

CLINICAL EVALUATION OF THE PATTERN OF DIFFERENT TYPES OF NECK INJURIES IN CASES UNDERGONE AUTOPSY

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Abstract:

It is learnt from literature that neck injuries are encountered with different manner (suicide, homicide, accident). Sometimes homicidal neck injuries are pleaded or disguised as suicide e.g. murdered victims placed on railway track and even accidental neck injuries are disguised as homicidal to bring false charge of offence on enemies. Meticulous examination of neck injuries can give clues to settle these challenges (Suicidal, homicidal or accidental). Over all, suicide is the major cause of neck injury because of social, economic, work pressure, love failure; failure in exams, unemployment, marital disharmony and depression etc. Accidental deaths are an unplanned event occurring suddenly unexpectedly as unforeseen circumstance. The exponentially increasing number of automobile vehicles, poor adherence to traffic rules and regulations, abuse of alcohol and drug are the cause of accidents. Accidents tragically are not often due to ignorance, but are also due to carelessness, thoughtlessness and due to over confidence. Incidence of road traffic accidents has been increasing at the alarming rate throughout the world. Hence based on these reported data the present study was planned for the clinical evaluation of the pattern of different types of neck injuries in cases undergone autopsy.

The present study was planned in Department of Forensic Medicine, Dr. Panjabrao Alias Bhausaheb Deshmukh Memorial Medical College, Shivaji Nagar, Amravati. Total 50 cases of the neck injuries undergone autopsy were evaluated in the present study.

The data generated from the present study concludes that Neck injuries constitute a potential factor in increasing the amount of morbidity and mortality; therefore proper attention should be paid towards their accurate diagnosis and satisfactory management. Death in young due to neck injuries causes heavy loss of valuable work force and human resources.

Keywords: Manner, Agents and Cause of death, Neck, etc.

Introduction

The neck is the part of the body on many vertebrates that connects the head with the torso and provides the mobility and movements of the head. The structures of the human neck are anatomically grouped into four compartments; vertebral, visceral and two vascular compartments.[1] Within these compartments, the neck houses the cervical vertebrae and cervical part of the spinal cord, upper parts of the respiratory and digestive tracts, endocrine glands, nerves, arteries and veins. Muscles of the neck are described separately from the compartments. They bound the neck triangles.[2] In anatomy, the neck is also called by its Latin names, cervix or collum, although when used alone, in

context, the word cervix more often refers to the uterine cervix, the neck of the uterus.[3] Thus the adjective cervical may refer either to the neck (as in cervical vertebrae or cervical lymph nodes) or to the uterine cervix (as in cervical cap or cervical cancer).

The neck structures are distributed within four compartments:[1][4] Vertebral compartment contains the cervical vertebrae with cartilaginous discs between each vertebral body. The alignment of the vertebrae defines the shape of the human neck.[5] As the vertebrae bound the spinal canal, the cervical portion of the spinal cord is also found within the neck. Visceral compartment accommodates the trachea, larynx, pharynx, thyroid and parathyroid glands. Vascular compartment is paired and consists of the two carotid sheaths found on each side of the

trachea. Each carotid sheath contains the vagus nerve, common carotid artery and internal jugular vein. Besides the listed structures, the neck contains cervical lymph nodes which surround the blood vessels. [6]

Muscles of the neck attach to the skull, hyoid bone, clavicles and the sternum. They bound the two major neck triangles; anterior and posterior.[1][7] Anterior triangle is defined by the anterior border of the sternocleidomastoid muscle, inferior edge of the mandible and the midline of the neck. It contains the stylohyoid, digastric, mylohyoid, geniohyoid, omohyoid, sternohyoid, thyrohyoid and sternothyroid muscles. These muscles are grouped as the suprahyoid and infrahyoid muscles depending if they are located superiorly or inferiorly to the hyoid bone. The suprahyoid muscles (stylohyoid, digastric, mylohyoid, geniohyoid) elevate the hyoid bone, while the infrahyoid muscles (omohyoid, sternohyoid, thyrohyoid, sternothyroid) depress it. Acting synchronously, both groups facilitate speech and swallowing.[1][2][6]

Posterior triangle is bordered by the posterior border of the sternocleidomastoid muscle, anterior border of the trapezius muscle and the superior edge of the middle third of the clavicle. This triangle contains the sternocleidomastoid, trapezius, splenius capitis, levator scapulae, omohyoid, anterior, middle and posterior scalene muscles.[1][2][6] Sensation to the front areas of the neck comes from the roots of the spinal nerves C2-C4, and at the back of the neck from the roots of C4-C5.[8] In addition to nerves coming from and within the human spine, the accessory nerve and vagus nerve travel down the neck.[1] Arteries which supply the neck are common carotid arteries which bifurcate into: - Internal carotid artery - External carotid artery.

