

Pulmonary Thromboembolism after Shoulder Arthroscopy: Two Case Reports

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Abstract

Thromboembolic events are one of the most serious and potentially fatal complications that can occur after an orthopedic surgery, especially pulmonary thromboembolism (PE). However, the incidence of such events are rare, specifically after upper limb surgery.

We presented two cases of PE after shoulder arthroscopy, in healthy patients, with no previous history of thromboembolic events. The PE presented in the first two postoperative weeks and both patients were anticoagulated and had full recovery. The occurrence of the thromboembolic events did not affect the clinical outcome of the shoulder. In this paper we try to identify possible risk factors and discuss the need of thromboprophylaxis, relating them to current literature.

The first case of deep venous thromboembolism (DVT) after shoulder arthroscopy was reported by Burkhart in 1990. Since then, few cases have been reported in the medical literature. Some risk factors have been discussed, such as: smoking, chronic obstructive pulmonary disease (COPD), high anesthetic risk (American Society of Anesthesiologists - ASA grade III or higher), age older than 60 years, obesity, and operative time longer than 90 minutes. There is no consensus about the impact of surgical positioning on the incidence of DVT and PE. Regarding prophylaxis, the advantages and impact of chemoprophylaxis remains controversial but should be considered in high-risk patients. On the other hand, mechanical prophylaxis should always be performed, from early ambulation to compression stockings and sequential compression devices, if available.

There is no level I evidence on occurrence of VTE after shoulder arthroscopy.

Keywords: Shoulder; Arthroscopy; Pulmonary thromboembolism; Rotator cuff repair; Case report

Introduction

Although shoulder arthroscopy surgery indications are increasing and consequently, also are the number of complications [1], only few cases of Deep Venous Thrombosis (DVT) after this procedure have been reported in the literature [2-4], since Burkhart et al, in 1990, published the first case of symptomatic case of DVT [5].

Thromboembolic events, such as venous thromboembolism (VTE) are uncommon after shoulder arthroscopy [2,6-7]. According to Dattani, et al. 2012, an incidence of 0.038% was found in their systematic Review [8], however when it happens, it should be fastly diagnosed and treated to avoid pulmonary embolism (PE) which is an extremely rare, but potentially fatal complication [9].

The major risk factors to VTE described in the literature are Diabetes mellitus, rheumatoid arthritis and ischaemic heart disease. The lateral decubitus position is also described as a possible risk factor to DVT, as a higher incidence of DVT compared with beach chair position was found, although no statistical significance has been found yet [8]. However, other authors did not find correlation with surgical positioning [3,10]. Distinct possible risk factors described are smoking history and operative time longer than 1.5 hours and thromboprophylaxis may be necessary in such cases [11].

Purpose

The purpose of this study is to present two cases of PE after shoulder arthroscopy, analyzing the possible risk factors, discussing the necessity of thromboprophylaxis and then, relate them to the current literature.

Case Presentation

Case 1

A 58-year-old female (weight 66kg, height 1,57cm, IMC 26,8kg/m²), unemployed, nonsmoker and with a negative personal and family history of thrombophilia, VTE or any other associated risk factors. She was submitted to arthroscopic rotator cuff repair of her left shoulder. The arthroscopic procedure took approximately 120 minutes, and it was performed by general anesthesia with association of interscalene nerve block, with the patient positioned in lateral decubitus and with 5kg traction. A small supraspinatus tendon tear was repaired with 2 anchors. No mechanical prophylaxis nor chemoprophylaxis was prescribed. Postoperatively the joint was immobilized in a sling for 4 weeks and during this period only active mobilization of the elbow and wrist, several times a day, were allowed.

The patient did not present any neurovascular complications until the eleventh day after the procedure, when abdominal discomfort started with irradiated dorsal pain. An abdominal CT scan and blood tests were done, but did not give any information. On the thirteenth day the pain got worse and the patient started to present mild dyspnea and fever (38,6°C).

Blood tests showed increased values of D-dimer (1930 ng/mL), PCR increased from 3.4 mg/dL to 13.2 mg/dL in 48 hours. Computed tomography pulmonary angiography (CTPA) showed filling failure in segmental arterial branches of both lower lung lobes, confirming the PE diagnosis. Arteriovenous echo color-doppler of the upper and lower limbs did not demonstrate VTE.

