



CASE REPORT

Occlusion of acute distal brachial, proximal radial and ulnar arteries in a young thrower



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KEYWORDS

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Summary Acute arterial occlusion, a rare condition in throwers, requires early detection and treatment for avoiding further complications. Thus far, no study has mentioned the occurrence of distal brachial, proximal radial, and ulnar artery occlusion in baseball players. An adolescent baseball pitcher presented with acute occlusion of the distal brachial, proximal radial, or ulnar artery. The patient complained of a cold sensation in the hand, wrist, and distal forearm. On physical examination, decreased surface skin temperature, and no radial pulse in the wrist suggested arterial occlusion. Emergency angiography validated the clinical suspicion, and identified the arteries and sites of vascular occlusion. Surgery was performed to alleviate the occlusions, thereby resolving the preoperative complaints and abnormal findings. Furthermore, postoperative magnetic resonance imaging of the shoulder and elbow joint was conducted to determine the causes of arterial occlusion. The patient resumed pitching 4 months postoperatively, and has remained active and symptom free. Magnetic resonance imaging examination revealed no vascular abnormalities or bony or soft tissue in the shoulder or elbow region. With early detection and treatment, a favorable prognosis can be achieved in baseball pitchers with acute upper extremity arterial occlusion so that their pitching career is not jeopardized.

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1. Introduction

Acute arterial injury is a rare condition but can occur in competitive athletes at any age. Vascular injury can occur in players of various sports. Among all vascular injuries, upper extremity vascular injury is most frequently observed in overhead throwers, predominantly affecting the shoulder region.^{1,2}

Schneider et al³ reported that arterial occlusion mainly occurs because of repetitive compression of the vessels at the level of the pectoralis minor muscle and humeral head during the throwing phase. Several etiologies of acute arterial occlusion in throwers have been identified, such as structural abnormality, trauma, coagulopathy, connective tissue disease, and iatrogenic factors.^{1–3}

Thus far, distal arterial occlusion injury beyond the shoulder region in throwers has not been reported. In this case report, we present a young thrower who experienced acute occlusion of the distal brachial, proximal radial, and ulnar arteries. The clinical presentations, methods of diagnosis and treatment, and functional outcomes are described.

2. Case Report

A 15-year-old left-hand-dominant pitcher experienced a cold and mild numbness in the left distal forearm, wrist, and hand for 3 days. He visited a primary care physician, and was diagnosed with and treated for the common cold. However, his symptoms persisted, and he visited our clinic for further evaluation.

The patient had no trauma history involving his left upper extremity and had previously experienced no similar symptoms. His daily practice involved 50–60 pitches, and he pitched two innings in a game 3 days before the occurrence of the initial symptoms.

On physical examination, the examiner reported that the left hand of the patient felt colder than the right hand did. Bilateral hand skin temperatures were measured using a temporal arterial thermometer (Tat-5000, Model 124275-p; Exergen, St. Watertown, MA, USA) (Table 1), revealing that the skin temperature of the left hand was substantially lower than that of the right hand. No pulse in the left radial or ulnar arteries could be detected. Suspecting arterial occlusion, we consulted a cardiovascular surgeon who subsequently suspected an occlusion of the brachial artery, because the surgeon could not detect any arterial pulsation in the elbow region.

A regular heartbeat with no heart murmur, and normal S1 and S2 heart sounds with no S3 or S4 gallop were found in cardiac examinations. A chest X-ray and an electrocardiogram showed no abnormal findings. A plain film of the left elbow revealed no fracture or other bony abnormality. Moreover, hematological examinations indicated no coagulopathy.

