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Autopsy Findings in Pressure over Neck Deaths: A Cross-Sectional Autopsy Study from Western India

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Consent for publication:

Autopsy photographs are published in accordance with departmental medicolegal records policy. Post-mortem case numbers are internal institutional identifiers that do not permit public identification of individuals or their families.

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Autopsy Findings in Pressure over Neck Deaths: A Cross-Sectional Autopsy Study from Western India

Running title: Autopsy findings in pressure over neck deaths

Abstract

Background: In some violent asphyxial deaths, fatal ligature-related neck compression is established at autopsy, but the available findings do not permit confident classification as hanging or ligature strangulation. Pressure over Neck (PoN) may be used as a cautious pathological description in such cases.

Objectives: To document demographic, scene, external and internal neck findings in deaths classified as PoN and compare them with confirmed hanging and non-hanging neck-compression deaths.

Methods: A cross-sectional observational autopsy study was conducted at a tertiary care government medical college hospital in Western India, from January 2023 to March 2024. Of 2,405 consecutive medicolegal autopsies, 203 (8.4%) were violent asphyxial deaths. Twenty-three deaths were classified as PoN because fatal ligature-related neck compression was established but the available findings did not permit confident classification as hanging or ligature strangulation. Hanging (n=147), ligature strangulation (n=15) and throttling (n=8) served as comparators. All cases underwent standardized external examination and layered internal neck dissection using the Prinsloo–Gordon bloodless technique. Fisher's exact test was used for selected categorical comparisons.

Results: PoN accounted for 11.3% of violent asphyxial deaths. Males represented 52.2% of PoN cases versus 95.2% in hanging. Open or non-residential scenes occurred in 56.5% of PoN cases versus 10.9% of hanging and none of the non-hanging neck-compression cases. No ligature was

present in situ in PoN. A ligature mark was present in 91.3%; direction was oblique in 60.9% and transverse in 39.1%. The mark was at the laryngeal prominence in 78.3%. Peri-ligature abrasions/ecchymoses occurred in 47.8%. Subcutaneous bruising/haemorrhage was present in 30.4%. Hyoid, thyroid and cricoid fractures were absent in all PoN cases. Laryngo-tracheal congestion was present in all PoN cases.

Conclusions: PoN should be understood as a cautious pathological description rather than a newly defined biological mechanism. It permits documentation of established fatal ligature-related neck compression without forcing the findings into hanging or strangulation when the evidence does not support such a specific classification. Manner of death remains a separate determination based on integrated autopsy, scene and investigative evidence.

Keywords: pressure over neck; ligature-related neck compression; hanging; ligature strangulation; throttling; forensic autopsy; Prinsloo–Gordon dissection; manner of death

Clinical trial number: not applicable.

1. Introduction

Violent asphyxial deaths from mechanical neck compression — hanging, ligature strangulation and manual strangulation (throttling) — form an important component of medicolegal autopsy practice. Classical descriptions distinguish these mechanisms on the basis of suspension, direction and level of ligature force, and associated soft-tissue and laryngohyoid findings.

In routine practice, not every case permits such a confident classification. A body may arrive without the ligature, the ligature may not be recovered from the scene, or the external and internal findings may show overlapping features. A mark may be oblique or transverse; it may be faint or atypically placed; internal soft-tissue haemorrhage may raise concern for strangulation without providing enough evidence to exclude an atypical hanging mechanism. Thorough neck

dissection is important because some injuries are only identifiable when the neck is examined layer by layer.

The practical problem in these cases is not necessarily uncertainty that neck compression occurred. Rather, the difficulty is whether the observed findings can be reconciled with sufficient confidence as hanging or strangulation. Contemporary literature emphasises that hanging findings are variable and that individual traditional signs should not be treated as pathognomonic; interpretation should integrate autopsy, scene and investigative evidence.

In this setting, we used the term Pressure over Neck (PoN) for a subset in which fatal ligature-related neck compression was established, but the available pathological findings did not permit a confident distinction between hanging and ligature strangulation. The term was used as a broader cause/mechanism description rather than as a claim of a separate biological entity. The present study characterises these cases and compares their findings with hanging and non-hanging neck-compression deaths. The central proposition is pragmatic: the specificity of the forensic opinion should not exceed the specificity of the evidence.

2. Materials and Methods

2.1 Study design and setting

A cross-sectional, observational autopsy study was conducted at a tertiary care government medical college hospital in Western India from January 2023 to March 2024.

