Original research paper

Title- Retrospective Study of Autopsy carried on Violent Asphyxial Deaths with special consideration to hanging cases done in C P R Hospital Kolhapur.

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Every human life has the end in the form of death either in natural way or sometime in unnatural manner. The term asphyxia denotes a mode of dying, rather than cause of death. Violent asphyxial death includes deaths occur as a result of constriction around neck, blockage of respiratory tract, pressure around chest or inability of respiration due to odd position of body. The present work is retrospective study of autopsies conducted between years Jan 2013 –Dec 2015 with an attempt to know the incidence of asphyxial deaths such as hanging, strangulation, smothering, drowning, throttling etc. at C P R hospital, Kolhapur. It includes detailed external as well as internal findings in violent asphyxia deaths in the form of hanging. Total 4480 autopsy conducted over three years out of which 2688 (60%) were unnatural deaths. Violent asphyxia deaths contribute 26.11% in unnatural deaths. While hanging as a cause of death in 51.39% cases of asphyxia deaths.

Key Words Asphyxia, hanging, drowning, throttling, strangulation

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Introduction

Every human life has the end in the form of death in either natural way or sometime in unnatural manner. The term asphyxia denotes a mode of dying, rather than cause of death. [1] Violent asphyxia death includes deaths occur as a result of constriction around neck, blockage of respiratory tract, pressure around chest or inability of respiration due to odd position of body. In Kolhapur region mostly covered by rural area the suicide mostly occurred by constriction around neck i.e. hanging, while the accidental deaths due to drowning were also common. In general violent asphyxial deaths contribute the major part of unnatural deaths in Kolhapur region. Present work is an attempt to study demographic pattern including age and gender of violent asphyxia deaths along with detailed external and internal neck structure findings on autopsy examination in case of hanging.

Material and methods

The study was conducted at C.P.R. Hospital post mortem centre and FMT Dept. of RCSM Govt. Medical College, Kolhapur which covers almost entire district for medico-legal post mortems and unnatural deaths. A retrospective study of autopsies conducted between years Jan 2013 to Dec 2015. During this period out of total 2688 cases of unnatural deaths 718 were of violent asphyxia deaths. These 718 cases were thoroughly studied. Police investigation reports, inquests were reviewed, the relatives were consulted and detailed medico-legal post mortem examination was conducted in each case which includes external examination in situ and internal examination. The relevant material was preserved for further examination. The results were tabulated and interpreted with special emphasis on cases of hanging.

Table No. 1] Distribution of types of cases according to duration.

Sr. No.	Year	No. of Autopsies	Un-natural deaths	Asphyxial deaths
1	2013	1518	870	229
2	2014	1502	915	242
3	2015	1460	903	247
4	Total	4480 (100%)	2688 (60%)	718 (26.71%)

Observation and results

Out of total 718 violent asphyxia deaths, 369 were due to hanging. Thus hanging is major cause which contributes towards violent asphyxia deaths followed by drowning. From this study it was seen that males are more prone to violent asphyxia deaths. Most vulnerable age group is 20 to 40 years of age. It means more productive age groups are victims of violent asphyxial deaths. In most of the cases i.e. in 50% cases ligature material used was rope, while cloth were used in 23.84% cases. However other material like wire, cycle chain and even medical IV set was used in some cases. The ligature material used was one which was easily available, 98.1% cases were of suicide while in 7 cases accidental hanging was observed. The autopsy surgeon always keep in mind the possibility of homicidal or accidental hanging which must be ruled out by scrutinising police report. Visit to crime scene seldom helps to arrive at diagnosis.

Table no. 2] Gender wise distribution of asphyxia deaths

Sr. No.	Cause	Male	%	Female	%	Total
1	Hanging	277	60.87	92	34.9	369 (51.39%)
2	Strangulation	4	0.87	10	3.8	14 (1.94%)
3	Drowning	168	36.92	156	59.31	324 (45.12%)
4	Chest compression	2	0.43	0	0	2 (0.27%)
5	Throttling	1	0.21	4	1.5	5 (0.69%)
6	Smothering	3	0.65	1	0.38	4 (0.55%)
	Total	455	--	263	--	718 (100%)

In female victims, 44.4% were in menstruating phase, psychological imbalance in menstrual period is commonly seen which was provocative the suicidal tendency in females.

