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ORIGINAL ARTICLE

Pattern of Death Due Hanging Special Emphasized on Neck cartilages

Mehul C Upadhyay[1], Alpesh B Bambhaniya[2]

ABSTRACT

INTRODUCTION:

Commonest form of asphyxial death come across during autopsy in the country is Hanging. The present study was carried out to studying the pattern of fracture in hyoid bone and neck cartilage (thyroid cartilage and cricoids) in deaths due to hanging in the Department of Forensic Medicine, M. P. Shah Govt. Medical College, Jamnagar. We found that death due to compression of ligature seen maximum in the age group of 21-30 years (36.9%), males are accounted for 43% as compared to 57% in females. Ligature material used was dupatta in 43.68% of cases. In hanging ligature mark was oblique, above thyroid cartilage, going backward and laterally. In majority cases, the ligature mark was above the thyroid cartilage (88% cases), followed by at and above the thyroid cartilage (10% cases) and only in 1 case the ligature mark was below the thyroid cartilage. In maximum cases, the position of knot was present at occipital region of the neck (49% cases), followed by left mastoid region (30% cases). In majority of cases, the ligature mark was prominent and discontinuous. Hyoid fracture was found in only 8.05% cases. There was only 1 case with thyroidcartilage fracture and no case of cricoidcartilage fracture.

KEYWORDS | Hanging; Hyoid bone; Ligature mark; Cynosis.

Author's Credentials:

[1,2]*Assistant Professor, Department of Forensic Medicine, M. P. Shah Government Medical College, Jamnagar, 361008, Gujarat, India.*

Corresponding Author:

Alpesh B Bambhaniya, *Assiatant Professor, Department of Forensic Medicine, M. P. Shah Government Medical College, Jamnagar, 361008, Gujarat, India.*

Email: *dralpeshb@gmail.com*

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INTRODUCTION

Hanging is that form of asphyxia which is caused by suspension of the body by ligature which encircles the neck, the constriction force being the weight of the body. It may be partial or complete, depending on the position or posture of the body at the time of hanging. Hanging is a common method of suicide around the world. In India hanging is among the top 5 methods of choice for committing suicide.[1-4] More than 800,000 people die due to suicide every year and there are many more who attempt suicide. Hence, millions of people are affected or experience suicide bereavement every year. Suicide occurs throughout the life-span and is the second leading cause of death among the age group of 15-29 year globally.[2]

Suicide by hanging is the most frequent method in India.[4] The profile of victims comprises of married females or unmarried males in the age group of 21-30 years, faced with stress in the form of an employment, harassment for dowry, prolonged illness, failure in examinations, financial duress, or interpersonal problems.[3] During the autopsy of hanging, strangulation, throttling case, hyoid bone and thyroid

cartilage becomes the most integral part of examination. This fact has been highlighted by many workers.[5] Some workers also claimed that a hard ligature material can cause fracture of hyoid bone and thyroid cartilage.[6] Various authors have reported the incidence of hyoid bone fracture being from nil/rare to as high as 67% in hanging cases.[7]

AIMS AND OBJECTIVES

The present study was undertaken with the aim of studying the presence of fracture in hyoid bone and thyroid cartilage in hanging cases and to determine their frequency along with it to review the anatomo-pathological findings over the neck.

MATERIAL AND METHODS

The present study was carried out in the Forensic Medicine Dept. M. P. Shah Govt. Medical College, Jamnagar, prospectively from 1st March, 2013 to 30th May, 2014. The materials for the present study were the deceased brought for autopsy from various police stations from Jamnagar district and nearby districts. Cases which died due to asphyxia as a result of hanging either alone or in association with some other causes were included for the study. Information pertaining to age, type of suspension, type of ligature material used and position of the knot were noted from the police records like inquest report, marnottar form etc., and detailed history from relatives, neighbours, gaurdians, and police persons accompanying the dead bodies. In case of hospital deaths, hospital records were also examined. A detailed and thorough post-mortem examination was carried on each and every case to examine the internal neck findings such as fracture hyoid bone and thyroidd cartilages, injury to subcutaneous tissues and vessels. The findings noted were carefully compiled, tabulated and systematically analyzed.

OBSERVATIONS AND RESULTS

There were 1320 cases of post-mortem examinations conducted during the study period and among those 87 cases were hanging i.e. 3.70%. The most number of cases of hanging were observed between 21-30 years (36.9%) followed by age group 31-40 years (22.9%). In the age group more than 50 years only few cases had been reported. No case found within 10 year age group. (Table:1)

Table 1: Age and sex wise distribution in the study

Age group	Hanging		Total	Percentage
	Male	Female		
0-10	0	0	0	-
11-20	4	6	10	11.5 %
21-30	13	19	32	36.9 %
31-40	8	12	20	22.9%
41-50	7	7	14	16.1%
51-60	5	5	10	11.5 %
>60	1	0	1	1.15%
Total	**38**	**49**	**87**	**100**

In maximum cases the nature of suspension was complete type (70.9%), where as partial type of hanging were few in number (29.1%). (Table 2)

Table 2: Distribution of cases according to type of hanging (whether complete or partial)

