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Original Research Article

An autopsy study of neck structures in manual strangulation [throttling]

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ABSTRACT

Introduction: Manual Strangulation injuries are a heterogeneous set of traumatic pathology that occurs as a result of mechanical force applied externally to the neck and surrounding structures by human Hand. These injuries may result in decreased cerebral oxygen delivery either by compression of cervical blood vessels, or tracheal occlusion.
Materials and Methods: All Cases Referred were Forensic Autopsies. Blood Less Filed was created at Neck Region to Study the Neck Injuries. The External and Internal injuries resulting as a result of Compression were entered in the Templates for Analysis.
Results: A Total of 36 Cases were Reported during the period of Study. Cases were reported in Individuals until Fifth Decade. Majority of the cases Reported in 2nd and 3rd Decade. Females Contributed to Major Number of Cases [72%].Hyoid bone fracture was noted in only 22%[n-8] of the cases.
Conclusion: Nail Scratch Abrasion with Contusions seen over Neck Surface in Majority of the Cases. Internal Muscular and Vascular Damage is Seen in Majority of the cases. Parotid and Thyroid Gland showed Parenchymal and Capsular Hemorrhages.

1. Introduction

Manual strangulation (also known as "throttling") is strangling with the hands, fingers, or other extremities. Depending on how the strangling is performed, it may compress the Airway, interfere with the flow of blood in the neck, or work as a combination of the two. Consequently, manual strangulation may damage the Larynx [1] and fracture the Hyoid or other bones in the neck. [2] In cases of airway compression, manual strangling leads to the frightening sensation of Air Hunger and may induce violent struggling. [1]

It is mostly seen in Domestic Homicides when a Husband kills his wife, in Sex-related Murders when the Victim is again Women, Child Killings, when the killer is an Adult Male. [3]

Strangulation injuries are a heterogeneous set of traumatic pathology that occurs as a result of mechanical force applied externally to the neck and surrounding structures. As a type of asphyxia, these injuries may result in decreased cerebral oxygen delivery either by compression of cervical blood vessels, or tracheal occlusion. Death rapidly ensues without the removal of compressing forces. Should a patient survive the initial injury, care must be taken to evaluate for occult injury. External signs of injury, or lack thereof, may under-represent the extent of deeper damage. [4]

The term asphyxia has been used to denote death or sub-lethal injury from mechanically induced cerebral hypoxia accompanied by signs of impeded venous return. Similar degree of hypoxemia of any organ/tissue can be produced by interference with its blood supply or by obstructing its drainage. Pressure on the neck can affect the brain in either way or both ways at the same time, resulting in infarction

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(ischemic or hyperemic).[5–9] The present prospective Study is an Attempt to Understand the Injuries to the Neck Structures in cases of Manual Strangulation, that could help us to understand the Manual Strangulation Better, which in turn helps us to differentiate it from other Violent Asphyxia Deaths.

2. Aims and Objectives

1. To Study the changes in the Neck, Face and Eye as result of Manual Compression of Neck.
2. To Analyze the External Injuries to Neck in case of Throttling
3. To Analyze the Internal changes in the Neck as a Result of Throttling
4. To Study the changes in the Face and Eye in Cases of Manual Compression of the Neck.
5. Materials and Methods

The Prospective Study was Carried out during the Period 2013-2021 at SIMS, and TOMCH&RC, Bangalore.

All the cases Examined were Forensic Cases Referred by the Police and Magistrate for Postmortem Examination. Each Case the Circumstances Surrounding the Case were Described in the Inquest Report Submitted Prior to the Postmortem Examination. All were Homicidal Deaths. Each case the external Examination of the Neck, Face and Eyes were Specifically Searched for Signs of Throttling and Asphyxial Changes besides other External Examination Protocols. All the details were documented in a predetermined Templates. The Neck Was Dissected after the Retrieval of Chest and Cranial Cavity contents, so as to create a Bloodless filed in the Neck. The Neck Tissue was dissected Layer by Layer, along with individual muscles, Glands, Respiratory passage, Cartilages and the Bones, the same were Documented in the Templates. The Examination also included to Rule out other Causes of Death.

3. Results

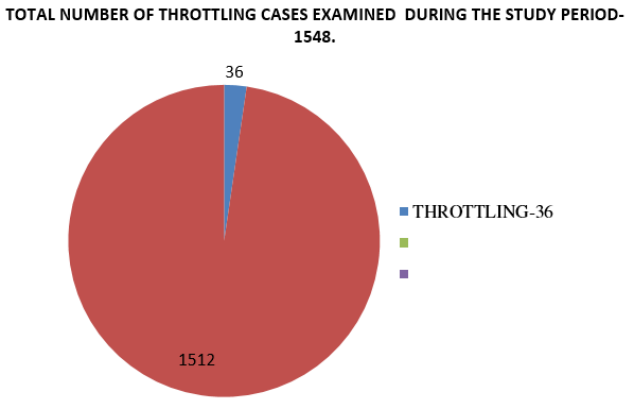
This Prospective Study was Carried during the period 2013-2021. A total of 1548 Autopsies were conducted during this Period o Study. Manual Strangulation[Throttling] contributed to only 2.3%[n-36] of the cases.