Table no. 3] Age wise distribution of asphyxia deaths due to hanging

Sr. No.	Age in year	No. of cases	Percentage
1	0 – 10	1	0.27
2	11 – 20	45	12.19
3	21 – 30	116	31.43
4	31 – 40	92	24.93
5	41 – 50	52	14.09
6	51 – 60	39	10.56
7	61 – 70	16	4.33
8	71 – 80	6	1.62
9	81 – 90	2	0.54
	Total	369	100

Thorough external as well as internal examination is mandatory before confirming the cause of death and arriving at conclusion. Typical findings may not be prominently seen in all cases especially in cases of rapid deaths. Particularly in cases where there is vagal or carotid body stimulation. In this study ligature mark was carefully observed using magnifying lens with light facility. Imprint of ligature material was noted in 265 (71.81%) cases. In 228 cases (86.03%) there was single ligature mark where as

Table no. 4] Ligature material used in hanging

Sr. no.	Material used	No. of cases	Percentage
1	Rope	186	50.40
2	Wire	73	19.18
3	Cloth	88	23.84
4	I.V.set	10	2.71
5	Miscellaneous	12	3.25
6	Total	369	100

in 37 (13.96%) cases multiple ligature marks were noted. In most of the cases of hanging 351 cases (95.12%) ligature mark was situated above thyroid cartilage.

Bending of neck was observed in 261(70.73%) cases and stretching was noted in 81 (21.95%) cases. Weight of the body, position of knot and point of suspension modifies these findings. In majority of cases 343 (92.95%) face was congested. Tongue was protruded and bitten in 247(66.93%) cases, dribbling of saliva which is an important conclusive sign of ante-mortem hanging was noted in 260 (65.06%) cases. Sub-conjunctival haemorrhages were noted in 196 (53.11%) cases. Post mortem lividity was noted on back in 206 (67.7%) cases and over hand and feet in 50 (16.3%) cases each, which is depends on time period of suspension. In 300 (81.3%) cyanosis was observed particularly on nails, lips and finger tips. Purging was noted in 156 (42.27%) cases. Out of total 227 male victims who died of hanging, 104 cases (28.18%) showed discharge of seminal fluid. In some cases 12 (3.2%) cases nail marks were noted on neck near ligature mark probably showing sign of struggle for survival.

Table no 5] Manner of asphyxia deaths in hanging

Sr.no	Manner	No. of cases	Percentage
1	Suicide	362	98.1
2	Homicide	0	0
3	Accidental	7	1.89
	T0tal	369	100

Table no 6]Types of hanging

Type	Percentage	Type	Percentage
Complete	92.12	Typical	76.1
Partial	7.8	Atypical	23.9

Table no 7] Examination of ligature mark in Hanging

Sr. No.	**EXTERNAL EXAMINATION**		**No. of victims**	**Percentage**
1	Imprint of ligature material	Single mark	228	86.03
		Multiple marks	37	13.96
2	Location	Above thyroid	351	95.12
		Below thyroid	18	4.87
3	Neck position	Bending	261	70.73
		Stretching	81	21.95
		Non particular	27	7.31
4	Face	Pale	26	7.04
		Congested	343	92.95
5	Tongue	Protruded & bitten	247	66.93
		Inside the mouth	122	33.06
5	Dribbling of saliva		260	65.06
6	Sub-conjunctival haemorrhage		196	53.11
7	PM staining	Hand	59	15.98
		Back	248	67.2
		Legs	62	16.8

8	Cyanosis of nails, fingers, lips	300	81.3
9	Purging	156	42.27
10	Seminal fluid discharge	104	28.18
11	Nail marks on neck	12	3.2

Internal examination revealed congestion of larynx and trachea in 296 (80.21%) cases and petechial haemorrhages in 170 (46.07%) cases. Sub-pleural and sub pericardial haemorrhages were found in 168 (45.52%) cases. Petechial in brain was noted in 229 (62.05%) cases. The tissue under ligature mark was glistening white in 319 (86.44%) cases. The haemorrhages in neck muscles particularly in sternocleidomastoid were present in 69 (18.69%) cases while platysma tear was found in 7 (1.8%) cases. In 2 (0.54%) cases there was fracture dislocation of cervical vertebra. Posterior pharyngeal wall was found congested with presence of petechial in 286 (77.5%) cases. In 66 cases (17.88%) cases alcohol was present in gastric contents. All these cases positive for alcohol were males. In all these cases there was no auto erotic asphyxia deaths.

Table no 8] showing internal neck structure findings in case of hanging.

