Case Report

An Unusual Fatal Crushing of Worker in Paddle Mixer of Chemical Fertilizer Manufacturing Industrial Unit

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A peculiar case of crushing injuries by compression of the body of a worker in a Paddle mixer machine used for mixing the raw material in a Chemical fertilizer production Industrial unit. Crushing injuries in mixer machine are relatively less in frequency of occurrence. This case is peculiar in the sense that the complete body was crushed into pieces involving bones of skull, pelvis, spine and all limbs. The patterns of injuries were also unusual because though it was caused by compression by rotating blades having a large surface area, the appearance of injuries were also altered by the raw material present in the machine admixed with the injuries. The workers engaged in working place with any sort of industrial machinery, there is always a potential risk of injuries or death in the event of an accident, so workers need to ensure that they must operate the machine in specified correct manner and not to divulge the safety precautions.

Key Words
Fatal industrial accident, Crushing injuries, Autopsy in industrial death, Industrial safety and precautions.
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A peculiar case of crushing injuries by compression of the body of a worker in a Paddle mixer machine used for mixing the raw material in a Chemical fertilizer production Industrial unit. Crushing injuries in mixer machine are relatively less in frequency of occurrence. This case is peculiar in the sense that the complete body was crushed into pieces involving bones of skull, pelvis, spine and all limbs. The patterns of injuries were also unusual because though it was caused by compression by rotating blades having a large surface area, the appearance of injuries were also altered by the raw material present in the machine admixed with the injuries. The workers engaged in working place with any sort of industrial machinery, there is always a potential risk of injuries or death in the event of an accident, so workers need to ensure that they must operate the machine in specified correct manner and not to divulge the safety precautions.

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Introduction

The deaths at industrial work place are not uncommon. During 2014, the total number of death by factory/machine accidents in India was 797. The top 10 states/UT’s accounted for accidental deaths in industries were Gujarat, Rajasthan, Madhya Pradesh, Maharashtra, Uttar Pradesh, Tamil Nadu, Chhattisgarh, Punjab, Haryana and Delhi in descending order[1]. The most common reason for such accidental deaths in industries were lack of adequate care and safety precautions while handling such machinery resulting in fatal injuries. Reporting herewith, an unusual case of fatal crushing of a worker in Paddle mixer of a chemical fertilizer industry, which vigorously mixes various raw materials. In this case, apparently, the deceased worker had not taken proper precautions while on work, resulted in accidental fall in mixer, spin inside it, got severe tearing and crushing of the body parts leading to instantaneous death. Such complete crushing of the body into small pieces is a very rare incidence.

Case History

The victim worker was a 38 year old male, working in a small scale industrial unit dealing with production of chemical fertilizers like DAP, Urea etc (fig.-7). There were no eyewitnesses who actually observed how the victim was trapped within the machine and had his body crushed.

Figure1- Gunny bag containing body parts
However, co-worker gave testimony that when the machine suddenly stopped rotating though the machine was “on”, he inspected & found the stuck human body parts in the blades of the Paddle mixer machine obstructing the normal functioning of machine. It was evident that, the victim’s body was jammed in the machine, who was working alone near the mixer machine.

**fig.2- On opening the bags, body parts mixed with raw materials**

Co-workers found that the victim hadn’t been wearing any safety headgear in the form of a helmet and even not maintained the proper distance from the mixer machine. The probable sequence of events reconstructed after the visit to the scene of incidence by the authors was that the left Lower limb of the victim got entangled with the greenish thread (fig.-4) and the deceased suddenly fall over the open / uncovered portion of paddle mixing machine which was in running mode. The Paddle mixing unit (fig.-8) is a large horizontally placed mixer having 12 feet long, 2.5 feet wide and 2 feet deep iron metallic box like structure having two rods on which blades are fitted in a spiral fashion.

**Fig.4- Antemortem wound of left leg**

Each blade is 8” long and is obliquely placed the blades are thick and are not sharp and moves in divergent fashion so that the raw material is properly mixed and pushed forward. The mixer has openable top cover which must be kept covered in all situations; however in this case the middle part of covering area of 6 feet was open. Due to the loud noise of these machines like mixer and dryers, the co workers couldn’t hear any call for help and when they rushed to inspect suddenly non-functioning mixer, till that time the deceased already had received the fatal crushing of body parts. The whole body was crushed into small pieces and even mixed with the raw material.

