

Original Research Article

Study of Death Due to Compression of Neck by Ligature

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Received: 04/07/2015

Revised: 22/07/2015

Accepted: 25/07/2015

ABSTRACT

This study was carried out to know the impact of various factors in cases of deaths due to compression of neck by ligature e.g. Age, Sex, etc. To study and compare the incidence of pattern of ligature mark and establish the relationship of pattern of ligature mark to one another in cases of deaths due to compression of neck by ligature. The present study was carried out in the department of forensic medicine, Shri M P Shah Govt. Medical College, Jamnagar. Post mortem study was carried out in cases of death due to compression of neck by ligature. A detailed history from police and relatives regarding incidence was taken. Detailed history from police regarding scene of crime, position of body material used, etc. were taken. Ligature mark was observed meticulously for all parameters. Ligature mark was examined for site, size, shape, level in neck, continuity, color and complicity. We found that death due to compression of ligature seen in the age group of 21-30 years (35%), males are accounted for 56% as compared to 44% in females. Ligature material used was dupatta in 44% of cases. Ligature strangulation was in 3% cases. In hanging ligature mark was oblique, above thyroid cartilage, going backward and laterally.

Key words: ligature mark, hanging, strangulation.

INTRODUCTION

Deaths due to compression of neck by ligature are one of the most important unnatural deaths encountered by forensic experts. It has wide varieties having different signs. Thus, the present study was carried out in the department of forensic medicine, Shri M P Shah Govt. Medical College, Jamnagar. It has been shown that deaths due to hanging are common among the suicides in all over India. The characteristic finding, the ligature mark, found around the neck in both hanging and strangulation creates an element of doubt in many cases. The difficulty increases

manifolds when one has to differentiate ligature mark of homicidal hanging from strangulation, as associated bodily injuries will be found on both occasions, though in partial hanging it may not be difficult due to absence of marks of violence and resistance. [1-3]

The ligature mark is a vital piece of evidence especially when the killer has taken away the actual ligature. Taking the most important finding i.e. ligature mark into consideration, there are a few points like (1) level (2) discontinuity (3) obliquity of the ligature mark which differentiate hanging from ligature strangulation.

However, it is a fact that not all these differentiating features are present simultaneously in all cases of hangings and strangulations. In practice, the distinction between the two groups important because strangulation is usually homicidal and hanging in vast majority is considered to be suicidal. [1-4]

So, many times there are so many difficulties in diagnosing ligature mark of hanging and strangulation faced on many occasions. The author has made an attempt to establish the most reliable factor for differentiating pattern of ligature mark of hanging from ligature mark of strangulation.

MATERIALS AND METHODS

The present study was carried out in the department of forensic medicine, Shri M P Shah Govt. Medical College, Jamnagar. Post mortem study was carried out in cases of death due to compression of neck by ligature. A detailed history from police and relatives regarding incidence was taken. Detailed history from police regarding scene of crime, position of body material used, etc. were taken. Ligature mark was observed meticulously for all parameters. Ligature mark was examined for site, size, shape,

level in neck, continuity, color and complicity.

OBSERVATION & RESULTS

Out of 100 cases studied from October 2010 to August 2012, maximum number of cases of deaths were due to compression of ligature seen in the age group of 21-30 years (35%) followed by 11-20 years (24%) and 31-40 years (22%). Minimum cases (4%) found in age group of >60 years, males are accounted for 56% as compared to 44% in females.

Table-1: Age wise distribution of cases.

Age group	Hanging		Ligature strangulation		Total
	Male	Female	Male	Female	
0-10	0	0	0	0	0
11-20	9	13	1	1	24
21-30	14	21	0	0	35
31-40	14	7	0	1	22
41-50	9	0	0	0	9
51-60	6	0	0	0	6
>60	3	1	0	0	4
Total	55	42	1	2	100

Cyanosis over nail beds was seen in 68 out of 100 cases, 66 cases of hanging and 2 cases of ligature strangulation. A sub-conjunctival haemorrhage was seen in 20 cases of hanging and 1 case of ligature strangulation. In 16 cases tongue was found protruded.

Table -2 Distribution of cases according to postmortem findings.

External post-mortem findings	Hanging	Ligature strangulation	Total (%)	
Cyanosis in nail beds	66	2	68	
Sub-conjunctiva haemorrhages	20	1	21	
Tongue protruded	15	1	16	
Dribbling of saliva	28	0	28	
Involuntary discharge	Semen on glans penis	12	0	12
	Urine	3	0	3
	Faecal matter	3	0	3
PM staining over lower limbs	27	0	27	

Most commonly used ligature material was dupatta in 45 cases followed by cotton rope in 17 cases. Out of 97 cases of hanging the ligature mark color were pale in 29 cases and reddish brown in 68 cases. In 3 cases of ligature strangulation pale color in 1 case and reddish brown in 2 cases.

Table-3: Distribution of cases according to material used.

