Association Between Ligature Material, Ligature Mark and Survival Period in Suicidal Hanging Victims: An Autopsy-Based Study

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Abstract

Hanging is a quick and very effective method used to commit suicide. The ligature material used for hanging is one of the important factors that determine the type of ligature mark or the pressure abrasion. Cases were divided into two groups. Group I included 25 cases of non-survived victims of hanging Group II consisted of 25 cases of hanging that survived for varying periods before death. Association between ligature material, ligature mark and survival period in suicidal hanging victims were studied in detail. Victims who used a hard but pliable ligature material had 13 times more risk of death compared to a victim who used a soft ligature material. A person with a well-defined ligature mark had 15 times more risk of death when compared to a victim with a faint ligature mark

Keywords: hanging, ligature material, pressure abrasion, risk of death

Introduction

Hanging is a quick and very effective method used to commit suicide. World Health Organization on analysis found hanging to be the most frequent method of committing suicide in 56 countries[1]. National Crime Records Bureau Report of 2012 stated that 37% of suicidal deaths is by hanging[2]. The departmental statistics from the State Medico-legal institute of Kerala, Government Medical College, Thiruvanathapuram for a period of 6 years from 2007 to 2012 had shown that around 22 to 29% of deaths among the total medico-legal postmortems conducted per year were due to hanging. It had been observed that 15 to 16% of cases were brought down alive following attempted hanging but died before getting any treatment and only 1 to 2 % survived to reach a hospital. Hence survival after hanging is a rare event. A long survival and recovery are rarer. In the present scenario, we could see many of the victims of hanging were brought down immediately by relatives or friends and they might have survived long enough to reach the hospital and later expired while undergoing treatment.

Ligature material used for hanging the body is important and may vary from case to case. The ligature material used is one of the important factors that

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determine the type of ligature mark or the pressure abrasion. Different materials are used for hanging which may be varying in consistency. Soft ligature materials like dhoti, saree, shawl, bed sheet, towels, handkerchief etc. and hard but pliable materials like coir or synthetic rope, cable, wire, sacred threads, belt etc. are used by different victims. They are usually tied around the neck with a knot which may be seen anywhere in the neck.[3,4,5,6,7,8]

Ligature mark is a pressure abrasion caused by the ligature material. A distinct ligature mark will not be seen if a soft ligature material is used. If a rough or patterned ligature like coir rope is used, mark will be distinct and patterned similarly.[6] Ligature mark was non continuous in 80% of cases which were placed above the level of thyroid cartilage in 38% of cases and over and above thyroid cartilage in 32% of cases.[9] The impression of the ligature will be more marked in a person with greater body weight, greater period of suspension and on using a thin and tough material as a ligature.[5,8] The ligature mark may be faintly visible or not so prominent if the beard or a portion of the clothing intervenes between ligature and skin or when a soft material is used as the ligature.[5,6,8,10] It may also be faint if the victim is rescued immediately and survives for some period before death.[3,10]

Materials and Methods

The study was conducted in the Department of Forensic Medicine, Government Medical College, Thiruvananthapuram during the period January 2013 to June 2014. 50 cases were included in the study. Victims of both sexes were included in the study and their age range was between 13 and 88 years. Cases were divided into two groups. Group I included 25 cases of non-survived victims of hanging Group II consisted of 25 cases of hanging that survived for varying periods before death. History and other details were collected from the police officer in charge of the concerned dead body, accompanying near relative and from clinical case records. The type and consistency of ligature material used for hanging and details of pressure abrasion were recorded in the proforma. Dissections were carried out by Modified Rokitansky procedure. Data were analyzed using SPSS (Statistical Package for Social Sciences) version 16

Observations and Results

Period of Survival

Table 1: Period of survival

Period of survival	Frequency	Percentage
Did not survive	25	100
<1 hour	4	16.0
1-3 hours	5	20.0
3-6 hours	3	12.0
6-12 hours	1	4.0
12-24 hours	4	16.0
1-2 days	1	4.0
2-3 days	1	4.0
3-7 days	5	20.0
7-12 days	1	4.0
Total number of non-survived victims (Group I)	25	100
Total number of survived victims (Group II)	25	100

Type of Ligature Used by the Vicitm

Table 2: Type of ligature used by the victims

Type	Group I (non-survived group)		Group II (survived group)	
	Frequency	Percentage	Frequency	Percentage
Saree	5	20.0	6	24.0
Shawl	1	4.0	8	32.0
Lungi/Dhoti	2	8.0	7	28.0
Bed Sheet	1	4.0	1	4.0
Coir Rope	8	32.0	1	4.0
Nylon Rope	8	32.0	2	8.0
Total	25	100.0	25	100.0

Consistency of Ligature Material

Ligature materials used were either soft or hard but pliable. Hard but pliable ligature material was used by most of the victims in Group I (non-survived group) (64%), and 36% of cases used soft ligature material. Most of the victims in Group II (survived group) used ligature material having soft consistency (88 %) and hard but pliable material was used by only 12% of cases.