Emergency angiography (Figure 1) showed patent subclavian and proximal brachial arteries; however, occlusion

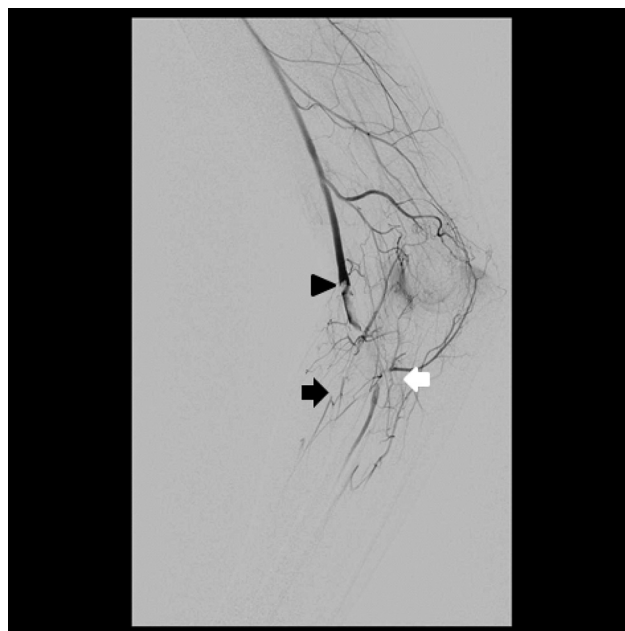


Figure 1 Occlusions of the distal brachial artery (arrow head). Distal collateral circulations of the radial (white arrow) and ulnar (black arrow) arteries are observed.

of the left distal brachial, proximal radial, and ulnar arteries was detected in the elbow region. Hence, an emergency operation was performed.

Thrombi were found stagnated in the left distal brachial, proximal radial, and ulnar arteries (Figure 2). The excised thrombus tip exhibited a whitish color change, suggesting its retention in the vessels for > 24 hours. Intraoperative Doppler examination revealed blood flow in all three vessels after excision of the thrombi.

The elbow joint was immobilized using a splint postoperatively. Intravenous prostaglandin E1 was administered for 3 days to prevent thrombosis recurrence. Moreover, ultrasonography conducted on Postoperative Day 5 showed a patent flow in the left brachial, proximal radial, and ulnar arteries, without residual thrombi. No postoperative complication was observed. The preoperative bilateral hand skin temperatures remained nearly identical to the postoperative skin temperatures (Table 1).

Magnetic resonance imaging (MRI) of the left shoulder revealed no congenital osseous dysplasia or anomaly, and no cervical rib was identified. Bilateral neck muscles appeared normal, and they were symmetrical in signal

Table 1 Surface skin temperatures measured preoperatively and on Postoperative Day 1, Day 3, and Day 5.

Temperature(°C, left versus right)	Dorsal aspect of hand		Palm		Pad of index finger		Pad of little finger	
	Left	Right	Left	Right	Left	Right	Left	Right
Preop	30.5	35.9	27.6	36.3	27.4	36.1	27.4	36.1
POD1	35.6	36.1	35.8	36.2	35.6	36.1	35.6	36.1
POD3	35.9	36.3	36.3	36.0	36.3	36.7	35.6	36.7
POD5	35.9	36.4	36.0	36.0	36.0	36.7	35.9	35.0

POD1 = Postoperative Day 1; POD3 = Postoperative Day 3; POD5 = Postoperative Day 5; Preop = preoperative.