Females Contributed to 72%[n-26] of the cases and Male contributed to only 28%[n-10] of the cases.

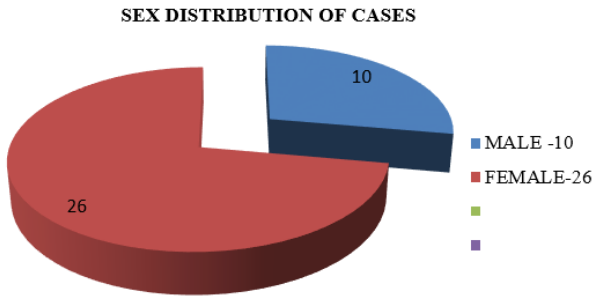
All the cases reported belong to individual until the Fifth Decade. No cases reported after Fifth Decade. Majority of the cases reported belong to 2nd and 3rd Decade, contributing to 25%[n-09] and 33%[n-12] respectively. Childrens below 10years contributed to 17%[n-06] of the cases.

The Surface of the Neck showed Ball[Patch] Contusions in 94%[n-34] of the cases. Nail Scratch Abrasions were Present in 81%[n-29] of the cases. Linear Scratch marks were found on the Neck Surface in 50%[n-18] of the cases. Laceration injuries were seen in 02 cases.

Majority of the Injuries on the Neck surface, in 67%[n-24] cases, were Distributed over the Left Upper Quadrant of the Neck. No Injuries were Observed in the Nape of the Neck. Right Upper Quadrant Demonstrated 25%[09] of the Injuries. Injuries over the Left Lower Quadrant were seen in only 11%[n-4] of the cases and Right Lower Quadrant injuries were seen in only 06%[n-2] of the cases.The Internal Structures damage to the Muscles of the Sterno Cleido Mastoid, Platysma Muscles an Thyroid muscles were seen in Majority of the cases. Parotid Glad and Thyroid Gland Congestion and Capsular were seen in 34 and 26 cases. Thyroid Cartilage was damaged in 44%[n-16] of the cases and Hyoid bone was damaged in only 22%[n-08] cases. Last Damage was observed in Cricoid Cartilage, 5.5%[n-2] cases. No damages were seen in Tracheal Rings. Carotid Artery showed intimal tear with Hemorrhages in Vertical Direction in 67%[n-24] of the cases.



Graph 1: Total number of throttling cases examined during the period 2013-2021.



Graph 2: Sex Distribution of cases.

4. Discussion

The Present Prospective Study was carried out during the period 2013 to 2021 at SIMS[Sapthagiri institute of Medical

Table 1: Age distribution of cases.

S.No.	Age group	Total number of Cases	Percentage of cases
01	0-10yrs	06	17%
02	11-20yrs	09	25%
03	21-30yrs	12	33%
04	31-40yrs	05	14%
05	41-50yrs	04	11%
06	51-60yrs	00	00
07	61-70yrs	00	00
08	71-80yrs	00	00

Table 2: Nature of injuries reported on neck surface.

S.No.	Nature of Injuries	Total Number of cases	Percentage of cases
	Ball [Patch] contusions	34	94%
	Multiple Cresentric Scratch Abrasions [Nail Marks]	30	83%
	Multiple Linear Scratch Abrasion	18	50%
	Lacerations	01	3%

Table 3: Distribution of injuries on the neck surface.

Cases involved	Right Upper Quadrant	Right Lower Quadrant	Left Upper Quadrant	Left Lower Quadrant	Nape of Neck
Percentage	89%	6%	97%	11%	00
Total Number	32	02	35	04	00

Table 4: Examination of injuries to the neck structures.

S.No.	Neck Internal Structure Injuries	Total Number of cases	Percentage of cases
01	Platysma Muscles	32	89
02	Sterno Cleido Mastoid Muscle	26	72
03	Thyrohyoid Muscles	32	89
04	Omohyoid Muscles	24	67
05	SternoThyroid Muscles	28	78
06	Parotid Gland	34	94
07	Thyroid Gland	26	72
08	Hyoid bone	08	22%
09	Cricoid Cartilage	02	5.5%
10	Thyroid Cartilage	16	44%
11	Tracheal Rings	00	
12	Carotid Artery	24	67%

Sciences and Oxford Medical College, Bangalore. Manual Strangulation contributed to only 2.3%[n-36] of the total 1548 Autopsies. This results are in total contrast to those made Mengh He et al[10] and S.Chand et al.,[11] wherin Manual Strangultion contributed to 12.5% and 6.84% of the Autopsies.