2.2 Case selection and operational definitions

Of 2,405 consecutive medicolegal autopsies, 203 (8.4%) were classified as violent asphyxial deaths. The final analytical groups were mutually exclusive.

Pressure over Neck (PoN, n=23): cases in which fatal ligature-related neck compression was established at autopsy, but the available external and internal findings did not permit confident

classification as hanging or ligature strangulation. In all PoN cases, no ligature was present in situ and none was recovered at the time of examination. Scene and investigative information was reviewed; where the overall circumstances did not establish a specific manner of death, manner was recorded as undetermined. An undetermined manner alone was not sufficient for PoN classification — the pathological basis for broader description had to be present independently.

Hanging (n=147): cases in which hanging/suspension was established as the pathological mechanism; 145 were classified as suicidal and 2 as undetermined manner. The two undetermined cases were retained in the hanging group because uncertainty related to circumstances/manner rather than to whether suspension had occurred.

Ligature strangulation (n=15) and throttling (n=8): cases with pathological findings and circumstances supporting ligature strangulation or manual neck compression respectively; all were homicidal in the study records.

Decomposed bodies in which neck structures could not be reliably assessed were excluded from all analytical groups. Mechanism/pathological classification and manner of death were recorded as separate variables throughout.

2.3 Examination protocol

All cases were examined using a pre-designed structured proforma. Thoraco-abdominal evisceration and brain removal were completed before neck dissection to provide a relatively bloodless field. A block beneath the shoulders extended the neck. Internal neck examination followed the Prinsloo–Gordon layered dissection technique, proceeding from the skin and platysma through the deeper soft tissues with inspection of each layer's undersurface before the next layer was opened. The sternocleidomastoid, strap and omohyoid muscles were examined

individually. The carotid arteries were opened longitudinally where indicated, and the hyoid bone and thyroid and cricoid cartilages were separately inspected for fractures and haemorrhage. External findings included ligature-mark presence, direction, completeness, level relative to the laryngeal prominence, parchmentisation, peri-ligature abrasions/ecchymoses and knot position when available. Internal findings included subcutaneous tissue character, carotid integrity, hyoid and laryngeal cartilage status, and laryngo-tracheal congestion. Associated external and intracranial findings were also recorded.

2.4 Statistical analysis

Data were summarised as frequencies and percentages. Fisher's exact test was used for selected categorical comparisons because of the small PoN sample and sparse cells. For mark direction and level, only cases with a ligature mark were eligible, and throttling was excluded because it does not produce a ligature mark. For selected internal injury comparisons, ligature strangulation and throttling were combined as a non-hanging neck-compression comparator because both involve externally applied compression without suspension; they were not pooled for ligature-mark analyses. P values are presented as exploratory indicators of group difference. No adjustment for multiple comparisons was applied because the analyses were hypothesis-generating and descriptive.

3. Results

3.1 Incidence and manner of death

Of 2,405 medicolegal autopsies, 203 (8.4%) were violent asphyxial deaths: hanging 147 (72.4%), PoN 23 (11.3%), ligature strangulation 15 (7.4%), throttling 8 (3.9%), and other violent asphyxial mechanisms 10 (4.9%). All 23 PoN cases were recorded with undetermined manner. Among the 147 hanging cases, 145 (98.6%) were suicidal and 2 (1.4%) undetermined manner;

the two undetermined hanging cases were not reclassified as PoN because hanging/suspension remained the established pathological mechanism. All ligature strangulation and throttling cases were homicidal.

3.2 Demographic and scene characteristics

In the PoN group, 12 (52.2%) were male and 11 (47.8%) female; in the hanging group, 140 (95.2%) were male and 7 (4.8%) female. The 10–20 and 20–30 year age groups comprised 65.2% of PoN cases. Open or non-residential locations accounted for 13/23 (56.5%) PoN cases, compared with 16/147 (10.9%) hanging cases and 0/23 (0%) non-hanging neck-compression cases ($p<0.001$ each). Table 1 and Fig. 1 present the demographic and scene characteristics.

3.3 External neck findings

No ligature was present in situ in any PoN case. A ligature mark was present in 21/23 (91.3%) PoN cases, 127/147 (86.4%) hanging cases and 13/15 (86.7%) ligature-strangulation cases. Among PoN cases with a mark, direction was oblique in 14/23 (60.9%) and transverse in 9/23 (39.1%); the level was at the laryngeal prominence in 18/23 (78.3%), below in 5/23 (21.7%) and above in none. Peri-ligature abrasions/ecchymoses were present in 11/23 (47.8%). Table 2 and Fig. 2 summarize the external findings. Representative ligature marks in hanging, ligature strangulation and PoN are shown in Figs. 3–5, respectively.