Type of hanging	No. of cases	Percentage
Complete hanging	61	70.1%
Partial hanging	26	29.9%
Total	**87**	**100%**

In maximum cases the position of Knot was present at occipital region of the neck back of neck (35.6%), followed by left mastoid region of the neck (29.9%) and followed by right mastoid region (26.44%) of the neck. There was only 7 cases (8.05%) found where the position of knot at the front of the neck. (Table:3)

Table 3: Distribution of cases according to position of knot

Type of hanging	Position of knot	No. of cases	Percentage
Typical	Occipital region	31	35.6%
Atypical	Front of neck	7	8.04%
	Right mastoid region	23	26.44%
	Left mastoid region	26	29.90%
Total		**87**	**100%**

Considering the information gathered from the police records, relatives of the deceased and taking the examination findings of the ligature material into consideration whenever it has been sent along with the dead body, it was observed that the maximum victims used soft ligature material (73.56%) like Dupatta, Saree, Muffler and Lungi etc. while in 26.44% cases hard ligature material like nylone rope, plastic rope, andelectric wire were used. This showed that most commonly used hard ligature material was the nylone rope, whereas the most commonly used soft ligature material was Dupatta. (Table 4)

Table 4: Distribution of various types of ligature material used

Material used		Hanging cases	Percentage
Soft material	Dupatta	38	43.68%
	Saree	14	16.10%
	Bed sheet	6	6.90%
	Maflar	0	0
	Dhoti	3	3.45%
	Shirt	1	1.15%
	Towel	2	2.30%
Sub total		64	73.56%
Hard material	Cotton rope	8	9.20%
	Nylon rope	12	13.79%
	Wire	3	3.45%
Sub total		23	26.44%
Total		**87**	**100%**

It was observed from Table 6 that in 88.6% cases, the ligature mark was above the thyroid cartilage whereas in about 12% cases, the ligature mark was at or below the thyroid cartilage. In majority of case the ligature mark is prominent reddish brown (89.65%) and discontinuous incomplete (93.10%). (Table 5).

Table 5: Distribution according to color, discontinuity and direction of ligature mark

Type of Neck Compression	Colour of Ligature mark		Encirclement		Direction	
	Pale -faint	Reddish Brown	Complete	Incomplete	Transverse	Oblique
Hanging	9	78	6	81	4	83
Percentage	10.35%	89.65%	6.9%	93.1%	4.6%	95.4%

Table 6: Distribution according to number and position of ligature mark

Type of Neck Compression	Number of Ligature mark			Position of ligature mark		
	1	2	3, >3	Above Thyroid carilage	Over the Thyroid cartilage	Below Thyroid cartilage
Hanging	81	6	0	77	9	1
Percentage	93.1%	6.9%	0	88.6%	10.34%	1.15%

It was also observed that the hyoid bone fracture was found in only 7 cases (8.05 %). (Table: 8) The findings of the present study showed that there was only single case amongst total cases studied in which the thyroid cartilage fractures was present (Table 7).

Table 7: Distribution of cases according to internal injuries of neck

Type Neck compression	Hanging cases	Percentage
Bruising of Subcut. tissue	4	4.60%
Intimal tear in carotid artery	3	3.45%
Fracture of thyroid cartilage	1	1.15%
Fracture of cricoid cartilage	0	0

Table 8: Distribution of cases according to fracture of hyoid bone

Fracture of hyoid bone	Hanging cases	Percentage
Present	7	8.05 %
Absent	80	91.95%
Total	**87**	**100%**

DISCUSSION

The present study was conducted to analyse the frequency of hyoid and thyroid fractures in hanging in relation to the ligature material, position of the knot, age etc. A study by Charoonnate N, Narongchai P, Vongvaivet S. et al. showed that the largest groupwas found to be 21-30 years, followed by 11-20 years and 31-40 years, respectively.[5] These findings are very much similar to our findings. More previous studies by Ahmad M et al., Meera Th et al., Patel AP et al., have also reported similar results, with 21-30 years age group being the most commonly involved by different other authors.[8-10] The above findings can easily be explained by the fact that 21-30 years of age group are most susceptible to frustration in life because of the factors like stressful marital/ personal life, dowry, financial instability, failure of love affairs, and competition in study/career etc.[4] In present study it was found that in the maximum cases, the nature of suspension was complete type, 70.10%, where as partial type of hanging was in few cases, 29.90%. The present findings are comparable with those of the other authors like Momin SG et al.' - complete hanging cases were about 64% and partial about 36%;[11], with Sudheer TS et al.' in which complete hanging in about 99% of cases studied;[12] and also with Sarangi MP et al.' about 88% complete and 12% incomplete.[13] Charoonnate Net al (authors from Thailand) observed higher number of incomplete hanging cases, (55%) as compared to complete hanging cases, (45%).[5]

