ABSTRACT

Although thromboembolic phenomena are frequent complications in lower-limb surgery, there are only two cases of pulmonary thromboembolism following shoulder arthroscopy in the literature. We describe the case of a 76-year-old patient with pulmonary embolism in both lungs after shoulder arthroscopy. No vascular abnormalities were found and no origin for the thrombus was detected. The exact cause of the thromboembolism remains unknown.

Keywords - Arthroscopy; Shoulder; Pulmonary embolism

INTRODUCTION

Deep vein thrombosis (DVT) and pulmonary embolism are well-known complications of orthopedic surgery on the lower limbs. In knee and hip arthroplasty procedures without prophylaxis, the incidence of thromboembolic phenomena is 29% to 60%\(^{(1,2)}\). In arthroscopic surgery on the knee, DVT is found in up to 4% of the cases\(^{(3)}\), while symptomatic pulmonary embolism is present in less than 1% of the patients\(^{(4)}\). Although there are reports of fatal pulmonary embolism following shoulder arthroplasty\(^{(5)}\), this complication is infrequent after videoarthroscopy on this joint.

The aim of this study was to report the case of a patient who developed bilateral pulmonary thromboembolism following shoulder videoarthroscopy.

CASE REPORT

The patient NMF was a 76-year-old housewife. She had been complaining about a pain in her left shoulder for one year. It felt like the pain of having needles inserted, particularly when she raised her arm or made unaccustomed and unexpected movements. The patient presented type II diabetes and systemic arterial hypertension, was doing hormone replacement and was overweight (70 kg; 1.60 m).

On physical examination, she presented symmetrical mobility of the right and left shoulders (150, 45, T 9), grade four abduction strength, grade five internal and external rotation strength and was positive in relation to Speed, Jobe and Neer. On raising her arm, she made a specific movement to avoid pain.

In the radiographic examination on the shoulder, she presented type II acromion and subchondral cysts in the region of the intertubercular sulcus of the humerus. Nuclear magnetic resonance (NMR) (Figures 1 and 2) showed increased levels of subacromial fluid, a lesion on the supraspinatus with 2 cm of retraction, a widened biceps tendon with intramural lesions, and acromioclavicular arthrosis.

In preoperative examinations, the patient did not present any blood abnormalities; her renal function was preserved and she did not present hypercholesterolemia.

Her diabetes, cholesterol and blood pressure were under control with medication. She was doing hormone replacement. She said that was a nonsmoker and did not have any allergic phenomena. She was not using anticoagulants.

The patient underwent videoarthroscopy on her shoulder in order to suture the rotator cuff and perform tenotomy on the long head of the biceps. She underwent
The arthroscopic inspection showed that one tendon of the biceps had degenerated and had become widened. There was synovial fluid in the subacromial space, and the rotator cuff presented a U-shaped lesion on the supraspinatus, with 2 cm of retraction (Figure 3). Tenotomy was performed on the biceps, acromioplasty was performed and the lateral extremity of the clavicle was resected, because of lesions on the lower capsuloligamentous structure of the acromioclavicular joint and because the latter presented advanced arthrosis. The U-shaped lesion on the supraspinatus was sutured by means of tendon-to-tendon stitching and two anchors, using a double-row technique: an anchor with two threads was placed at the anatomical neck and two mattress stitches were made. A second anchor with one thread was placed on the greater tubercle and a U-shaped stitch was made, going through the anterior and posterior borders of the lesion and thus closing it completely (Figure 4). An infusion pump was used at 40 mmHg and, occasionally, at 60 mmHg, in order to verify and implement hemostasis using radiofrequencies.

In the recovery room, one hour after the procedure, the patient appeared anxious and impatient, complaining of nonspecific discomfort in the upper esophageal region. She also complained about pain in her left shoulder, even though she was still under the analgesic effect of the interscalene blockade. Because the patient was making considerable complaints about pain,
she was treated with morphine sulfate, but she did not present any improvement in the symptoms. The arterial oxygen saturation (SpO₂) with a nasal catheter remained in the range of 94-96%. Over the subsequent hours, the patient complained and wailed even more, and the saturation went down to 93-94%. The oxygen supply was increased to 5 liters/minute and, three hours after the procedure, SpO₂ was 92%. The patient was reassessed and she said she was hoarse, with retrosternal discomfort. Lung auscultation presented crepitation sounds bilaterally, and diuretic was administered to treat likely acute lung edema. Chest radiographs were requested, and these showed consolidation at the base of the right lung. Arterial gasometry presented SpO₂ of 90% and D-dimer in the range of 500-1,000 ng/ml (reference value < 250 ng/ml). The patient continued to receive oxygen at the rate of 3 liters/minute for another two days, and the blood oxygen saturation remained at around 94-95%. Blood pressure and blood glucose levels were under control. Computed tomography on the chest presented some opaque areas in the centers of lobes and atelectasis striae in the lower left lobe, of inflammatory/post-inflammatory etiology. Doppler echocardiography showed a condition of slight mitral and tricuspid insufficiency, and made it possible to estimate the lung pressure as 41 mmHg. Pulmonary perfusional scintigraphy (Figure 5) showed evidence of several subsegmental abnormal hypoperfused areas in both lungs, which were highly suggestive of pulmonary embolism. Echo Doppler on the venous system of the lower limbs did not present any signs of thrombosis or reflux in the deep venous system of the lower limbs.

