Traumatic Ulnar Artery Aneurysms In Children: A Case Report And Review

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Abstract

Ulnar artery aneurysms, though uncommon, are encountered secondary to traumatic injury to the hand. The diagnosis can be unsuspected, especially in children, as symptoms may be subtle. A high index of suspicion and color flow Doppler technology enables accurate diagnosis. The following is a case of a child who suffered a traumatic ulnar artery aneurysm with an accompanying literature review and discussion highlighting reparative surgical interventions and the benefits of color flow Doppler in the management of ulnar artery aneurysms.

INTRODUCTION

True aneurysms of the ulnar artery, while uncommon[1] are the most reported site of arterial aneurysms of the upper extremity[2,3]. Blunt trauma is the most common identifiable cause of true upper extremity arterial aneurysms. They are usually localized to the superficial segment of the ulnar artery on the hypothenar eminence and associated in adults with the hypothenar hammer syndrome, which results from repeated local injury[4]. In children, the lesion is rarer and can be more innocuous. The following is a case of a child who presented with an aneurysm of the ulnar artery due to blunt trauma. Ulnar artery aneurysms, diagnostic modalities, and management strategies are discussed.

CASE PRESENTATION

A right-hand dominant 13-year old male was referred for evaluation of a right hand mass. The hand was normal until 3 months prior to presentation when he fell while mountain biking. The hand was acutely painful with associated swelling, followed by evolution of a palpable mass within 24 hours after injury. Though swelling subsided, the mass persisted. At presentation, he denied numbness or weakness in the hand. There was a palpable pulsating mass in the ulnar/volar palm at the level of Guyon's canal. (Figure 1) An Allen test was consistent with a patent palmar arch with noted delayed ulnar antegrade fill. Ulnar neurosensorimotor examination was intact. Median nerve function was also normal. There was no thrill or bruit. Preoperative evaluation included color flow Doppler (CFD) studies, which revealed a dilated segment of the ulnar artery beyond the distal wrist crease. Both antegrade and retrograde flow was demonstrated, and signals were dampened supporting the diagnosis of an ulnar artery aneurysm.

Figure 1

Figure 1: A pulsating mass in the right hand of a 13-year old male who presented with an aneurysm of the right ulnar artery.

OPERATIVE TECHNIQUE

The right upper extremity was partially exsanguinated and a tourniquet inflated. A midpalmar incision was made as a modified carpal tunnel approach. Sharp dissection through fascia revealed a 9mm aneurysm of the ulnar artery. After identification of the ulnar nerve, dissection was performed proximal and distal to the lesion revealing a 2.5mm vessel. The distal aspect of the aneurysm extended just proximal to the takeoff of the common digital artery to the fifth digit. This vessel was preserved. (Figure 2) Once the aneurysm

was circumferentially mobilized, the vena comitans were dissected and ligated. The extremity was then reperfused. Doppler signals were noted in the aneurysm and palmar arch. Two-thousand units of heparin were administered intravenously after which the aneurysm was resected-proximally at the level of the normal artery and distally at the junction of the common digital artery and the palmar arch takeoff. (Figure 3) Conservative proximal and distal mobilization allowed primary anastomosis using interrupted #9-0 nylon via standard microsurgical technique. (Figure 4) Following revascularization, antegrade and retrograde flows were demonstrated within the ulnar artery. Intraoperative Doppler evaluation confirmed normal flow signals.

Figure 2

Figure 2: In-situ, the aneurysm extended just proximal to the takeoff of the common digital artery to the fifth digit.

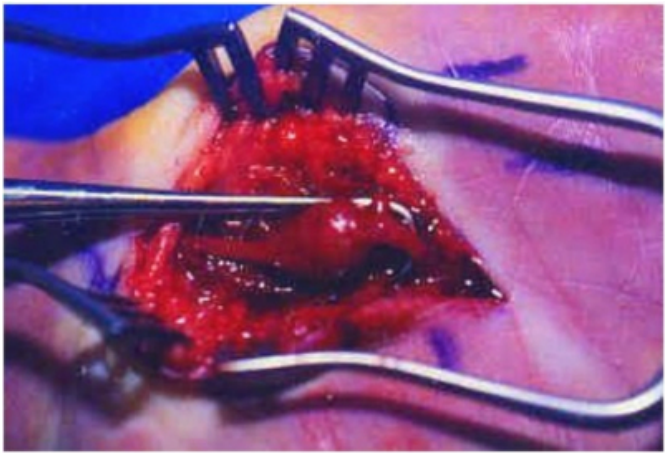
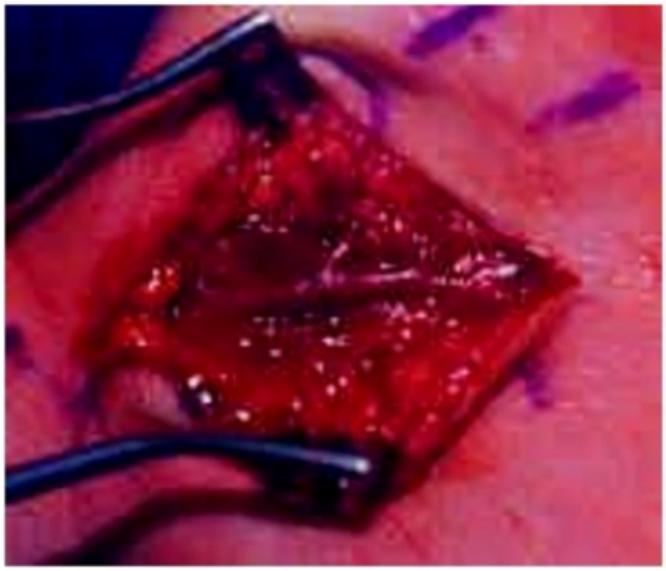


Figure 3

Figure 3: The resected specimen approximated 1.2 cm in length.

