

UPPER-EXTREMITY DEEP-VEIN THROMBOSIS AFTER ANTERIOR SHOULDER DISLOCATION AND CLOSED REDUCTION

A CASE REPORT

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The shoulder is one of the most commonly dislocated joints in the body, accounting for nearly 45% of all dislocations¹. Approximately 85% of glenohumeral dislocations are anterior, and they are typically the result of an acute traumatic event. Typically, these injuries involve disruption of the anterior aspect of the glenoid labrum, joint capsule, or rotator cuff tendons; associated fracture of the glenoid rim or proximal part of the humerus is not uncommon². Neurovascular injury is infrequent, and few studies have addressed associated venous complications.

Although deep vein thrombosis in the upper extremity is a rare entity, major thromboembolic complications, including symptomatic and fatal pulmonary embolism, have been documented in the upper extremity³⁻⁵. Recently, deep vein thrombosis of the upper extremity has been recognized as a potential complication after shoulder surgery⁶⁻⁸. Prompt diagnosis and early intervention are generally recommended to reduce the risk of thromboembolic complications. Although the treatment of deep vein thrombosis of the upper extremity remains controversial, recent evidence suggests that systemic anticoagulation, local thrombolytic therapy, and surgical thrombectomy may limit the risk of thromboembolic complications^{9,10}.

To the best of our knowledge, deep vein thrombosis of the upper extremity complicating a traumatic dislocation of the shoulder has not been previously described. Our patient was informed that data concerning the case would be submitted for publication.

Case Report

Approximately one hour after falling down a flight of stairs, a thirty-four-year-old right-hand-dominant man presented to an outside emergency room because of pain in the right shoulder. He reported that the right shoulder felt similar to the way the left shoulder had felt when it was dislocated; that left dislocation had been successfully treated with an open stabilization procedure three years previously. The patient had no his-

tory of voluntary dislocation or psychiatric illness. Examination revealed obvious deformity of the right shoulder with a restricted range of motion and pain. The limb was noted to be well perfused with an intact radial pulse, and a neurologic examination revealed normal findings. A radiograph confirmed the diagnosis of anterior dislocation of the shoulder with no evidence of fracture of the proximal part of the humerus, the glenoid rim, the scapula, or the clavicle (Fig. 1).

Closed reduction was attempted by the staff emergency room physician, who used the traction-countertraction technique with the patient under conscious sedation. After multiple attempts to achieve closed reduction were unsuccessful, an orthopaedic physician assistant was asked to aid with the reduction. Following administration of more fentanyl, adequate sedation was achieved and a successful reduction was obtained with the traction-countertraction method.

At this point, a repeat radiograph showed satisfactory reduction of the shoulder and no evidence of fracture. On repeat examination, the radial pulse was found to be intact, the arm appeared well perfused, the neurologic function was grossly intact, and the patient reported that he did not have paresthesias in the affected limb. The arm was then placed in a sling, and the patient was discharged home with instructions to return for follow-up in the orthopaedic clinic.

The patient presented to the senior author (R.F.W.) two days later for evaluation of the right shoulder, which demonstrated no deformity and a range of motion limited by discomfort. Forward flexion was to 90°, external rotation with the arm at the side was to 30°, and strength in abduction and external rotation was normal. The result of the Gerber lift-off test was normal as well. The limb was warm and pink, and neurologic examination demonstrated unremarkable findings. The management of primary shoulder dislocations was discussed with the patient, who was instructed to begin gentle motion exercises.

The patient called the senior author approximately ten



Fig. 1
Scapular-Y radiograph of the right shoulder, demonstrating anterior dislocation.

days later because of systemic chills, but no documented fever, and worsening pain and swelling in the entire right upper extremity. He was seen in the office that day and was noted to have a temperature of 100.5°F (38.1°C) as well as a grossly swollen right upper extremity. Additional examination in the

office revealed an area of erythema, induration, and tenderness over the medial aspect of the antecubital fossa, with a palpable cord extending from the elbow to the axilla. The muscle compartments were soft, and the radial pulse was intact and symmetric with that on the contralateral side. Motor and sen-

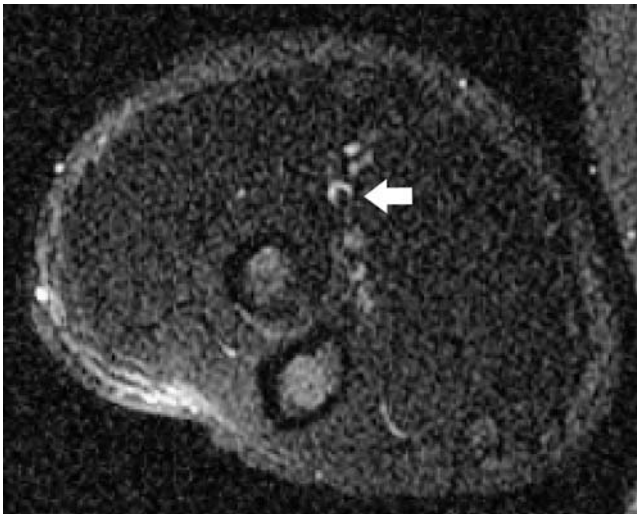


Fig. 2-A

Figs. 2-A and 2-B Axial source image from a two-dimensional, time-of-flight noncontrast magnetic resonance venogram (Fig. 2-A) and projection reconstruction image (Fig. 2-B), demonstrating a low-signal-intensity thrombus (arrows) within the brachial vein.



