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Original Research Article

Histopathological Changes in Tissues, At And Around the Ligature Mark : An Autopsy Based Study, at SCB Medical College and Hospital, Cuttack, Odisha

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Conflict of interest: Nil

Abstract

Background: Death by hanging is one of the commonest methods of suicide that are chosen more often in our country with a common belief that it is an immediate and painless death. The person chooses any of the ligature material in his/her vicinity to execute the event of suicide. Period and point of suspension, built of the person, composition and texture of the ligature material, position, and type of knot ,all have a major role in production of the impression of the ligature mark around the neck. The histopathological findings of tissue samples taken from the ligature site play a major role in defining the ante mortem nature of the death. Here in this study we could determine array of HP changes in the vicinity of the ligature mark and internal changes in structures like sub mandibular gland and carotid arteries in addition to certain conventional features.

Aim and Objective: The aim of the study was to critically analyze the deaths due to compression of neck with ligature and to have a scientific corroboration in the context of histo-pathological and autopsy evidences. The objectives of this study was to analyze the gross pattern of compression on the neck, the microscopic features in the underlying tissues and its association with the configuration of ligature mark, and to evaluate the histopathological changes in carotid arteries of either sides.

Material and Methods: The present Prospective study described the histopathological changes in both epidermis and dermis and also changes in carotid artery and in sub cutaneous tissue.

Observation: Total number of suicidal hanging cases included in the study was 67. The ligature material, knot, ligature mark configuration along with histopathological changes were observed and evaluated.

Conclusion: The histopathological findings of tissue samples taken from the ligature mark play a major role in defining the antemortem nature of the death.

Keywords: Suicidal hanging, Ligature mark, HP changes, Knot.

Introduction

Death by hanging is one of the commonest methods of suicide that are chosen more often in our country with a common belief that it is an immediate and painless death. The person chooses any of the ligature material in his/her vicinity to execute the event of suicide. Period and point of suspension, built of the person, composition and texture of the ligature material, position and type of knot, all have a major role in production of the impression of the ligature mark around the neck. When a person dies in a position of hanging it always raises a doubt whether it was suicidal or homicidal in nature. A thorough external and internal examination of the body including the local effects on and around the neck in relation to the ligature mark is sufficient enough to diagnose a case of ante mortem hanging. But sometimes, certain conditions like minimal suspension time, incomplete hanging and use of soft and broad ligature material produce no or faint ligature mark and bring challenges for the forensic expert.

So, it is very much necessary to look for histopathological examination of tissues on and around the faint or absent ligature mark in alleged compression of neck to establish the ante mortem hanging.

This study was undertaken to determine the deaths due to compression of neck with ligature in context of autopsy and histopathologic evidences.

Aim and Objectives

The aim of the study was to critically analyze the deaths due to compression of neck with ligature and to have a scientific corroboration in the context of histo-pathological and autopsy evidences.

The objectives of this study was to analyze the gross pattern of compression on the neck, the microscopic features in the underlying tissues and its association with the configuration of ligature mark, and to evaluate the histo-pathological changes in carotid arteries of either sides.

Materials And Methods

This descriptive observational study was conducted in the central Morgue of FM&T department of SCB Medical College, Cuttack, Odisha in association with Department of Pathology for histopathology of samples for a period of two year .As per inclusion and exclusion criteria 67 cases were included in the study. Irrespective of the information gathered from the police records and from accompanying relatives of the deceased, in all cases both external and internal findings were observed meticulously along with thorough examination of ligature material during post mortem examination to rule out homicidal hanging or any other cause of death. Complete perusal of all the records done prior to Medico-legal Autopsy. Search for external injury, dribbling of saliva, hemorrhages, rigormortis were looked for along with details of the ligature mark. Dissection of the neck in extended position with midline incision was done. A portion of skin and subcutaneous tissue 2x2cm from the ligature mark and portion of carotid artery were send for histopathology examination to department of pathology.

Sample size, inclusion and exclusion criteria:

Total number of 67 cases of alleged hanging were included in the study. Cases of decomposed bodies, unclaimed bodies, manual strangulation, and other asphyxia were excluded.

Observation

Detailed interview of the relatives , both external and internal findings of the diseased especially of the neck region were observed along with examination of the ligature material. As per routine

protocol of Medico legal autopsy neck dissection was done.

A portion of the skin and subcutaneous tissue of size 2cmx2cm from the ligature mark, portion of carotid arteries adjoining the division and submandibular salivary glands were taken out and preserved in 10% formalin and send for histopathological examination. After processing histopathological slides were prepared in the department of pathology. All the positive and negative findings were analyzed and documented.

