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Experience in penetrating neck trauma in two university hospitals in Uruguay

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Introduction

Penetrating neck trauma carries high morbidity and mortality due to the potentially injured structures in a reduced anatomical space. This translates into a constant challenge for the emergency surgeon. They represent 5-10% of traumatic wounds and are associated with high morbidity and mortality, which ranges from 1 to 17%.[1]

The volume of injuries from projectiles and knives in Uruguay is low compared to other Latin American countries, a fact that denotes a growth in the rates of civil violence.

The National Registry shows an increasing trend in the number of injuries caused by firearms from 2017 to 2020.[2] We do not have updated data regarding injuries caused by stab weapons. Likewise, to date there are no studies that reflect the epidemiology of penetrating neck trauma in Uruguay. Knowing the trend of increasing violence in general allows us to advance public policies and educate the population in order to reduce this number. Between 40 and 60% of neck traumas are penetrating. 30% will have injury to more than one organ. They are more frequently caused by knives, however those caused by firearms are, in general, more serious.[3]

The organs affected in order of frequency are: the Aerodigestive tract, large vessels and, to a lesser extent, nerve lesions.[4]

The management of these injuries has evolved throughout history. Prior to the First World War, treatment was mostly conservative, a behavior that as a result reflects high mortality, while, After this, surgical exploration became the predominant tactic.[5]

In 1979, Roon and Christensen described the management of penetrating neck wounds according to the anatomical zones delimited by Morson 1969.[3,6.]

These areas are:

- Zone I between the upper edge of the clavicle to the lower edge of the cricoid cartilage
- Zone II extends from the lower edge of the cricoid cartilage to the angle of the mandible.
- Zone III between the angle of the jaw and the base of the skull.

The most frequently affected area corresponds to zone II, however, the one with the most mortality is zone III.

Recently, Yánez Ottolino et al, at the 22nd national surgery meeting, proposed an F zone for cervico-facial trauma, in order to identify potentially fatal pharyngeal and laryngeal injuries with early airway compromise.[7]

The initial management of cervical trauma will be guided by the ATLS (Advanced Trauma Life Support) protocol in order to recommend serious injuries that confer an immediate risk to life, acting accordingly during the primary assessment. In the secondary assessment, progress will be made in the diagnosis and treatment of life-threatening injuries or long-term complications.

"Hard" and "Soft" signs are recognized (Table 1). The former include: pulsating hematoma, active bleeding, airway compromise, subcutaneous emphysema and blowing wound. While the latter include: non-pulsatile hematoma, neurological deficit, proximity of vascular structure among others.

Classically, it has been described that patients with hard signs should be taken for immediate surgical exploration and those with soft signs will be candidates for diagnostic studies.[8]

The most frequent complications are respiratory or digestive tract disorders, acute mediastinitis, and are often linked to diagnostic and therapeutic delay.[9]

Surgical exploration is agreed upon in patients with hard signs, as we will analyze. However, the presence of soft signs in stable patients has undergone a paradigm shift in recent decades, which does not take into account Morson's zones. This, associated with the growing availability of imaging and endoscopic studies, simplifies diagnosis and treatment selection, improving cost/effectiveness ratios.

Goals

a) To communicate the epidemiology of injuries caused by stab weapons and firearms to the neck in two university centers.

b) Analyze the relationship between hard signs and airway injury or vascular injury.

c) Discuss the therapeutic management carried out and compare data with the international bibliography.

Methodology

This is a multicenter, observational, descriptive and retrospective study, based on the analysis of medical records of patients with penetrating neck wounds, in two public and university hospitals in Montevideo.

The database was obtained by reviewing the single electronic record and the manual record of the operating rooms of the respective hospitals.

The variables recorded were: age, sex, injury mechanism, hemodynamic situation at admission, surgical approach, injury topography, presence of hard or soft signs and intraoperative findings.

All patients who arrived at the emergency department were initially assessed and assisted following ATLS protocols.

The neck region is defined as that anatomically limited above: the lower edge of the jaw and the base of the skull, and below: the upper edge of the clavicle and the seventh cervical vertebra.

Penetrating neck injury is defined as any injury caused by trauma that exceeds the platysma muscle. The hemodynamic situation was defined as stable: blood pressure (BP) greater than 90mm/hg systolic and 60mm/hg diastolic, heart rate (HR) less than 100 beats per minute (rpm). Unstable BP below the mentioned limits or requirement for vasopressor drug support to maintain them. HR greater than and equal to 100 rpm. The presence of hard and soft signs is defined based on guidelines established in the literature and are listed in Table 1.

Table 1 Hard and soft signs for traumatic neck injury

Hard signs	Soft signs
Pulsatile hematoma	H8 Non-pulsatile hematoma
Active bleeding.	Neurological deficit.
Subcutaneous emphysema	Proximity of vascular structure
Blowing wound	
Shock	

Inclusion and exclusion criteria were established:

Inclusion criteria

Patients over 13 years of age, who were admitted with penetrating neck wounds, admitted to the emergency services of the Hospital de Clínicas y Hospital Maciel, in the period between January 1, 2018 and December 31, 2022.

