**Case Report**

**Axillary Vein Thrombosis: Presentation of Four Cases and Review of the Literature**

Ilias BISBINAS¹, Zacharoula KARABOUTA², Dimitrios GEORGIANNOS³, Christos BISSIAS⁴*

Affiliation of the authors:

1. LtCol (Army), MD, FRCS, FEBOT, MSc, PhD
   Consultant in Orthopaedic and Trauma Surgery,
   424 General Military Hospital, Thessaloniki, Greece

2. MD, MRCP, MRCPCH, DCH, MSc
   Consultant in Paediatrics, AHEPA University Hospital, Thessaloniki, Greece

3. Major (Army), MD, Senior Clinical Fellow in Orthopaedic and Trauma Surgery,
   Royal Bournemouth Hospital, Bournemouth, UK

4. Cmdr (Navy), MD, MSc, Consultant in Orthopaedic and Trauma Surgery
   Naval Hospital of Athens, Athens, Greece

Corresponding author:
Ilias Bisbinas
19 Monastiriou Street, Thessaloniki, 546 27, Greece
Tel.: 00 30 2310 381000, ext 1925
E-mail: ibisbinas@hotmail.com
Abstract
Four patients with axillary vein thrombosis (AVT) are presented. Thrombosis in the deep veins of the upper limb is quite an infrequent medical problem presented to doctors in different specialities and with varying patient profiles. Medical and surgical trainees come across those cases in emergency departments and unfortunately there is often a delay in diagnosis. Bearing in mind its significant morbidity and potential mortality, early diagnosis of AVT is extremely important. Innocent swelling with venous engorgement in the upper limb and predisposing factors from the patient’s history should alert the clinician for further investigations to confirm or exclude it before it is too late.

Key-Words: Axillary vein thrombosis, Delayed diagnosis, Management

Introduction
Deep vein thrombosis (DVT) is a very well known medical entity. In the majority of the cases DVT is connected with the deep veins of the lower limbs. Upper extremity thrombosis appears to comprise about 1-2% of all deep venous thrombosis [1] and it is rarely seen further distally to the axillary vein level [2].

Axillary vein thrombosis is difficult to diagnose. Early and persistent swelling in the upper limb, especially when accompanied with superficial venous plethora should always alert the physician.

We report four cases of axillary vein thrombosis of different etiology: fracture in the thoracic outlet (extrinsic trauma), catheter-related in an oncology patient (tumour history, intrinsic trauma), contraceptive pill ingestion (thrombophilic tendency) and finally effort (Paget-Schroetter syndrome).

Case 1 (Trauma case)
A 66-year-old right-handed female patient presented in the emergency department after a fall down 12 stairs. She landed on her right shoulder and right thoracic wall. Clinically, there were painful bruises of the right shoulder, right upper limb, skull and obvious deformity of the right clavicle.

On examination there was reduced sensation in the ulnar nerve distribution over the right hand without motor function compromise.

Plain X-rays revealed a skull fracture, right clavicular middle-shaft fracture and 1st, 3rd and 5th rib fractures (Figure No 1).

Figure No 1. Plain x-rays of clavicle and right upper ribs demonstrating a middle-shaft fracture of clavicle and fracture of the 1st rib. Case 1

She was treated conservatively with a broad arm sling and analgesia. The ulnar nerve paraesthesia resolved spontaneously but she developed swelling 10 days later as other bruises were settling down. Although it was attributed to the related fractures, four weeks later the swelling had not settled and her superficial ipsilateral upper limb veins were more prominent
comparing to the other side. That was aggravated by hand dependency and activities such as knitting, with obvious venous distension of the hand and forearm. A venogram showed complete blockage of the axillary vein with well-developed venous collateral circulation (Figures No 2 and 3). The patient was treated with anticoagulation.

**Case 2 (Tumour case)**

A 45-year-old patient with a known history of multiple myeloma was referred to the surgical team with a few weeks history of swelling in his right arm. He had a known multiple myeloma lesion in his sacrum and many lytic lesions in the spine. He was about to finish a chemotherapy regime using a Hickman line and he developed a whole arm swelling with vein distension and “dusky” colour skin associated with hypaesthesia in the hand. The clinical picture was even more complicated because he had a concomitant phrenic nerve paralysis and a chest infection, causing remarkable breathing problems.