3.4 Internal neck findings

Subcutaneous tissue was dry/pale/glistening in 16/23 (69.6%) and bruised/haemorrhagic in 7/23 (30.4%) PoN cases. Hyoid, thyroid and cricoid fractures were absent in all 23 PoN cases. Among the combined non-hanging neck-compression comparator (n=23), hyoid fractures were present in 6 (26.1%), thyroid fractures in 12 (52.2%) and cricoid fractures in 5 (21.7%). Carotid intimal tears were not identified in PoN cases but were present in 8/147 (5.4%) hanging cases and 1/23

(4.3%) non-hanging neck-compression cases. Laryngo-tracheal congestion was present in all 23 PoN cases (100%), compared with 90/147 (61.2%) hanging cases and all 23 (100%) non-hanging neck-compression cases. Internal and general findings are presented in Table 3 and Fig. 6. Representative layered neck dissection and thyro-laryngeal findings are shown in Figs. 7 and 8.

3.5 General associated findings

Facial congestion was present in 19/23 (82.6%) PoN cases and cyanosis in all 23 (100%). Subconjunctival haemorrhages were present in 3/23 (13.0%). Sub-arachnoid haemorrhage was present in 18/23 (78.3%). These findings are included in Table 3.

4. Discussion

The most important result of this study is not the identification of a new type of neck compression. Rather, it is the description of a recurring practical problem in forensic autopsy: fatal ligature-related neck compression can be established while the available morphology does not justify a confident decision between hanging and ligature strangulation. In such cases, a broader pathological description may be more accurate than a specific label that exceeds the evidence.

4.1 Ligature-mark direction should not determine the opinion alone

In the PoN group, 60.9% of marks were oblique and 39.1% transverse. The presence of transverse marks can raise suspicion of strangulation, but it is not diagnostic of a homicidal mechanism. Peri-ligature injuries may also occur in hanging, including when a decedent attempts to loosen the ligature. Recent reviews emphasise that no individual external finding should be applied dogmatically. The present data therefore support interpreting direction alongside level, completeness, associated soft-tissue injury and the circumstances of the body and scene.

4.2 Mark level at the laryngeal prominence

The most frequent mark level in PoN was at the laryngeal prominence (78.3%). In this series, all hanging marks were above the prominence and all ligature-strangulation marks were below it. This distribution is notable within the dataset, but the prominence-level mark should not be treated as pathognomonic of PoN. Its contextual value is that it did not conform to the dominant pattern in either comparator group and therefore contributed to the overall difficulty of mechanistic classification.

4.3 Peri-ligature injury and subcutaneous findings

Peri-ligature abrasions/ecchymoses were present in 47.8% of PoN cases, documenting local tissue injury at the site of compression. The 30.4% prevalence of bruised or haemorrhagic subcutaneous tissue indicates that soft-tissue injury occurred in a substantial proportion of cases, but its presence alone does not establish strangulation. Neck haemorrhage has multiple possible explanations including postmortem artefact, and careful layered examination is important to distinguish genuine injury from dissection artefact.

4.4 Laryngeal skeleton: the value of negative findings

No hyoid, thyroid or cricoid fractures were identified in any of the 23 PoN cases. The absence of these fractures does not exclude fatal neck compression; equally, their presence would not alone determine the manner of death. Recent literature continues to demonstrate substantial variability in hanging-related skeletal findings, and current reviews caution against treating any single sign as definitive. These findings therefore support documenting the laryngeal skeleton carefully while interpreting both positive and negative findings within the complete case context.

4.5 Laryngo-tracheal congestion

Laryngo-tracheal congestion was present in all PoN cases and all non-hanging comparator cases, versus 61.2% of hanging cases. This descriptive difference in the series is of interest, but congestion alone does not establish a specific mechanism of death or confirm direct airway obstruction. It is better understood as one component of the overall neck-finding profile rather than a mechanism-specific sign.

4.6 Demographic and scene observations

PoN cases showed a near-equal sex distribution, unlike the marked male predominance in the hanging group. The study was not designed to determine the cause of this distribution, and causal explanations should therefore be avoided. The higher proportion of PoN cases in open or non-residential locations is an observation of this series rather than evidence of a particular manner of death. Outdoor scenes may provide additional opportunities for displacement or non-recovery of ligature material, but such possibilities remain contextual hypotheses requiring scene-specific confirmation.

