

## Case Report

## Suicidal hanging resulting in decapitation: A case report and review of the literature

Céline Leccia<sup>a,\*</sup>, Véronique Alunni<sup>b</sup>, Gérald Quatrehomme<sup>b</sup><sup>a</sup> *Laboratoire de Médecine Légale et d'Anthropologie médico-légale, Faculté de Médecine, Université Côte d'Azur, 28 avenue de Valombrose, 06107 Nice cedex 2, France*<sup>b</sup> *Université Côte d'Azur, Institut Universitaire d'Anthropologie médico-légale, Faculté de Médecine, and CEPAM (UMR CNRS 7264), 28 Avenue de Valombrose, 06107 Nice cedex 2, France*

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## ABSTRACT

Decapitation following suicidal hanging is rarely encountered in forensic practice. The authors report a case of suicidal hanging resulting in decapitation following a fall of 5 m. This case is compared with 30 cases found in the literature. Several factors including type of rope, skin abrasion, level of the severed vertebrae, thyroid cartilage and hyoid bone injuries and vital signs are studied. The force applied to the neck and the kinetic energy were calculated. The kinetic energy (ranging from 1820 to 7310 J) takes into account the weight of the victim but also the length of the rope (height of the fall). The speed of the body as it is stopped by the rope ranged between 6.49 and 14.01 m s<sup>-1</sup>.

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## 1. Introduction

Decapitation following suicidal hanging is a rare event in forensic practice. This paper reports on a case of suicidal hanging resulting in near complete decapitation. The victim fell an estimated 5 m after jumping off a balcony. A 9 cm wide strip of skin was all that remained to join the back of the head to the body. Only 30 cases of hanging–decapitation were found in the forensic literature. The most difficult aspect of such cases is always to rule out homicidal decapitation and dismemberment.

## 2. Case report

The victim's body was found hanging from a nylon rope on the side of a building. The body weighed 85 kg for a height of 175 cm. The head was severed from the torso between the thyroid cartilage and the hyoid bone anteriorly, and between the atlas and the axis posteriorly (the odontoid of the axis was fractured). The head was still attached to the back of the neck by a 9 cm wide strip of skin and neck muscles. The epiglottis and the hyoid bone were still attached to the head. Laterally, the carotid arteries were totally severed by the decapitation. The edge of the section was bloody (especially the muscles of the neck) and a circular band-like abrasion of 0.5–2 cm

was visible on the edge of the section. A ligature mark was still visible on the strip of left skin between the head and the torso. Bruises were visible on the elbows and knees. Blood had run down the trunk from the wound and had pooled at the bottom of the building. The autopsy found a slight hemorrhage of the cerebellum. No blood aspiration was visualized during the autopsy.

A suicide note was found. The victim suffered from depression with suicidal tendencies. The inquiry revealed that the victim jumped from the 6th floor at the end of a 10-m rope. The nylon rope measured 10 mm in diameter and presented with very little elasticity. The system used for the hanging was difficult to determine. Because of the public nature of the location where the body was found, the body and the rope were removed before the arrival of the forensic pathologist. Circumstantial evidence suggested the rope was wrapped twice around the neck. The presence of a knot was in doubt. The height of the fall was estimated at 5 meters. The prosecutor did not require toxicological and histopathological assays, estimating that the investigations led without any doubt toward suicide.

## 3. Discussion

Worldwide, hanging is a very common form of suicide [e.g., 1]. In contrast, decapitation resulting from suicide is very rare and is most often due to suicide by jumping under a train [2–5], strangling assisted by a vehicle [2,3,6–10] or rare cases decapitation by use of a guillotine [6,11–13]. Cases of decapitation are also

\* Corresponding author.

E-mail address: [leccia.c@chu-nice.fr](mailto:leccia.c@chu-nice.fr) (C. Leccia).

**Table 1**

Force, kinetic energy and speed as the rope stops the fall.