There were suspicions about axillary vein thrombosis but an ultrasound showed patency and good flow without any sign of thrombosis. Following this, because of all his other problems, the attention on the swelling was reduced. He concentrated on that again before the end of his chemotherapy regime when the swelling got worse and venous engorgement was added.

A venogram showed blockage of the axillary vein. The patient was treated on streptokinase thrombolysis and Low Molecular Weight Heparin with dramatic improvement of his right arm symptoms.

In this patient the axillary vein thrombosis was finally attributed to his oncology history as well as to the chemical inflammation that was caused to the intima of the vein wall.

**Case 3 (Coagulation-related case)**

A 19-year-old female patient without any medical or trauma history, on contraceptive pill for the past two years, presented in the emergency department with a twenty-day history of swelling and heaviness in her left upper limb. Initially it
was attributed to allergy and her General Practitioner treated her on anti-allergic medications. She reported swelling, pins-and-needles sensation, “dusky” colour, heaviness and discomfort all over her left arm, which used to get worse during daytime without improvement on anti-allergic medications.

The patient was admitted and a venogram showed complete block of the axillary vein (Figure No 4). She started the appropriate anticoagulation protocol and she was put on Low Molecular Weight Heparin having improvement from the first 10 days of treatment. In this case, axillary vein thrombosis was considered a complication of the oral contraceptive pill.

Case 4 (Orthopaedic case)

A 21 year-old welder was referred to the Orthopaedic team because of persistent “muscle contusion” and swelling of his left arm, not responding to anti-inflammatory medication. The patient, who was active and athletic working out in the gym on a daily basis, had a swelling of his left non-dominant arm with some distension of the superficial veins for the past two weeks (Figure No 5). There was no significant past medical history and the patient was taking no medications. He had discomfort at the gym during the past month associated with difficulties in exercises involving the shoulder.

Initially that was attributed to muscle contusion after the exercises but instead of getting better with NSAIDs prescribed by his General Practitioner, it got worse.

The patient was admitted and had a venogram that showed complete blockage of the axillary vein. He was treated using Low Molecular Weight Heparin. This case was diagnosed as “effort axillary vein thrombosis” (Paget-Schroetter syndrome).

Discussion

DVT is not an uncommon medical problem that physicians and surgeons come across in their practice. It was in 1846 in Berlin when Virchow, one of the “fathers” of modern Medicine was the first to associate the aetiology of DVT with endothelial injuries, local or systemic stasis in the blood circulation or blood hypercoagulability [3].

Although a lot has been written and attention has been focused on lower limb DVT, paucity of data regarding the upper limb DVT, axillosubclavian thrombosis, has been published [4].
Axillary vein thrombosis can be primary or secondary. Primary AVT is called Paget-Schroetter syndrome and is attributed to increased effort in the dominant upper limb [5-7]. Secondary AVT can be related to a variety of underlying medical problems as malignancies and systemic diseases, anatomical conditions in the locality, long lines/catheters, failed dialysis access graft or even trauma [2, 8, 9].

Post-traumatic axillary vein thrombosis is rarely seen because the vein is well protected in the armpit up to the thoracic outlet below the clavicle. However, fractures in the bony frame of the thoracic outlet, clavicle and 1st rib, put in great danger the brachial plexus as well as the subclavian-axillary vessels [10, 11]. When there is a post-traumatic neural lesion following a fracture, an associated vascular lesion should be suspected. Axillary vein thrombosis can follow directly, complicating vein injury from the bone fragments, or because of increased pressure in the vein from displaced bone fragments and fracture haematoma [12].

With the development of the chemotherapy and the applications of long line-catheters the possibility for intrinsic parietal lesion in large veins and chemical inflammation has increased [8, 13]. As a result of that, oncology patients tend to have axillary vein thrombosis either because of mechanical aetiology or thrombotic tendency [14].

Apart from those reasons, when there is any kind of thrombophilia and hypercoagulability, thrombosis can occur theoretically in any deep vein. DVT is one of the very well recognised complications of the oral contraceptive pill and it can potentially happen even in the axillary-subclavian vein [15]. There is a pharmacologic influence of the hormones in the pill on the pathogenesis of DVT in women on oral contraceptives [16]. Following effort, AVT occurs after a period of unusual or exaggerating exercises most of the times in young, healthy athletes [5, 6, 17]. Other times it is strongly connected to a “muscle sprain” during sport activities [18].