4.7 Undetermined manner and undetermined mechanism are separate concepts

The study contained two hanging cases in which manner of death was undetermined. These were retained within the hanging group because the pathological mechanism — suspension — was established; the uncertainty concerned the circumstances and manner. This distinction matters. Modern forensic literature recognises that apparent hanging may require consideration of postmortem suspension and other alternative scenarios, but such uncertainty should not automatically reclassify an established hanging mechanism as PoN. Undetermined manner and undetermined mechanism are not interchangeable concepts.

4.8 Practical medicolegal significance

The value of the PoN designation is not that it represents a newly discovered mechanism. Its value is that in selected autopsy cases it allows the pathologist to document established fatal ligature-related neck compression without forcing the findings into hanging or strangulation when the available evidence does not support such a specific classification. Manner of death remains a separate determination based on integrated autopsy, scene and investigative evidence. The autopsy report should state the observed findings, the limits of mechanistic inference, and the reason a broader description was used. The specificity of the forensic opinion should not exceed the specificity of the evidence.

4.9 Strengths and limitations

Strengths include consecutive medicolegal autopsies, a clearly identified PoN subgroup, systematic external documentation, standardised layered neck dissection, and preservation of the distinction between ligature strangulation and throttling when ligature-mark characteristics are analysed. Limitations include the single-centre setting, small PoN sample (n=23), absence of postmortem CT and systematic histopathology, and the possibility that scene and investigative classification may evolve after autopsy. The designation is institutionally contextual and should not be assumed to have identical meaning across jurisdictions. Multicentre studies using harmonised operational definitions are required before the observed pattern can be considered generalisable.

5. Conclusion

In this cross-sectional autopsy series, deaths classified as Pressure over Neck showed a recurring combination of absent ligature in situ, frequent ligature marks at the laryngeal prominence, soft-

tissue injury in a subset, absence of laryngeal skeleton fractures, and universal laryngo-tracheal congestion. These findings do not establish a new biological mechanism.

The practical value of the PoN designation lies in disciplined forensic documentation. Where fatal ligature-related neck compression is established but the available evidence does not permit confident classification as hanging or strangulation, a broader pathological description may better represent what the autopsy actually demonstrates. Manner of death should remain a separate determination based on integrated autopsy, scene and investigative evidence. The specificity of the forensic opinion should not exceed the specificity of the evidence.

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Tables

Table 1. Demographic profile, manner of death and place of incidence in pressure-over-neck, hanging and non-hanging neck-compression groups.

Variable	PoN (n=23) n (%)	Hanging (n=147) n (%)	Non-hanging comparator (n=23) n (%)	p-value*
Sex				

Male	12 (52.2)	140 (95.2)	14 (60.9)	—
Female	11 (47.8)	7 (4.8)	9 (39.1)	—
Age group (years)				
0–10	0 (0.0)	1 (0.7)	0 (0.0)	—
10–20	8 (34.8)	26 (17.7)	4 (17.4)	—
20–30	7 (30.4)	51 (34.7)	8 (34.8)	—
30–40	0 (0.0)	38 (25.9)	6 (26.1)	—
40–50	5 (21.7)	22 (15.0)	3 (13.0)	—
50–60	3 (13.0)	7 (4.8)	2 (8.7)	—
≥60	0 (0.0)	2 (1.4)	0 (0.0)	—
Manner of death				
Suicidal	0 (0.0)	145 (98.6)	0 (0.0)	—
Homicidal	0 (0.0)	0 (0.0)	23 (100.0)	—
Undetermined	23 (100.0)	2 (1.4)	0 (0.0)	—
Place of incidence				
Closed/domestic	10 (43.5)	131 (89.1)	23 (100.0)	p<0.001
Open/non-residential	13 (56.5)	16 (10.9)	0 (0.0)	p<0.001

Fisher's exact test, PoN vs each comparator. — = descriptive data; no test applied. PoN = pressure over neck. Non-hanging comparator = ligature strangulation (n=15) + throttling (n=8).

Table 2. External neck findings in pressure-over-neck, hanging and ligature-strangulation deaths.

