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Case Report

Unusually extensive head trauma in a hydraulic elevator accident: Post-mortem MSCT findings, autopsy results and scene reconstruction

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Abstract

Accidental or intentional falls from a height are a form of blunt trauma and occur frequently in forensic medicine. Reports describing elevator accidents as a small subcategory of falls from heights are rare in the medical literature and no report on injury patterns or scene reconstruction of such an accident was found. A case of an accident in a hydraulic elevator with a man falling 3 m was examined using post-mortem multi-slice computed tomography (MSCT) and autopsy. The man suffered an unusually extensive trauma and died at the scene. Post-mortem MSCT examination showed a comminute fracture of the skull, the right femur and the first lumbar vertebra. Severe lacerations of the brain with epidural, subdural and subarachnoidal haemorrhages over both hemispheres were diagnosed. Autopsy confirmed these findings. To reconstruct the accident we used radiological and autopsy results as well as findings at the scene.

Keywords: Virtopsy; Forensic radiology; Elevator accident; Computed tomography; Skull fracture

1. Introduction

Accidental or intentional falls from a height representing a form of blunt trauma occur frequently in forensic medicine, but elevator accidents form a small subcategory within the falls from heights.[1] The reports describing elevator accidents are rare in the medical literature and no report on injury patterns or scene reconstruction of such an accident was found.

According to Gupta et al.[2] injury patterns of persons who die after a fall from a height can be variable. The fall related injuries can be caused by direct impact resulting in severe injuries of the impacted body region or by indirect force leading to injuries in a body region distant from the impact. Severity of the injuries can be influenced by a number of factors such as the distance of the fall, the body orientation and the material of the impact surface.[3–5]

A fatal occupational accident in an elevator with the victim falling 3 m was examined using post-mortem multi-slice computed tomography (MSCT), which is currently performed in selected cases at our institute. The documented skull fracture far exceeded the expected injury after a low fall. The aim was to reconstruct the accident using the radiological and autopsy results as well as findings at the scene.

2. Materials and methods

2.1. Case

A 48-year old elevator maintenance worker was working on the platform of an elevator still under construction

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when suddenly the platform dropped from the ground level 3 m downwards to the basement level. The man died at the scene (Fig. 1). The only witness saw him standing upright with both feet on the platform during the fall.

2.2. Data of the elevator

The elevator was used for transporting goods from the ground to the basement. The platform measured 4 × 2 m and weighed around 1500 kg. It was moved by electric hydraulics, using the so-called piggyback system (Fig. 2). The middle hydraulic pillar was responsible for transporting the platform to an intermediate stop, which was located 3 m below the ground floor. At this stop the platform became connected with two external hydraulic pillars by bolts and subsequently was transported by the pillars to the ground floor. During construction of the elevator the maintenance worker had to check audibly whether the bolts locked in at the intermediate stop.

Fig. 1. The scene with the victim lying on the elevator platform in a pool of blood. The arrow indicates the smeared blood including downward oriented blood spatters and traces of brain tissue at the back wall of the elevator shaft.

Fig. 2. Photograph demonstrating the electric hydraulics, so called piggyback-system. The middle hydraulic pillar was responsible for transporting the platform to an intermediate stop, where the platform is connected with the two other outside hydraulic pillars by bolts. Subsequently, the outside pillars transported the platform from the intermediate stop to the ground floor.

2.3. Post-mortem MSCT

A post-mortem MSCT of the body was performed using a 6-row scanner (Emotion 6, Siemens, Germany) prior to autopsy. A collimation of 6 × 1.25 mm, a slice thickness of 1.0 mm and reconstruction kernels B30's and B80's were used. A three-dimensional volume rendering reconstruction was performed using a musculoskeletal protocol.

For further data segmentation MIMCS software (Materialise, Leuven, Belgium) was used.

3. Results

3.1. External inspection

At the scene the victim was lying in a right lateral position across the platform (Fig. 1). There were extensive blood spatters on the platform and the shaft. At the back wall of the shaft, around 1.5 m above the platform level smeared blood with downward oriented blood spatters and traces of brain tissue were observed.

Fig. 3. External inspection of the body shows an open head injury with an extensive galea laceration, skull fracture and severe brain laceration.