Case Reports

Heritable Thrombophilia Associated with Deep Venous Thrombosis after Shoulder Arthroscopy

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Abstract Thromboembolic complications after shoulder arthroscopy are rare and their cause has not been well determined. Heritable thrombophilia has been studied in relation to numerous clinical conditions, and it has been associated with thromboembolic complications after some orthopaedic surgeries, especially after total hip or knee arthroplasty. We report three patients who had deep vein thrombosis develop after shoulder arthroscopy. All three tested positive for heritable thrombophilia, a condition undetected until this complication occurred. This report highlights the possibility that unrecognized coagulation disorders might seriously influence the clinical outcome of minimally invasive surgery. We suggest heritable thrombophilia is a possible risk factor for or etiology of deep vein thrombosis after shoulder arthroscopy.

Introduction

Deep venous thrombosis (DVT) is a common and often presumed life-threatening complication after orthopaedic surgery, especially hip and knee surgery. Shoulder arthroscopy is increasingly used to treat many shoulder

abnormalities. The incidence of thromboembolic complications after this kind of surgery is considered low and their cause has not been well determined.

We report three patients who had DVT develop after shoulder arthroscopy. All three tested positive for heritable thrombophilia, a condition undetected until this complication occurred. The patients had neither personal nor family histories of thromboembolic disorders. Shoulder arthroscopy was performed with the patient in the beach chair position without traction under interscalene regional anesthesia. None of the patients received anticoagulation therapy perioperatively. When DVT occurred, the three patients were referred to the hematology department in our hospital and were treated with a standardized protocol for DVT.

They were tested for anti-thrombin III activity, proteins C and S, prothrombin promoter G20210A mutation, Factor V G1691 A mutation (Factor V Leiden), homocysteine serum levels, 4G4G promoter mutation of the plasminogen activator inhibitor, lupic inhibitor, activated protein C resistance, seric fibrinogen, and anticardiolipins.

Case Reports

Patient 1

A healthy, 30-year-old man, who was a high-performance taekwon do athlete, had a 3-month history of pain in his left, nondominant shoulder. He was categorized as having Grade 1 physical status of the American Society of Anesthesiology (ASA) scale [25] at the preoperative evaluation. His complete blood count and coagulation studies were normal. A Type II [39] superior labrum anterior posterior lesion (SLAP) and an articular partial tear of the

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supraspinatus tendon were repaired without complications within 1 hour and 20 minutes.

Four days after surgery, the patient complained of pain and swelling of the affected arm. An upper extremity Doppler ultrasound was performed and confirmed DVT of the basilic and humeral veins. Twelve months later, a new Doppler ultrasound showed resolution of the DVT and recannulation of the vessels. Tests for heritable thrombophilia revealed elevated levels of IgG anticardiolipins, suggesting an antiphospholipid antibody syndrome.

Patient 2

A 54-year-old woman had pain in her dominant shoulder for 2 years. She was categorized as having ASA Grade 2 physical status at the presurgery evaluation. A full-thickness L-shaped rotator cuff tear was repaired, and the distal end of the clavicle was resected. Surgery took no longer than 90 minutes. No complications occurred during the procedure. Ten days postoperatively, she was admitted to the emergency room with pain and swelling of her left inferior limb. Doppler ultrasound showed DVT of the popliteal vein and tibiofibular branch. Genetic studies for detection of thrombophilia showed prothrombin promoter G20210A mutation (heterozygous) and 4G4G promoter mutation of the plasminogen activator inhibitor. Six months later, a new Doppler ultrasound showed blockage of the occluded vessels had resolved.

Patient 3

A healthy, 66-year-old man had had shoulder pain for 6 months. He was categorized as having ASA Grade 2 physical status at the presurgery evaluation. Arthroscopic repair of a massive rotator cuff tear took 80 minutes and was performed without intraoperative complications. Six days after surgery, he reported pain and swelling on the inner part of the affected arm. Doppler sonography showed occlusion of the homolateral humeral, cephalic, and basilic veins. Genetic studies showed mutation of the 1691A gene for Factor V (Factor V Leiden) and another mutation in the C677T gene for the methylenetetrahydrofolate reductase enzyme. A followup ultrasound at 12 months after surgery revealed no current evidence of thrombosis.

Discussion

We report three patients who had DVT develop after shoulder arthroscopy. All three had positive tests for heritable thrombophilia. These were the only detected cases of

DVT in our series of 1082 shoulder arthroscopies (0.3%) during a 3-year period. It is unknown how many silent or asymptomatic cases may have occurred during that period.