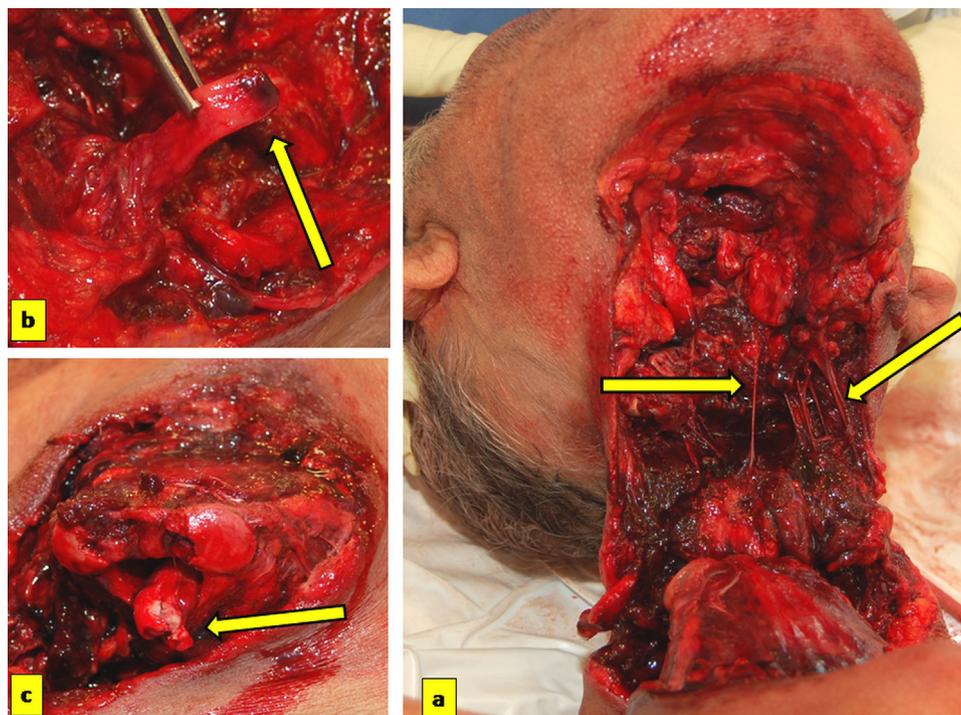
Current case						
Force (N)						833.85
Ek (J)						4169.25
Speed (m s <sup>-1</sup> )						9.90
	Mean	Sd	Median	Mini	Maxi	N
Whole sample [2,22–43, including the current case]						
Force (N)	801.51	193.89	784.80	470.88	1412.64	27
Ek (J)	3289.76	1302.87	3037.18	1819.76	7310.41	27
Speed (m s <sup>-1</sup> )	8.97	1.82	8.52	6.49	14.01	27
Complete decapitation [22,22,23,25–27,29,30,32–37,39–43]						
Force (N)	788.37	208.73	774.99	470.88	1412.64	22
Ek (J)	3363.26	1407.30	3092.62	1819.76	7310.41	22
Speed (m s <sup>-1</sup> )	9.14	1.93	8.52	6.49	14.01	22
Incomplete decapitation [22,24,28,31,33,38, case of Nice]						
Force (N)	859.36	102.33	833.85	716.13	981.00	5
Ek (J)	2966.34	689.55	2721.29	2501.55	4169.25	5
Speed (m s <sup>-1</sup> )	8.23	1.08	7.80	7.14	9.90	5

seen in traffic accidents [14–19]. Post mortem decapitation is usually the result of homicidal dismemberment [20,21].

Only 30 cases of hanging–decapitation were found in the forensic literature. Four of them were reported by Hejna and Bonhert [22]. They also reviewed 21 cases originally published by various authors [2,22–38]. Other cases have also been published by Morild and Lilleng [39], Matschke et al. [40], Ajuha and Rastogi [41], Jang and Yang [42], and Kim and Lee [43]. Most of the cases were complete decapitation, with the head totally severed from the neck or trunk. Only six cases of incomplete decapitation by hanging have been published in the literature [22,24,28,31,33,38]. The current case is classified as an incomplete hanging–decapitation since the head was still attached to the back of the trunk by a 9 cm strip of skin and neck muscles. All of the cases published in the literature concern male victims, just as in the current case. The

weight of the victims ranged from 48 kg to 144 kg with an average of 81.7 kg (median: 80 kg; Sd: 19.8, N=27). Our victim weighed 85 kg. The most common type of rope used was nylon (18 cases out of 28 available cases, including the current case). Other types of rope used were steel or metal cable (4 cases), hemp (4 cases), or were not described (3 cases). A slip knot was used in the quasi-totality of the cases (21 out of 24 available cases). In the current case the rope twice wrapped around the neck and may be considered as a fixed knot. The ropes used varied in diameter from 4 to 20 mm (average 11.7 mm; median 10 mm; N=25). Our victim used a rope with a diameter of 10 mm.

The force ( $\vec{F}$ ) applied to the neck is calculated by multiplying the weight (mass in kg) by the acceleration constant ( $g=9.81\text{ m s}^{-2}$ ). Table 1 shows the results concerning the force (Newtons), the kinetic energy (Joules) and the speed of the fall ( $\text{m s}^{-1}$ ). In the



**Fig. 1.** Severed neck in suicidal hanging with incomplete decapitation. Big arrow: fracture of the second cervical vertebra (odontoid process). Small arrows: circumferential abrasion.

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