Material used		Hanging	Ligature strangulation	Total
Soft material	Dupatta	44	0	44
	Saree	10	0	10
	Bed sheet	6	2	8
	Maflar	3	1	4
	Dhoti	1	0	1
	Shirt	1	0	1
Hard material	Towel	1	0	1
	Cotton rope	17	0	17
	Nylon rope	11	0	11
	Wire	3	0	3
Total		97	3	100

Out of 97 cases of hanging complete ligature mark seen in 19 cases whereas incomplete ligature mark in 78 cases. Out of 3 cases of ligature strangulation, complete

ligature mark seen in 2 cases and 1 case shows incomplete ligature mark. Out of 100 cases in 95 cases ligature mark was oblique in direction, 93 were of hanging and 2 were of ligature strangulation. In rest of 5 cases the ligature mark was transverse in direction, 4 were of hanging and 1 was of ligature strangulation. In 97 cases of hanging we found 1 ligature mark in 90 (92.78%) cases of followed by 2 mark in 6 (6.18%) cases and >3 mark in 1 (1.03%) case. Out of 3 cases of ligature strangulation 2 mark seen in 2 (66.66%) cases and >3 mark in 1(33.33%) case.

Table-4: Distribution according to color, discontinuity and direction of ligature mark

Type of Neck Compression	Colour of Ligature mark		Encirclement		Direction	
	Pale	Reddish Brown	Complete	Incomplete	Transverse	Oblique
Hanging	29	68	19	78	4	93
Ligature strangulation	1	2	2	1	1	2
Total	30	70	21	79	5	95

Table-5: Distribution according to number and position of ligature mark

Type of Neck Compression	Number of Ligature mark			Position of ligature mark		
	1	2	>3	Above TC	Over TC	Below TC
Hanging	90	6	1	64	30	3
Ligature strangulation	0	2	1	0	3	0
Total	90	8	2	64	33	3

The ligature mark situated above thyroid cartilage in 64 (65.97%) cases, over thyroid cartilage in 30 (30.92%) cases and below thyroid cartilage in 3 (3.09%) cases. Out of 3 cases of ligature strangulation, the ligature mark was situated on thyroid cartilage in 3 (100%) cases.

Out of 100 cases of deaths due to compression of neck by ligature, we observed that in 32 cases the knot was centre back of neck, in 24 cases it was left back of neck. (Table:-)

Thyroid cartilage fracture was seen in 1 (1%) case of ligature strangulation in which the victim was 18 years female. Intimal tear in carotid artery was found in 4 (4.12%) cases of hanging.

Table- 6: Distribution of cases according to internal injuries of neck

Type Neck compression	Hanging		Ligature strangulation	
	Male	Female	Male	Female
Bruising of SCT	4	0	0	2
Intimal tear in carotid artery	1	3	0	0

DISSCUSION

Age group of 21-30 years showed higher incidence of cases of hanging and ligature strangulation (35%) followed by age group of 31-40 years (24%), which is consistent with observations of Momin et al, [5] Sharma et al, [6] Joshi et al, [7] Naik et al, [8] Jani et al.

In present study 56% male and 44% female cases were observed, which is consistent with the works of Momin et al, [5] Sharma et al, [6] Joshi et al, [7] Jani et al. [9]

Sarangi et al^[10] found more number of male cases in their study. Males are more active in various activities and customs and hence they are vulnerable for more stress and tension. But in the study of Naik et al^[8] female cases account for 62.5%, this finding were in contrast with the present study and most of the authors.

In the present study we found 66% cases in married person and 34% cases of unmarried person. These observations are consistent with the study of Momin et al^[5] and Jani et al.^[9] Out of 100 cases 93% cases were found from indoor places like home, work places, hotel room and custody barrack. These findings are almost similar to the study of Th. Meera et al.^[11]

Facial features were pale in 60.38% cases of hanging and 66.66% cases of ligature strangulation. It was found congested in 39.17% cases of hanging and 33.33% cases of ligature strangulation.

Cyanosis in nail beds was seen in 66 cases of hanging and 2 case of ligature strangulation. This is consistence with most of study. Out of total 97 cases of hanging, dribbling of saliva was found in 28.86% cases. In study of Momin^[9] dribbling of saliva was found in 61.11% of hanging. In present study dribbling of saliva was not found in any cases of ligature strangulation, this is consistent with the studies of Momin^[5] and Sarangi.^[10] Involuntary discharge of urine was present in 3 cases of hanging and was not found in cases of ligature strangulation.

In study of Momin^[9] the most common ligature material in cases of hanging was dupatta, 31 cases (34.44%) followed by nylon rope in 28 cases (31.1%), sari in 15 cases (16.66%) and cotton rope in 15 cases (16.66%). In ligature strangulation most commonly used material was metal wire and handkerchief, 2 cases (28.57%) each while in 3 cases, ligature material was absent. Sharma^[6] found dupatta was more

used in their study followed by rope. In contrast to these studies Joshi,^[7] Patil^[12] found uses of rope was more than dupatta.

