

Medicolegal Aspects of Deaths Due To Hanging

"Blood Markers Study, Macroscopical, Histopathological & Immunohistochemical Studies"

*A Protocol Submitted In the Partial Fulfillment Of
The MD Degree in Forensic Medicine*

By

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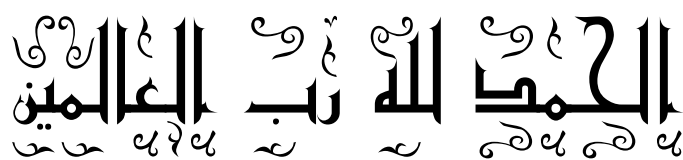
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Abstract

Soft-tissue or muscle hemorrhages are seen in a minority of hanging cases. The aim of the current study is to investigate the effectiveness blood markers, macroscopic, microscopic examination, using routine histological stains and immunohistochemical study using Anti- Myoglobin. This was performed on 100 autopsied cases at the different morgues of the Ministry of Justice - Egypt. Positive findings included opaque fibers observed in almost all muscle specimens (92%), and were seen only at the region of the just beneath the compression mark on the neck, irrespective of material used in suspension. It is concluded that myoglobin immunostaining study is an important supplementary evidence of compression of the neck, especially when the compression mark on the neck is indefinite macroscopically.

Key Words: hanging, myoglobin, immunohistochemistry

Contents

	<i>Page</i>
✱ List of Abbreviations	<i>i</i>
✱ List of Figures	<i>iii</i>
✱ List of Tables	<i>iv</i>
✱ List of Pie and Column Charts	<i>v</i>
✱ Introduction and Aim of the Work	<i>1</i>
✱ Review of Literature	
✱ Applied Anatomy of the Neck	<i>4</i>
✱ Hanging	<i>23</i>
✱ Forensic Pathology Management Of Hanging Deaths	<i>43</i>
✱ Methodology	<i>71</i>
✱ Results	<i>87</i>
✱ Discussion	<i>106</i>
✱ Summary and Conclusion	<i>124</i>
✱ Recommendations	<i>127</i>
✱ References	<i>128-155</i>
✱ Arabic Summary	

List of Abbreviations

ABC	Avidin-Biotin Complex
APES	Amino-propyl-tri-ethoxy-silane
BSA	Bovine Serum Albumin Fraction 5
C	Cervical (vertebra)
C5b-9	Complement component 5 - chromosome 9
CK-MB	Creatine Kinase MB isoenzyme
CPK	Creatine phosphokinase
CPR	Cardio-respiratory resuscitation
CT	Computed tomography
cTnT	cardiac isoform of troponin
ECG	Electrocardiography
ft	Feet
GCS	Glasgow Coma Scale
gm	Gram
H&E	Hematoxylin and Eosin
H ₂ O	Water
H ₂ O ₂	Hydrogen Peroxide
IgG	Immunoglobulin G
IMS	Industrial methylated spirits
Kg	kilogram
Km	Kilometer
lb	pound
m	meter
MB	myoglobin
MD	Medical doctorate
ml	Milliliter
mph	Meter per hour
MRP14	Myeloid-related protein 14
n/a	Not available
ng	Nanogram
No.	Number

List of Abbreviations *(continued)*

NS	Normal Serum
PMI	Postmortem interval
SD	Standard deviation
SIDS	sudden infant death syndrome
SPSS	Statistical Package for Social Science
T3	triiodothyronine
T4	thyroxine
TBS	Tris-Buffered Saline
TSH	Thyroid-stimulating hormone or thyrotropin

List of Figures

<i>No.</i>	<i>Figure</i>	<i>Page</i>
1	The basic plan of the neck in cross-section.	4
2	A more detailed plan of the neck	5
3	Subdivisions of the anterior triangle	6
4	The main structures in the posterior triangle	7
5	The course and main branches of the external carotid artery.	9
6	The last four cranial nerves and their relation to the large vessels	11
7	The vagus and accessory nerves	12
8	The pharynx and larynx, and some of the related nerves	13
9	Anterior view of the laryngeal skeleton	14
10	The laryngeal muscles and their functions	16
11	Larynx viewed from the inside	18
12	The thyroid gland and its blood supply	20
13	Classification according to the position of the knot	24
14	Classification according to the degree of suspension	24
15	Classification according to the type of noose	24
16	Classical "hangman's fracture	36
17	Method of cutting the noose with preservation of the cut ends and the knot	44
18	Method of Recommended incision for exposure and dissection of neck	55
19	Pattern of the opaque fibers	66
20-21	Micrographs of muscle specimens of control group	95
22	Micrograph of carotid artery in control group	96
23	(A-B) Micrographs of muscle specimens of group II	97
24	Micrograph of carotid artery in group II (in the Tunica intima)	98
25	Micrograph of carotid artery in group II (in the Tunica intima)	99
26	Micrograph of carotid artery in group II (Complete transaction of both intima and media layers)	99
27	Micrograph of carotid artery in group II (sub-intimal tear)	100
28	Micrograph of carotid artery in group II (Multiple contraction bands)	101
29	Micrograph of muscle specimen of control group	102
30	Micrograph of muscle specimen of hanging group (II) (immunostaining showing round opaque fibers)	103
31-32	Micrographs of muscle specimen of hanging group (II) (immunostaining showing round opaque fibers)	104