Fig. 2-B

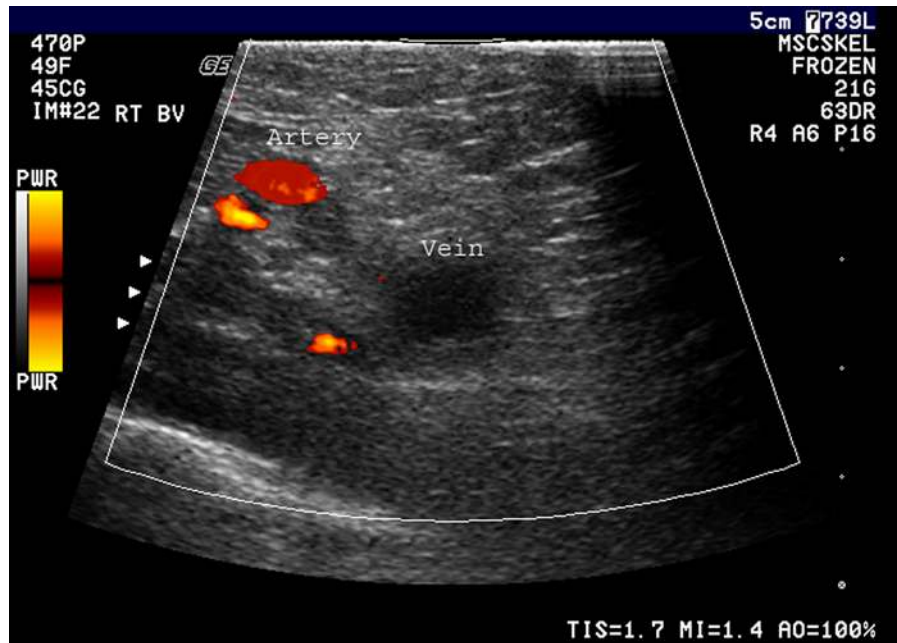


Fig. 3

Doppler ultrasound of the right upper extremity, showing complete thrombosis of the brachial vein in the upper arm.

sory function was intact throughout the extremity, and the patient reported that he had no paresthesias.

A presumptive diagnosis of septic thrombophlebitis of the upper extremity was made, and the patient was admitted to the hospital. An intravenous catheter was placed in the left upper extremity, and intravenous administration of cefazolin was begun. Laboratory studies revealed a normal white blood-cell count, hemoglobin level, and platelet count. The sedimentation rate, however, was elevated to 72 mm/hr. The results of coagulation studies were within the normal range, with a partial thromboplastin time of 32.9 sec, a prothrombin time of 13.9 sec, and an international normalized ratio of 1.3. Magnetic resonance venography (Figs. 2-A and 2-B) revealed thrombosis of the axillary vein as well as the paired brachial veins extending from the axilla to the elbow. Substantial soft-tissue swelling was noted at the level of the elbow, but no focal fluid collection was identified. A color-flow Doppler ultrasound (Fig. 3) confirmed the presence of a complete thrombosis of the axillary vein and the paired brachial veins from the axilla to the elbow without evidence of an associated focal fluid collection or abscess. The superficial basilic veins showed thrombosis extending distally to the level of the wrist. The subclavian and jugular veins remained patent. Both magnetic resonance and ultrasound imaging demonstrated that the arterial system of the affected limb was patent with normal flow and no evidence of gross injury or compromise. The patient reported no known personal or family history of hematologic abnormalities, prior venous thromboses, or intravenous drug abuse.

Treatment of symptoms was initiated. The limb was placed in an overhead sling to elevate it and to limit elbow

motion in an attempt to control swelling and relieve pain. Anticoagulation therapy was started immediately with subcutaneous low-molecular-weight heparin (enoxaparin), at a dose of 1 mg/kg, as well as oral warfarin. The vascular surgery consultant thought that, given the history of acute trauma and the decrease in the symptoms with the anticoagulation therapy, the potential complications associated with thrombolytic treatment outweighed the potential benefits for this particular patient.

Over the next three days, enoxaparin therapy was continued while we waited to achieve a therapeutic international normalized ratio of >2.0 with the warfarin. The patient remained afebrile, and the swelling, erythema, and pain in the upper extremity all decreased substantially. The patient began gentle range-of-motion exercises of the elbow as tolerated and continued with the gentle motion exercises of the shoulder to prevent shoulder stiffness. After a therapeutic international normalized ratio was obtained on the fourth hospital day, the treatment with the low-molecular-weight heparin was discontinued and the patient was discharged home. Anticoagulation treatment with warfarin for three months was prescribed. The risks of a potential thromboembolic complication were discussed in detail, and the patient was educated about early recognition of associated clinical signs and symptoms.