Thinning, wrinkling and breaking of epidermis[Fig-1][Fig-2][Table-3]were found in 45(67%), 38(56%), 27(40%) of total cases respectively and in 32(59%), 35(46%), 15(28%) cases where soft and broad ligature materials were used respectively. Dr Navneet Sharma et al[1]in their study found abraded epidermis in 35% of cases and congestion in dermis in 48% of cases.Jyothi Prasad et al[2] in their study found thinning, wrinkling and breaking of epidermis were found in 33%,36%,25% of cases respectively. Chandrakanth et al[3] noted that there was epidermal thinning and crowding of keratinocytes in 67.5% of cases. Breaking of skin in 35.6% of cases as per Anil Yadav et al[4]. In our study compression of keratinocytes, congestion in dermis were found in 39(58%), 35(52%) of total cases and in 26(48%), 24(44%) cases where soft and broad ligature material were used respectively. Inflammatory changes, congestion were found in 07(10%),13(19%) of total cases and 04(07%),07(13%) cases where soft and broad ligature materials were used respectively. Focal interstitial hemorrhage was found in 07(10%) cases where the ligature mark was above or over and above the thyroid cartilage. In 19(28%) of cases there was histopathological changes like sub intimal hemorrhage and loosening of muscle fiber[Fig-3][Fig-4]observed in tunica media of carotid artery. Vinay Kumar et al[5] in their study of carotid trauma in asphyxia deaths observed intimal and sub intimal pathology.

Table 1: Age (in groups) vs. Sex

Age in years	Male	Female	Total
11-20	05	04	09(13.43%)
21-30	21	10	31(46.26%)
31-40	08	05	13(19.4%)
41-50	07	02	09(13.43%)
54-60	01	01	02(2.98%)
>60	03	00	03(4.27%)
Total	45(67.16%)	32(32.83%)	67(100%)

Table 2: Type of Ligature Material Used

Ligature Material Used	Number of Cases (percentage)	
Saree	20(30.77%)	Soft and Broad 54(80.59%)
Gamuchha	19(29.23%)	
Chunri	11(16.92%)	
Bedsheet	02(3.08%)	
Others	02(3.08%)	
Plastic Rope	09(13.85%)	Rough and Thin 13(19.41%)
Jute Rope	03(4.62%)	
Nylon Rope	01(1.54%)	
Total	67	(100%)

Table 3: Histopathological Changes in Epidermis vs. Type of Ligature Material

	Soft and broad (54)	Rough and Thin (13)	Total (67)
Thinning	32	13	45(67.16%)
Wrinkling	25	13	38(56.72%)
Breaking	15	12	27(40.30%)

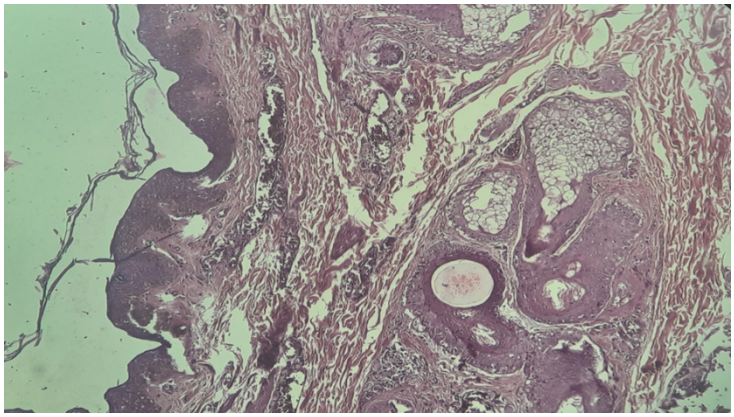

Figure 1: Thinning and Wrinkling of Epidermis, Congestion In Dermis (10x)

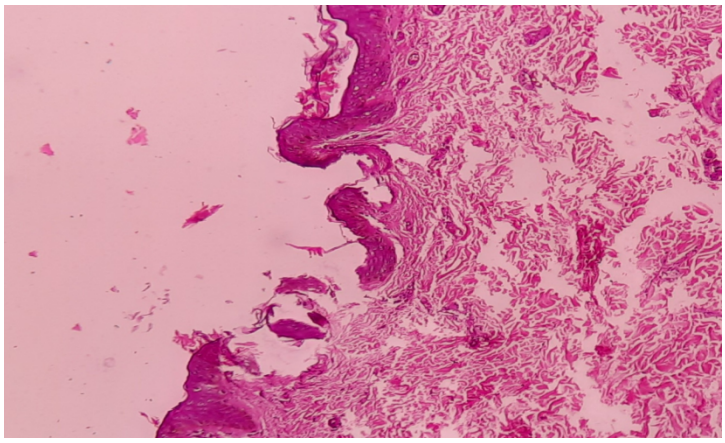

Figure 2: Breaking of Epidermis (10x)