Sr. No.	Internal examination		No. of victims	Percentage
1	Larynx & Trachea	Normal	50	13.55
		Congested	296	80.21
		Petechial haemorrhage	170	46.07
2	Sub-Pleural haemorrhages		168	45.52
3	Sub-Pericardial haemorrhages		154	41.73
4	Petechial haemorrhages in brain		229	62.05
5	Tissue under ligature mark	Glistening white	319	86.44
		Normal	50	13.55
6	Neck muscles	Platysma tear	7	1.8
		Haemorrhages in SCM muscle	69	18.69
7	Hyoid fracture	Present	12	3.2
		Absent	357	96.74
8	Tear in intima of carotid		56	15.17
9	Fracture dislocation of cervical vertebra		2	0.54
10	Congestion & petechial haemorrhages in posterior pharyngeal wall		286	77.5
11	Alcohol consumption		66	17.88

Discussion

The results of study were matched to the other studies such as Patel et al[10], Th Meera et al, Reddy S et al[9]. Among all these registered suicides cases, hanging was the commonest method used to commit suicide [4]

Hanging is more prevalent in males and age group 21-30 years were more prevalent this result is similar to other studies Sharma et al[5], Singh et al[6] Singh et al[7]. In our study we get hanging and drowning were the commonest type of violent asphyxia deaths. Hanging is common cause of death as it is non expensive, easy availability of ligature and surety of

causing death. The above study helps in confirming the mode of death in hanging. Various mechanisms causing death in hanging were described in literature, most common being asphyxia secondary to compression of laryngo-pharynx, larynx and trachea and cerebral ischemia due to compression of carotids and jugular veins. [1,2,3].

The study shows variation regarding ligature material used for hanging. This variation is probably because of the fact that suicide is impulsive disorder and for that victim uses whatever material available nearby on that particular time.

Carotid sinus reflux may lead to bradycardia and hypotension and death in which one may not get all typical findings of suggestive of asphyxia deaths. First information report and information obtained from relatives corroborate to arrive at diagnosis. Autopsy is insufficient itself to establish that hanging is homicidal. Tardiae spots external and internal is considered hall mark though it is simply a marker of increased cephalic venous pressure and purely a mechanical vascular phenomenon. Alcohol consumption further adds to the suicidal act. Apart from examination of ligature mark thorough external examination of whole body to search for signs of asphyxia and corresponding positive findings in internal examination helps in establishing the cause and manner of death.

A vigilant autopsy surgeon thus can contribute for social justice by helping law enforcing agencies in such cases.

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Case report

DILEMMA OF MANNER OF DEATH IN ROAD TRAFFIC ACCIDENT

Dr. Bangal R.S, Dr. S.S.Bhise, Dr. S.D.Nanandkar, Dr. A.B. Dheeraj

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Abstract
Decapitation of bodies is a rare event in the civilian setting and is reported to account for approximately 0.1% of medico-legal autopsies. Suicidal decapitation is a method of self destruction. In suicidal decapitation, the favored method is the one involving trains. Other encountered methods are decapitation in vehicle-assisted ligature suicide, and rarely also by guillotine. Amongst the homicidal decapitation literature majority is by the murderers during or after the killing and among the accidental one mostly the reason is tragic traffic accidents. Non-suicidal decapitation appears to be very rare which perhaps makes each case shocking irrespective of how it happened.

In this case decapitation of the rider took place while riding on a motorcycle. Decapitation has occurred by hitting a pole on flyover during accident. Relatives were suspecting foul play. It's one of the rare cases of decapitation by hitting a pole while riding on bike

Key-words Decapitation, Road-traffic accidents, Motorcycle.

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Introduction

Decapitation has been used as a form of capital punishment. The terms "capital offence", "capital crime", "capital punishment," derive from the Latin *caput*, "head", referring to the punishment for serious offences involving the forfeiture of the head. *i.e.,* death by beheading.[1] Decapitation (from Latin, *caput*, *capitis*, meaning head) is the separation of the head from the body. Beheading means intentional decapitation. Murder or execution; may be accomplished, for example, with an axe, knife, wire, sword, or by other more sophisticated means.

History

A 21year male was travelling on his motorcycle over eastern freeway flyover (Fig 1). He met with an accident; the 21 year male was brought decapitated with multiple injuries over the body. Post mortem examination was done.

Post-Mortem findings (Fig 2 and 3)

- Traumatic decapitate laceration was present at the level of mandible and base of skull involving underlying muscles, soft tissues, vessels, exposing cranial cavity and brain matter of size 38cmx22cm cutting the both ears in middle region with communited fracture of mandible, maxilla, base of skull which is completely destroyed with protrusion of brain outside, with laceration of upper gingiva with dislocation of upper incisors. Irregular, crushed margin

Fig. 1: Accident spot satellite view

Fig No.2: Body with decapitated head

noted with infiltration of blood & soil particles.

- Graze abrasions were present over Right shoulder, Right arm laterally, Right forearm, Right side of chest, Lateral and posterior side of right thigh, left knee, These abrasions were of varying size. All were fresh.
- Laceration of left hand base of index finger was noted.
- Skull & brain: Under scalp contusion of size 13cmx8cm was present over right frontal region. Fractured bone of base of skull, occipital bone exposing brain & soft tissues was noted. Diffuse subarachnoid haemorrhage was present.