List of Tables

<i>No.</i>	<i>Table</i>	<i>Page</i>
1	Percentage of body weight involvement on stretching ligature in hanging according to body position	25
2	Weights required to produce compression/damage to neck structures in hanging	26
3	Points to be considered by the forensic medical examiner, while investigating the death scene in a case of hanging	43
4	Anti-Myoglobin Kit (ab9536) datasheet	74
5	Chi square analysis of the studied cases according to age	87
6	Distribution of suicidal hanging cases by months of occurrence during the study period	88
7	Chi square analysis of the studied suicidal hanging cases	89
8	Distribution of the studied cases according to external examination general findings	91
9	Distribution of the studied cases according to external examination findings regarding the position of the furrow and the course of the ligature	92
10	Distribution of the studied cases according to autopsy findings regarding soft tissue injuries and fractures of the neck structures	93
11	Student 't' test of the studied groups according to serum thyroid markers	94
12	Fisher's exact statistical analysis of histopathological results by standard stains detection of RBCs' extravasation in the muscle specimens and immunohistochemical results by anti-myoglobin (Mb) immunostaining for detection of opaque fibers in the studied group	105

List of Pie Charts

<i>No.</i>	<i>Pie Chart</i>	<i>Page</i>
1	Distribution of age groups	87
2	Distribution of cases according to place of body discovery	89

List of Line Charts

<i>No.</i>	<i>Line Chart</i>	<i>Page</i>
1	Distribution of month of occurrence	88

Introduction

Death by hanging is believed to be a painless method of committing suicide (*Kumar, 2007*). It is a common method of committing suicide and a routine task in medico-legal autopsies (*Suárez-Peñaranda et al., 2008*). Suicide is one of the ten leading causes of death in the world, accounting for more than a million deaths annually. Victims in this category of suicide are mostly drawn from low socioeconomic status. They were less educated or illiterates. The principal reasons for the suicide include financial burden and marital disharmony (*Mohanty et al., 2007*).

Soft-tissue or muscle hemorrhages are seen in a minority of hanging cases. In various series, the range is from about 3% to about one-third. Soft-tissue hemorrhages in the neck indicate that the individual was alive when the injuries were inflicted. Hemorrhage adjacent to fracture sites supports the supposition that they occurred antemortem. No correlation between the presence of soft-tissue hemorrhages and larynx fractures has been noted. The amount of hemorrhage is usually insufficient to cause death. In certain situations, extensive hemorrhage in the neck musculature has caused asphyxia (*Shkrum and Ramsay, 2007*).

Various studies in the forensic literature have reported considerable

differences in the frequency of thyroid cartilage fractures and injuries to the musculature and the vasculature of the neck. Some important reasons to which these variations could be attributed include: lack of a common method for examination of neck structures, varying degrees of thoroughness in examining the neck structures and lack of seriousness in the documentation of the findings (as cases of hanging are almost always suicidal) thus affecting the results of retrospective studies (*Sharma et al., 2008*).

The forensic literature on the pathophysiology of human hanging is still limited. Therefore, forensic pathologists often feel uncomfortable when confronted with the related questions of this type of cases (*Sauvageau and Racette, 2007*).

Aim Of The Work

This work aimed to investigate characteristic postmortem features of hanging deaths, on the basis of:

- macroscopic 'gross' examination,
- blood markers studies,
- microscopic examination, *and*
- immunohistochemical study.

Applied Anatomy of the Neck

(Faiz and Moffat, 2002 ; Faller et al., 2004 and Ellis, 2006)

The neck consists essentially of blocks of tissue running longitudinally (*figures 1 and 2*). These are as follows:

1. The cervical vertebrae surrounded by a number of muscles and enclosed in a dense layer of prevertebral fascia.
2. The pharynx and larynx, partially enclosed in a thin layer of pretracheal fascia. Below the level of C6 these give way to the oesophagus and trachea.
3. Two vascular packets consisting of the common and internal carotid arteries, the internal jugular vein and the vagus nerve, all enclosed in the fascial carotid sheath.
4. An outer enclosing sheath consisting of the sternomastoid and trapezius and the investing layer of deep fascia of the neck.