**Autopsy Findings**

The two gunny bags were brought by police, containing the crushed body pieces (fig.-1).
The pieces were of human as few larger size body parts were completely bearing the anatomical & morphological characteristics of male human. The torn clothes were mixed with body parts and the raw material i.e. grayish whitish irregular mixed size granules measuring from less than 1mm x 1mm to 0.8 cm x 1cm (fig.-2).

**Fig.5- Antemortem wound of left arm lower third**

The limbs were crushed to pieces. The scalp, face, neck was not identifiable as bones were completely crushed and tissues were torn and severed irregularly. Initially the clothes were identified and separated. The body parts were washed vigorously with water. One greenish nylon thread, routinely used for stitching the pre-filled bag, was found entangled in the left foot great toe and second toe and crushed upper part near the left knee (fig.-4).

**Fig.6- Antemortem wound of left part of lower jaw**

It was 240cm long. The injuries over body parts showed mixed pattern of cuts and stretch lacerations, fractures of the underlying bones to pieces and most of the wounds did not show any vital reaction or blood staining. On careful observations, injuries of following body parts (fig.4-6) showed blood infiltrations in the tissues i.e. the left leg in its lower one third, the left arm near elbow joint, the right forearm and left part of lower jaw, indicating their occurrence before the death. The opinion as to the probable cause of death was shock due to multiple crush injuries.

**Discussion**

A crush injury occurs when a body part is subjected to severe degree of sustained force or ressure, usually after being trapped between two heavy objects or hard surfaces [2]. Crush injuries are produced by static or quasi-static applied forces, which are defined as those that occur over a longer period of time (>200 ms) and are applied over a large area (as opposed to a point). Crush injuries are usually described in the context of industrial accidents & road traffic accidents [3]. However, various other case reports have described compressive injuries to head and or thorax and abdomen are as in various other scenarios. Crush injuries in natural disasters, such as earthquakes, have been described, but these situations are uncommon in clinical practice.
Takeshi et al [4] have reported seven cases of crushing head injury out of which one patient had sustained crushing of the head by a press machine and the said patient expired after 4 days. Multiple temporal and parietal bone fractures have been observed in the said patient.

**Fig. 7 Industrial production process unit diagram**

Russell and Schiller [5] have carried out clinical and experimental observations on crushing injuries to the skull in which, bi-temporal compression of the head was experimentally shown to produce a bilateral narrowing and antero-posterior elongation of the skull. Clinical cases described by them included case of head being caught between hutches, head crushed by fall of rock in mine, head crushed between railway carriages, head crushed between backing lorry and wall, head crushed between two motor vehicles, head crushed under the axle of a motor vehicle, head crushed under an overturned lorry, head crushed under oil drums, head crushed under several 100-lb. Shells and head crushed under gun-wheel. In these cases, transverse fracture of the base of the skull was observed, running in the direction of the compression.

However the crushing to such multiple pieces is rarely seen and is rarely reported. Medico-legally such cases are important and need proper identification of antemortem wounds, their distribution on body and presence of any natural disease (that may cause giddiness, fall or even death). In the present case, most of the antemortem wounds were situated on left side, indicating the person had fall on his left side. From autopsy finding, it appeared that the diseased might have fall in the moving machine either while using as short cut or due to accidental entangling with green packing thread in his left foot toes. As the organs were crushed to pieces hence it was very difficult to comment on the disease process. Viscera analysis ruled use of any intoxicant like alcohol. Accident was considered as the most probable manner of death, suicide or homicide cannot be ruled out from post mortem examination.

**Conclusions**

In industries, where workers have to work with any sort of industrial machinery, there is always potential risk of injuries or death in the event of an accident. Hence it is necessary to ensure that workers must endow with proper medical checkup facility, also must provide proper safety measures to minimize the risk of injuries and most importantly workers needs to ensure that they
operate the machine in only correct manner and must not bring their bodies in close proximity to moving parts of the machinery [6]. Presence of safety equipment and headgear would be of more helpful in preventing injuries and death, however less helpful in cases where the bodies or parts of bodies get entrapped within heavy machinery.

References