Ligation of the Anterior Humeral Circumflex Artery Ablates Blood Flow to the Lesser Tuberosity Osteotomy in a Cadaveric Model

Tyler J Thorne, Bejan Alvandi, Cameron Richard Guy, Amanda Marie Crawford, Christopher Joyce, Max Mouritsen

INTRODUCTION: A lesser tuberosity osteotomy (LTO) is commonly utilized during shoulder arthroplasty. However, LTOs are associated with nonunion rates as high as 13%. The anterior humeral circumflex artery (AHCA) and its ascending branches, the primary blood supply to the lesser tuberosity, are commonly ligated during the approach and may contribute to nonunion. This study hypothesized that AHCA ligation would compromise blood flow to the LTO in a cadaveric model.

METHODS: Ten cadaveric shoulders were prepared via a standard deltopectoral approach. The axillary artery was cannulated for dye injection. With the AHCA intact, a radiopaque contrast agent was injected to visualize vasculature under fluoroscopy. After flushing, an LTO was performed, followed by blue-dye injection to assess bleeding at the osteotomy site and contrast dye to confirm radiographic pooling. The process was repeated after tying off the AHCA.

RESULTS: The 10 shoulders were from donors with a mean age of 50.7 years, seven of which were male. Utilizing the contrast agent the AHCA, posterior humeral circumflex artery (PHCA), and ascending branches were visible via fluoroscopy in all specimens. Bleeding and contrast pooling at the LTO were observed with the AHCA intact in 10/10 specimens. 10/10 had bleeding from the inferior LTO from the periosteum, and 3/10 also had osseus bleeding from the inferior half of the osteotomy. Following ligation of the AHCA, 0/10 had bleeding or contrast pooling, and 0/10 had any flow to the lesser tuberosity from the PHCA or other contributing vessels. In 10/10 specimen, ligation of the AHCA led to collapse and disappearance of the ascending vessels seen on fluoroscopy.

DISCUSSION AND CONCLUSION: In this cadaveric model, AHCA ligation during a standard deltopectoral approach eliminated blood flow to the LTO. Additionally, in all sample the blood flow to the lesser tuberosity occurred in a retrograde fashion with increased periosteal and osseus bleeding from the inferior aspect of the LTO. The lesser tuberosity may have a natural watershed zone which is threatened with ligation of the AHCA. Future research with advanced imaging and clinical studies need to assess the risk of LTO nonunion with AHCA ligation.