Oxygen therapy and low molecular weight heparin (Clexane 1 mg/kg 2x/day) were administered for four days. Anti-thromboembolic treatment (rivaroxaban 15 mg/day) was continued for two months, and no further complication was observed. Besides, any genetic mutation was found, then, a diagnosis of thrombophilia was excluded. The patient had good recovery with no pain and limitations.

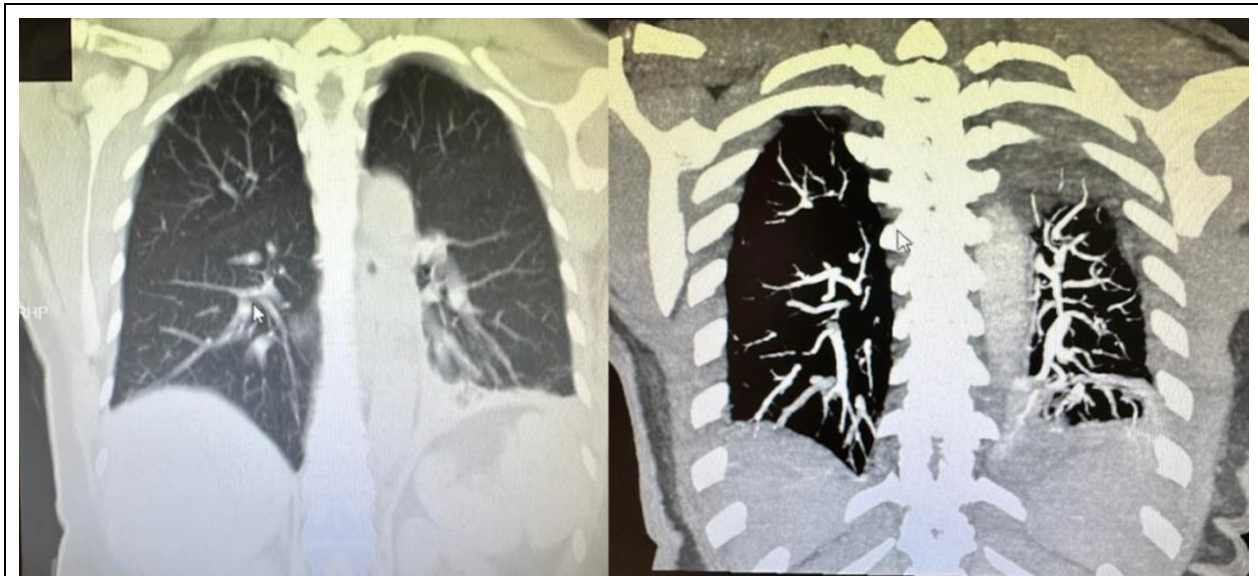


Figure 1: Computed tomography pulmonary angiography showing filling failure in segmental arterial branches to both lower lung lobes.

Case 2

A 50-year-old female (weight 46kg, height 1,58cm, IMC 18,4kg/m²), public agent, asthmatic, nonsmoker with a negative personal and family history of thrombophilia, VTE or any other associated risk factors was submitted to an arthroscopic rotator cuff repair of her right shoulder. The arthroscopic procedure took approximately 60 minutes and was performed by general anesthesia, associated with interscalene nerve block with the patient at beach chair position. A partial upper third of subscapularis tear was repaired with one anchor and partial bursal supraspinatus tear was repaired with two anchors. Compression stockings were prescribed during the procedure till the end of her hospitalization. No chemoprophylaxis was prescribed. Around 6 hours after the surgery, a cough and mild dyspnea started. Due to asthma diagnosis, three jets of salbutamol were administered without complete symptoms relief.

Blood tests showed increased values of PCR 2.1 mg/dL and D-dimer blood test was not done. CPTA showed filling failure in the segmental pulmonary arterial branch to medial and posterior lower segments of the inferior right lower lung lobe confirming the PE diagnosis. Arteriovenous echo color-doppler was negative to diagnose DVT in the upper and lower limbs.

Oxygen therapy and low molecular weight heparin (Clexane 1 mg/kg 2x/day) were prescribed for four days during hospitalization. Anti-thromboembolic treatment (rivaroxaban 20 mg/day) was continued for six months, and no further complication was observed. Also, in this case, any genetic mutation was found and a diagnosis of thrombophilia was excluded. At the last follow-up, at the seventh month after the procedure, the patient was satisfied with the treatment, with no pain and full ROM.