Fig. 3: Fractured occipital bone with exposed brain

- Visceral organs: All were pale. Stomach contained 50cc of semi-digested food with peculiar odour.

Scene visit findings (Fig 1, 4, 5)
Eastern free way satellite view of accident spot as shown in figure no 1. The steep curvature is seen where the accident took place. The bike was found 40 feet away from the blood spots on road. Decapitated body was lying near to the pole on the right side which had the blood stains over it. The head was approximately 25 feet diagonally away from the body in the direction of slope and on left side of road. Blood splatter was noted along the tract between the body & the head. On examining the bike, damage was more on the right side.

Fig.4:Pole on which accident occurred

Discussion

Decapitation of bodies is a rare event in the civilian setting and is reported to account for approximately 0.1% of medico-legal autopsies. [2] Suicidal decapitation is a very rare method of self destruction. In suicidal decapitation, the favored method is the one involving trains. Other encountered methods are decapitation in suicidal hanging, vehicle-assisted ligature suicide, and rarely also by guillotine.

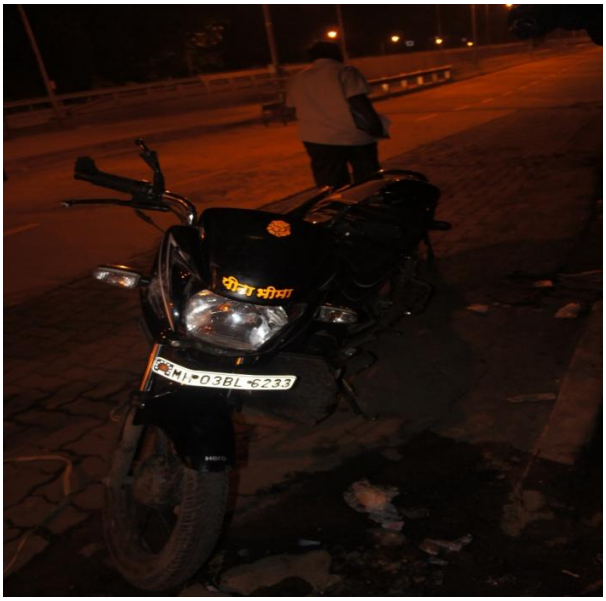

Fig. 5: Fig 5: Damage on right side of bike

Amongst the homicidal decapitation literature majority is by the murderers during or after the killing. And among the accidental one mostly the reason is tragic traffic accidents.[3] Homicidal decapitation appears to be very rare which perhaps makes each case shocking irrespective of how it happened. Understanding the biomechanics of road traffic collision injuries is important for diagnosing and managing road traffic injured patients. As road traffic collisions may entail high-energy trauma, the degree of injury will depend on the mass and speed of the collided vehicles. The physics behind the pillion rider to go in air and smash to the pole can be understood by following proposed theories:

1. Dash with another vehicle at high speed. According to law of moment of inertia, sudden stoppage of any moving object can make the object of its track. As is commonly seen in case of head on collision of trains.
2. Dash with the side railings of the freeway with head on, as the turn was steep overlooked by rider while at high speed.
3. Centrifugal force acting at the curvature was too high to get limited by the banking provided at the road.

Supposedly by any of the above postulates, person flew of the bike. The neck structure must get a blow sufficient to rip off from the body.

- The possibility is, either the body struck with the electric pole on side railing, or struck with the railing itself.
- Both of this can't be ruled out, as there was presence of blood on both the site.
- Force is defined as product of mass & acceleration. i.e**. F=mxa**, *m*=mass in kg, *a*=acceleration. ***m***= weight of the person 70kg, ***a***=25metre in one second. Then ***F***=1750kg.m.sq sec (kgF) which is more than sufficient to cause decapitation.[4]
- Centrifugal force is the force acting on the body in outward direction while body is in curvilinear motion. As is in this case. ***F=mv2/r*** = **m(n2πr/60)2**/r = **0.01097mrn2** [**n**=revolution per minute rpm]. Putting the values **r**=300m, **m**=70kg, **n**=**rpm**=5 calculate at speed of 90kmph. **F=5759 N**. This is again sufficient to lead to decapitation. [4]

Conclusion

All injuries present over the body were mostly on the right side and above waist level Comminuted fracture was present from left to right side of the mandible in decapitated head. Degloving of skin of mandible was seen from left to right side. Damage of bike is on right side. From these findings it can be concluded that direction of force was from left to right. While he might be swaying on his right side with his left side of face being struck first due to centrifugal

force and According to the references force developed was sufficient enough to cause decapitation at that point of impact.

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