

Position of the Knot in Hanging and Strangulation in Asphyxial Deaths in Medico-Legal Autopsies in Lahore

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ABSTRACT

Objective: This study was carried out to find out the position of the knot in all the asphyxial deaths due to hanging and ligature strangulation.

Study Design: Retrospective study.

Place and Duration of Study: This study was carried out at Forensic Medicine Department KEMU, Lahore, during the period from Jan. 2006 to Dec. 2008.

Materials and Method: Out of total 2979 medico-legal autopsies, 220 cases of fatal compression to the neck were selected. The autopsy reports, police documents and hospital records were studied.

Results: Out of total autopsies compressive trauma to the neck was in 220 cases (7.39%). Hanging was the commonest cause 42.27%, ligature strangulation 29.09% and manual throttling 23.64%. The manner of death out of 104 cases of hanging was 68.50% (68 cases) with predominance of males (Male/Female ratio 2.78:1). 3rd decade showed higher incidence in males than the females which were more in 2nd decade. No hanging was seen in the 1st decade. The strangulation was common in 2nd, 3rd and 4th decades of life. Males showed higher incidence than females in hanging in 3rd and 4th decade. Females showed higher incidence in 2nd, 3rd and 4th decades in ligature strangulations than males. In throttling males showed higher incidence in 3rd decade than females in 4th decade. The homicidal deaths were 57.27%, suicidal 30.90% and undetermined were 11.82%. Ligature strangulation and throttling were the methods used in homicidal manner (57.27%) while hanging was used for suicide (30.97%). In hanging the position of the knot was at occiput in 62.50% cases and 23.08% had lateral position. In ligature strangulation 78.13% showed the knot on the front and 21.87% lateral.

Conclusion: In hanging, which is a common method of suicide in our country, the knot was at occiput in 65 cases (62.50%), on right or left lateral in 24 cases (23.08%) and in none of the case was on the front. While in ligature strangulation, in 50 cases (78.13%) it was on the front, in 14 cases (21.87%) on right or left side and in none of the case it was on the front.

Key Words: Asphyxia, Hanging, Ligature Strangulation

INTRODUCTION

Neck transmits important vital structures from head to body, like major blood vessels, nerves, wind pipe and esophagus. So this region is most vulnerable to injuries and most important of these injuries is mechanical compression to the neck. This causes mechanical asphyxia and most common means used to do this is by ligature or manual compression. In hanging the body weight acts as a constricting force¹. This mechanical compression can also be achieved by direct blow on neck, arms lock, accidental falls on to the neck and accidental entanglement in cords².

As a consequence of mechanical compression the asphyxia will develop. The outcome will depend upon the effects of the structures involved, individually or in total and method & force applied. Occlusion of the jugular veins will occur with only 2 kg of weight; and it will cause obstruction to return of blood to the heart and

will appear as cyanosis, congestion and petechiae. Carotids arteries needs 3.5 kg and will cause cerebral ischemia. Pressure on carotid bodies will cause stimulation of baro-receptors in the carotid sinus lying in the internal carotid arteries, and will cause sudden cardiac arrest by stimulation of vagus nerve. The obstruction to the respiratory passages can be achieved with elevation of larynx and pushing the base of tongue against the posterior pharyngeal wall. Due to rigid structures of wind pipe it is difficult to occlude the airways, but 15 kg of tension can do that. Direct pressure on the larynx can also cause the fractures of hyoid and thyroid cartilages.^(2, 3, 4, 5, 6)

Whatever mechanism is used to achieve mechanical asphyxia, the reduction in O₂ level will result in tissue anoxia leading to endothelial damage, capillary dilatation, increased permeability and stasis of blood. This will appear as cyanosis, congestion, petechial haemorrhage oedema and serous effusion. This

reduction in circulating blood volume will set in a vicious cycle of more anoxia and so on.

MATERIALS AND METHODS

All the medico- legal autopsies which had been conducted in the Department of Forensic Medicine & Toxicology KEMU Lahore during Jan-2006 to Dec-2008 were studied. The autopsy reports, police documents and hospital records were scrutinized. The asphyxial death cases were studied and analyzed for age, sex, type of compression, manner of death, level in relation to thyroid cartilage, number of turns, fracture of hyoid bone and position of the knot. All those cases where the cause of death was hanging or ligature strangulation were included while other cases were excluded in which the trauma to the neck was present but the cause of death was other than hanging or strangulation.