Figure 4

Figure 4: Primary end-to-end anastomosis of the ulnar artery after resection of the aneurysm.



Despite a normal neurovascular exam and CFD studies that revealed normal flow, mild fourth finger parasthesias, mild weakness, and a sensation of the hand being “tired” marked the patient's early postoperative course. However, at twelve months follow-up, the patient reported resolution of the

parasthesias, more normal strength, and described the hand as less tired.

DISCUSSION

Aneurysms of the distal upper extremities are not rare[2]. Since the first report in 1772 by Guattani, greater than 170 cases of arterial aneurysms of the hand have been reported in the English literature.[6] True aneurysms of the upper extremity involve the ulnar artery most often. The vast majority of ulnar artery aneurysms occur in adults, whose vocations often involve activities that expose the vessel to injury. Though cases due to infection and atherosclerosis have been reported, trauma, either acute or of a chronic repetitive nature, is the precipitant most often credited with aneurysm development.

Cadaveric studies show that the ulnar artery is often the dominant blood supply to the four common digital arteries. Due to its anatomic course, the ulnar artery is particularly susceptible to injury and subsequent development of a true aneurysm. It is at most risk at the hypothenar eminence due to its superficial location over the hook of the hamate. Over this distance, the artery is covered only by the palmaris brevis muscle, subcutaneous tissue, and overlying skin.[5]

As a result of blunt trauma, weakening of the vessel wall may result. True aneurysms form when portions of the arterial wall lose structural integrity. It is proposed that compression of the arterial wall secondary to trauma produces a contusion of the arterial media with subsequent weakening of the wall and fusiform dilatation[2,3]. In addition, a discontinuity and duplication of the internal elastic lamina occurs[5], with granulation tissue development within the walls of the evolving aneurysm as well as adjacent arterial segments. This process contrasts pseudoaneurysm formation, which results when fibrous tissue surrounds a post-traumatic hematoma that is in continuity with arterial flow. Pseudoaneurysms most often result from penetrating trauma.

Clinically, patients with an ulnar artery aneurysm may exhibit a variety of signs and symptoms. Symptom severity is related to the degree of resultant vascular compromise and can include digit ischemia, embolic stigmata, and ulnar nerve palsy. Individuals most often complain of numbness, pain, and paresthesias. In addition to a tender, pulsating hypothenar mass, the clinician may note pallor and cyanosis of the digits on examination. Although the Allen test is usually positive, indicating a discontinuous palmar vascular arch, it has been reported as negative in several cases.[5] Standard ultrasonography alone may mistakenly reveal a simple cyst. CFD studies enhance sensitivity and result in a reduction in false negative studies.

Intraarterial pharmacotherapies, thrombectomy without resection, resection alone, and resection with revascularization have all been described as therapeutic avenues in the treatment of ulnar artery aneurysms.[7,8] Currently, either resection alone, or resection with revascularization is performed. Debate still persists as to which is superior[6,7]. Resection without vessel reconstruction is acceptable if an effective arterial supply exists. Gray endorsed routine resection of the lesion with selective revascularization based upon the presence of back bleeding, clinical evidence of perfusion, and/or results of digital plethysmography[8]. Moore supports resection with microsurgical reconstruction arguing that current techniques permit reliable repair and thereby reduce the potential hazards of arterial ligation and vascular reliance upon the radial arterial system[9]. Arguably, revascularization offers the best restoration of pre-injury anatomy, as well as more normal blood flow to the ulnar side of the hand.

Though similar in pathophysiology and presentation, cases of true aneurysms of the ulnar artery are less frequent in children. All have been secondary to acute traumatic events. Rothkopf reported two children aged 6 and 9 who developed ulnar artery pseudoaneurysms secondary to puncture wounds. Both cases were treated by resection without microsurgical reconstruction[7]. Cron reported a 12-year-old child who developed an asymptomatic aneurysm after falling on an outstretched hand[1]. This case was treated with resection alone as well.

This case of a traumatic ulnar artery aneurysm in a child is illustrative that these lesions can be difficult to diagnose as they are often relatively asymptomatic. A persistent mass may well be the only presenting complaint. Though the differential diagnosis includes neurofibromas, ganglion cysts, etc., the pulsating character makes a vascular lesion most likely. While arteriography has been the gold standard for assessing arterial injuries, current CFD technology allows for evaluation of these lesions in most patients. CFD is a relatively inexpensive, noninvasive tool that demonstrates a greater than 90% sensitivity and specificity in both symptomatic and asymptomatic patients with potential vascular injury[10]. CFD performed by a skilled sonographer can effectively identify lesions that might require surgical intervention[11] and is useful in following patients postoperatively. This case demonstrates its utility in

the preoperative diagnostic and post-operative management of distal upper extremity arterial aneurysms.

In summary, aneurysms of the ulnar artery in children often present with few symptoms after incurred blunt trauma. CFD studies can effectively identify these lesions, and can be used to assess vessel patency post-operatively. While resection alone is an acceptable option, aneurysm resection with reestablishment of vessel continuity via microvascular techniques provides the restoration of baseline circulation to the ulnar side of the hand.

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