

# Rumpel-Leede phenomenon associated with noninvasive blood pressure monitoring

## -A case report-

Yeon Soo Jeon, Yong Shin Kim, Jung-Ah Lee, Kwon-Hui Seo, and Jang Hyeok In

Department of Anesthesiology and Pain Medicine, Saint's Vincent's Hospital, The Catholic University of Korea, Suwon, Korea

We report a case of Rumpel-Leede (RL) phenomenon, - acute dermis capillary rupture, secondary to noninvasive blood pressure (NIBP) monitoring in a patient with type 2 diabetes mellitus (DM) and hypertension. The first most likely cause is vascular fragility in microangiopathy as a result of DM and chronic steroid use. The second is the increased venous pressure during cycling of the blood pressure cuff in a hypertensive state. Anesthesiologists need to be aware that acute dermal capillary rupture, although rare, can occur in patients with long-standing DM, hypertension and chronic steroid use. (Korean J Anesthesiol 2010; 59: 203-205)

**Key Words:** Hypertension, Noninvasive blood pressure cuff, Rumpel-Leede phenomenon, Steroid, Vascular fragility.

Although non-invasive blood pressure (NIBP) monitoring is regarded as a safe procedure, blood pressure (BP) cuff can cause petechial rash, ecchymoses, venous stasis, thrombophlebitis [1,2], infection [3], hematoma formation in patients on anticoagulants [4], compartment syndrome [5], compressive neuropathy [2,6] and skin necrosis [7].

We report a case of mechanical trauma due to NIBP monitoring, which presented as prolonged severe rash and petechiae, distal to the BP cuff.

## Case Report

A 62-year-old, weight 50 kg, height 158 cm woman was scheduled for microdiscectomy for herniated nucleus pulposus

at L<sub>5</sub>S<sub>1</sub>. She had a 5-year and 3-year history of type 2 diabetes mellitus (DM) and hypertension respectively. Her past surgical history was left total knee replacement due to osteoarthritis two years ago. Her laboratory examination showed normal fasting serum glucose at 109 mg/dl, platelet  $234 \times 10^9/L$ , prothrombin time 9.8 sec, activated partial prothrombin time 20.0 sec except rheumatoid factor positive and protein 6.1 g/dl. Preoperatively, she took an antihypertensive drug in the morning of the operation day.

The patient was taken to a standard American Standards Association monitor upon arrival in the operating room. An appropriately sized BP cuff was placed on her left arm above the elbow. Her BP was monitored at 5-minute intervals. Her pre-induction BP was 150/95 mmHg. Anesthetic induction was

Received: November 6, 2009. Revised: 1st, November 17, 2009; 2nd, December 6, 2009. Accepted: December 22, 2009.

Corresponding author: Jang Hyeok In, M.D., Department of Anesthesiology and Pain Medicine, Saint's Vincent's Hospital, The Catholic University of Korea, 93, Ji-dong, Paldal-gu, Suwon 440-060, Korea. Tel: 82-31-249-7214, Fax: 82-31-258-4212, E-mail: gooddoctor@catholic.ac.kr

© This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/3.0/>), which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.



**Fig. 1.** View of petechiae rash located on the left upper arm distal to the blood pressure cuff.

performed using fentanyl 50 µg, lidocaine 40 mg, propofol 100 mg, rocuronium 30 mg and anesthesia was maintained by 2 vol% sevoflurane-O<sub>2</sub> 2 L/min-N<sub>2</sub>O 2 L/min.

Post-induction, a rash was noted on her left arm during inflation of BP cuff, which diminished immediately. The cause of the rash was an initially thought to be due to increased venous pressure, and a transient phenomenon without serious consequences. The patient's BP stabilized in the prone position, and her arm was covered by a sterilized sheet to prevent a fall in body temperature. During the operation, the patient showed severe BP fluctuations, ranging from 80–140/55–85 mmHg. For the purpose of maintaining a stable BP and postoperative pain control, we set up patient-controlled analgesia using fentanyl 1,000 µg, ketorolac 120 mg and ondansetron 8 mg 20 min before the end of the operation. Operation time was 60 minute, the anesthetics took 90 min. When the sterilized sheet was removed from the patient at the end of the operation, a severe rash with petechiae on the left arm was noted associated with facial flushing in the supine position (Fig. 1).

The patient's facial flushing diminished in the recovery room. Once recovered from anesthesia, the patient did not complain about pain in the affected extremity. All motor and sensory function appeared intact. The petechiae and rash of the forearm resolved spontaneously within ten days.