Exclusion criteria

Non-penetrating injuries, wounds resulting from traumatic mechanisms other than firearms or knives, patients who died during transport or upon arrival at the emergency service.

Statistical analysis

Quantitative variables were expressed in means and standard deviations while qualitative variables were expressed in absolute frequencies and percentages. The association was assessed using the Chi square test. In case of expected values less than 5, Fischer's exact test was used. An alpha error of 0.05 was considered. Data processing was carried out using SPSS v22.0 statistical software (IMB, inc.)

Results

23 patients were included, the majority being men (78.2%) with an average age of 33.5 years, a minimum of 15 and a maximum of 83 years. The majority were stab wounds (60.9%), with the predominant male population also in this subgroup (Table 2). The wound path was lateral in a transfixing direction in 60.8% of cases, anteroposterior in 30.4% and posterolateral in the remaining 8.8%.

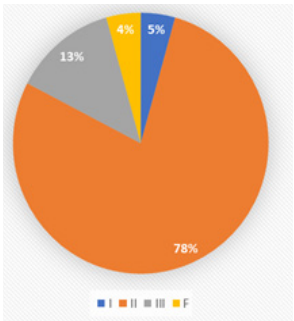
Table 2 Distribution by variable

Variable	Absolute frequency (N= 23)
Sex	
Female	4
Male	19
Injury agent	
Firearm	9
White weapon	14
Lesion topography by area	
Yo	1
II	18
III	3
Hemodynamics upon admission	
Stable	twenty
Unstable	3

Table 3 Boundaries and associated injuries

Zones	Boundaries	Associated injuries
Zone I	Upper border of the clavicle to the lower border of the cricoid cartilage	Common carotid artery, subclavian artery, vertebral arteries, nameless vein, internal jugular vein; recurrent laryngeal nerve, vagus nerve, spinal cord
Zone II	Inferior border of the cricoid cartilage at the angle of the mandible	carotid arteries, vertebral arteries, jugular veins, esophagus, spinal cord, Recurrent laryngeal nerve pneumogastric nerve, hypopharynx
Zone III	Between angle of jaw and base of skull	carotid arteries, vertebral arteries, jugular veins, spinal cord, glossopharyngeal nerve hypoglossal nerve, Sympathetic trunk.

The impact by area is reflected in graph 1.



Graph 1 Lesion topography according to area.

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Regarding the hemodynamic situation on admission, 80% were classified as stable during the primary assessment. Given the presence of hard signs, initial surgical exploration was performed in 82.6% of the cases, of which in 5.4% cases no airway, digestive, vascular or nervous injury was identified. The remaining 17.4% underwent computed tomography (skull, cervical spine, neck and thorax, according to clinical characteristics), of which 50% underwent expectant surgical management, and the other 50% underwent exploration in the operating room. By the imaging findings.

The characteristics of the patients at admission are detailed in Table 2.

Of the intraoperative findings in the patients explored, the following stand out:

a) 47.3% presented vascular compromise.

b) 31.6% presented airway injury.

c) 31.6% associated esophageal injury

d) 36.8% bone and/or soft tissue injury

e) 10.5% neurological injury. (brachial plexus)

78.9% presented multivisceral injuries, the most frequent being vascular injury associated with the airway. Regarding the approach of choice, 89.5% performed a pre-sternocleidomastoid incision, while 10.5% performed a transverse cervicotomy. There were no patients who died in this series. The relationship between the presence of hard signs and airway injury is statistically significant, with a p value of 0.0181, with a positive predictive value (PPV) of 100%, and a negative predictive value (NPV) of 80%. The same happens for the association between hard signs and vascular injury, with a p value of 0.0055, PPV of 100% and NPV of 62%. If we analyze by zone, zone II was the most affected, in 78% of the cases, while for zones I and II, there is no predominance in frequency. Regarding the direction of the injury, those that had an anteroposterior path all had an airway injury (larynx or trachea), 33.3% had an esophageal injury, and 33.3% had a vascular injury. In the lateral tract, 21.4% had vascular injury, 21.4% esophageal, and 28.5% had airway injury. (pharynx and hypopharynx)

Discussion

Neck trauma is more common in men, as is this series.[10] The neck is a small anatomically complex area, with passage of vitally important vascular-nervous and visceral structures. Injuries in this region are fortunately rare.