Finding	PoN (n=23)	Hanging	Ligature	p-value

	n (%)	(n=147) n (%)	strangulation† (n=15) n (%)	(PoN vs H / PoN vs LS)
Ligature mark present	21 (91.3)	127 (86.4)	13 (86.7)	NS / NS
Ligature in situ	0 (0.0)	55 (37.4)	0 (0.0)	—
Mark direction				
Oblique	14 (60.9)	147 (100.0)	2 (13.3)	p<0.001 / p=0.006
Transverse	9 (39.1)	0 (0.0)	13 (86.7)	p<0.001 / p<0.001
Mark level				
Above laryngeal prominence	0 (0.0)	147 (100.0)	0 (0.0)	p<0.001 / —
At laryngeal prominence	18 (78.3)	0 (0.0)	0 (0.0)	p<0.001 / p<0.001
Below laryngeal prominence	5 (21.7)	0 (0.0)	15 (100.0)	— / p<0.001
Mark completeness				
Incomplete	19 (90.5)	106 (83.5)	10 (76.9)	NS / NS
Complete	2 (9.5)	15 (11.8)	3 (23.1)	NS / NS
Parchmentisation	8 (34.8)	68 (46.3)	5 (33.3)	NS / NS
Peri-ligature abrasions/ecchymoses	11 (47.8)	32 (21.8)	13 (86.7)	p=0.018 / p=0.020

NS = not significant. — = descriptive data; no test applied. Throttling was excluded from mark-direction and level analyses because manual compression produces no ligature mark. Mark completeness percentages are calculated among cases with a ligature mark. LS = ligature strangulation.

Table 3. Internal neck and selected general findings in pressure-over-neck, hanging and non-hanging neck-compression groups.

Finding	PoN (n=23) n (%)	Hanging (n=147) n (%)	Non-hanging comparator‡ (n=23) n (%)	p-value (PoN vs H / PoN vs NHC)
Subcutaneous tissue				
Dry/pale/glistening	16 (69.6)	87 (59.2)	2 (8.7)	NS / —
Bruised/haemorrhagic	7 (30.4)	7 (4.8)	20 (87.0)	p<0.001 / p<0.001
Carotid artery				
Intact	23 (100.0)	139 (94.6)	22 (95.7)	NS / NS
Intimal tear	0 (0.0)	8 (5.4)	1 (4.3)	NS / NS
Laryngeal skeleton				
Hyoid — fractured	0 (0.0)	2 (1.4)	6 (26.1)	NS / p=0.022
Thyroid — fractured	0 (0.0)	1 (0.7)	12 (52.2)	NS / p<0.001
Cricoid — fractured	0 (0.0)	0 (0.0)	5 (21.7)	NS / p=0.049
Laryngo-tracheal congestion	23 (100.0)	90 (61.2)	23 (100.0)	p<0.001 / NS

General associated findings				
Facial congestion	19 (82.6)	92 (62.6)	14 (93.3)	—
Cyanosis	23 (100.0)	102 (69.4)	15 (100.0)	—
Subconjunctival haemorrhages	3 (13.0)	64 (43.5)	14 (93.3)	—
Sub-arachnoid haemorrhage	18 (78.3)	74 (50.3)	18 (78.3)	—

NS = not significant. — = descriptive data; no test applied. NHC = non-hanging comparator. Ligature strangulation (n=15) + throttling (n=8) were combined for internal injury comparisons only.

FIGURE LEGENDS

Autopsy Findings in Pressure over Neck Deaths: A Cross-Sectional Study from Western India

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NOTE TO PRODUCTION / PUBLISHER: All clinical autopsy photographs (Figures 4–8) were recorded during statutory medicolegal post-mortem examinations at the Department of Forensic Medicine and Toxicology, Government Medical College and New Civil Hospital, Surat, Western India. Post-mortem (PM) numbers represent internal institutional record numbers that ensure strict decedent de-identification. Formal ethical approval and waiver of consent were granted by the Institutional Ethics Committee (GMCS/STU/ETHICS-3/Approval/7551/23).

Figure 1. Demographic profile and place of incidence comparing Pressure over Neck (PoN), Hanging, and Strangulation/Throttling deaths (N = 203).

Panel A (Sex Distribution) shows the comparative sex frequencies across the three diagnostic groups, highlighting a near-equal sex distribution in PoN (52.2% male, 47.8% female) that contrasts significantly with suicidal hanging (95.2% male, $p < 0.001$) and resembles homicidal strangulation (60.9% male). Panel B (Place of Incidence) demonstrates that while hangings (89.1%) and strangulations (100%) occur predominantly in closed domestic spaces, 56.5% of PoN deaths occurred in open or non-residential spaces (the 'outdoor paradigm'), reflecting complex outdoor scene dynamics where ligatures are frequently displaced or unrecovered ($p < 0.001$).

Figure 2. External neck findings and ligature mark characteristics defining the intermediate forensic position of Pressure over Neck (PoN).

