermal injuries are commonly encountered in forensic practice and sometimes provide a challenging problem in cases, which may have serious criminal aspects. The body may present a wide range of damage from mere reddening over wide areas to almost total cremation in which search may have to be made at the scene of the fire to collect or even discover the remnants. At  $> 70^{\circ}\text{C}$  exposure burn is instantaneous.

Death due to Industrial accident is one of the important incident in the segments of unnatural death investigation, since in this category of death investigation, several aspects are evaluated viz. Identity of the victim, Negligent act on the part of the victim or not, Negligence on the part of the owner or the operator of the plant. Even in the U.S. Department of Labor report (1942) [1] had acknowledged the fact of danger of burns from the molten metal. Even Suresh (2014) [2] had discussed the grounds for different types of fatalities in an existing steel plant blast furnace capacity of 0.6 MTPA (Metric Ton Per Annum) which produce around 1000 ton of hot metal known as pig iron daily. In Indian scenario death and casualties due to accident in Iron industry can be referred from the incidents of Bokaro Steel Plant [3], Keonjhar sponge iron plant [4] and Visakhapatnam Steel Plant [5]. Melting point of Wrought Iron, Gray Cast Iron, Ductile Iron, Steel are  $1482-1593^{\circ}\text{C}$  [6],  $1127-1204^{\circ}\text{C}$  [6],  $1149^{\circ}\text{C}$  [6] and  $1371^{\circ}\text{C}$  [7] respectively. So considering the crime scene report as submitted by the Law Enforcing Agency (i.e. Police), deceased meet with an accident while working in a Metal Plant (Iron). Coupling this information with the melting point of Iron or associated alloys and  $> 70^{\circ}\text{C}$  exposure burn is instantaneous. Therefore the death was also instantaneous. With an object to exonerate any kind of foul play blood of the deceased was preserved. In the same line of action with an object to exonerate the future problem regarding identity of the deceased 3rd Molar teeth was preserved because in air accidents, burned and putrefied bodies dental pulp tissue could be obtained in most cases from materials obtained under experimental conditions and from forensic casework [8]. Even Madhya Pradesh High Court at Jabalpur in Ashok Dubey (Dr.) V. State of M.P., [9] had criticized the concerned autopsy surgeon for perfunctory autopsy coupled with non preservation of viscera.

## Conclusion

Since as per police report the deceased had died while working in iron plant and P.M. finding also shows the deposition of metallic particles in different bodily parts as well as in wearings of the deceased (vide photographs B, C, D, E, F, H) on this basis knowledge about temperature of molten iron is needed to be co-related with the injury of the deceased. With an object to exonerate any foul play the body of the deceased should be photographed from different angles prior to autopsy for pictorial depiction. Meticulous autopsy should be performed. Body fluids for laboratory analysis and biological evidence for D.N.A. fingerprinting should also be preserved.

## References

1. Injuries and Accident Causes in the Foundry Industry, 1942; Bulletin No- 805, Bureau of Labour Statistics, United States Department of Labour, pg-12, internet source: [https://fraser.stlouisfed.org/files/docs/publications/bls/bls\\_0805\\_1945.pdf](https://fraser.stlouisfed.org/files/docs/publications/bls/bls_0805_1945.pdf) accessed on 26-02-2017.
2. R. Suresh, M. Sathyanathan, K. Visagavel, M. Rajesh Kumar (2014); Risk Assessment for Blast Furnace Using FMEA, International Journal of Research in Engineering and Technology; 2014 June;03(Special Issue: 11):27-31.
3. Nine technicians killed, 23 injured in Bokaro steel plant blast; <https://www.indiatoday.in/magazine/indiascope/story/19810430-nine-technicians-killed-23-injured-in-bokaro-steel-plant-blast-772869-2013-11-21> accessed on.
4. 13 injured in Keonjhar sponge iron plant blast, <http://www.newindianexpress.com/states/odisha/2017/oct/14/13-injured-in-keonjhar-sponge-iron-plant-blast-1673722.html>.
5. Accident in blast furnace raised several questions; <http://www.thehindu.com/news/cities/Visakhapatnam/accident-in-blast-furnace-raises-several-questions/article3379616.ece>.
6. [https://www.engineeringtoolbox.com/melting-temperature-metals-d\\_860.html](https://www.engineeringtoolbox.com/melting-temperature-metals-d_860.html).
7. [https://eaglesteel.com/wp-content/uploads/2016/04/Melting\\_Points\\_of\\_Various\\_Metals.pdf](https://eaglesteel.com/wp-content/uploads/2016/04/Melting_Points_of_Various_Metals.pdf).
8. L. Pötsch U. Meyer S. Rothschild P. M. Schneider Ch. Rittner; Application of DNA techniques for identification using human dental pulp as a source of DNA, International Journal of Legal Medicine, 1992 May;105(3):139-43.
9. 1980 Jab LJ 250: 1980 M.P.L.J. 300: Law Finder Doc Id # 747644.