Single ligature mark above the level of thyroid cartilage was seen in maximum number of hanging cases and more than one ligature mark at or below the level of thyroid cartilage in cases of ligature strangulation were seen, which is consistent with the studies of Momin,^[5] Sharma,^[6] Sarangi,^[10] Patil,^[12] Mommonchand,^[13] Naik.^[14]

It is a well accepted fact that the ligature mark of hanging and strangulation are not found at same level. Authors have reported that ligature mark in cases of hanging is situated higher in the neck usually above thyroid cartilage. Where suspension is low; the resulting mark may be set at a lower level typically immediately above or below the thyroid cartilage. Reddy has mentioned that ligature mark in cases of hanging is situated above the level of thyroid cartilage, between larynx and chin in 80% cases. It may be situated at the level of thyroid cartilage in about 15% cases and below the level of thyroid cartilage in about 5% cases especially in partial suspension.

In the present study, it was observed that ligature mark was above the level of thyroid cartilage, in 65 (67.03%) cases of hanging. However, it was found below the level of thyroid cartilage in 3 cases (3.09%) of hanging, all of which were cases of partial hanging. The mark in cases of ligature strangulation was found below the level of thyroid cartilage in most of the studies, but in the present study it was found at the level of thyroid cartilage in all cases of ligature strangulation which is more or less similar to the studies of Ahmed^[15] (28.09% cases) and Naik^[8] (42.85% cases).

It is also well known fact that discontinuity along the course of the ligature mark is another important criterion while describing the ligature mark of hanging or ligature strangulation.

Out of 97 cases of hanging, ligature mark was completely encircled in 19 cases (19.58%) and in 78 cases (80.41%) the ligature mark was incompletely encircled. The higher incidence of ligature mark in cases of hanging, which incompletely encircling the neck was observed in most of the studies. These observations are more or less similar to the studies of Momin, [5] and Sharma. [6]

In present study, it was noticed that though discontinuity of the ligature mark was a common feature of hanging still it was missing in 19 cases (19.58%) of hanging. In strangulation, discontinuity of the ligature mark was present in 1 case. Out of 100 cases, the direction of the ligature mark was oblique in 93 cases of hanging and 2 cases of ligature strangulation and mark was transverse in 4 cases of hanging and 1 case of ligature strangulation. Ahmed [15] and Naik [14] have reported in their study that ligature mark in cases of hanging is situated obliquely across the circumference of neck. Present study revealed that obliquity along the course of ligature mark was a constant feature in all deaths due to hanging irrespective of their manner of suspension whether homicidal or suicidal. In ligature strangulation, horizontal ligature mark was observed in 1 case while it was oblique in 2 cases.

None of us will disagree that the number of deaths due to ligature strangulation are rare in comparison to hanging. Therefore, the variations to the characteristics of ligature mark of strangulation are rather very rare to meet. Out of 97 cases of hanging, 66 cases (68.04%) were of atypical hanging and 31 cases (31.95%) were of typical hanging. Th. Meera, [11] and Naik [8] reported more number of cases of atypical hanging in their respective studies which is consistent with the present study.

Occlusion of both jugular and carotid systems creates a blood less field. Intimal tear in the carotid artery was found in 4.12% cases of hanging whereas Th. Meera [11] found 26.19% cases. This could be partially associated with the use of hard fixed noose and body weight.

Out of 100 cases bruising of subcutaneous tissue were seen in 4.12% cases of hanging and 66.66% cases of ligature strangulation. In most of the studies this findings were similarly found. Out of 100 cases of compression of neck by ligature, injury to hyoid bone in 2 cases and thyroid cartilage in 1 case was observed. Fracture of cricoid cartilage, tracheal rings and cervical vertebrae were not observed in any cases of neck compression which was in contrast to observation of other workers.

Out of these 2 cases of hyoid bone fracture one (33.33%) case was of ligature strangulation of adult female and one (1.03%) case was of hanging of elderly male victim. Thyroid cartilage fracture was seen in one (33.33%) case of ligature strangulation of young female. Incidence of fracture of hyoid bone in present study is almost quite lower than majority of workers like Sarangi, [10] Th. Meera, [11] Patil, [12] but almost similar to Naik [8] and Joshi. [7] and Simonsen [16] found higher number of hyoid bone fracture in their study because of in their study about 50% of cases were of more than 40 years; in this age incidence of calcification of the structure is increased.

CONCLUSION

In hanging, the ligature mark was found above the level of thyroid cartilage, oblique in direction and incompletely encircling the neck in maximum number of cases. Obliquity in the course of ligature mark being directed upwards to the knot position is a better criterion for diagnosis of hanging than the factor of discontinuity which may not be present in all cases of

hanging. It can be thus concluded that the presence of discontinuity along the course of ligature mark is highly suggestive of hanging but its absence neither rules out hanging nor concludes strangulation.

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How to cite this article: Patel JB, Bambhaniya AB, Chaudhari KR, et. al. Study of death due to compression of neck by ligature. *Int J Health Sci Res*. 2015; 5(8):76-81.
