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Appendix

The Appendix includes additional information on both upper and lower extremity junctional region neurovascular anatomy.

Junctional Anatomy

Shoulder and Axillary Region

Vascular Anatomy. Shoulder region junctional injury is relatively uncommon, even though the axillary region is not fully protected by contemporary body armor. In this area vessels at risk include the subclavian artery and vein, and axillary artery and vein and their branches. The left and right subclavian arteries lie inferior to the clavicles and are supplied by the aortic arch. There are three parts of each subclavian artery that are relative to the anterior scalene muscle. The first part is medial to the anterior scalene muscle and its branches are the vertebral artery, internal thoracic artery, and thyrocervical trunk. In most people, the suprascapular artery arises from the thyrocervical trunk. The second part is immediately posterior to the scalene muscle and gives off the costocervical trunk. The third part is lateral to the scalene muscle and gives off the dorsal scapular artery. Once the subclavian artery passes the lateral border of the first rib, it is known as the axillary artery²⁰. In most patients, the axillary artery, which continues distally as the brachial artery, is the only source of blood supply to the upper extremity. The axillary artery has several branches. Some of the larger branches, especially the subscapular and occasionally the circumflex humeral, are approachable through an axillary incision²⁰.

Nerve Anatomy. The brachial plexus is formed by the anterior rami of C5 through C8 and T1 and supplies sensation and motor function to the upper limb. It begins in the root of the neck, passes through the axilla, and continues through the entire upper extremity. The brachial plexus is divided into five parts: Roots, trunks, divisions, cords and branches. The roots refer the anterior rami of the spinal nerves. They leave the spinal cord via the intervertebral foramina of the vertebral column, and pass between the anterior and medial scalene muscles to enter the base of the neck. Here the roots of the brachial plexus converge to form three trunks as they pass between the scalenus anterior and medius muscles: The superior trunk (C5 and C6), the middle trunk (C7), and the inferior trunk (C8 and T1). The trunks then traverse the posterior triangle of the neck.

Each trunk divides into an anterior and posterior division posterior to the mid clavicle. The divisions exit the posterior triangle and pass into the axilla, forming the three cords of the brachial plexus, named by their position relative to the axillary artery: Lateral cord (lateral border of the first rib), posterior cord, and medial cord. In the axilla and the proximal aspect of the upper limb, the three cords give rise to the musculocutaneous, axillary, median, radial, and ulnar nerves.

Pelvis, Torso and Proximal Thigh

Vascular Anatomy. This anatomic region is more prone to junctional trauma than the upper extremity^{10,21}, and understanding the relevant vessel anatomy is critical to gaining control of vascular injury. The aorta is divided into four parts: the ascending aorta, the aortic arch, the thoracic (descending) aorta, and the abdominal aorta. The abdominal aorta, beginning at the T12 vertebral level, is the most relevant to junctional injuries involving the groin, perineum, and buttocks. It branches into left and right common iliac arteries at the L4 vertebral level which then branch into external and internal iliac arteries at the L5-S1 vertebral level. The external iliac artery continues distally to become the common femoral artery which then branches into the deep and superficial femoral arteries²². The internal iliac artery crosses the pelvic inlet, enters the lesser pelvis, and at the superior border of the greater sciatic foramen divides into anterior and posterior trunks. The anterior trunk supplies pelvic organs, perineum, and gluteal and adductor muscle groups. The posterior trunk supplies the lower posterior abdominal wall, posterior pelvic wall, and gluteal region.

Nerve Anatomy. The lumbosacral plexus is comprised of the ventral rami from T12 through S3. It is found on the anterior surface of the quadratus lumborum and lies posterior to the psoas muscle. The sciatic nerve is formed by branches of L4 through S3, and the femoral nerve is formed by L2, L3, and L4. The femoral triangle, which is bordered superiorly by the inguinal ligament, laterally by the medial border of the sartorius, and medially by the adductor longus, contains major neurovascular structures that include the femoral nerve, artery, and vein; as well as lymphatics.

Junctional injuries to the groin and/or perineum not only have high acute mortality rate, but also can result in long-term disability to survivors. Complex pelviperineal injuries have a mortality rate upward of 70%²³. Injuries to the perineum include scrotal, testicular and penile trauma, and rectal/anal injuries. For early survivors, a contaminated perineal wound or rectal injury can lead to sepsis and increased morbidity and mortality.