## Discussion

Petechiae under the BP cuff, even over a short operating duration, are commonly observed. These petechiae mostly resolved spontaneously, but some patients complain of pain. The Rumpel-Leede (RL) phenomenon is the appearance of petechiae in an area following application of pressure on vessels, such as by a tourniquet, for 10 min or less [8]. This technique was used in the past to assess thrombocytopenia [9]

and capillary fragility secondary to diabetic microangiopathy [10]. It can be seen in intravenous drug users, and in infectious diseases such as Rocky Mountain spotted fever, meningococemia, disseminated intravascular coagulopathy, idiopathic thrombocytopenic purpura, thrombotic thrombocytopenic purpura, fat embolism, DM [11] and in elderly patients [12]. We hypothesize two causes in this case. The first and the most likely cause is vascular fragility. The patient could have had microangiopathy caused by DM and steroid use for 6 years for osteoarthritis. Facial flushing could also be due to microangiopathy, skin thinning by negative collagen formation in chronic steroid use and vascular stasis by prone position. The second is increased venous pressure during cycling of the BP cuff in a hypertensive state. She did not complain of pain due to postoperative patient-controlled analgesia, but complained of a prolonged rash with petechiae on her left arm. Chester et al. [8] reported a similar case of the RL phenomenon that occurred on the left arm after difficult intubation and uncontrolled high BP. Immediately following surgery the RL phenomenon was noted. NIBP cuff was moved to the right arm, and a thin cotton roll was placed between the arm and the NIBP cuff. After careful NIBP monitoring and BP control, no injury occurred to the right arm.

As noted previously, NIBP monitoring can lead to serious problems. Devbhandari et al. [7] suggested proper use of the NIBP device, as follows: 1) avoid wrapping the cuff tightly, 2) avoid applying the cuff across a joint, bony prominence or superficial nerve, 3) periodically inspect and alternated the cuff site, 4) carefully control BP, 5) select the maximum cycle time with satisfactory monitoring, 6) keep device alarms enabled, 7) consider the possibility of a device malfunction and 8) consider use of a thin layer of padding between the BP cuff and the skin. A thin cotton layer significantly reduced cuff-related trauma and there was no significant effect on systolic, mean and diastolic arterial BP [13]. We also found this effect in our pilot experiment.

In conclusion, anesthesiologists should be aware that acute dermal capillary rupture, although rare, can occur in patients with long standing DM, hypertension and chronic steroid use.

## References

1. Creevy PC, Burris JF, Mroczek WJ. Phelbitis associated with noninvasive 24 h-hour ambulatory blood pressure monitor. *JAMA* 1985; 254: 2411.
2. Lin CC, Jawan B, de Villa MV, Chen FC, Liu PP. Blood pressure cuff compression injury of the radial nerve. *J Clin Anesth* 2001; 13: 306-8.
3. Base-Smith V. Nondisposable sphygmomanometer cuffs harbor frequent bacterial colonization and significant contamination by organic and inorganic matter. *AANA J* 1996; 64: 141-5.
4. Alford JW, Palumbo MA, Barnum MJ. Compartment syndrome of the arm: a complication of noninvasive blood pressure monitoring

- during thrombolytic therapy for myocardial infarction. *J Clin Monit Comput* 2002; 17: 163-6.
5. Sutin KM, Longaker MT, Wahlander S, Kasabian AK, Capan LM. Acute biceps compartment syndrome associated with the use of a noninvasive blood pressure monitor. *Anesth Analg* 1996; 83: 1345-6.
  6. Bickler PE, Schapera A, Bainton CR. Acute radial nerve injury from use of an automatic blood pressure monitor. *Anesthesiology* 1990; 73: 186-8.
  7. Devbhandari MP, Shariff Z, Duncan AJ. Skin necrosis in a critically ill patient due to a blood pressure cuff. *J Postgrad Med* 2006; 52: 136-8.
  8. Chester MW, Barwise JA, Holzman MD, Pandharipande P. Acute dermal capillary rupture associated with noninvasive blood pressure monitoring. *J Clin Anesth* 2007; 19: 473-5.
  9. Sartorius JA. Steroid treatment of idiopathic thrombocytopenic purpura in children. Preliminary results of a randomized cooperative study. *Am J Pediatr Hematol Oncol* 1984; 6: 165-9.
  10. Rürup C, Stobbe H. Simple diagnosis of diabetic microangiopathy by means of the tourniquet test. *Z Gesamte Inn Med* 1979; 34: 756-8.
  11. Gross AS, Holloway RJ, Fine RM. The Rumpel-Leede sign associated with drug-induced erythema multiforme. *J Am Acad Dermatol* 1992; 27: 781-2.
  12. White WB. The Rumpel-Leede sign associated with a noninvasive ambulatory blood pressure monitor. *JAMA* 1985; 253: 1724.
  13. Archer LJ, Smith AJ. Blood pressure measurement in volunteers with and without padding between the cuff and the skin. *Anaesthesia* 2001; 56: 847-9.
-