

# The Penetrating Neck Wound: A Few Points

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## Abstract

Penetrating injuries to the neck are, at times, difficult to truly assess. Historical treatment has varied across the clinical spectrum. Before the second World War, few penetrating wounds underwent operative treatment unless major bleeding or deep injuries were

obvious; reported mortality rates were 18% of 188 cases in the Spanish-American War and 11% of 594 cases in World War I. Fogelman and Stewart in 1956, reported a mortality rate of 6% with prompt exploration versus 35% in cases with delayed or omitted operation. This led to the widespread theory of treating the platysma like the peritoneum: if violated, explore.

## IN GENERAL

Penetrating injuries to the neck are, at times, difficult to truly assess. Historical treatment has varied across the clinical spectrum. Before the second World War, few penetrating wounds underwent operative treatment unless major bleeding or deep injuries were obvious; reported mortality rates were 18% of 188 cases in the Spanish-American War and 11% of 594 cases in World War I.<sup>1</sup> Fogelman and Stewart in 1956, reported a mortality rate of 6% with prompt exploration versus 35% in cases with delayed or omitted operation.<sup>2</sup> This led to the widespread theory of treating the platysma like the peritoneum: if violated, explore. In this atmosphere, Jones et al. reported a mortality of 3.6% (11 deaths in 274 cases, four from spinal cord injuries and associated complications; three from massive hemorrhage; and four from cerebral complications of laryngotracheal trauma).<sup>3</sup> Of these 274 cases, 38% had negative explorations. Subsequent series reported similar rates. Apffelstaedt and Muller, in a prospective study of 393 patients with stab wounds penetrating the platysma, found that clinical signs were absent in 30% of positive neck explorations. In this study, there was a 58% rate of negative explorations, five minor complications (3 wound hematomas and 2 superficial infections), and an average length of stay of 1.5 days. These authors concluded that mandatory exploration was safe and effective - avoiding unnecessary diagnostic studies while minimizing hospital stay.<sup>4</sup> However, given high rates of negative operations (ranging from 30 - 89% in the world literature), many modern trauma centers began "selective exploration" based on clinical examination and the results of a variety of investigational studies. The specific role or

criteria of nonoperative treatment has yet to be clearly defined and, even today, serves as a source of controversy amongst surgical colleagues. Asensio et al. concluded, after an extensive review of the literature, that neither approach (mandatory exploration versus selective exploration with angiography) is definitively superior.<sup>5</sup>

## MONSON'S DIVISION OF THE NECK

As described by Monson, the neck can be divided into three specific zones: I, II, and III. Zone I, the thoracic inlet, is defined as the area beginning at 1 cm below the claviculomanubrial junction up to the cricoid cartilage. Zone II lies between the cricoid and the angle of the mandible. Zone III is between the mandibular angle and the base of the skull; Zones II and III form the neck proper.<sup>1,6</sup> This division of the neck is helpful in describing (and standardizing) entry wounds as well as guiding further treatment. However, any patient with obvious signs or symptoms of a major vascular or tracheoesophageal injury, regardless of anatomical zone, should be emergently explored.

## MANAGEMENT OF A NECK INJURY

Standard Advanced Trauma Life Support (ATLS) protocols should be followed when a patient presents with a penetrating injury to the neck.<sup>1</sup> According to Pate, approximately 10% of these patients will present with airway compromise.<sup>8</sup> In stable patients, fiberoptic nasotracheal intubation should be attempted first; with significant respiratory distress, an orotracheal intubation under direct vision or a cricothyroidotomy should be performed. Any external bleeding should be controlled with direct pressure and, intravenous lines should be placed

contralaterally to the side of injury. The patient should be placed in Trendelenburg to decrease the risk of air embolism - a common cause of death in the presence of major venous disruptions.

A systems-approach should then be undertaken. The presence of a neck injury (regardless of zone) must not distract from other traumatic findings; a neck injury, in and of itself, must not hinder the physician from conducting a thorough and well-documented examination. Once the secondary survey has been completed, a precise analysis of the cervical structures should then be conducted. Further management is then directed by the exact clinical findings; one example of such a "directed approach" is the "USC Algorithm" which has been shown to be both safe and cost-effective.<sup>9</sup>

### **ROUTINE VERSUS SELECTIVE ANGIOGRAPHY**

Many surgeons believe that physical examination is not reliable in identifying arterial injuries and thus employ routine angiography for all proximity injuries.<sup>1</sup> Demetriades et al., in a series of 176 patients, eliminated nontherapeutic operations with this approach. In his series, routine angiography revealed vascular injuries in 19%, but only 8% required treatment - and all cases that required treatment were symptomatic.<sup>7</sup> The drawbacks of this approach are, of course, the high costs and invasiveness of angiography. A more selective approach can be found in many trauma centers today: the use of angiography with injuries to Zones I and III irrespective of symptoms. Given that these areas can be difficult to clinically examine and are technically-challenging areas to expose, a more-precise definition of injury is warranted. This approach has been shown to decrease nontherapeutic operations: 5% of 148 Zone I injuries and 13% of 92 Zone III injuries required surgical intervention.<sup>7</sup>

### **CONCLUSION**

An alternative in approaching neck injuries, is one which

uses angiography (and esophagoscopy / endoscopy) with injuries involving Zones I and III. With Zone I, a preoperative Vascular Surgery consult may be in order; in Zone III, a Neurosurgery consult may prove beneficial. In Zone II, Mandatory Operative Exploration can be recommended without reserve; preoperative angiographic studies are then dependent on the anatomical location of the penetrating wound (i.e. "the suspicious nature"). This approach, does by effect, increase a center's negative exploration rate, however, the final cost:benefit ratios may improve overall outcome.

"our hospitals, operating rooms, and wards must become laboratories of the highest standard" - Sir William Halstead

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### **References**

1. Shires, GT, Thal, ER, Jones, RC, Shires III, GT, Perry, MO. Trauma. Principles of Surgery, 6th ed. Schwartz. McGraw Hill, 1994: 187 - 193.
2. Fogelman MJ, Stewart, RD: Penetrating wounds of the neck. Am J Surg 91:581, 1956.
3. Jones RF, Terrell JC, Salyer KE: Penetrating wounds of the neck: An analysis of 274 cases. J Trauma 7:228, 1967.
4. Apffelstaedt JP, Muller R: results of mandatory exploration for penetrating neck trauma. World J Surg 18:917-920, 1994.
5. Asensio JA, Valenziano CP, Falcone RE, Grosh JD: Management of penetrating neck injuries. The controversy surrounding zone II injuries. Surg Clin North Am 71:267-296, 1991.
6. Monson DO, Saletta JD, Freeark RJ: Carotid-vertebral trauma. J Trauma 9:987, 1969.
7. Demetriades D, Charalambides D, Lakhoo M: Physical examination and selective conservative management in patients with penetrating injuries of the neck. Br J Surg 80:1534 - 1536, 1993.
8. Pate JW: Tracheobronchial and esophageal injuries. Surg Clin North Am 69:111-123, 1989.
9. Demetriades D, Theodorou D, Cornwell E, et al.: Evaluation of penetrating injuries of the neck. A prospective study of 223 patients. Submitted World J Surg.

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