Paget-Schroetter Syndrome in a Baseball Pitcher

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Summary
Paget-Schroetter syndrome (PSS) is thrombosis of the deep veins draining the upper extremity due to anatomic abnormalities of the thoracic outlet causing subclavian compression and subsequent thrombosis.1,2 The subclavian vein could be compressed by the first rib, clavicle anterior scalene muscle, and costoclavicular ligament due to the structural abnormality, which leads to vascular endothelial damage and thrombus formation.3,4 Vigorous arm activity in sports is a known risk factor. Here, we report a case of Paget-Schroetter syndrome in a non-professional baseball pitcher. (Int Heart J 2017; 58: 637-640)

Key words: Upper extremity deep venous thrombosis, Thoracic outlet, Sports

Paget-Schroetter syndrome (PSS) is defined as thrombosis of the deep veins draining the upper extremity due to anatomic abnormalities of the thoracic outlet causing subclavian compression and subsequent thrombosis.1,2 The subclavian vein could be compressed by the first rib, clavicle anterior scalene muscle, and costoclavicular ligament due to the structural abnormality, which leads to vascular endothelial damage and thrombus formation.3,4 Vigorous arm activity in sports is a known risk factor. Here, we report a case of Paget-Schroetter syndrome in a non-professional baseball pitcher.

Case Report
A 31-year-old left-handed man without a remarkable medical history presented to our hospital with acute pain in the left subclavian-axillary region. He has been a smoker for 10 years and had no other cardiovascular risk factors. He began playing baseball on weekends 5 years ago and 6 months ago started rigorous arm and shoulder training using training machines at a gym twice a week. Swelling with varicosis was observed on his left upper arm (Figure 1A, C). A 12-lead electrocardiogram showed no significant findings, and echocardio-gram revealed resolution from thrombus in the subclavian-axillary vein and pulmonary artery (Figure 1F, H). On venography after resolution from thrombus, we found no stenosis of the subclavian-axillary vein, and subclavian-axillary vein flow was not interrupted when his left arm was at 0° abduction, or in functional position (Figure 2F); however, flow interruption was noted when the left arm was at 90° abduction (Figure 2G). No interruption was detected in the non-affected right arm on 90° abduction (Figure 2E). Vascular echography showed that subclavian-axillary vein compression began at 45° abduction (Figure 2A-D). He quit strenuous training for baseball and anti-coagulation therapy was stopped after 3 months. Thereafter, thrombosis did not recur.

Discussion
Several cases of PSS in young athletes, including baseball pitchers, in some occupations and due to certain movements have been reported (Supplemental Table). PSS typically manifests as sudden, severe upper extremity pain and swelling following repeated upper extremity activity in young, otherwise healthy individuals.3,4 Repetitive or prolonged hyperabduction or external rotation of the shoulder joint, particularly in the overhead position, can cause PSS.3,4 Therefore, overhead lifting or throwing-like movements are risk factors for PSS.5-7

The Supplemental Table summarizes sports/occupations/movements known to be risk factors for PSS based on a literature search on PubMed. We found that PSS occurred often in young athletes, particularly in weight-lifters or baseball players. We also found that non-vigorous arm activities such as playing computer games can also cause PSS.
Millions of people throughout the world participate in sports that involve throwing-like movements, however, the prevalence of PSS is relatively low. Therefore, the pathogenesis of PSS involves not only repetitive damage to the endothelium of the vein but also anatomic variants associated with the thoracic outlet syndrome. These anatomic variations could decrease the normal mobility of the subclavian vein, increasing its susceptibility to injury from arm activity. Combined with anatomic variations, repetitive damage leads to vascular intimal hyperplasia, inflammation, fibrosis, and activation of the coagulation cascade, leading to thrombus formation.3 In our patient, repetitive compression due to rigorous weight training for baseball pitching caused endothelial damage following thrombus formation in the subclavian vein.

We confirmed the subclavian-axillary flow interruption by changing the arm position and venography and echocardiography. We observed no stenosis or flow interruption of the subclavian-axillary vein at 0° abduction. Therefore, dynamic venography and echocardiography could be useful for the diagnosis of PSS. In particular, dynamic vascular echography is useful for identifying the arm position at which the flow is interrupted, because it is noninvasive and inexpensive. Informing the patients about their correct arm position might be helpful for them to avoid keeping their arm in a position that presents a risk of thrombosis.

PSS treatment includes anticoagulant therapy, thrombolysis including catheter-based therapy, and thoracic outlet decompression with or without venoplasty.36 We chose systemic administration of anticoagulant drugs rather than local administration of thrombolytic and anticoagulant drugs because the thrombus was small, echocardiography showed no right ventricular overload, and the symptoms were not severe. In addition, we chose warfarin, but not a direct oral anticoagulant, as an anticoagulant drug, because a direct oral anticoagulant was...

not available at that time for the treatment of venous thromboembolism in Japan. If a patient is not able to avoid the risk factors of thrombotic recurrence, such as quitting rigorous arm and shoulder training, surgical treatment for thoracic outlet compression should be considered because anatomical and structural abnormalities remain. However, the patient chose to quit the rigorous training for baseball rather than have surgical treatment. Therefore, we advised the patient to avoid repetitive or prolonged hyperabduction or external rotation of the shoulder joint in the overhead position in daily life.

Although the risk of pulmonary embolism in PSS is thought to be relatively low compared to that in deep vein thrombosis of lower extremities, pulmonary embolism can occur. Physicians should be aware that repetitive maneuvers with the arm positioned overhead can cause deep vein thrombosis in upper extremities, especially in those involved in sport.30

REFERENCES


Supplemental Files

Supplemental Table
Please see supplemental files; https://www.jstage.jst.co.jp/article/ihj/58/4/58_16-447/_article/supplement