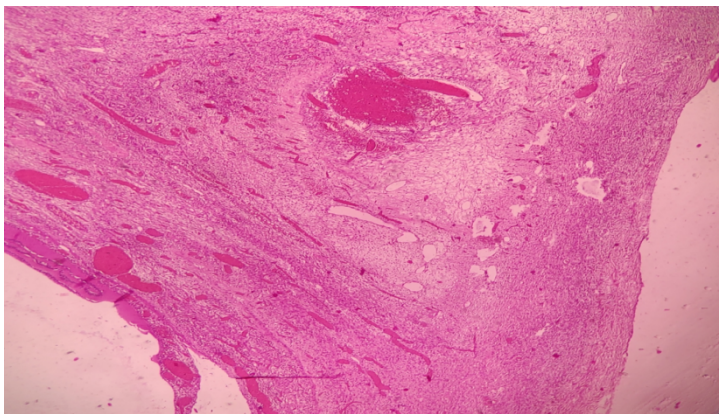

Figure 3: Loosening of Muscle Fibers (Edema) and a thrombus in the Media of Carotid Artery (4x)

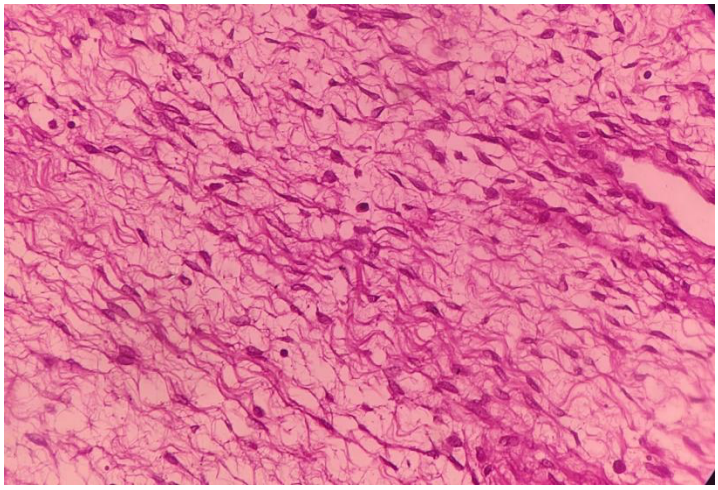

Figure 4: Loosening Of muscle Fibers (Edema) In Media of Carotid Artery 40x

Discussion

This observational study was conducted at SCB Medical college and hospital in the department of FM&T and department of Pathology for a period of 2 years after ethical approval. Total number of alleged hanging cases were 67 of which 45(67%) were male and 22(33%) were females.(Table 1) It is similar to the incidence of M:F ratio of 2:1 by Dr B R Sharma et al[6] also with the study by K Jyothi Prasad et al[2]. 20-30 year age group were the common victims because at this age people are emotionally unstable for frustrations about study, job, love exam failure, and family disturbances.

In this study soft and broad ligature materials like saree, gamuchha, chunri, bedsheet was noticed in 80.59% of cases followed by rough and tough ligature materials (19.41%) [Table 2] like plastic rope, coir rope etc. Dr. Shrabana noticed soft material in 54.70% cases of hanging and hard material in 28.60% of cases in his study. Females commonly used soft materials and males prefer hard material for their hanging.

In this study complete hanging was seen in 34 cases (51%) and partial hanging in 33 cases (49%). This finding is similar to the study by Charoonate N. et[7] who reported equal number of complete and partial hanging cases. In this study Atypical hanging was seen in 61 cases (91%) and typical hanging in 06 cases (09%). Similar to this study Saini O P et al[8] reported 90% of cases as atypical hanging. The ligature mark was found discontinuous in 44(66%). Among those cases with fixed knots (40) discontinuity was observed in 32(80%) cases. Of 12 cases with slipping knots, 03 cases(25%) cases showed discontinuous ligature mark. Of continuous ligature mark 78% were partial in nature and in discontinuous mark 34% were partial. Dribbling of saliva was observed in 50% of cases where the ligature mark was placed above or over the thyroid cartilage.

In 04 cases of 67 extravasation of blood was found in the soft tissue of neck beneath the ligature mark and (5%) cases with hyoid bone fracture.

Conclusion

Increased incidence of suicide by hanging among the younger age has been a matter of worry. The role of medical officer gets tougher in situations of partial hanging. In the present age of evidence based practices it is not enough to rely on naked eye observation and opinion. Supplementary evidence has immense help for the decision.

The recent controversies of alleged hanging deaths ie body found hanging at a crime scene creates doubts to conclude as

hanging. In analysing cause of death due to asphyxia involving compression over neck, information related to statements of witness, suicide note, examination and adequate photography of crime scene must be taken into consideration along with thorough external and internal examination of the deceased and examination of ligature material.

The Histopathological findings of tissue samples taken from the ligature site also play a major role in proving vitality of the event thus defining the ante mortem nature of the death. In this study we could identify array of histopathological tissue changes in the vicinity of the ligature mark and internal changes in the structures like submandibular gland and carotid arteries in addition to conventional features of ante mortem hanging like saliva dribbling, La facie sympathique etc.

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