Details of Pressure Abrasion Seen on the Neck

Continuity of Pressure Abrasion

Pressure abrasion (ligature mark) was either continuous or non-continuous. Noncontinuous pressure abrasion was seen in 80% cases of Group I (non-survived group) and 84% of cases in Group II (survived group). Continuous pressure abrasion was seen in 20% of cases in Group I (non-survived group) and 16% of cases in Group II (survived group).

Appearance Of Pressure Abrasion

In Group I (non-survived group), 92% of the victims had a well-defined pressure abrasion and 8% showed faint pressure abrasion. Pressure abrasion was well defined in 44% and faint in 56% of the cases in Group II (survived group).

Location of Pressure Abrasion in Relation to Thyroid Cartilage

Ligature mark or pressure abrasion was either placed over and above the thyroid cartilage or above the thyroid cartilage. It was placed over and above the thyroid cartilage in 88% cases of Group I (non-survived group) and 80% of Group II (survived group). Only 12 % of cases in Group I (non-survived group) and 20% of cases in Group II (survived group) showed ligature mark above thyroid cartilage.

Chi Square test was done to find out the association between the consistency of ligature material, appearance of pressure abrasion and risk of death. The test had shown a significant association between outcome of hanging and the above-mentioned variables.

Table 3: External findings found significant in bivariate analysis

Factors	Category	Group I (non-survived)	Group II (survived group)	P value	OR (CI)
Consistency of the ligature	Hard but pliable	16	3	<0.001	13.07 (3.03-55.95)
	Soft	9	22		
Appearance of pressure abrasion	Well defined	23	11	<0.001	15 (2.8-75.9)
	Faint	2	14		

Discussion

Easily available materials from the vicinity were used as a ligature material by most of the victims. Hard but pliable materials like coir or nylon rope were used by most of the victims (64%) in Group I (non-survived group). Majority of the victims (88%) in Group II (survived group) used a ligature material having a soft consistency like shawl, lungi or dothi. These findings are consistent with observations made by various authors. [5,7,9,10] Using a ligature of soft consistency could be the reason for varying periods of survival before death. According to Sharija et al, 48% of the victims used soft materials as ligature in comparison to 62% in the present study [9]. Ligature mark in the neck is the principal external sign of hanging. Ligature mark in the form of a pressure abrasion was present in all the 50 study subjects. In Group I (non-survived group), non-continuous ligature mark was seen in 80% of cases and it was well defined 92% of cases in this group and faint in 8% of the cases. In 88% of cases, pressure abrasion was located over and above the thyroid cartilage and in 12% it was placed above thyroid cartilage. In Group II (survived group), non-continuous ligature mark was seen in 84% of the cases. The pressure abrasion was faint in 56% of the cases and well defined in 44% of cases and in 80% of the cases in Group II (survived

group), ligature mark was placed over and above the thyroid cartilage and in 20%, it was above the thyroid cartilage. In none of the cases studied, ligature mark was placed below the thyroid cartilage. Ligature mark is placed above thyroid cartilage in 80% of cases, at the level if thyroid cartilage in 15% and below thyroid cartilage in 5% of cases.[5,10]. Various authors had projected these observations earlier.[4,5,6,8,9,10]

Victims who used a hard but pliable ligature material had 13 times more risk of death compared to a victim who used a soft ligature material. A person with a well-defined ligature mark had 15 times more risk of death when compared to a victim with a faint ligature mark. (Table 3). Such a finding has not been reported in literature.

Conclusion

Deaths due to hanging is very common but only very few cases are found to survive for varying periods before death. Survival after attempted hanging is a rare event hence the number of victims who survived for varying periods before death is also small. The limitation of the study is the small sample size due to limited availability of cases and the limited period available to conduct the study.

Hard but pliable materials like coir or nylon rope were used by most of the victims (64%) in the non-survived group. Majority of the victims (88%) in the survived group used a ligature material having a soft consistency like shawl, lungi, or dhoti. In the non-survived group, a well-defined ligature material was seen in 92% of the cases and it was non continuous in 80% of cases. In the survived group, a well-defined ligature mark was seen only in 44% of cases and it was faint in 56% of the cases. Most of the ligature marks were non continuous (84%). Chi Square test had shown that victim who had used a hard but pliable ligature material had 13 times more risk of death compared to a victim who used a soft ligature material and a person with a well-defined ligature mark had 15 times more risk of death when compared to a victim with a faint ligature mark.

Conflict Of Intrest: We hereby declare that there is no conflict of interest

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