Abstract
An isolated stab wound to the right posterior neck in a hemodynamically unstable patient usually infers an injury of vascular origin. Once vascular control and repair are accomplished, these patients generally recover from this insult. We present a case of a healthy 19 year old male who arrived at our Level I Trauma Center (Bronx, New York) with such an injury. He underwent an emergency angiogram which showed right vertebral artery transection. Injuries to branches off the thyrocervical trunk and transected internal jugular vein. His major vascular injuries were initially controlled at first by micro coil embolization techniques and then by surgery. Though it appeared full recovery was in progress, acute neurologic deterioration approximately 2 weeks post-operatively was the precursor to a work up which revealed a neoplastic process. The patient quickly succumbed to this infectious insult. Postmortem evaluation revealed leptomeningitis and necrotizing cerebritis. Despite broad-spectrum antibiotic regimen which was initiated on presentation and through intra-operative investigation of this wound, we suspect occult violation of the Central Nervous System (CNS) was present. We suggest broad-spectrum antibiotics and high index of suspicion for these deep cervical stab wounds, as well as emergent micro coil embolization of vascular injuries.

Case Presentation
We present a case of a 19 year old male who presented to our Level I Trauma Center with an isolated stab wound to the right neck, posterior to the sternocleidomastoid muscle at approximately the level of the third - fourth cervical body (zone I). He presented in Stage III-IV hemorrhagic shock and was resuscitated following Advanced Trauma Life Support (ATLS) guidelines. The stab wound was profusely bleeding but direct pressure seemed to impede the blood loss to an acceptable rate. His airway was secured and there was no crepitus noted.

The patient was taken for emergent angiography, which demonstrated complete transection of the right vertebral artery, and major extravasation from the thyrocervical trunk. The right vertebral artery was able to be coil embolized both proximal and distal and control of the thyrocervical trunk was also achieved. Despite the embolization, blood loss remained to be unrelenting. Delayed images from the angiogram revealed complete transection of the right internal jugular vein.

Without delay, the patient was brought directly to the operating suite for neck exploration. Intra-operative findings revealed a stab wound that entered the posterior-lateral right neck and penetrated to the depth of the cervical vertebral bodies. No tracheo-esophageal injuries were noted. The transected right internal jugular vein was then ligated proximally and distally. Sequentially, the wound was then packed and the patient was transferred to the intensive care unit for resuscitation and planned “second look” in 24 hours. The next day, the patient was brought back to the operating suite where the wound was re-explored, hemostasis assured and the wound closed, leaving a Jackson-Pratt drain.

Case Presentation (cont...)  
Angiogram revealing extravasation of contrast from the right vertebral artery, indicative of injury.

Digitally Subtracted Image (DSI) of angiogram depicts gross extravasation of contrast from the vertebral artery.

Angiogram after micro coil embolization of the vertebral artery, both proximal and distal to the injury, reveals no further contrast extravasation.

Venous, or delay phase of angiogram depicts gross venous extravasation of contrast. Operative exploration revealed a completely transected internal jugular vein.

Contrast enhanced CT of the brain reveals droplets of pneumocephalus.

Imaging of the neck shows post-surgical changes, but no spinal cord involvement.

Discussion
Arterial hemorrhage is associated with rapid development of shock, requiring homeostasis to save life in many cases. 1, 2, 3 Vertebral artery injury of vascular origin is a rare entity. 1, 2, 4, 5, 6 In a unilateral vertebral artery injury if there is a normal contralateral vertebral artery and PCA blood supply, 2, 7, 8 Zones 1 and 3 of the cervical region have deep vital structures which are less accessible to physical investigation or surgical exploration; thus, should be taken into account in deciding for additional diagnostic procedures. 2, 4, 8, 9, 10

1. Surgery and embolization are two management options for penetrating neck injuries that include the vertebral artery. 10 Our patient had life threatening zone I vascular injuries and we demonstrate a combined endovascular and surgical approach to these injuries. The infectious complications associated with penetrating wounds are typically caused by perforation of a hollow viscus with leakage of gastrointestinal contents causing peritonitis or intra-abdominal abscesses. Infection of this kind can involve the thoracic or lumbar vertebral column, causing meningitis. 2 Although meningitis caused by a penetrating neck wound is an unusual case, 8, 10 our patient had succumbed to this, despite broad-spectrum antibiotic regimen initiated on presentation and throughout the inoperative investigation of this wound. Leptomeningitis is very rare and literature search revealed only a very few reported cases in the neurosurgical literature.

In conclusion, this case report illustrates the team approach necessary to manage complicated penetrating neck trauma. Despite aggressive intervention and treatment, our patient survived his initial traumatic insult, yet succumbed to a rare, unexpected and rapid infectious process.

References
