

SYMMETRICAL PERIPHERAL GANGRENE AND DOPAMINE

Taner COLAK, MD¹, Okan ERDOGAN, MD¹, Ozlem YEREBAKAN, MD², Cumhuri ARICI, MD¹, Alihan GURKAN, MD¹**ABSTRACT**

We describe the case of a 55-year-old man with hypovolemic shock who developed a symmetrical peripheral gangrene (SPG) on hands and feet. The SPG syndrome consists of sudden onset of symmetrical gangrene of the fingers, toes and rarely, the nose, upper lip, ear lobes or genitals without large vessel obstruction or vasculitis. Vasopressors have been implicated directly or as a contributory cause in many cases. In this case, dopamine was used with high dose (> 20 µg/kg/min) which is inappropriate in hypovolemic shock states. SPG might be a severe and rare complication of dopamine. Care should be taken with the use of dopamine in patients with shock.

Key words: Symmetrical peripheral gangrene, dopamine, hypovolemic shock

INTRODUCTION

Symmetrical peripheral gangrene (SPG) is a well documented but rare syndrome. The SPG syndrome consists of sudden onset of symmetrical gangrene of the fingers, toes and more rarely, the nose, upper lip, ear lobes or genitals without large vessel obstruction or vasculitis. Hutchinson first reported this condition in 1891.¹ SPG syndrome is associated with low cardiac output states^{2,3}, infection-sepsis^{4,5}, malignancy⁶, disseminated intravascular coagulation^{7,8} and administration of vasoactive drugs.^{9,10} We present a case of SPG associated with hypovolemic shock and administration of dopamine.

CASE REPORT

A 55 years old man was transferred to our clinic because of upper gastrointestinal hemorrhage from another hospital where he had been first evaluated and transfusion of 12 units of blood had been required to achieve hemodynamic stability during the last two days and dopamine infusion (>20 µg/kg/min) was administered during the last 24 hours. The patient had a history of chronic alcoholism and hypertension. On admission, the patient was in the shock state and his blood pressure and pulse rate were 80 / 50 mm Hg and 120/min respectively. Physical examination revealed symmetrical, well demarcated cyanotic changes of the tips of 3rd and 4th digits at both hands. He had symmetrical black discoloration of the tips of second and 3rd toes. Radial, ulnar and pedal pulses were present. Remainder of the physical examination was normal. Laboratory findings were hemoglobin, 9.0 g/dL; hematocrit,

27.5 %; platelets, 72 000/mm³; blood urea nitrogen, 37 mg/dL; serum creatinine, 2.1 mg/dL; serum alanine aminotransferase, 48 U/L; serum aspartate aminotransferase, 63 U/L; total serum bilirubin, 0.9 mg/dL; serum albumin, 2.5 g/dL; prothrombin time 14.3 sec (control 12 sec). Emergency upper gastrointestinal endoscopy revealed active bleeding from a duodenal ulcer in the first portion of duodenum. Subsequent to the resuscitation, emergency laparotomy, duodenotomy, bleeding control by ligation and Heineke-Mikulicz pyloroplasty were performed. The early postoperative course was uneventful but dry gangrene was noted on the tips of 3rd and 4th digits of both hands and second toes of both feet (Picture 1, 2). Distal phalanx amputation of 3rd and 4th digits of both hands was performed on third week of hospitalization.



Picture 1. Symmetrical gangrene of the fingers before amputation.

Symmetrical Peripheral Gangrene and Dopamine



Picture 2. The tips of second toes with gangrene.

CONCLUSION

SPG is a relatively rare syndrome characterized by the sudden onset of symmetrical gangrene in both hands and feet. There are nearly 100 cases reported in the literature so far. Various diseases leading to hypotension and impaired peripheral perfusion are associated with most of these cases and potential effect of vasoactive drugs including dopamine was documented in many reports. This is probably a result of the vasospastic effect which may be more intense in digital vascular beds than larger vessels. This fact was supported by studies which have shown the occlusion of small blood vessels when the intraluminal pressure falls below a critical value¹¹ and break of the flow through human digital arteries at perfusion pressures between 36 mmHg to 60 mmHg.¹² Dopamine has three distinct actions depending on dosage. Low doses in the range of 1-2 µg/kg/min result in vasodilatation. Medium doses of 2-10 µg/kg/min increase cardiac output due to beta adrenergic action, while above 10 µg/kg/min a potent alpha-adrenergic, vasoconstrictor effect predominates.¹³