Panel A (Ligature Mark Direction) shows the mixed orientation in PoN (60.9% oblique, 39.1% transverse), representing an intermediate state between suicidal hanging (100% oblique, $p < 0.001$) and homicidal strangulation (86.7% transverse, $p = 0.006$). Panel B (Ligature Mark Level) highlights the characteristic anatomical midpoint signature of PoN, where 78.3% of marks were placed directly AT the laryngeal prominence, whereas 100% of hangings were above and 100% of strangulations were below the prominence ($p < 0.001$ for both comparisons). Panel C shows intermediate peri-ligature abrasions/ecchymoses in PoN (47.8%) compared with hanging (21.8%,

p = 0.018) and strangulation (86.7%, p = 0.020).

Figure 3. Internal neck autopsy findings and laryngeal pathology comparing Pressure over Neck (PoN) with Hanging and Strangulation/Throttling.

Panel A (Subcutaneous Tissue Bruising) demonstrates intermediate bruising in PoN (30.4%) compared with hanging (4.8%, $p < 0.001$) and strangulation/throttling (87.0%, $p < 0.001$). Panel B (Laryngeal Skeleton Fractures) illustrates complete structural preservation (0% fractures of hyoid bone, thyroid cartilage, or cricoid cartilage) in all 23 PoN cases, contrasting sharply with high skeletal disruption in homicidal compression (thyroid cartilage fractures: 52.2%, $p < 0.001$). Panel C shows universal (100.0%) laryngo-tracheal mucosal congestion in PoN, matching strangulation (100.0%) and significantly exceeding suicidal hanging (61.2%, $p < 0.001$).

Figure 4. Incomplete Oblique Ligature Mark in Suicidal Hanging (PM No. 958/23).

Gross post-mortem photograph of a representative suicidal hanging case showing the classical high, oblique, non-continuous ligature furrow positioned well above the level of the thyroid cartilage, with parchmentisation of the groove and rising towards the knot suspension point.

Figure 5. Transverse Ligature Mark in Homicidal Strangulation (PM No. 263/23).

Gross post-mortem photograph of homicidal ligature strangulation showing a continuous, horizontal, low-level ligature furrow positioned completely below the level of the thyroid cartilage, accompanied by adjacent scratch abrasions and contusions.

Figure 6. Pressure over Neck Mark Positioned AT the Laryngeal Prominence (PM No. 889/23).

Gross post-mortem appearance of an atypical ligature mark in a Pressure over Neck case, demonstrating intermediate horizontal-oblique placement situated directly across the midline apex of the thyroid cartilage (laryngeal prominence).

Figure 7. Layer-by-Layer Prinsloo–Gordon Dissection & Subcutaneous Tissue Bruising (PM No. 495/24).

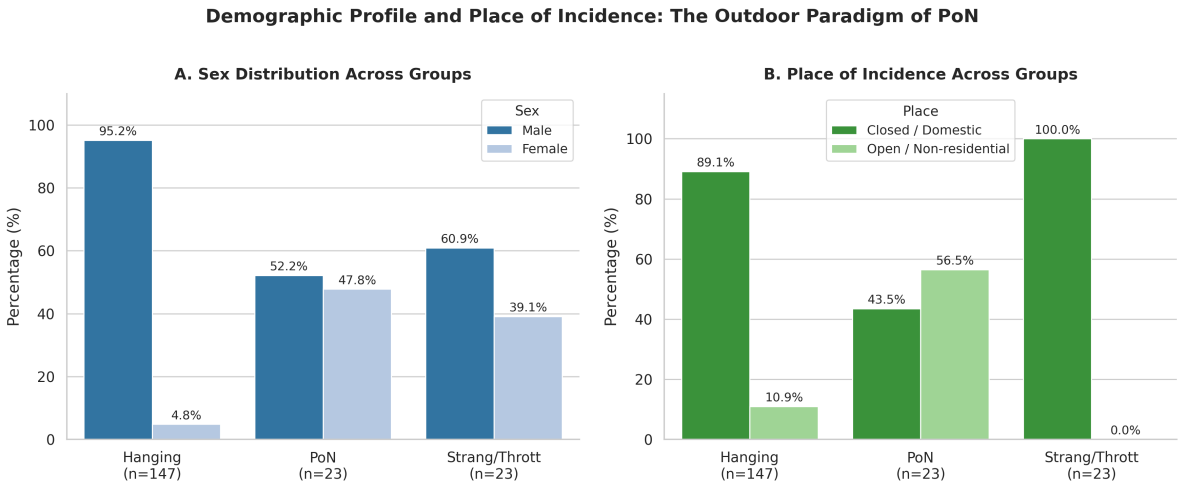
Anterior cervical dissection using the bloodless Prinsloo–Gordon technique following thoraco-abdominal evisceration. Layered reflection of the platysma and strap muscles demonstrates focal interstitial extravasation and haemorrhage within the deep anterior musculature while preserving laryngeal cartilaginous integrity.