In the present Study Females Sex were the Major Affected contributing to 72%[n-26] of the cases. Increasing number of females in neck strangulations is due to homicidal tendency in male dominating society. This argument of increasing number of females is strengthened by Afridi HK et al,[12] though is study was covered all Violent Asphyxial Deaths.

The External Skin Damage pattern is due to the Nails of the Accused observed in 83%[n-30] of the cases and presence of Ball[patch] contusions in 94%[n-34] of the cases, this is due to the finger Pulp at the tips involved in the compression[Pic 1,2], the absence of the Nail marks in some cases is due to the possible clipping of Nails or interference by clothing during the process of manual strangulation.

The presence of Laceration[Pic 3] noted in 01 case[3%], this is due to excessive pressure over the bony structures like Mandible.

The Maximum Distribution of the External Injuries are distributed over the Left Upper Quadrant in 97% [n-35] of the cases and Right Upper Quadrant in 89%[n-32] of the cases, this is due to the violent compression

Fig. 1: Showing contusion and nail marks over the right upper quadrant neck.

Fig. 2: Showing contusion and nail marks over the left upper quadrant neck.

Fig. 3: Showing contusion, laceration and nail marks over the right & left upper quadrant neck.

Fig. 4: Showing contusion and nail marks over the left upper quadrant neck.

in the direction of upwards and backwards, tossing movements of the Victim, and Mandibular structure acting as Fulcrum[Figures 1, 2, 3 and 4] thereby adding further to the compression of the neck. The absence of Injuries on the Nape of Neck confirms the fact that all attempts of Manual Strangulation involves only the Front and Sides of the Neck, wherein All the Vital Structures are located and the Intention of the assailant is much Satisfied.

Hyoid Bone Fractures are considered to be the major Internal Structures affected, but in our study Hyoid bone were found to be fractured in only 22%[n-08] of the cases this is close to those observations made by Ali MA et al,[13] in his study 20% of the Manual Strangulations Hyoid Fracture was Recorded, but this results are in contrast to those observations made by Kaheri et al,[14] who observed in his study. fracture of hyoid bone in 50% cases of manual strangulation.

The Present Study also Indicated Maximum Victims belonged to age group in 2nd and 3rd Decade, which is closer to those observations made by Ali M.A et al[13] who observed the mean age dominated around 24years, but the present study is in contrast to the similar study done by Nicolic et al,[15] who concluded that the Mean age at 47.33. This difference is possible due to regional factors and Cultural factors and also, due to vulnerability of young females and males due to strong connection between sexual assault and strangulation.

In the present the Neck Muscles were found to be damaged in majority of the Cases[Average 85%], whereas the study conducted by S.Chand Et al[11] all the cases of Manual Strangulation showed damage to Internal Muscles. However in none of the studies involving Violent Asphyxial Deaths the Pathological Examination was made on the Parotid Gland and Thyroid gland, the present study draws an edge to all those studies wherein the Glands were Grossly studies and Microscopically examined, which revealed Capsular hemorrhages in all

the cases of Manual Strangulation and Besides Extensive Congestion and hemorrhages in the Parenchyma of the Gland.

The Common Carotid Arteries showed Vertical Intimal Tears in 67%[n-24] of the cases, this is in sharp contrast to those observations made by S.chand et al[11] wherein Carotid Artery Tears were observed in only 205 of the 5.2% of his cases, this is possible due to low number of cases involved in his study. This results also indicated the fact that Examination of the Carotid Artery is essential to understand the Manual Strangulation. The tears are the result of inward Localized pressure over the arteries causing localized Shear Strain with pressure directed squeezing the walls against each surface at right angles to the vertical length of the vessel.

The present cases Fracture of Thyroid Cartilage was found in 44%[n-16] of the cases whereas in the study conducted by S.chand et al[11] the Thryoid Cartilage Fractures were observed in 75% of his cases, the low number of cases studied may be the reason of his conclusion.

The present study also highlights the fact that none of the Tracheal Rings were damaged and cricoid cartilages were damaged in only 02 cases[5.5%], this is possible because of the Location of this structures which escape the External pressure involved in Manual Strangulation.

5. Conclusion

Manual Strangulation are always homicidal. The Front and Sides of the Neck are Always Involved, The Upper Left and Upper Right Quadrant are Majorly Involved in the Damages. The Muscles of the Neck are Damaged in 85% of the Cases. underlying the Compression. Hyoid Bone and Thyroid Cartilage are involved in only Not necessarily Damaged in all Cases of Manual Strangulation. The Parotid and Thyroid gland Capsular Hemorrhages and Parenchyma hemorrhages are always present in Manual Strangulation.

6. Conflict of Interest

The authors declare that there is no conflict of interest.

7. Source of Funding

None.

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