Hanging-related injury in Pietermaritzburg, South Africa

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Background. Hanging is a common form of self-harm, and emergency care physicians will not infrequently be called upon to manage a survivor. Despite the relative frequency of the injury, there is a paucity of literature on the topic and the spectrum and incidence of associated injuries are poorly described.

Objectives. To review experience with management of victims of hanging at a major trauma centre in South Africa.

Methods. All patients treated by the Pietermaritzburg Metropolitan Trauma Service following a hanging incident between December 2012 and December 2018 were identified from the Hybrid Electronic Medical Registry. Basic demographics were recorded, and the management and outcome of each patient were noted.

Results. During the 6-year period under review, a total of 154 patients were seen following a hanging incident. The mean age was 29.4 years. There were 24 females (15.6%) and 130 males (84.4%). The vast majority (n=150; 97.5%) had attempted suicide, and only 4 hangings (2.5%) were accidental. A total of 92 patients (60.9%) had consumed alcohol prior to the incident. There were 23 patients with a Glasgow Coma Score (GCS) <9 (severe traumatic brain injury (TBI)), 14 with a GCS of 9 - 12 (moderate TBI) and 117 with a GCS >12 (mild TBI). A total of 7 patients (4.5%) required intensive care unit admission, and 25 (16.2%) required intubation. The following extracranial injuries were documented on computed tomography scans: hyoid bone fractures (n=2), cervical spine fracture (n=10), mandible fracture (n=4) and oesophageal injury (n=1). Intracranial pathology was evident on 27.0% of scans, with the most common finding being global cerebral ischaemia. The mortality rate was 2.5% (4/154).

Conclusions. Hanging is a common mechanism of self-harm. It is associated with significant injuries and mortality. The acute management of hanging should focus on airway protection followed by detailed imaging of the head and neck. Further work must attempt to include mortuary data on hanging.

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Hanging is a common form of self-harm, and emergency care physicians will not infrequently be called upon to manage a survivor.3-6 Despite the relative frequency of the injury, there is a paucity of literature on the topic and the spectrum and incidence of associated injuries are poorly described. Our current algorithm for the management of this injury is based on the resuscitation protocols of the Advanced Trauma Life Support (ATLS) Course, which essentially emphasise maintenance of an adequate airway while ensuring that the cervical spine is immobilised and protected. Once this has been achieved, all hanging victims have a contrast-enhanced computed tomography (CT) scan of the head and neck to exclude major intracranial lesions and assess the cervical spine, aerodigestive tract and carotid arteries. Many of the potential injuries to these structures are occult in that they are difficult to detect clinically and potentially serious. Blunt pressure on the carotid vessels may result in the formation of an intimal tear, creating a highly thrombogenic surface in the carotid vessel that may result in a cerebral embolus or complete occlusion of the carotid vessel. This injury may have significant sequelae if undetected and untreated.1-4

Objectives
In the light of the above, we set out to review our experience with the management of hanging victims, to establish the yield from contrast CT scans of the head and neck in these patients, and to compare our findings with the international literature.

Methods
Clinical setting
The study was undertaken at the Pietermaritzburg Metropolitan Trauma Service (PMTS), South Africa. The PMTS provides definitive trauma care to the city of Pietermaritzburg, the capital of KwaZulu-Natal (KZN) Province, and tertiary trauma care to western KZN, with a total catchment population of >3 million people. The PMTS maintains a regional trauma registry, the Hybrid Electronic Medical Registry (HEMR). All patients who present to our trauma centre are prospectively entered into the database, and the information recorded includes details regarding injury mechanism, operative intervention, patient progress and clinical outcomes.

Ethics approval for the maintenance of the HEMR has been formally endorsed by the Biomedical Research Ethics Committee of the University of KwaZulu-Natal (ref. no. BCA221/13).

Management of hanging
All patients presenting to the PMTS are managed according to ATLS principles. The airway is secured while maintaining inline stabilisation of the cervical spine. If a patient is unable to protect
In view of the severity of the potential complications of blunt carotid artery injury, most centres, including our own, aggressively investigate the carotid vessels in these patients.

Study limitations
This study is limited by its retrospective nature and by a lack of mortuary data. Patients who die may be taken directly to the state mortuary and bypass our facility, leading to underestimation of hanging-associated mortality and the incidence of potentially lethal

### Table 1. Physiological parameters in cases of attempted hanging (N=154)

| Parameter | Mean (SD) |
|-----------|-----------|
| PO₂ (KPa) | 16 (12.32) |
| HGT (g/dL) | 8.3 (2.82) |
| Hb (g/dL) | 13.1 (2.06) |
| Lactate (mmol/L) | 4.1 (3.57) |
| CO₂ (KPa) | 7.1 (5.88) |
| pH | 7.4 (0.15) |
| HCO₃ (mmol/L) | 22.8 (5.02) |
| BE (mmol/L) | -2.8 (6.47) |
| SATS (%) | 95 (13.97) |
| SBP (mmHg) | 120 (23.08) |
| DBP (mmHg) | 72 (16.55) |
| Temperature (°C) | 37.2 (0.69) |
| Respiratory rate (/min) | 20 (7.82) |
| Pulse rate (/min) | 84 (26.46) |

PO₂ = partial pressure of oxygen; HGT = haemo glucose test; Hb = haemoglobin; CO₂ = carbon dioxide; HCO₃ = bicarbonate; BE = base excess; SATS = oxygen saturation; SBP = systolic blood pressure; DBP = diastolic blood pressure.
injuries such as blunt carotid artery injury. We therefore continue to advocate a formal CT angiogram in these patients to exclude these relatively rare but potentially devastating and occult injuries. Further work should review mortuary data to determine the true incidence of blunt carotid artery injury in victims of hanging.

Conclusions
Hanging is a common mechanism of self-harm. It is associated with significant injuries and mortality. The acute management of hanging should focus on airway protection, followed by detailed imaging of the head and neck. Further work must attempt to include mortuary data on hanging.

Declaration. None.

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Conflicts of interest. None.

| Table 2. Comparison of studies on attempted hanging |
|-----------------------------------------------------|
| Martin et al.,[7] 2005 (N=655) | Salim et al.,[8] 2006 (N=63) | Buitendag et al. (present study) (N=154) |
| Age (years), mean (SD) | 30.3 (13.3) | 28 (14) | 29.4 |
| Sex male, n (%) | 84.1 | 87.3 | 84.4 |
| SBP (mmHg), mean (SD) | 115 (56.3) | 123 (41) | 120 (23.08) |
| GCS, % |
| >12 | 23.0 | 60.3 | 76.0 |
| 9 - 11 | 7.0 | 7.9 | 9.1 |
| <9 | 60.0 | 27.0 | 14.9 |
| Missing data | 10.0 | 4.8 | 0 |
| Mortality, % | 33.0 | 9.5 | 2.5 |
| CT findings, % |
| Intracranial pathology | 41.0 | 12.7 | 27.0 |
| Spinal pathology | 18.0 | 4.8 | 6.5 |
| Laryngeal pathology | 5.0 | 4.8 | 1.3 |
| Vascular pathology | 2.0 | 1.6 | 2.0 |

SD = standard deviation; SBP = systolic blood pressure; GCS = Glasgow Coma Score; CT = computed tomography.

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