Tourniquet-Induced Purpura during Hand Surgery

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Abstract

We report a rare case of acute dermal capillary rupture secondary to 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.

Keywords: Capillary fragility, Rumpel–Leede phenomenon, tourniquet-induced purpura

INTRODUCTION

The 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 safety device; however, inappropriate use can lead to complications.

We report an unusual presentation of Rumpel–Leede (RL) phenomenon following tourniquet application during hand surgery, which spontaneously resolved.

CASE REPORT

A 44-year-old male was scheduled for emergency left ring finger tendon surgery following knife injury. He had a 1-year history of medical management of noninsulin-dependent diabetes mellitus with no other comorbidities. The patient was not a known hypertensive and did not have any history of easy bruising and bleeding disorders. Blood tests showed a platelet count of 268 × 10^9/l, hemoglobin 13.3 g/dl, a white cell count of 9.07 × 10^9/l, bleeding time (BT) 2 min, clotting time (CT) 6 min 30 s, and random blood sugar 84 mg/dl. Preoperatively, the patient was clinically assessed by the anesthetist. The blood pressure (BP) was found to be 140/92 mm Hg, pulse rate 66/min, and surgery was scheduled under Bier’s block (intravenous regional anesthesia).

On arrival in the operating room, appropriately sized BP cuffs were placed for Bier’s block on his left arm above the elbow. His BP was continuously monitored at 10-min intervals. His preinduction 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. During the surgery, the patient showed BP fluctuations, ranging from 135/85 to 163/89 mmHg. The operative and regional anesthesia time was 71 min and 90 min, respectively.

After the drapes were removed severe nonblanch able nonpalpable cutaneous purpuric rashes were noted on the operated limb distal to the tourniquet extending to the hand [Figures 1 and 2]. The limb temperature was comparable, the bronchial and distal pulsations were normal, and SpO2 value of 94 was noted. The postoperative blood chemistry revealed a platelet count of 267 × 10^9/l, and coagulation parameters were found to be in reference range (BT 2 min, CT 7 min, prothrombin time 14 s, and activated partial prothrombin time 31.9 s). The color Doppler revealed normal blood flow in the involved limb. After recovering from the regional block, the patient did not complain about any pain in the affected extremity. No sensory-motor deficit was noted. The patient refused consent for a skin biopsy.

The patient was reassured and discharged on Vitamin K cream and antihypertensives as prescribed by the physician. The purpuric rashes of the involved limb resolved spontaneously within 13 days [Figures 3 and 4].

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DISCUSSION

The RL phenomenon or sign is the appearance of petechiae or purpuric rashes in an area distal to a tourniquet or BP cuff on the 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 RL capillary-fragility test, also known as Hess or tourniquet test, was used to assess patients for thrombocytopenia and capillary fragility. In dengue hemorrhagic fever, tourniquet test with thrombocytopenia (100,000 cells \(\text{mm}^2\) or less) has high predictive value. The tourniquet test is performed by inflating the BP cuff on the upper arm to a point midway between systolic and diastolic pressures for 5 min. The test is considered positive if there are more than 20 petechial rashes per 2.5 \(\text{cm}^2\) 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 <2 mm in greatest diameter), purpura (2 mm–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 seems to be increased dermal capillary fragility subsequent to diabetic microangiopathy compounded by increased venous pressure in a hypertensive state during Bier’s block.

The characteristic early histologic change seen in the RL phenomenon is focal hemorrhage in the upper dermis, and a perivascular lymphocyte infiltrates with focal areas of lymphocytic epidermal invasion.\(^7\)

Even after an extensive search of the literature, we could not find a similar case exhibiting RL phenomenon following...
tourniquet application during hand surgery. White reported RL phenomenon following noninvasive ambulatory BP monitor.[8] Chester et al.[9] and Jeon et al.[4] reported RL phenomenon following NIBP cuff use in patients with diabetes. Dubach et al. reported a case of RL sign in thrombocytopenia due to Epstein–Barr virus-induced mononucleosis.[3] Rehman and Ahlijah reported RL phenomenon involving the right upper limb below the BP cuff following electroconvulsive therapy in a diabetic and hypertensive lady.[10] Wang and Lee reported a 47-year-old woman with a history of abdominal surgery who also presented with RL phenomenon following continuous BP monitoring.[1] Balamurugesan and Viswanathan described a hypertensive female on amlodipine who developed RL phenomenon following the use of a tourniquet to obtain a blood sample.[11]

The management of the patients exhibiting RL 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, Pulsed dye Laser may find some application. In spite of benign and self-resolving nature, surgeons and anesthesiologists must be aware of this condition to avoid unexpected discomfort to self and the patient.

**Declaration of patient consent**

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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**Conflicts of interest**

There are no conflicts of interest.

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