A repeat ultrasound study was performed six weeks later, and it demonstrated some evidence of venous recanalization without further propagation of the thrombus. The patient remained asymptomatic without evidence of substantial thromboembolic morbidity, and upper-extremity function was satisfactorily restored.

Discussion

Venous thrombosis in the upper extremity is a rare entity, representing approximately 1% to 3% of all diagnosed deep vein thromboses¹¹; consequently, the causes, complications, and treatment options are not as well defined as are those for lower-extremity thromboses. The degree to which hematologic abnormalities increase the risk of deep vein thrombosis of the upper extremity remains controversial, although there is emerging evidence from studies of the lower extremity that some patients have a genetic predisposition for thromboembolism^{12,13}.

In the case presented in this report, the exact etiology of the deep vein thrombosis of the upper extremity is unclear and we can only speculate on its pathogenesis. It is possible that the endothelium of the axillary vein was slightly damaged as a result of the high-energy dislocation. This intimal injury combined with venous stasis due to temporary occlusion of the axillary vein by the dislocated humeral head theoretically could cause an isolated venous thrombosis. Although the patient reported no known history of hematologic abnormalities, specific laboratory testing was not performed; thus, decreased fibrinolytic capacity may have contributed to the risk of thrombosis of the upper extremity in this patient.

The traction-countertraction technique described by Wirth and Rockwood is a well-established, safe, and efficient method of reduction that is commonly used¹⁴. It is possible, however, that this technique may have contributed to the development of the deep vein thrombosis of the upper extremity in our patient. Traction applied at the flexed elbow may have resulted in clot formation that propagated proximally, or it is possible that the injury occurred proximally as a result of the countertraction force on the dislocated humeral head, with clot propagation distally. However, if this was the primary etiology of the thrombus formation in this patient, it is unclear why deep vein thrombosis of the upper extremity is not reported more frequently after shoulder dislocation since the traction-countertraction shoulder reduction technique is used so often.

Although previous studies on deep vein thrombosis of the upper extremity had suggested that associated thrombotic complications are rare and innocuous, the recent literature, including larger retrospective studies and prospective trials, has challenged those earlier findings. Becker et al. reported an overall prevalence of pulmonary embolism of 9.4% and a 1% prevalence of fatal pulmonary embolism in 329 patients with proven venous thrombosis of the upper extremity¹⁵. Horattas et al. reviewed their experience with thirty-three cases of deep vein thrombosis of the upper extremity over a six-year period and reported a 12% prevalence of symptomatic pulmonary embolism⁴. Those authors also reviewed 218 cases of deep vein thrombosis of the upper extremity from nine different studies and found a 12.4% prevalence of pulmonary embolism. Several other investigators have suggested that the prevalence of thrombotic emboli resulting from deep vein thrombosis of the upper extremity is even higher than had been reported, as many are not apparent clinically^{5,16}.

While there is no clear consensus about the best treat-

ment of deep vein thrombosis of the upper extremity, early diagnosis and prevention of thrombus organization and propagation are thought to be the cornerstones of a successful outcome in these patients. Therapeutic modalities can be grouped into four general categories: (1) symptomatic therapy, (2) anticoagulation, (3) thrombolysis, and (4) surgical procedures. Elevation of the extremity, heat, and rest have been used to relieve symptoms of deep vein thrombosis of the upper extremity; however, as many as 74% of patients may have chronic sequelae consisting of pain, fatigue, weakness, discoloration, and swelling of the involved extremity with these interventions alone¹⁷. Anticoagulation with heparin or warfarin for three to six months has been advocated by some authors to prevent propagation of a thrombus, maintain venous collateral circulation, and protect against pulmonary embolism^{9,10}. When a thrombus is identified early, catheter-directed local thrombolysis with streptokinase or urokinase can be used^{9,18,19}. While fibrinolytic therapy appears to be effective, concern has been raised with regard to the expense and potential morbidity. Because conventional anticoagulation may fail to prevent pulmonary emboli or clot progression, surgical intervention consisting of Fogarty balloon angioplasty and thrombectomy, or open thrombectomy and autogenous venous-venous bypass, has been utilized with success^{20,21}. Finally, immediate or delayed surgical correction of any compressive anatomic abnormalities has been emphasized to minimize future complications and recurrences.

Although deep vein thrombosis of the upper extremity is a rare entity, major complications, including pulmonary embolism and death, have been described. We report what we believe to be the first case of upper-limb thrombosis following an acute traumatic anterior shoulder dislocation and reduction with the traction-countertraction technique. We believe that it is important to be aware of this unusual but potentially serious complication in patients who sustain a shoulder dislocation, as early diagnosis and treatment may limit morbidity and mortality. If a deep vein thrombosis of the upper extremity is suspected following a shoulder dislocation and reduction, Doppler ultrasound or magnetic resonance venography should be performed immediately to confirm the diagnosis. Anticoagulation, local fibrinolysis, and surgical intervention have been shown to be successful for treating patients with this condition. The patients should be carefully followed, and there should be a high index of suspicion for embolization when a patient presents with new cardiopulmonary or neurologic symptoms in the presence of a deep vein thrombosis of the upper extremity. ■

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