Figure 8. Excised Thyro-Laryngeal Block & Universal Mucosal Congestion (PM No. 504/24). Posterior longitudinal opening of the excised laryngo-tracheal visceral unit in a Pressure over Neck case, displaying deep, uniform mucosal venous congestion, cyanosis, and petechial suffusion of the upper airway lining with completely intact hyoid and cricothyroid skeletal architecture.

MANUSCRIPT FIGURES & CLINICAL ANNEXURES

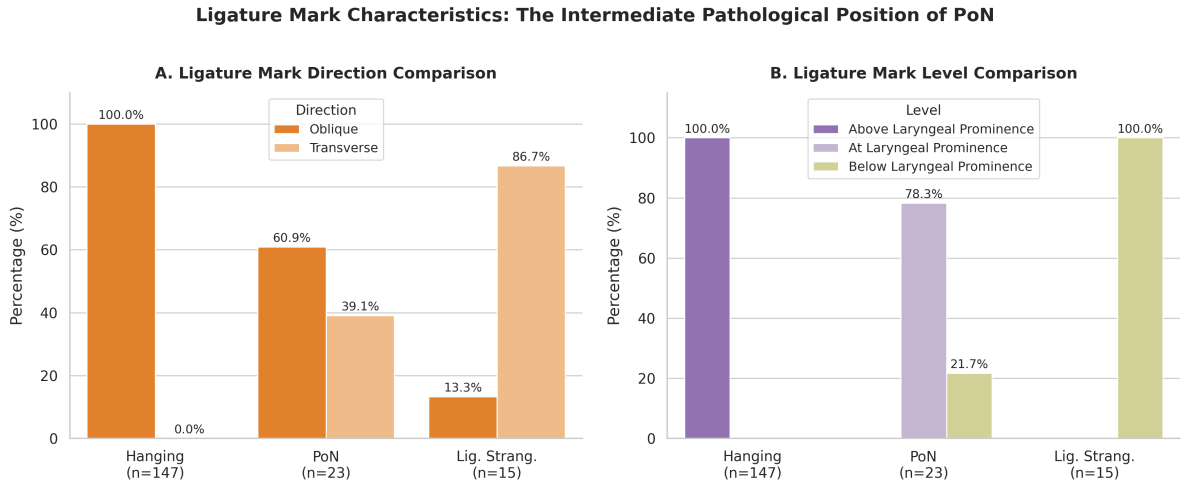
Autopsy findings in pressure over neck deaths: a prospective cross-sectional study from western India

Figure 1. Demographic profile and place of incidence comparing Pressure over Neck (PoN), Hanging, and Strangulation/Throttling deaths (N = 203).



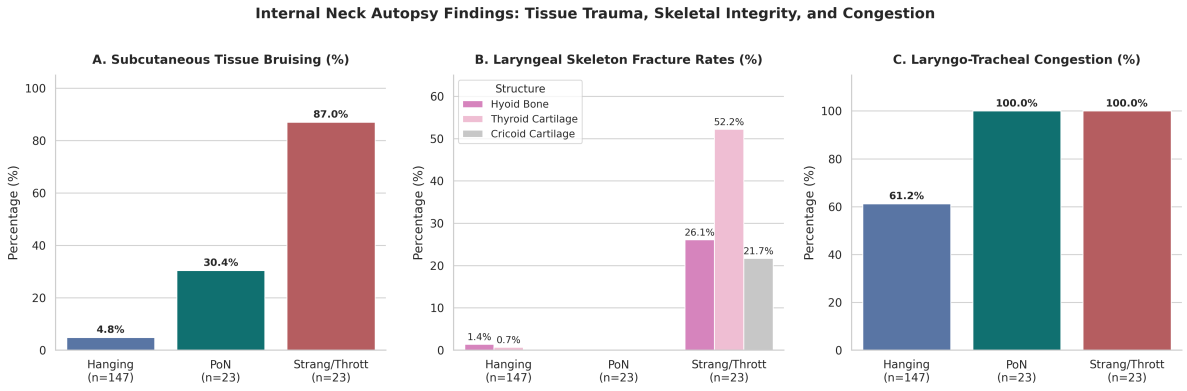
Panel A (Sex Distribution) shows the near-equal sex ratio in PoN (52.2% male, 47.8% female), contrasting significantly with suicidal hanging (95.2% male, $p < 0.001$) and resembling homicidal strangulation (60.9% male). Panel B (Place of Incidence) illustrates the outdoor paradigm of PoN, where 56.5% of cases occurred in open or non-residential spaces, compared to 10.9% in hanging and 0% in strangulation ($p < 0.001$).