The thyroid cartilage of the larynx forms a bulge in the midline of the neck called the Adam's apple. The Adam's apple is usually more prominent in men.[9][10] Inferior to the Adam's apple is the cricoid cartilage. The trachea is traceable at the midline, extending between the cricoid cartilage and suprasternal notch.

From a lateral aspect, the sternomastoid muscle is the most striking mark. It separates the anterior triangle of the neck from the posterior. The upper part of the anterior triangle contains the submandibular glands, which lie just below the posterior half of the mandible. The line of the

common and the external carotid arteries can be marked by joining the sterno-clavicular articulation to the angle of the jaw. Neck lines appear at a later age as a development of skin wrinkles.

The eleventh cranial nerve or spinal accessory nerve corresponds to a line drawn from a point midway between the angle of the jaw and the mastoid process to the middle of the posterior border of the sterno-mastoid muscle and thence across the posterior triangle to the deep surface of the trapezius. The external jugular vein can usually be seen through the skin; it runs in a line drawn from the angle of the jaw to the middle of the clavicle, and close to it are some small lymphatic glands. The anterior jugular vein is smaller, and runs down about half an inch from the middle line of the neck. The clavicle or collar-bone forms the lower limit of the neck, and laterally the outward slope of the neck to the shoulder is caused by the trapezius muscle.

With the neck protected by the spine posteriorly, the head superiorly, and the chest inferiorly, the anterior (larynx and trachea) and lateral regions are most exposed to trauma. [9] Few emergencies pose as great a challenge as neck trauma. Because a multitude of organ systems (eg, airway, vascular, neurological, gastrointestinal) are compressed into a compact conduit, a single penetrating wound is capable of considerable harm. Furthermore, seemingly innocuous wounds may not manifest clear signs or symptoms, and potentially lethal injuries could be easily overlooked or discounted. Neck injury may result in the laceration of major vessels, potentially leading to hemorrhagic shock. Extracranial arterial injuries to the brachiocephalic, common carotid, and vertebral arteries can result in major neurologic deficits. [10] Airway occlusion and exsanguinating hemorrhage pose the most immediate risks to life. From the time when Ambroise Pare successfully treated a neck injury in 1552, debate has continued about the best approach for particular neck wounds. Awareness of the various presentations of neck injuries and the establishment of a well-conceived multidisciplinary plan prior to the traumatic event is critical for improving patient outcome. The neck is divided into anatomic zones or regions to assist in the evaluation of neck injuries. The image below illustrates the zones of the neck.

With the neck protected by the spine posteriorly, the head superiorly, and the chest inferiorly, the anterior and lateral regions are most exposed to injury. The

larynx and trachea are situated anteriorly and are therefore readily exposed to harm. The spinal cord lies posteriorly, cushioned by the vertebral bodies, muscles, and ligaments. The esophagus and the major blood vessels are between the airway and spine.

Two fascial layers invest the neck: the superficial fascia (enveloping the platysma muscle) and the deep cervical fascia. The deep cervical fascia envelops the sternocleidomastoid and trapezius muscles as well as demarcates the pretracheal region (including the trachea, larynx, thyroid gland, and pericardium), the prevertebral area (containing the prevertebral muscles, phrenic nerve, brachial plexus, and axillary sheath), and the carotid sheath (enclosing the carotid artery, internal jugular vein, and vagus nerve). Musculoskeletal structures at risk include the vertebral bodies; cervical muscles, tendons, and ligaments; clavicles; first and second ribs; and hyoid bone. Neural structures at risk include the spinal cord, phrenic nerve, brachial plexus, recurrent laryngeal nerve, cranial nerves (specifically IX-XII), and stellate ganglion. Vascular structures at risk include the carotid (common, internal, external) and vertebral arteries and the vertebral, brachiocephalic, and jugular (internal and external) veins. Visceral structures at risk include the thoracic duct, esophagus and pharynx, and larynx and trachea. Glandular structures at risk include the thyroid, parathyroid, submandibular, and parotid glands. Associated structures at risk of intrathoracic injuries include the esophagus, tracheobronchial tree, lung, heart, and great vessels.