RESULTS

Out of total 2979 medico-legal autopsies carried out during the three years study period of 2006-2008 in the Department of Forensic Medicine & Toxicology, 220 (7.38%) cases were due to compression of neck. (Table No. 1).

Table No. 1 Causative Agent (2979 cases)

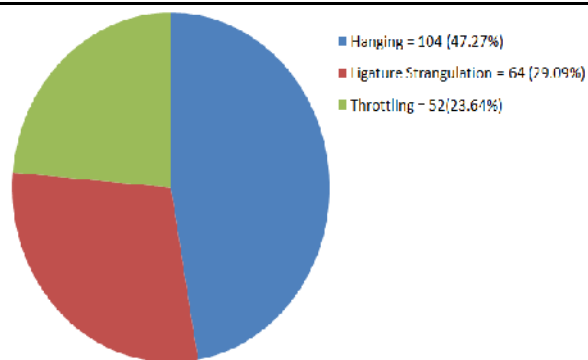
	Total	%age
Blunt Means	403	13.52
Sharp Means	256	8.5
Fire-arms	1285	43.13
Poisoning	74	2.48
Burns	50	1.68
All Asphyxial Deaths	220	7.38
Electrocution	19	0.64
Drowning	17	0.57
Bomb Blast	65	2.18
Natural	347	11.65
Un-Determined	213	7.15
Total	2979	100.00

Types of Neck Compression:

Three types of neck compression means were seen commonly in our study, out of these 220 cases of asphyxial deaths, the cases of hanging were 104 (47.27%) and 64 cases (29.09%) were those of ligature strangulation. (Table No. 2) (Graph 1).

Table No.2: Types of Neck Compression (220 cases)

Types	No. of Cases	%age
Hanging	104	47.27
Ligature Strangulation	64	29.09
Throttling	52	23.64
Total	220	100.00



Graph No.1: Types of neck compression

Age and Sex Distribution: The most common age group involved was between 21-30 years (35.91%) and next to it was between 31-40 years (25.91%). Next involved age group was between 11-20 years (17.27%). Total of 144 (65.45%) male cases were seen out of all 220 asphyxial deaths, and females were 76 (34.55%). (Table No. 3).

Table No. 3: Age and Sex Distribution in 220 cases

Years	Male	Female	Total	%age
< 1	-	-	-	-
1-10	3	2	5	2.27
11-20	23	15	38	17.27
21-30	59	20	79	35.91
31-40	36	21	57	25.91
41-50	9	6	15	6.82
51-60	10	7	17	7.73
>60	5	4	9	4.09
Total	144 (65.45%)	76 (34.55%)	220	100.00

Manner of Death: Manner of death is either natural or un-natural. Un-natural in our study include homicide, suicide or un-determinable death in which the exact cause of death could not be ascertained due to natural or acquired limitations. No case of accidental asphyxial death was reported during the period of study.

The distribution according to manner of death showed that, incidence of homicide was 57.27% (126), suicidal 30.90% (68), while 11.82% (26) cases remained un-determined. Male to female ratio was 2.15:1 in homicidal deaths, 2.77:1 in suicidal and 1.6:1 in un-determined deaths. (Table No. 4)

Position of Knot: The knot was present on occipital position in 65 cases (62.50%) and it was on lateral right or left positions in 24 cases (23.08%) and in ligature strangulation in 50 cases (78.13%) the knot was on front and in 14 cases (21.87%) it was on lateral right or left. (Table No. 5).

Table No. 4: Manner of Death in All Asphyxial Deaths (n=220)

Age (Years)	Total	Homicide M/F Ratio 2.15:1			Suicide M/F Ratio 2.77:1			Un-Determined M/F Ratio 1.6:1		
		M	F	Total	M	F	Total	M	F	Total
<1	0	0	0	0	0	0	0	0	0	0
1-10	5	2	3	5	0	0	0	0	0	0
11-20	38	8	6	14	5	9	14	7	3	10
21-30	79	36	11	47	20	06	26	4	2	6
31-40	57	20	14	34	16	02	18	3	2	5
41-50	15	8	2	10	4	01	5	0	0	0
51-60	17	6	3	9	5	0	5	0	3	3
>60	9	6	01	7	0	0	0	2	0	2
Total	220	86	40	126 (57.27%)	50	18	68 (30.91%)	16	10	26 (11.82%)