Figure 2: CTPA revealing filling failure in segmental pulmonary arterial branch to medial and posterior lower segments.

Discussion

We presented two cases of PE after shoulder arthroscopy for rotator cuff repair. One of our cases developed symptoms 6 hours after surgery, and the other on the eleventh day and, none of them had any medical record information which could be classified as possible risk factors.

In up to one-third of the patients, upper limb DVT may be asymptomatic. The clinical features are: swelling, pain, erythema, skin discoloration and a non-specific feeling of heaviness or discomfort in the upper limb [8,12]. In our cases none of them had these symptoms, neither had a positive echo-doppler.

Deep vein thrombosis (DVT) and pulmonary embolism (PE) events are common complications associated with lower extremity surgery and are rarely reported after upper limb surgery, especially after shoulder arthroscopy. PE is a recognized complication of shoulder surgeries, much less frequent than in lower limb surgeries [10].

Reviewing the literature, we found a very low rate of VTE (both DVT and PE) occurring after shoulder arthroscopy. Shields et al described 0,07% of occurrence of PE [13]. Cancienne, et al. found a rate of VTE within 90 days of 0,20%, an overall rate of lower extremity DVT of 0,12%, of upper extremity DVT of 0,04% and an overall rate of PE in the same time frame of 0,10% [14]. Martin et al described a rate of 0,09% for DVT and 0,06% for PE [11]. Kuremsky, et al. found a higher rate, being 0,26% for DVT and 0,20% for PE [15].

For shoulder arthroplasty the rates are higher compared to shoulder arthroscopy. Rapp et al describe VTE rates after shoulder arthroplasty ranging from 0,24% to 2,6% and after shoulder arthroscopy ranging from 0,01% to 0,38% [6]. Regarding DVT rates, for shoulder arthroplasty it ranges from 0,09% to 1,69% while for shoulder arthroscopy it ranges from 0,01% to 0,38% [6]. Also, PE rates range from 0% to 3% in shoulder arthroplasty cases versus 0% to 0,21% in shoulder arthroscopy [6]. There are some reasons for this higher incidence after shoulder arthroplasty. First, the patients are usually older and the surgeries are

longer than arthroscopic procedures. The beach chair position for a longer time can cause venous stasis of the lower limbs. The axillary vein may sustain an intimal damage when the humerus is repeatedly rotated or tractioned during shoulder replacement or even by direct pressure from retractors when exposing the glenoid.

Burkhart was the first to report a case of VTE after shoulder arthroscopy. He described a case of upper limb DVT after an arthroscopic Bankart repair which was operated in lateral decubitus position and the timing of the procedure was 65 minutes. After the clinical presentation of the upper limb DVT, during the investigation a chest x-ray was taken, and a mass in the mediastinum was identified and posteriorly diagnosed as Hodgkin's Lymphoma. Therefore, the author reported that systemic or anatomical factors predisposed to PE [5]. Currently, we know that cancer creates a state of systemic hypercoagulability, predisposing to thromboembolic events. Since this article, other studies have tried to establish risk factors to develop VTE after arthroscopic shoulder surgery [10].

There are some well-established risk factors to thromboembolic events after orthopedic surgery, such as: age, obesity, family or personal history of VTE, pregnancy, hip or knee replacement, spinal cord injury, chemotherapy, malignancy, hormone therapy [16,17]. Nonetheless, some authors described risk factors related to shoulder surgery: advanced age, alcohol use disorders, anemia, arthroplasty for fracture, arthroscopy in high altitude (>4000ft), cancer, diabetes mellitus, rheumatoid arthritis, ischemic heart disease, elevated Charlson Comorbidity Index or significant medical comorbidities, revision arthroplasty, general anesthesia without interscalene nerve block, heritable thrombophilia, metabolic syndrome, proximal humerus open reduction and internal fixation, prior VTE, prolonged inpatient stay and prolonged surgical time (>60 minutes) [6,16].

Regarding risk factors specifically related to shoulder arthroscopy, vein injury by the arthroscopic shaver, excessive fluid extravasation, traction of the arm or post-operative immobilization in a brace can be related [8]. Other risk factors for postoperative complications are age older than 60 years, surgical time greater than 90 minutes, chronic obstructive pulmonary disease (COPD), inpatient status, disseminated cancer, ASA III or higher and current smoking history [11,13]. Specific risk factors to upper limb DVT after shoulder arthroscopy are acquired or inherited hypercoagulable states, anatomic abnormalities causing venous compression, strenuous upper extremity exercise, venous catheterizations as with pacemakers, and cancer [1]. The complexity of the procedure was also correlated with a greater risk of complications [13].