Figure 2. External neck findings and ligature mark characteristics defining the intermediate forensic position of Pressure over Neck (PoN).



Panel A (Ligature Mark Direction) shows the mixed orientation in PoN (60.9% oblique, 39.1% transverse), intermediate between hanging (100% oblique) and strangulation (86.7% transverse). Panel B (Ligature Mark Level) highlights the anatomical midpoint signature of PoN, where 78.3% of marks were placed directly AT the laryngeal prominence, whereas 100% of hangings were above and 100% of strangulations were below ($p < 0.001$). Panel C displays intermediate peri-ligature abrasions (47.8% in PoN).

Figure 3. Internal neck autopsy findings and laryngeal pathology comparing Pressure over Neck (PoN) with Hanging and Strangulation/Throttling.



Panel A (Subcutaneous Tissue Bruising) demonstrates intermediate bruising in PoN (30.4% vs 4.8% in hanging and 87.0% in strangulation/throttling, $p < 0.001$). Panel B (Laryngeal Skeleton Fractures) visualizes 100% skeletal integrity (0% fractures) in PoN, compared to 52.2% thyroid cartilage fractures in strangulation. Panel C shows universal (100.0%) laryngo-tracheal mucosal congestion in PoN.

CLINICAL AUTOPSY PHOTOGRAPH CATALOG (ANNEXURES 4–8)

The following section contains representative clinical autopsy photographs from the original MD dissertation records (FMTD, GMC Surat), mapped to their respective diagnostic categories and Post-Mortem case numbers.

Figure 4. Incomplete Oblique Ligature Mark in Suicidal Hanging (PM No. 958/23)

Uploaded Sources: 3.png, 4.png, 12.png | Date: 15/06/2023 | FMTD, GMC Surat

Figure 4. Incomplete Oblique Ligature Mark in Suicidal Hanging (PM No. 958/23)]



Figure 5. Transverse Ligature Mark in Homicidal Strangulation (PM No. 263/23)

Figure 5. Transverse Ligature Mark in Homicidal Strangulation (PM No. 263/23)]



Figure 6. Pressure over Neck Mark Positioned AT the Laryngeal Prominence (PM No. 697/23 & 889/23)]



Figure 7. Layer-by-Layer Prinsloo–Gordon Dissection & SCT Bruising (PM No. 495/24)

Figure 7. Layer-by-Layer Prinsloo–Gordon Dissection & SCT Bruising (PM No. 495/24)]

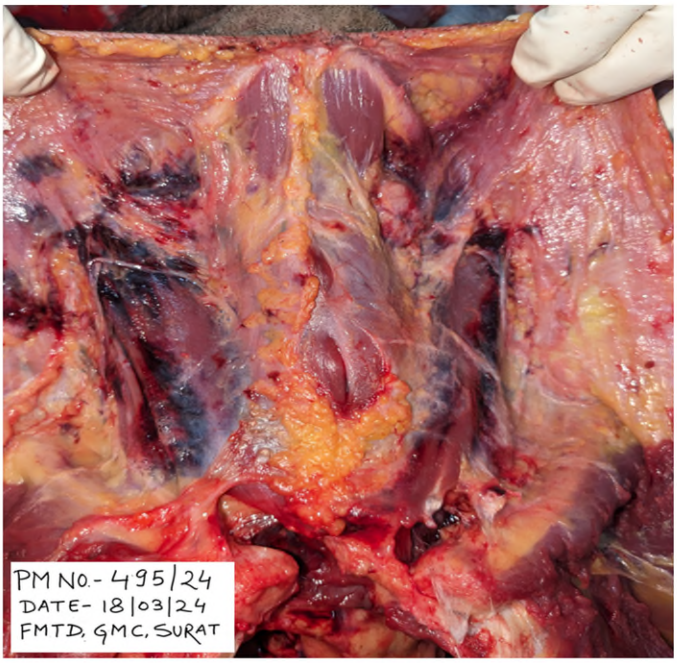


Figure 8. Excised Thyro-Laryngeal Block & Universal Mucosal Congestion (PM No. 504/24)

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