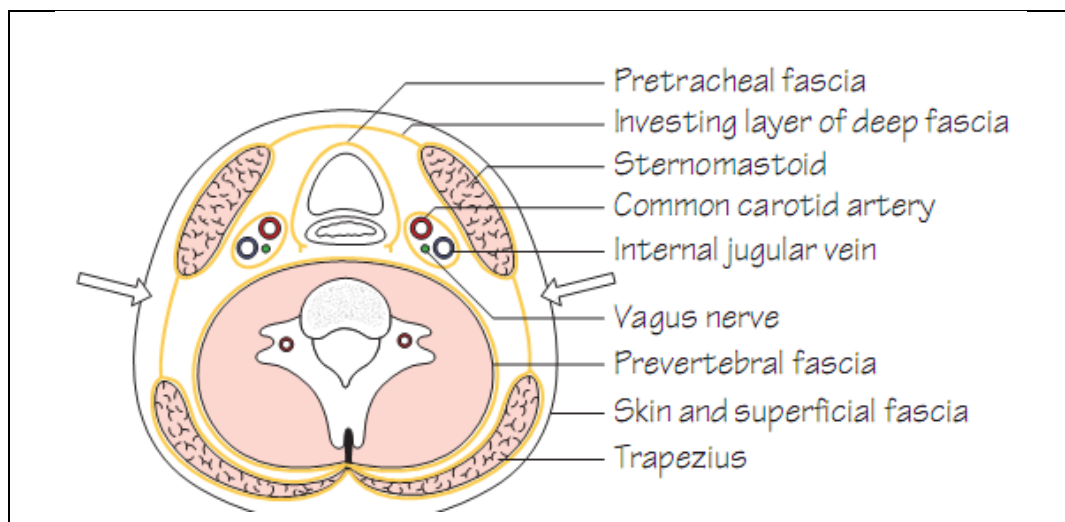


Figure (1): The basic plan of the neck in cross-section. The arrows indicate the posterior triangle (*Faiz and Moffat, 2002*).

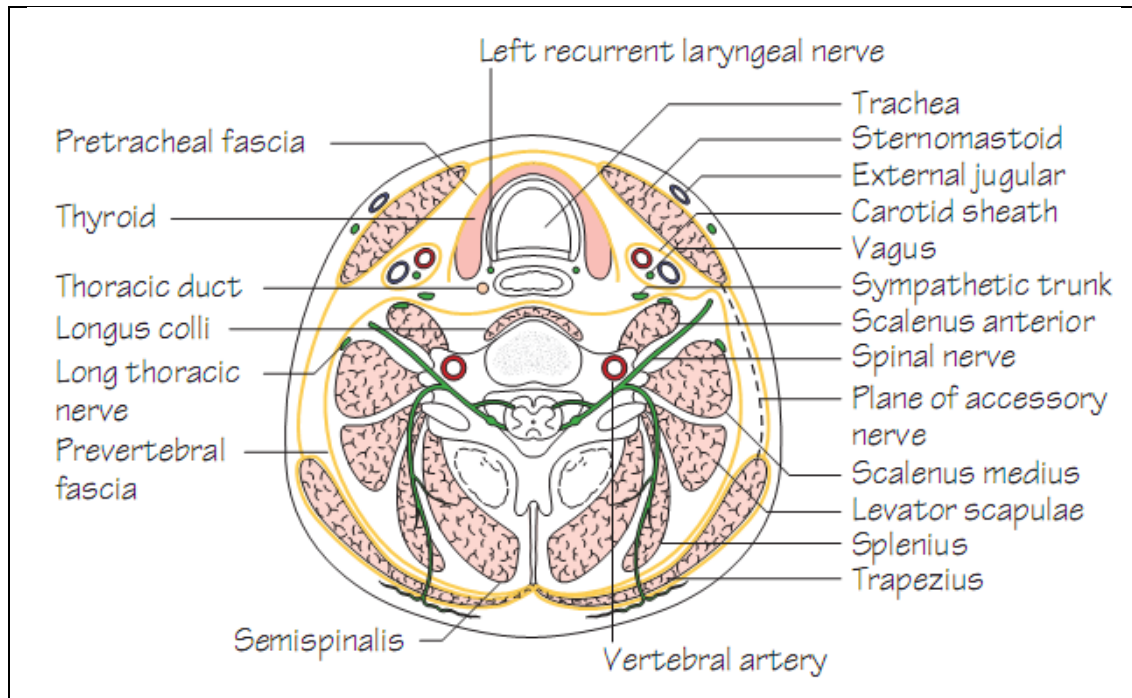


Figure (2): A more detailed plan of the neck, based on previous figure. There are still some structures omitted from the diagram for the sake of simplicity, for example the strap muscles (**Faiz and Moffat, 2002**).

The Anterior Triangle of the Neck

The anterior triangle (**figure 3**) is bounded by the lower border of the mandible and its backward continuation, the anterior border of sternomastoid and the midline of the neck.

The anterior triangle is subdivided into:

- (a) The digastric triangle, bounded by the lower border of the mandible and the two bellies of the digastric.
- (b) The carotid triangle, bounded by the superior belly of the omohyoid, posterior belly of the digastrics and anterior border of sternomastoid.
- (c) The muscular triangle, bounded by the superior belly of the omohyoid, anterior border of sternomastoid, and the midline of the neck.