**DISCUSSION**

Thromboembolic phenomena are frequent complications in patients who undergo orthopedic surgery on the lower limbs. Thromboembolic venous pathological conditions following knee and hip arthroplasty occur in 29% to 60% of the patients who do not use prophylaxis. Studies on patients undergoing knee arthroplasty have shown that the incidence may vary from 4% to 17%. The incidence of this pathological condition following upper-limb surgery has not been well defined. In a retrospective prognostic study, Lyman et al. found that the incidence of DVT following shoulder arthroplasty was 0.5%. There are few reported cases following shoulder videoarthroscopy in the literature.

There is a clear association between DVT and pulmonary embolism. The incidence of pulmonary thromboembolism increases with increasing incidence of DVT. Wirchow’s trio of hypercoagulability, stasis and
lesions of the tunica intima is the cause of thrombus formation. These factors are present both in lower-limb and in upper-limb surgery\(^5\).

The following factors have been correlated with thromboembolic phenomena: age, obesity, trauma, deficiency of antithrombin III, deficiency of proteins C and S, cancer, use of oral contraceptives, myocardial infarction, prolonged immobilization and previous histories of pulmonary embolism or DVT\(^5,6\).

Unlike the situation regarding the knee and hip joints, few systematized studies have investigated the incidence of DVT and pulmonary embolism in the shoulder. Only a few cases of thromboembolic complications following shoulder videoarthroscopy have been reported\(^8,9\). Reports on DVT following upper-limb arthroscopy have correlated DVT with coagulopathy and anatomical abnormalities\(^8,9\). In the case described above, the patient presented several risk factors for thromboembolism: advanced age, type II diabetes, use of hormones and obesity. In this case, we did not find any coagulopathy or mechanical cause for the embolism. Thus, the true cause of the pulmonary embolism of the case reported here was not found. We can only take into consideration the presence of risk factors.

Polzhofer \textit{et al}\(^10\) believed that lesions of the subclavian vein caused by compression from the shaver tip could lead to thromboembolic phenomena, and stated that this was the likely cause of the pathological condition. They considered that inappropriate arm positioning, compression caused by edema during the operation and elevated traction could also contribute towards subclavian lesions that would lead to thromboembolism. In our case, although we did not use arm traction in the deckchair position, we agree that the edema caused by serum infusion through the infusion pump and manipulation of the shaver in the anterior port during resection of the acromioclavicular joint could have contributed towards subclavian lesions. We also believe that the positioning at 70 degrees of trunk flexion (deckchair position) may have led to stasis and, consequently, thromboembolism. We also raise the hypothesis that mechanical lesions of the acromion and clavicle during resection using a burr may have led to fat embolism.

The use of drug prophylaxis is controversial. Wirth \textit{et al}\(^3\) found in a controlled study using low molecular weight heparin, with 239 patients evaluated, that six presented DVT: five in the control group and one in the treated group. Since there is no data in the current literature regarding the exact incidence of thromboembolic complications, there is no consensus on whether drug prophylaxis should be recommended. Nevertheless, we agree with Polzhofer \textit{et al}\(^10\) that prophylaxis with low molecular weight heparin can be used for patients who are at a high risk of thromboembolic complications.

**CONCLUSION**

Surgical videoarthroscopy on the shoulder is a safe procedure. However, despite the rarity of serious complications such as pulmonary embolism, they may occur and this should always be remembered.

**REFERENCES**

1. Aaron RK, Ciombor D. Venous thromboembolism in the orthopedic patient. Surg Clin North Am. 1983;63(3):529-37.
2. Warwick D, Martin AG, Glew D, Bannister GC. Measurement of femoral vein blood flow during total hip replacement. Duplex ultrasound imaging with and without the use of a foot pump. J Bone Joint Surg Br. 1994;76(6):918-21.
3. Wirth T, Schneider B, Misselwitz F, Lomb M, Tüylü H, Egbring R, Griss P. Prevention of venous thromboembolism after knee arthroscopy with low-molecular weight heparin (reviparin): Results of a randomized controlled trial. Arthroscopy. 2001;17(4):393-9.
4. Schippinger G, Wirsberger GH, Obernosterer A, Babinski K. Thromboembolic complications after arthroscopic knee surgery. Incidence and risk factors in 101 patients. Acta Orthop Scand. 1996;69(2):144-6.
5. Saleem A, Markel DC. Fatal pulmonary embolus after shoulder arthroplasty. J Arthroplasty. 2001;16(3):400-3.
6. Lyman S, Sherman S, Carter TI, Bach PB, Mandl LA, Marx RG. Prevalence and risk factors for symptomatic thromboembolic events after shoulder arthroplasty. Clin Orthop Relat Res. 2006;448:152-6.
7. Demers C, Marcoux S, Ginsberg JS, Laroche F, Cloutier R, Poulin J. Incidence of venographically proved deep vein thrombosis after knee arthroscopy. Arch Intern Med. 1998;158(1):47-50.
8. Burkhart SS. Deep venous thrombosis after shoulder arthroscopy. Arthroscopy. 1990;6(1):61-3.
9. McFarland EG, O’Neill OR, Hsu CY. Complications of shoulder arthroscopy. J South Orthop Assoc. 1997;6(3):190-6.
10. Polzhofer GK, Petersen W, Hasselpluf J. Thromboembolic complication after arthroscopic shoulder surgery. Arthroscopy. 2003;19(9):E129-32.