

Tourniquet Induced Purpura During Hand Surgery - A Case Report

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Citation

S . *Tourniquet Induced Purpura During Hand Surgery - A Case Report*. The Internet Journal of Hand Surgery. 2016 Volume 7 Number 1.

DOI: [10.5580/IJHS.45096](https://doi.org/10.5580/IJHS.45096)

Abstract

We report a rare case of acute dermal capillary rupture secondary to pneumatic tourniquet application during hand surgery which presented as severe purpuric rashes (Rumpel-Leede phenomenon) distal to the tourniquet site. The likely cause was capillary fragility subsequent to diabetic microangiopathy and hypertension.

INTRODUCTION

Pneumatic tourniquets are widely used in hand surgery where they are invaluable in creating a bloodless surgical field. The tourniquet, when used in accordance with accepted principles, is a safe device; however, inappropriate use of it can lead to complications.

We report an unusual presentation of Rumpel-Leede phenomenon following tourniquet application during hand surgery with spontaneous resolution.

CASE REPORT

A 44-year-old male was scheduled for an emergency left ring finger flexor tendon surgery following a knife injury. He was on medical management of diabetes mellitus (Oral hypoglycemic agents) for one year with no other co-morbidities. The patient was not a known hypertensive and did not have any history of easy bruising and bleeding disorders. Pre-operative blood investigations showed a Platelet count of $268 \times 10^9/l$, Hemoglobin 13.3 g/dl, a white cell count of $9.07 \times 10^9/l$, Bleeding time 2 min, Clotting time 6 min 30 sec and random blood sugar 84 mg/dl. Pre-operatively, BP was found to be 140/92 mm of Hg, Pulse rate 66/min and surgery was scheduled under Bier's block (Intra venous regional anesthesia).

Upon arrival in the operating room, appropriately sized adult (24 cm) cuffs of Zimmer pneumatic tourniquet were applied for Bier's block on his left arm above the elbow. His BP was continuously monitored at 10-minute intervals in other arm. His pre-induction BP was 163/89 mm Hg. The patient was

given Bier's block with 15 ml of 2 % Xylocard (Diluted with 25 cc NS) after adequate exsanguination of the involved limb. The pressure of the pneumatic tourniquet was kept at 250 mm of Hg. During the surgery, the patient showed BP fluctuations, ranging from 135/85-163/89 mmHg. The operative and regional anesthesia time was 71 and 90 minutes respectively.

After the drapes were removed, severe non-blanchable and non-palpable cutaneous purpuric rashes were noted on the operated limb distal to the tourniquet extending to the hand (Fig.1)

Figure 1

Rumpel-Leede phenomenon



The limb temperature was comparable and, the brachial and

distal pulsations were well perceptible with SpO₂ of 94%. The post-operative blood investigations revealed a platelet count of 267 x 10⁹/l, coagulation parameters were in the reference range (BT 2 min, CT 7 min, prothrombin time 14 sec, activated partial prothrombin time 31.9 sec) and the colour Doppler revealed normal blood flow in the involved limb. After recovering from the regional block, the patient did not have any pain in the affected extremity with no sensory-motor deficit. The patient refused consent for a skin biopsy.

The patient was reassured and discharged on Vitamin K cream and anti-hypertensives, as prescribed by the physician. The purpuric rashes of the involved limb resolved spontaneously within 10 days. (Fig 2)

Figure 2

After 9 days



DISCUSSION

The Rumpel-Leede (RL) phenomenon or sign is the appearance of petechiae or purpuric rashes in an area distal to a tourniquet or blood pressure cuff on release of pressure.

This sign was reported independently by Theodor Rumpel in 1909 and again by Carl Stockbridge Leede in 1911, while treating patients with scarlet fever. Both noted petechiae on the arms of patients distal to the part of the arm where a tourniquet had been applied.¹ Historically, the Rumpel-Leede Capillary-Fragility Test, also known as Hess or tourniquet test was used to assess patients for thrombocytopenia and capillary fragility. In dengue haemorrhagic fever (DHF), tourniquet test with thrombocytopaenia (100,000 cells/mm² or less) has high predictive value. The Tourniquet test is performed by inflating the blood pressure cuff on the upper arm to a point midway between systolic and diastolic pressures for 5 minutes. The test is considered positive if there are more than 20 petechial rashes per 2.5 cm square are observed.² This technique was also used in the past to assess capillary fragility secondary to diabetic microangiopathy.³ This phenomenon can also be seen in infectious diseases such as Rocky Mountain spotted fever, meningococcemia, disseminated intravascular coagulopathy, idiopathic thrombocytopenic purpura, intravenous drug abusers, thrombotic thrombocytopenic purpura, fat embolism, diabetes mellitus, Ebola virus disease, thrombocytopenia due to Epstein-Barr virus-induced mononucleosis and in elderly patients.^{4,5}

Depending on their size, purpuric lesions are traditionally classified as petechiae (pinpoint hemorrhages less than 2 mm in greatest diameter), purpura (2 mm to 1 cm) or ecchymoses (more than 1 cm).⁶ The basic pathology is increased capillary fragility leading to extravasation of erythrocytes resulting in purpuric lesions in the skin. The likely cause in the reported patient seem to be increased dermal capillary fragility subsequent to diabetic microangiopathy compounded by increased venous pressure in a hypertensive state after tourniquet application during Bier's block.

The characteristic early histologic change seen in the Rumpel-Leede phenomenon is focal hemorrhage in the upper dermis, and a perivascular lymphocyte infiltrate with focal areas of lymphocytic epidermal invasion.⁷

Even after extensive search of the literature, we could not find a similar case exhibiting Rumpel-Leede phenomenon following tourniquet application during hand surgery. White reported Rumpel-Leede (RL) phenomenon following a noninvasive ambulatory blood pressure monitor.⁸ Chester et al⁹ and Jeon YS et al⁴ reported Rumpel-Leede (RL) phenomenon following NIBP cuff use in diabetic patients. Dubach et al reported a case of Rumpel-Leede sign in

thrombocytopenia due to Epstein–Barr virus-induced moucleosis.⁵ Rehman H and Ahlijah W reported Rumpel-Leede phenomenon involving right upper limb below the BP Cuff following electro convulsive therapy (ECT) in a diabetic and hypertensive lady.¹⁰ Wang K and Lee J reported a 47-year-old woman with a history of abdominal surgery who also presented with Rumpel-Leede phenomenon following continuous blood-pressure monitoring.¹ Balamurugesan et al described a hypertensive lady on Amlodipine who developed Rumpel-Leede phenomenon following the use of a tourniquet to obtain a blood sample.¹¹

The management of the patients exhibiting Rumpel-Leede phenomenon is treating the underlying cause, reassurance to the patient along with expectant conservative management with topical Vitamin K cream or heparinoid containing preparations in not so extensive areas. The pathology usually settles down in 1-3 weeks time. In persisting purpuric patches, PDL laser may find some application. Despite its benign and self resolving nature, surgeons and anesthesiologists must be aware of this condition to avoid unexpected discomfiture to self and the patient.

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