Early diagnosis and a high index of suspicion of injury to noble structures will be essential to try to reduce morbidity and mortality, which ranges between 1 and 17%.[1] There were no deceased patients in the present study. In relation to this item, we believe that the low rate of violence and subsequent incidence in our environment, compared to international studies, influences these results. The initial management of cervical trauma should be guided by the ATLS protocol in order to recommend serious injuries that confer an immediate risk to life, acting accordingly during the primary assessment. In the secondary evaluation, progress is made in the diagnosis and treatment of life-threatening injuries or distant complications. The classic anatomical division for neck trauma by zone allows for inferring probable associated injuries with a high index of suspicion, favoring early diagnosis and treatment. The primary clinical assessment, with a correct and exhaustive physical examination, allows us to detect hard signs suggestive of serious vascular or airway injury. This reduces the use of imaging studies safely, which could lead to a diagnostic and therapeutic delay, as well as an increase in associated costs. Following ATLS guidelines, the airway must be secured as an initial measure, and in the presence of hard signs, surgical exploration is mandatory. In the absence of the latter, paraclinical studies will be indicated. Their choice will depend on the injury mechanism. We know that injuries caused by a firearm projectile tend to be more disruptive than those caused by a knife.[1,10] Fortunately, in the present study, the latter was predominant, as in the literature.

Neck angiotomography is proposed in multiple publications as the main diagnostic imaging study in stable patients. As a benefit, it stands out that it is an objective test, accessible in most centers, with high sensitivity (83-100%) and specificity (98.6-100%) to determine the indication for surgical exploration.[3] Various works report that it may be the only initial evaluation test in stable patients with soft signs. It offers an accurate diagnosis and guides management, whether surgical or requesting other subsequent studies.[10] Likewise, Quiodettis et al, establish that the presence of soft signs has a low sensitivity for the detection of vascular lesions. This fact is reflected in the series presented, since, of the patients who underwent initial imaging, 50% did not require surgical exploration. On the other hand, the absence of any soft sign has a NPV of 100%.[8] According to the literature, 30% associate more than one injury, contrary to our publication, where the figure rises to 78%. We believe that the high rate of injury association in this series is linked to the path of the wound, which was 60.8% transfixing lateral, which could involve more than one structure. As previously mentioned, the presence of hard signs associates vital injuries. What stands out from this series is a statistically significant relationship between the presence of hard signs and airway or vascular injury. For the first, the p value is 0.0181, with a positive predictive value (PPV) of 100% and negative predictive value (NPV) of 80%; while , for the second, the p value is 0.0055 with a PPV of 100% and NPV 62%. This fact affirms that the presence of hard signs is strongly linked to compromise of vital structures with associated immediate morbidity and mortality, if timely surgical treatment is not provided. Zone II was the most frequently affected (78%), as in the literature, which ranges between 50-82%. Zone I and II do not have predominance in frequency. It is highlighted that it is a work carried out in Uruguay, a country with a low incidence of this ailment, carried out in two university centers, where the teaching staff remains present but which has a high turnover of health equipment (residents and surgeons in training). The challenge that comes with the management of these patients affirms the need for a protocolized approach for the safe and efficient approach to this entity. It would be of interest to collect more data that would allow us to know the intraoperative management for the different injuries found, as well as evaluate the morbidity of the behaviors taken.

Conclusion

Civil violence remains a global public health problem. Knowing its epidemiology in the country is very important in order to develop policies that aim to reduce it. Proper management of these patients is essential to reduce their morbidity and mortality, and the costs that they entail. The diagnostic and therapeutic approach must be taken taking into account multiple factors: hemodynamic stability of the patient, the area involved, the presence of hard signs, and the possibility of having emergency angiotomography.

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Conflicts of interest

The authors declare that there are no conflicts of interest.

References

1. Ramírez MA, Vergara H, Guerrero AA, et al. Penetrating cervical trauma: experience of a teaching hospital in Mexico. *Rev Colomb Cir*. 2022;37:393–400.
2. Gub sf. Ministry of public health. 2022.
3. Petrone P, Brown VL, Gendy A, et al. Diagnosis, management and treatment of traumatic cervical injuries. *Cir Esp*. 2019;97:489–500.
4. Nason RW, Assuras GN, Gray PR, et al. Penetrating neck injuries: analysis of experience from a Canadian trauma centre. *Can J Surg*.2001;44.
5. Thal ER, Meyer DM. Penetrating neck trauma. *Curr Probl Surg*. 1992;29:5–56.
6. Monson DO, Saletta JD, Freeark RJ. Carotid vertebral trauma. *J Trauma*. 1969;9:987–999.
7. Visual abstract. Trauma and emergency surgery communication. 2024.
8. Quiodettis M, Valderrama OM, Ávila AA, et al. Are hard signs of neck injury mandatory for surgical exploration? *Panam J Trauma.* 2013;2:17–20.
9. Fernando ADG. Cervical trauma. *Manual of trauma surgery*. 2019:26–36.
10. Pacheco MA, Aldana GE, Granados ÁE, et al. Management of penetrating neck trauma in two hospitals in Bogotá, Colombia. *Rev Colomb Cir*. 2018;33:34–43.

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