The most common clinical picture following axillary vein thrombosis is drawn with swelling in the arm, which is enlarged and plethoric with a prominent pattern of dilated superficial veins over the upper arm and anterior shoulder and chest. Those are persistent and aggravated with activity (venous claudication) and dependency mainly during daytime [19]. The diagnosis can be made by an accurate history, thorough clinical examination and can be confirmed by Doppler ultrasound-duplex scan or venography [1, 2, 20]. Doppler ultrasound scan is increasingly valuable but sometimes inaccurate when applied from peripheral going to more central veins [21-23]. In those veins, thrombosis can be missed with unfortunate delay for the diagnosis.

Early anticoagulation or catheter-directed thrombolysis using streptokinase/urokinase is most of times the treatment of choice [2, 14, 24-27]. However, depending on the cases, more radical methods have been described. Such measures include percutaneous transluminal angioplasty or thoracic outlet decompression with claviculectomy when there is phlebographically demonstrated intrinsic stenosis or extrinsic thoracic outlet compression, respectively [27-29].

If the patient does not receive the appropriate treatment in time, a potentially fatal pulmonary embolism (PE) could be one of the probable complications. Some authors believe that upper limb DVT is a “benign” non-lethal disease [30] with low incidence of PE [2, 4, 31]. However, others have reported significant incidence of PE and rate of morbidity [25, 30, 32] (late post-thrombotic sequelae) and mortality [9, 25, 32, 33]. The morbidity and mortality incidence increases dramatically when
upper limb DVT is diagnosed in patients with significant risk factors or while they are admitted in a hospital for other reasons or when the thrombosis is a result of extrinsic obstruction [9, 14] (Table No 1).

Table 1. The incidence of Pulmonary Embolism (PE) as well as the mortality rate in clinical series of patients reported in the literature

<table>
<thead>
<tr>
<th>Authors</th>
<th>N</th>
<th>PE</th>
<th>Mortality rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marie et al 1998</td>
<td>49</td>
<td>6 (12%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Hingorani et al 1997</td>
<td>170</td>
<td>PE: 12 (7%) * all of them were from the in-patient group</td>
<td>1-month rate 27 (16%) 3-month rate 58 (34%) * all of them were from the in-patient group</td>
</tr>
<tr>
<td>Montreal et al 1994</td>
<td>86</td>
<td>PE: 13 (15%)</td>
<td>2 (2%)</td>
</tr>
<tr>
<td>Kerr et al 1990</td>
<td>123</td>
<td>PE: 10 (8%)</td>
<td>2 (2%)</td>
</tr>
<tr>
<td>Becker et al 1991</td>
<td>329</td>
<td>PE: 31 (9.4%)</td>
<td>4 (1.2%)</td>
</tr>
<tr>
<td>Lindblad et al 1988</td>
<td>120</td>
<td>In primary cases 0 In secondary cases 5 (10.64% in their group)</td>
<td>In primary cases 0 In secondary cases 4 (8.51% in their group)</td>
</tr>
<tr>
<td>Gloviczki et al 1986</td>
<td>95</td>
<td>PE: 4 (4.21%)</td>
<td>0</td>
</tr>
<tr>
<td>Ameli et al 1987</td>
<td>20</td>
<td>PE: 1 (5%)</td>
<td>0</td>
</tr>
<tr>
<td>Donayre et al 1986</td>
<td>41</td>
<td>PE: 5 (12.19%)</td>
<td>0</td>
</tr>
<tr>
<td>Harley et al 1984</td>
<td>14</td>
<td>PE: 5 (35.7%)</td>
<td>0</td>
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The presented cases emphasise the value of thorough history taking and clinical examination more broadly rather than concentrating mostly in our specialty field. We have highlighted that the innocent appearance of upper limb swelling should raise the index of suspicion of a potential underlying vascular lesion, the diagnosis can be made early and appropriate therapy commenced. Although quite rare, upper limb deep venous thrombosis may be life threatening.

References

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