Dividing the neck into anatomic zones or regions assists in the evaluation of injury. Serving as the line of demarcation, the sternocleidomastoid separates the neck into anterior and posterior triangles. Most of the important vascular and visceral organs lie within the anterior triangle bounded by the sternocleidomastoid posteriorly, the midline anteriorly, and the mandible superiorly. Except for individual nerves to specific muscles, few vital structures cross the posterior triangle, which is delineated by the sternocleidomastoid, the trapezius, and the clavicle (with the exception of the region just superior to the clavicle). [10-11]

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murdered victims placed on railway track and even accidental neck injuries are disguised as homicidal to bring false charge of offence on enemies. Meticulous examination of neck injuries can give clues to settle these challenges (Suicidal, homicidal or accidental). Over all, suicide is the major cause of neck injury because of social, economic, work pressure, love failure; failure in exams, unemployment, marital disharmony and depression etc. Accidental deaths are an unplanned event occurring suddenly unexpectedly as unforeseen circumstance. The exponentially increasing number of automobile vehicles, poor adherence to traffic rules and regulations, abuse of alcohol and drug are the cause of accidents. Accidents tragically are not often due to ignorance, but are also due to carelessness, thoughtlessness and due to over confidence. Incidence of road traffic accidents has been increasing at the alarming rate throughout the world. Hence based on these reported data the present study was planned for the clinical evaluation of the pattern of different types of neck injuries in cases undergone autopsy.

Methodology:

The present study was planned in Department of Forensic Medicine, Dr. Panjabrao Alias Bhausaheb Deshmukh Memorial Medical College, Shivaji Nagar, Amravati. Total 50 cases of the neck injuries undergone autopsy were evaluated in the present study.

All the cases autopsied were screened for neck injuries resulting from deaths due to road traffic accidents, machinery accidents, assault, firearm injuries, fall from height and suicide etc. A detailed information and data pertaining to the cases were collected. After receiving the details, post-mortem examination was conducted and cause of death was determined. Information pertaining to agent and manner of death was sought from the police personnel investigating the case. Some of the particulars of the victim were also obtained from the direct interrogation with relatives, friends and others along with the police. Following points were noted with respect to age, sex, manner of death, agents causing the injury, frequency of organs involved, relationship with fall from height and the cause of death.

Approval of the institutional ethical committee was taken prior to conduct of this study. Following was

the inclusion and exclusion criteria for the present study.

Inclusion Criteria: Cases of neck injuries autopsied.

Exclusion Criteria: Cases other than victims of neck injury.

Results & Discussion:

Suicide is menace in present day society, causing huge damage to young population affecting the social economic aspects of nation. Hanging is one of the most sought after method to commit suicide. According to National Crime Report Bureau report 2009 the incidence of suicide by hanging in India is 31.7% in 2007, 32.2% in 2008 and 31.5% in 2009. Hanging is among the top five methods of choice for committing suicide, the other preferred methods being poisoning, drowning, burning and jumping from height, etc. Hanging is a form of asphyxial death produced by suspending the body with a ligature around the neck, the constricting force being the weight of the body or a part of body weight. [12]

Mark of ligature on the neck is the most characteristic sign of death from hanging. The ligature mark is an abrasion showing pressure effects or grooving or oblique fibre patterns. The situation of the mark will be largely influenced by the method of application, degree of suspension, movement of the ligature, and type of ligature material. The tighter the ligature, the deeper will be the ligature mark. [13] Ligature mark is usually situated above the level of thyroid cartilage and is directed obliquely upward towards the point of suspension. It may be noncontinuous at the back or may show an irregular impression of a knot. The depth of the ligature mark will be more on the side of the neck opposite the knot where the maximum weight bearing occurs. [14] Ligature mark is superficial and broad if a cloth or similar soft material is used.

Ligature mark helps us in identifying the type of hanging – typical or atypical, complete or partial and also the manner of death whether it's suicidal, accidental or homicidal.

Observation is incomplete when obliquity along the course of the ligature mark is not noted in cases of hanging and strangulation. Authors have reported that hanging mark is situated obliquely across the circumference of neck. [15-18] Where suspension point is low, the pull on the rope is almost at right angle to the axis of the body, so the resulting mark

may be almost horizontal. In strangulation, unlike hanging, the mark tends to encircle victim's neck horizontally. However, the mark may be oblique as in hanging, if the victim has been compressed by a cord while in recumbent posture, or if the victim was sitting and the assailant applied the ligature on the neck while standing behind victim, thus using the force backward and upward. [16, 18] Simpson K has opined that the mark of hanging usually rises to a 'peak' pointing the junction of the noose and vertical part of the ligature, this being a distinguishing feature from ligature strangulation. However, exceptions occur if the suspension point is low, a horizontal mark may be produced which can be confused with strangulation. In strangulation, the mark is usually horizontal and will not show any rising peak to a suspension unlike hanging.

