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ScienceDirect
Journal of Forensic and Legal Medicine 15 (2008) 180–184
JOURNAL OF FORENSIC AND LEGAL MEDICINE
www.elsevier.com/jflm

Case Report

Incomplete decapitation in suicidal hanging – Report of a case and review of the literature

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Received 9 June 2006; received in revised form 16 February 2007; accepted 14 May 2007
Available online 5 September 2007

Abstract

Complete or incomplete decapitation is an unusual complication of suicidal hanging. We present a case of incomplete decapitation due to hanging with soft tissue injuries, spinal cord dissection between C2 and C3, fracture of the hyoid bone and injuries of cartilages. The 52-year-old male victim with a 95 kg body mass used a 1.5 cm thick and 3.1 m long nylon rope snap-hooked to a rafter. The comprehensive literature review of incomplete or complete decapitation by suicidal hanging emphasises the importance of investigation of biomechanical process. In the presented case we calculated the physical parameters (final speed: 7.8 m/s, kinetic energy: 2945 J, force: 9500 N). The previous observations were confirmed that body weight and falling distance were the most important factors in the pathomechanism of decapitation. In the hanging process energy can be stored by changing the position of the human body in the gravitational field, by changing the shape of the hanging rope and by changing the motion of the hanging body. We concluded that the occurrence of complete or incomplete decapitation can increase by the increasing energy stored as potential energy at the starting position and the characteristics of the rope extended by the hanging body.
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Keywords: Incomplete decapitation; Hanging; Stored potential energy; Energy transfer; Spring model

1. Introduction

Despite hanging being the most frequent method of suicides,[1,2] complete[3,4] or incomplete[5] decapitations are unusual complications of such hanging. In complete decapitation the head is totally severed from the trunk,[1] and separation of cervical vessels, muscle and nerve tears and lacerations,[3] severance of cervical vertebra between CV2 and CV3,[1,4] or CV1 and CV2[2,4] with the intervertebral disc injury can be observed. In incomplete decapitation there remain tissue connections with the trunk; but disruption of cervical spine and of most anatomical structures of the neck can be detected. The pathomechanism of incomplete or complete decapitation depends on several factors influenced by the movement and acceleration of body in hanging process.

In this report we describe a case with incomplete decapitation after suicidal hanging. Differences of physical parameters (body mass, length and elasticity of rope, potential, kinetic, and elastic energy) were examined in the comprehensive literature reported incomplete or complete decapitations.

2. Case history

The 52-year-old man was found in a storage building, hanging in a 1.5 cm thick nylon rope. The upper end of the rope was fixed at 5.1 m height. The length of the rope was 3.1 m from the point of fixation to the running knot of the noose. A 2.25 m long ladder was found near the body as a climbing aid. A suicidal letter was found by the police at the home of victim.

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1752-928X/$ - see front matter © 2007 Elsevier Ltd and FFLM. All rights reserved.
doi:10.1016/j.jflm.2007.05.004

2.1. Autopsy findings

The autopsy revealed the body (weight: 95 kg, height: 178 cm) of a male victim with marked post-mortem hypostasis. A nylon rope was located at the upper cervical region 2–3 cm below the mandible gonions. The wound showed a skin abrasion, 75–80 mm in width at the front (Fig. 1), and there were several fine parallel surface fissures at the abrasion. The neck was narrowed by the nylon rope to about 10 cm in diameter; however, the skin did not show separation. The severance line passed under the skin, and soft tissues of the neck were separated above the thyroid notch. The cervical spine was severed between C2 and C3, and the intervertebral disc was torn apart, the spinal cord and dura, all the muscles, cervical vessels and nerves were lacerated (Fig. 2). The hyoid bone showed multiple fractures, both superior horns of the thyroid cartilage were broken and the epiglottis was torn off and remained attached to the head (Fig. 3). There were several horizontal tears of the carotid arteries. Blood aspiration, acute emphysema of the lungs, excessive strain-induced bleeding and haemorrhages under the anterior longitudinal ligament in the cervical region were observed. Pathomorphological changes of natural diseases were not detected. Post-mortem blood and urine tested negative for alcohol, pharmaceuticals and drugs.

Fig. 1. A nylon rope was located at cervical region with skin abrasion, and several parallel surface fissures at the abrasion. The neck was narrowed by the rope to 10 cm in diameter; and the skin did not tear.

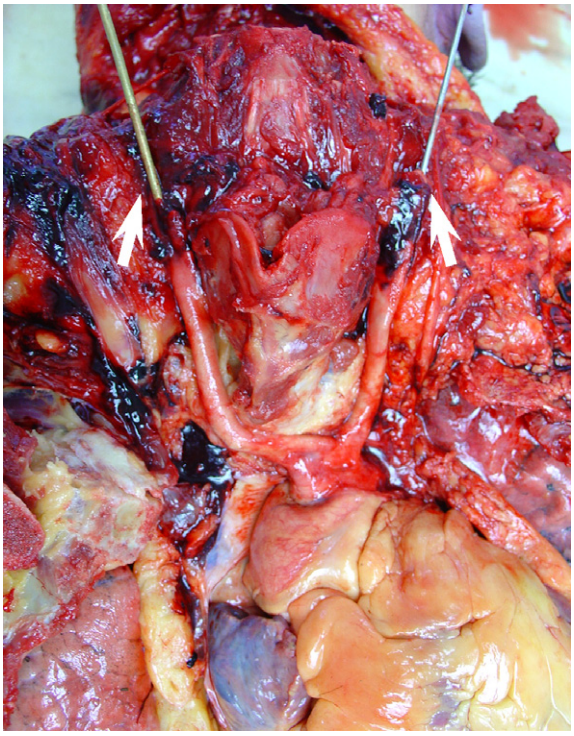

Fig. 2. Probes placed in the carotid arteries demonstrate the severe injuries. The severance line passed under the skin, the soft tissues of the neck were separated above the thyroid notch, the cervical spine was severed between C2 and C3, and the intervertebral disc was torn apart.

Fig. 3. The hyoid bone showed multiple fractures, both superior horns of the thyroid cartilage were broken, and the epiglottis was torn off and remained attached to the head.

3. Discussion

In this report we present a case of incomplete decapitation due to suicidal hanging. It has been pointed out that decapitation in hanging is a highly dynamic process with severe injuries.[1] Cervical fractures and spinal cord injuries[1–4] are uncommon complications of hanging, however, the victims suffer a wide range of soft tissue injuries.[6,7] The final cause of death is brain hypoxia.[1,2,8] In spite of the low incidence of complete or incomplete decapitation, a careful medico-legal investigation can differentiate between

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