Shoulder arthroscopy is considered a safe procedure for diagnosis and treatment of various shoulder disorders. DVT after arthroscopic shoulder surgery is rare, especially when compared with knee arthroscopy, where the incidence of DVT or pulmonary embolism is reportedly 1.5% to 17.9% [11, 12, 38, 44].

Few cases of thromboembolic complications after shoulder arthroscopy have been reported, and different causes have been proposed. Burkhart [6] reported a 32-year-old man who had DVT of the basilic vein develop after shoulder arthroscopy in the lateral decubitus. A previously asymptomatic Hodgkin's lymphoma mass subsequently compressed the innominate vein. Polzhofer et al. [35] described an overweight man with Type 2 diabetes who had a massive, hemodynamically relevant pulmonary embolism develop after undergoing shoulder arthroscopy in the lateral decubitus. This complication occurred despite prophylaxis with low-dose heparin. The authors suggested the embolism might have been caused by the motor-driven shaver's irritation of the subclavian vein. These first two cases might seem to suggest patient positioning in lateral decubitus and traction could contribute to the development of DVT. However, two cases of DVT after shoulder arthroscopy with patients in the beach chair position have been published [8, 9]. In a study of 263 patients with complications after arthroscopic rotator cuff repair, there was one case of ipsilateral upper extremity DVT. No reference was made to the probable etiology of the disease [5].

Recognized clinical risk factors for development of DVT include age, malignancy, obesity, diabetes mellitus, smoking, alcohol abuse, stroke, history of venous thromboembolism (VTE), atrial fibrillation, valvular disease, endocarditis, cardiac deficiency, estrogen or raloxifene treatment, atherosclerosis, and ASA Physical Status Classification of 3 or more [30, 43]. These clinical risk factors unfortunately are not sensitive or specific enough to allow preoperative detection of patients who will have DVT develop. Upper extremity DVT is an uncommon complication, occurring in less than 4% of patients in whom DVT develops [23]. Risk factors for DVT in this location include acquired or inherited hypercoagulable states, anatomic abnormalities causing venous compression, strenuous upper extremity exercise, cancer, and venous catheterization as with pacemakers [2, 7, 10, 15, 21, 26, 40].

Inherited thrombophilia is defined as a genetically determined tendency to VTE, which generally occurs at a young age without apparent causes and tends to recur [13]. The concept of an inherited predisposition for VTE was introduced in 1956 [24]. In the following decade, Egeberg

analyzed families with thromboembolic predisposition [14]. Since the 1990s, many authors have investigated the role of thrombophilia and hypofibrinolysis in the pathophysiology of various phenomena, including stroke, pregnancy loss, avascular necrosis of the femoral head, and Legg-Calvé-Perthes disease, among others [1, 4, 18–20, 22, 27, 29, 31, 33]. Some authors have linked heritable thrombophilia and/or hypofibrinolysis with the appearance of VTE after orthopaedic surgery, especially THA or TKA [32, 37, 41, 42, 45]. Pola et al. [34] reported two cases of DVT after knee arthroscopy. One patient had a severe pulmonary embolism develop. Both patients were athletes and had the thrombophilic factor lupus anticoagulant. Neither had a history of thrombotic diseases.

We found five inheritable abnormalities in the three patients we report (elevation of the IgG idiotype anticardiolipin antibodies, prothrombin promoter G20210A mutation, plasminogen activator inhibitor 1 4G74G polymorphism, the single point mutation [guanine to adenine] in the Factor V gene at position 1691, and mutation of gene 677 from cytosine to thymine) [3, 16, 17, 28, 36, 37, 41]. Each interferes in a different way in the coagulation cascade, promoting a procoagulation state. This report therefore highlights the possibility that unrecognized coagulation disorders might seriously influence the clinical outcome of minimally invasive surgery, such as shoulder arthroscopy, in otherwise healthy subjects. A prothrombotic disorder should be suspected when a case of thromboembolism occurs after shoulder arthroscopy in a young patient without risk factors.

Preoperative screening for heritable thrombophilia and hypofibrinolysis can identify postoperative DVT risk, allowing appropriate prophylaxis [32, 37, 41]. The incidence of thromboembolic complications seems to be low. Screening for heritable thrombophilia is expensive and its availability limited; however, should it become more accessible, it clearly will help prevent postarthroscopy DVT.

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