Table 1: Place of occurrence

| Place | No. of Cases |
|--------|--------------|
| Open | 18 |
| Closed | 32 |
| Total | 50 |

Table 2: Type of ligature material

| Material | No. of Cases |
|-----------------|--------------|
| Soft and broad | 37 |
| Thin and tough | 6 |
| Rough and tough | 7 |
| Total | 50 |

Table 3: Type of Hanging

| Type of Hanging | Typical | Atypical | Total |
|-----------------|---------|----------|-------|
| Complete | 2 | 32 | 34 |
| Partial | 1 | 15 | 16 |
| Total | 3 | 47 | 50 |

Table 4: Sternocleidomastoid muscle tears

| SCM tear | No. of Cases |
|----------|--------------|
| Present | 16 |
| Absent | 34 |
| Total | 50 |

Table 5: Carotid tear

| Carotid artery tear | No. of Cases |
|---------------------|--------------|
| Present | 5 |
| Absent | 45 |
| Total | 50 |

One hundred eighty-nine cases of known dead bodies brought for medicolegal autopsy with alleged history of hanging were studied at the Department of

Forensic Medicine State Medico Legal Institute, Government Medical College, Thiruvananthapuram. Males were involved in 70.9% of cases, and only 29.1% were females. The maximum number of victims (22.2%) was in the age group of 21 to 30 years. In 22% of cases, ligature material could not be recovered, where the bodies were brought down while apparently "alive" from the hanging state by the relatives, to be declared dead at the casualty. Soft materials were used by 47% of subjects. Ligature mark was present in 97.9% of cases; it was oblique in 94.2% of cases, non-contiguous in 78% of cases, and at or above the level of thyroid cartilage in 96.3% of cases. In 95.8% of cases, the subcutaneous tissues were pale and dry. The most commonly injured muscle was sternocleidomastoid. Fracture of hyoid bone occurred in 2.7%, fracture of thyroid cartilage in 5.3%, and vertebral injuries in 1.6% of cases. [19]

In a study on 84 cases of suicidal hanging brought for autopsy to the mortuary of the Regional Institute of Medical Sciences, Imphal during 2004 to 2008, it was observed that 77.38% of the cases were males and 22.62% were females. The highest number of victims was in the age range of 21-40 years. 73.81% of the cases committed suicide indoors and 57.14% of them used ropes as ligature material. 85.75% of the victims had fixed knots with a single turn and 10.71% had slip knots. Complete atypical hanging constituted 88.10% of the cases. 23.81% of the cases had tear of the carotid artery and 3.57% had hyoid fractures. None of the cases had cricoid or trachea fractures. The neck findings vary depending upon the composition, multiplicity and tightness of the ligature material used, the suspension time, type of hanging, etc. [20]

In a study done at Kurnool medical college of 205 cases of hanging, soft materials are the preferred choice for ligation, particularly married group. Bed sheets, dhotis and chunnis in unmarried group. Hence the marital status of the deceased and the nature of the ligature material can also be used as indicator in arriving to the manner of death. Atypical hangings are more particularly with knot on left side. There by typical hangings with knot over the occipital region or under the chin usually allow suspicion as it is a deviation from normalcy. The course of ligature mark over the neck is influenced by the type of knot applied which itself has no medico legal bearing. An interrupted ligature mark over and above thyroid cartilage is diagnostic of hanging. [21]

All these facts, which surfaced, have their geographic, cultural, social, political and personal reasons and which vary over time, but we believe that common denominator is intolerance. Though, continuous research in this field is need of hours to constitute strategies which can foil unlawful human killings. To curb the menace of homicide, state and society should ensure education, employment and socioeconomic wellbeing along with strict law enforcement. But authors feel that murder is an act of moment in mind so any decision made under excitement or incitement is the real culprit. Therefore we would like to wrap up this by suggesting to improving once ability to think over any problem with a balanced and reasonable tolerance.

Conclusion:

The data generated from the present study concludes that Neck injuries constitute a potential factor in increasing the amount of morbidity and mortality; therefore proper attention should be paid towards their accurate diagnosis and satisfactory management. Death in young due to neck injuries causes heavy loss of valuable work force and human resources.

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