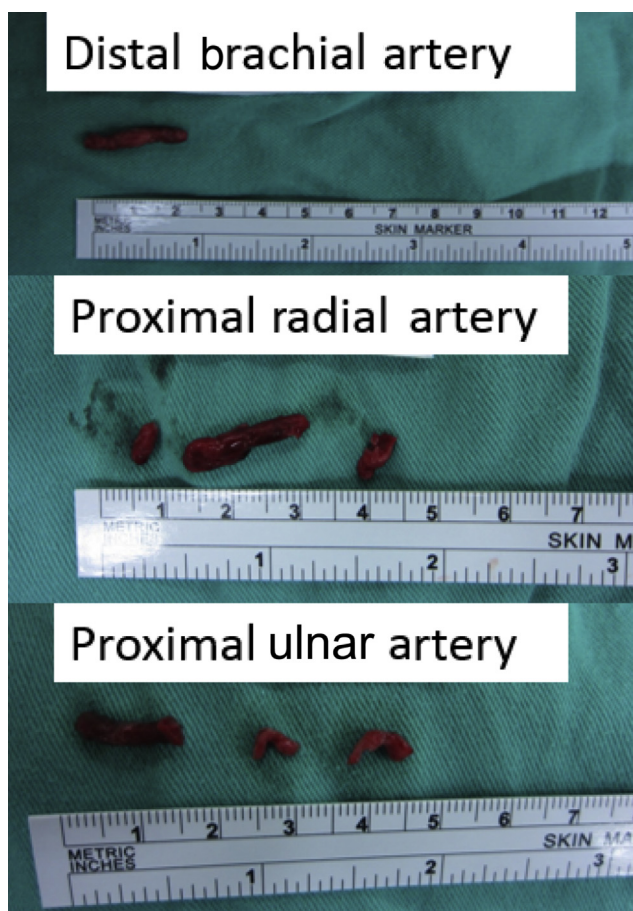


Figure 2 Thrombi are found stagnated in the left distal brachial, and proximal radial and ulnar arteries.

intensity and bulk. The major arteries and veins in the region were patent without any vascular anomaly such as an aneurysm or arteriovenous malformation.

MRI of the elbow joint indicated no muscle anomaly or hypertrophy in the left elbow region.

Follow-up sonography at 6 months postoperatively showed a patent flow in the left brachial, radial, and ulnar arteries. The patient resumed pitching 4 months postoperatively and has remained symptom free.

3. Discussion

Previous studies have reported that arterial occlusions, particularly occlusion of the axillary artery, in throwing athletes mainly occurs in the shoulder region. The axillary artery can be compressed by the humeral head and at the thoracic outlet when the arm is in the pitching position. Rohrer et al² postulated that thrombosis of the axillary artery could be caused by a repetitive mechanical trauma of the humeral head during throwing.

Thoracic outlet syndrome (TOS) has been reported as the leading cause of arterial occlusion in throwers, and is described as a compression at the superior thoracic outlet caused by external pressure on the neurovascular bundle.⁴⁻⁶ Duwayri et al⁷ conducted a retrospective study and reported that 8.2% of TOS was arterial occlusion

involving the subclavian artery (81%) and axillary artery (19%).

Duwayri et al⁷ examined arterial occlusion in their patients with TOS and reported that a spectrum of pathology could be found in overhead athletes. TOS is caused by a repetitive positional compression of the axillary artery during throwing. The pathology of vascular occlusion includes focal intimal hyperplasia, aneurysm formation, segmental dissection, and branch vessel aneurysms.

Other causes of arterial occlusion in the shoulder region include structural abnormalities such as a congenital first rib, trauma, coagulopathy, connective tissue disease, arrhythmia, and iatrogenic factors.^{3,4,6}

Our patient complained of no subjective discomfort in the shoulder region. A preoperative X-ray and postoperative MRI examinations of the patient's shoulder region revealed no abnormality. His hematological data were within normal limits; an electrocardiogram revealed no arrhythmia. The patient had no apparent trauma history. Furthermore, angiographic examination showed patent subclavian and axillary artery with no aneurysm or arteriovenous malformation. The possibility of emboli having dislodged from higher-level vessels into the distal brachial, as well as proximal radial and ulnar arteries was excluded. The MRI examination indicated no bone or muscle anomaly in the elbow region.

The cause of arterial occlusion in this patient remains obscure. Nuber et al¹ examined upper extremity ischemia in athletes, and reported that soft tissue hypertrophy and hyperactivity played unique and predominant roles in the pathogenesis of an arterial injury. In our patient, one possible mechanism was temporary vascular compression of the adjacent swollen muscles and soft tissues induced by repetitive pitching. Stasis of the blood stream caused the formation of thrombi and complete occlusion of the arteries.

Early detection of, and surgery for, acute arterial occlusion are essential for a successful treatment outcome. The patient has been closely followed up for > 1 year and has been pitching for 8 months. No symptom recurrence has been observed.

Acute occlusion of the distal brachial, proximal radial, and ulnar arteries is a rare condition in throwers. With early detection, diagnosis, and treatment, favorable prognosis can be achieved.

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