Nonetheless, Schick et al evaluated 15033 cases and found an incidence of VTE of 0,15%. All cases were operated in the beach chair position and no risk factors variables were found to be predictive of symptomatic VTE, following shoulder arthroscopy [3].

Based on the information obtained in the literature, it is possible to analyze both cases regarding their potential risk factors. Both patients were female, younger than 60 years-old, with no clinical comorbidities, no prior personal or family history of VTE, no cancer diagnosis, nonsmokers, not using any type of medications, including hormone therapy. However, in one case the surgery took 60 minutes, while the other had an operation time over 90 minutes.

Regarding surgical positioning, there is no evidence of statistically significant difference between beach-chair and lateral decubitus in the occurrence of VTE [3,10]. The hypothesis is that in the beach chair position, the hip and knee joints were always flexed during surgery which could induce DVT formation in the lower limbs during surgery [10]. On the other hand, a higher rate of VTE complications is described on patients operated in lateral decubitus [8,17] and it could be correlated to traction injuries that the upper limb may suffer in this position [8,16]. However, these results have to be interpreted with caution because of the small sample size and the fact that there is no strong evidence in the literature, with no statistical significance [8]. In our two cases, one was operated in a beach-chair position and the other in lateral decubitus.

Interestingly, one of our cases developed symptoms of PE during the first 6 hours after surgery, and the other on the eleventh day, being the diagnosis confirmed only 2 days after the beginning of the symptoms. Most VTE events occur within the first postoperative week, however they may occur even three months after the surgery [6].

Although VTE complications can develop a significant impact in quality of life and even evolve to a fatal condition, its occurrence after shoulder arthroscopy is not relevant. Thus, most authors do not recommend chemoprophylaxis whether the patient does not have risk factors [6,7,9,18]. On the other hand, Jameson et al showed that despite the introduction of national VTE prophylaxis guidelines recommending the use of chemoprophylaxis in shoulder surgery the rates of VTE did not change [7]. The English NHS suggests that VTE is not a significant problem and thromboprophylaxis may not be required even in high-risk patients. However, it is recommended the use of mechanical prophylaxis, such as, compression stockings, sequential compression devices, and early ambulation for all patients [6,7,9,18]. Unfortunately, these devices are not always available in our country, especially in the public health system.

Identifying risk factors is important for preoperative patient preparation for surgery, as well as accurate prescription of thromboprophylaxis. Perioperative mechanical prophylaxis and early mobilization and ambulation must be considered in all patients submitted to shoulder arthroscopy, while chemical prophylaxis may be considered for some cases, in accordance with individual characteristics [6]. Chemoprophylaxis is routinely unnecessary in young and healthy patients, submitted to short time and elective procedures. So, its prescription should be considered to older patients (over 60 years), with medical comorbidities, prolonged immobilization or submitted to more complex surgical procedures, such as shoulder arthroplasty [8]. Prior history of VTE is the only risk factor recognized by the 2010 American Academy of Orthopaedic Surgeons (AAOS) guidelines that increases the VTE risk after surgery [19]. Moreover, In the United Kingdom, the National Institute for Clinical Excellence (NICE) recommends that high-risk patients should receive mechanical prophylaxis in admission and chemoprophylaxis six to 12 hours after the procedure, not routinely for all patients submitted to upper limb procedures. It is recommended that patients with medium and low risk of VTE should receive only mechanical prophylaxis. Pharmacological prophylaxis should only be prescribed to high-risk patients [8].

Conclusion

Pulmonary thromboembolism occurs in the immediate or late postoperative period and does not influence the outcome of the surgery. Chemoprophylaxis may be indicated in patients with risk factors, but it remains controversial in healthy patients, so the surgeon must perform an individual evaluation of patient clinical records, surgical duration and complexity and ponder risks and benefits of chemoprophylaxis before recommending it. Mechanical prophylaxis should be used when available (compression stocking, sequential compression devices, early ambulation). The relation of VTE occurrence and surgical positioning remains unclear. So far, literature does not have strong evidence papers on occurrence of VTE after shoulder arthroscopy.

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