Table No. 5: Position of knot in hanging

Position of knot	Hanging	Front	-	-
		Occiput	65	62.50%
Ligature Strangulation	Lateral (right or left)	24	23.08%	
	Front	50	(78.13%)	
Ligature Strangulation	Occiput	-	-	
	Lateral (right or Left)	14	(21.87%)	

Age and Sex Distribution: The highest incidence of all neck compression deaths, hanging, ligature strangulation and throttling is seen in the 21-30 years of age group. This is comparable with the previous studies also 57%¹¹, 3rd decade¹², average of 41.9 years¹⁴. Bowen¹⁶ has shown highest incidence of hanging in 50-59 years of age. Guarnier & Hanzlick¹⁷ mentioned 31 years of age showing highest incidence in USA.

Male/Female Ratio: In our study male/female ratio in hanging is 2.25:1, ligature strangulation 2.05:1 and in throttling 1.26:1. So males have shown higher incidence in all the three asphyxial deaths.

DISCUSSION

Incidence of Death: Our study showed that fatal compression to the neck caused 220 deaths out of 2979 medico-legal autopsies carried out at the Department of Forensic Medicine & Toxicology K.E.M.U. Lahore with an incidence of 7.39% and 89.45% of all asphyxial deaths. This incidence is much higher than reported by 1.6%⁷, 1.75%⁸, and 1.88%⁹ of all asphyxial deaths. And it was 2.94%¹⁰ of all deaths 24.53% of all asphyxial deaths, 5%¹¹ of all deaths and 82% of asphyxial deaths, and 1.17%¹² & 12.4%¹³ of all and 5.5% of all deaths but lower than 15.7%¹⁴ in Edirne Turkey.

Type of Neck Compression: The incidence of hanging is the highest 47.27% (n=104), next is ligature strangulation 20.09% (n=64) and throttling is 23.64% (n=52). These values are comparable with (hanging 57%, strangulation 21%, and throttling 18%)⁹, (hanging 61.17%, ligature strangulation 21.19% and throttling 17.64%)⁸, (hanging/ligature strangulation 80.7% and throttling 19.3%)⁷, (hanging/ligature strangulation 85% and throttling 6%)¹⁵, (ligature strangulation 12.4%)¹³, (ligature strangulation 19.23%, throttling 46.15%)¹⁰, (hanging 41.8%, ligature strangulation 2.9% and throttling 2.3%)¹⁴, (hanging 69%)¹¹.

In hanging males were 69.23%, which is higher than females having 30.76%. This is comparable with those of 83.9% males of Azmak¹⁴, 2.7:1 (males 73.07% and females 26.92%) of Bashir MZ⁹ et al. In ligature strangulation and throttling Bashir MZ⁹ has shown 58.9% males and 41.02% females. Azmak D¹⁴ has quoted 1:3 for strangulation and 1:2 for throttling, and Srivastava AK¹⁰ had shown 30.77% males and 69.23% females, giving higher incidence in females than males.

Manner of Death: The homicidal deaths in our study were which shows higher incidence than that of Bashir MZ⁹ 45.05% but lower than that of Demirci S¹³ 85%. Suicidal 30.90% in our study is lower than Bashir MZ⁹ 45.45% and Azmak D¹⁴ 47%. It is higher than that of Demirci S¹³ 15%. In hanging the suicidal incidence in our study was 65.38%, which is lower than that of Bashir MZ⁹ 86.53%. Homicidal showed 9.62% which is also higher than 3.84%⁹. But lower than that of Bowen DA¹⁶, which is 95%. There was no case of accidental hanging; however Bowen DA¹⁶ reported 5% of auto-erotic accidental asphyxial deaths.

Position of Knot: In 65 cases (62.50%), the knot was present at occiput, which is comparable with the findings of Azmak D¹² narrating 66% on occiput in hanging and 88.7% on the chin in ligature strangulation. In 24 cases (23.08%), it was on lateral side, either right or left. Whereas in ligature strangulation, in 50 cases

(78.13%) the knot was on front and in 14 cases (21.87%) it was on lateral right or left. Our findings are also comparable with those of Bawon DA.¹⁶ et al and Sharma BR¹⁵ et al.

CONCLUSION

Hanging remains the most preferable method of suicidal asphyxial deaths and ligature strangulation being the next in number in homicidal asphyxial deaths. In hanging, the position of the knot is typically at the occiput in most of the cases, and similarly in homicidal strangulation the knot is on the front in majority of the cases.

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