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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Acknowledgment

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ACKNOWLEDGMENT

All Praise to ALLAH.

I would like to express my deepest gratitude and appreciation to ***Prof. Sherien Salah Ghaleb****, Professor of Forensic Medicine and Clinical Toxicology, Faculty of Medicine – Cairo University, for her kind guidance with her ultimate academic knowledge and truthful directions from the early beginning of this study and all the way through this thesis .*

I am deeply grateful to ***Prof. Amany Fahmy Hanoon****, Professor of Forensic Medicine and Clinical Toxicology, Faculty of Medicine – Cairo University, for her great constant help, appreciated supervision and valuable guidance throughout the work. Her guidance was genuine, meticulous and really supportive.*

I am deeply grateful to ***Dr. Mohamed Adly Mohamed****, Lecturer of Forensic Medicine and Clinical Toxicology, Faculty of Medicine – Cairo University, for his constructive advices and valuable time and fruitful guidance since the beginning of this work.*

I am deeply grateful to ***Dr. Dina Solaiman Badran****, Lecturer of Forensic Medicine and Clinical Toxicology, Faculty of Medicine – Cairo University, for her vital help, and valuable guidance. Her support was great, unlimited and sincere.*

I am deeply indebted to all ***my professors*** *and respectable* ***staff members*** *of Forensic Medicine and Clinical Toxicology Department, Faculty of Medicine – Cairo University especially Head of the Department* ***Prof. Osama AlBarany****. Thanks for all for their constant faith and encouragement.*

My deep respect to all directors and chiefs and respectable staff members of the ***Medicolegal Administration, Ministry of Justice*** *and the related* ***Histopathology Department*** *who assisted me to get a better experience and attitude in my career, and supported me a lot to perform the great part of the practical work of this thesis at the Medicolegal Department - Zeinhom.*

Last but not least, I wish to thank and present all my love and consideration to my family.

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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, immunohistochemitry

Contents

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
H2O	Water
H2O2	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

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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.

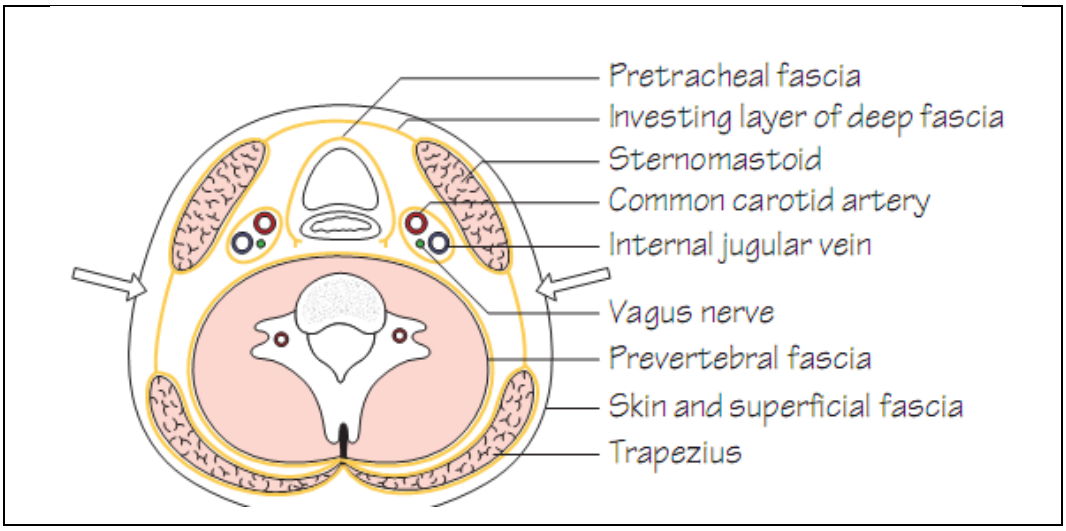

Figure (1): *The basic plan of the neck in cross-section. The arrows indicate the posterior triangle* ***(Faiz and Moffat, 2002).***

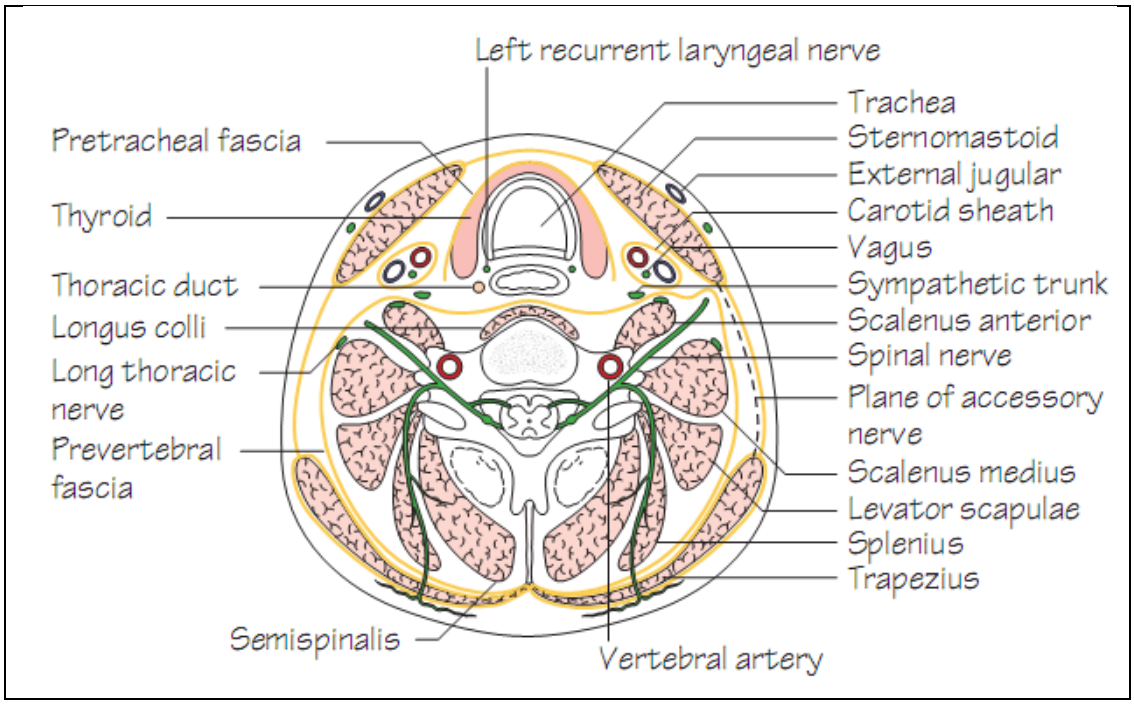

Figure (2): *A more detailed plan of the neck, based on previous figure. There are still some structures omitted from the diagram for the sake of simplicity, for example the strap muscles* ***(Faiz and Moffat, 2002).***

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.