Hanging also classified with respect to being typical/ atypical. In the present study, typical hanging was seen in about 35.60% and atypical in 64.40% of cases. There are some other studies reported similar or slightly different findings – Th. Meera et al. shows atypical hanging in about 97% and only 3% were typical of total cases studied.[14]; while Saiyed MZG et al shows about 89% cases the hanging was atypical and in 11% it was typical.[15] Meera Th et al. shows that atypical hanging was seen in about 96% of the cases and typical hanging in only 4%.[9] Similar findings were also observed by the authors from different countries like Ahmad M et al. (Bangladesh), and Uzun I et al. (Turkey) that in about 82% cases right or left sided knot that indicate atypical hanging while in only 13 cases about 18% showed knot was located on back of neck over Occipital area suggesting typical hanging.[8,16] In the present study we observed that maximum victims uses soft ligature.(73.56%) like Dupatta, while hard material like nylone rope, wire etc were used in 26.44% cases. The most common ligature material used overall was Dupatta (Soft) in 38 (43.68%) cases, followed by sari in 14 (16.1%) cases. Similarly, study by Patel AP et al. reported that 57% used cloth as a ligature material which waseither scarf, towel, Lungi etc (Soft) and about 43% were used ropes - nylon or jute (Hard).[10] In our study, in 88.60% cases, the ligature mark was above the thyroid cartilage. These are comparable with those of others like; Th. Meera et al shows 83% the ligature mark was above the thyroid cartilage, followed by about 12% overriding the thyroid cartilage and about 5% below the thyroid cartilage.[14] Sarangi MP et al. shows that in about 88% cases the mark was present above thyroid cartilage, in 10% it was present over the thyroid cartilage and in 2% it was present below the thyroid cartilage.[13] Similar observation was made

by Joshi R et al. that in about 62% of cases where the ligature mark was above the thyroid cartilage followed by in about 20% cases over the thyroid cartilage, about 13% on and above the thyroid cartilage and about 5% cases below the thyroid cartilage.[19]

The present study showed that the in majority of cases, the ligature mark was prominent (89.65%) and incomplete (93.10%). Similar observations were observed by Momin SG et al and Sudheer TS.[11,12] Again, of 87 cases in our study, fracture of hyoid bone was present in only 7 (8.05%) cases, all on the unilateral Greater cornu. Comparable findings are reported by Clement R et al. in 1.6% ofcases,[17] by Green H et al. in 4% of total cases[18], by Joshi R et al. in about 4% of cases,[19] and by Feigin Gin 2.7% cases,[20] whilesome other study reported by Meera Th et al. and Naik SK et al. shows that incidence of fracture of hyoidbone was nil in hanging cases in their study.[9,21] According to variousauthors, the hyoid bone was intact in 90-95% cases of hanging. Clement R et al. opined thatdue to direct lateral compression of the neck, fractures of hyoid bone are rare.[17] In contrast, there are some other studies by Sudheer TS et al. and Saiyed MZG et al. have reported higher incidence of hyoid bone fracture among the hanging cases.[12,15] They have mentioned about the variation of incidence offractures of hyoid bone from 0-60%, with an average being 15-20% cases. Opinion varies regarding the frequency of fracture of the hyoid bone. Estimates range from 0 to 60%, but the average is 15 to 20%. Fractures are rare below 40 years because of the elasticity of the cartilage and mobility of the joints.[22] The fracture is common in persons above 40 years and involves the great horns, at the junction of inner two-thirds and outer one third. Hyoid bone is a U-shaped structure and lies at the root of the tongue. The bone haves a central body, two greater horns which sweep backwards and upwards and two lesser hornson the upper surface of the body that have no forensic anatomical significance. The bone is having natural joints between the body and the greater horns.[23] It is calcified at variable times: the body is usually calcified, but the horns maycalcify irregularly, both in space and time. In teenagers and young adults they are usually cartilaginous and the joints mobile. In middle and later life, the hyoid and thyroid horns calcify and become more brittle. These natural joints maybe mistaken as fractures, if dissection is not done meticulously. There is also the possibility of fractures being post-mortem, due to incorrect autopsy techniques, in experienced forensic pathologist, body transit trauma, improper handling in the mortuary etc.[22,23] There was only 1 (1.15%) case amongst total cases studied in which the fracture of thyroid cartilage was found. Similar findings are also reported by Patel AP et al. in their study conducted at Ahmedabad.[10] However, in another study by Cle´ment R et al. it was found that thyroid cartilage were fractured in a small percentage of cases (5.3%).[17] In contrast to that, there are some authors who reported higher incidence of thyroid cartilage fractures in hanging cases. According to Green H et al., the cases of isolated thyroid cartilage fractures were about 15% and combined thyroid cartilage and hyoid bone fracture was 7% in hanging cases.[18] Thyroid cartilage fracture is dependent on the age of calcification, type of ligature, position of ligature over neck, nature of suspension etc.

CONCLUSION

Hyoid fracture was found in only 8.05% cases studied in this series and there was only 1 case detected with thyroid cartilage fracture. With majority of the cases studied, the age group were young, the two structures so mentioned are not yet calcified and are still quite flexible and likely to be able to withstand compression. As the age increases, the likelihood of hyoid bone and thyroid cartilage fracture increases as it calcified and becomes more brittle. A radiological study of hyoid bone and thyroid cartilage prior to autopsy in suspected cases may aid in fracture detection.

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