REFERENCES

1. Hutchinson J. Severe symmetrical gangrene of the extremities. *Br Med J.* 1891; 2: 8-9.
2. Cotton RT, Bedford DR. Symmetric peripheral gangrene complicating acute myocardial infarction. *Am J Med.* 1956; 20: 301-307.
3. Abrahams DG. Incipient symmetrical peripheral gangrene complicating paroxysmal tachycardia. *Br Heart J.* 1948; 10: 191-194.
4. Joheansen K, Hansen ST Jr. Symmetrical peripheral gangrene (purpura fulminans) complicating pneumococcal sepsis. *Am J Surg.* 1993; 165: 642-645.
5. Itin P, Stalder H, Vischer W. Symmetrical peripheral gangrene in disseminated tuberculosis. *Dermatologica.* 1986; 173: 189-195.
6. Arrowsmith JE, Woodhead MA, Bevan DH, et al. Digital gangrene in small cell lung cancer: response to aspirin treatment. *Thorax.* 1991; 46: 63-64.
7. Molos MA, Hall JC. Symmetrical peripheral gangrene and disseminated intravascular coagulation. *Arch Dermatol.* 1985; 121: 1057-1061.
8. Davis MDP, Byrd J, Lior T, et al. Symmetrical peripheral gangrene due to disseminated intravascular coagulation. *Arch Dermatol.* 2001; 137: 139-140.

The alpha-adrenergic vasoconstriction effects of dopamine would not be expected for all SPG cases to whom dopamine administered. The development of gangrene was reported at dopamine dosages of 5.1 to 10.2 µg/kg/min in patients who had disseminated intravascular coagulation (DIC) and hypovolemia.¹⁴ Furthermore, reports of low dose dopamine causing SPG are associated with vascular diseases.^{15,16}

There are many other risk factors that increase likelihood of SPG induction by dopamine and while the most important is DIC. Other risk factors include frostbite, Raynaud phenomenon, diabetes mellitus, atherosclerosis and rates of dopamine infusion greater than 20 µg/kg/min.¹⁷ In this case, dopamine was used with high dose which is inappropriate in hypovolemic shock states. The peripheral arterial pulses were normal but since the patient had history of hypertension, there was probably atherosclerosis on the arterial system. This condition might further decreased peripheral vascular flow by vasoconstrictor effect of high dose dopamine.

Although there were some reports in the literature about the use of aspirin⁶, vasodilators¹⁸ and sympathetic blockade for the successful treatment of the SPG¹⁹, but these treatment modalities is generally unsatisfactory. The prevention of the condition that causes peripheral ischemia and early recognition SPG are important factors in preventing amputations. Early surgical intervention should be withheld and if the ischemia progresses to dry gangrene of digits, local amputations, debridement, and skin grafting should be considered.

SPG might be a severe and rare complication of dopamine. The infrequency of this complication of dopamine treatment suggests that it occurs with some predisposing factors. Care should be taken with the use of dopamine in patients with shock.

9. Joynt G, Doedens L, Lipman J, et al. High-dose adrenaline with low systemic vascular resistance and symmetrical peripheral gangrene. *S Afr J Surg.* 1996; 34: 99-101.
10. Hayes MA, Yau EH, Hinds CJ, Watson JD. Symmetrical peripheral gangrene: association with noradrenalin administration. *Intensive Care Med.* 1992; 18: 433-436.
11. Nichol J, Girling F, Jerrard W, et al. Fundamental instability of the small blood vessels and critical closing pressures in vascular beds. *Am J Physiol.* 1951; 164: 330-334.
12. Roddie IC, Shepherd JT. Evidence for critical closure of digital resistance vessels with reduced transmural pressure and passive dilatation with increased venous pressure. *J Physiol.* 1957; 136: 498-506.
13. Stetson JB, Reading GP. Avoidance of vascular complications associated with the use of dopamine. *Can Anaesth Soc J.* 1977; 24: 727-733.
14. Winkler MJ, Trunkey DD. Dopamine gangrene. Association with disseminated intravascular coagulation. *Am J Surg.* 1981; 142: 588-591.
15. Alexander C, Sako Y, Mikulic E. Pedal gangrene associated with the use of dopamine. *N Engl J Med.* 1975; 293: 591.
16. Barriere SL, Hudson LD, Huseby JS. Gangrene and dopamine. *Ann Intern Med.* 1977; 86: 366-367.
17. Park JY, Kanzler M, Swetter SM. Dopamine-associated symmetrical peripheral gangrene. *Arch Dermatol.* 1997; 133: 247-249.
18. Denning DW, Gilliland L, Hewlett A, et al. Peripheral symmetrical gangrene successfully treated with epoprostenol and tissue plasminogen activator. *Lancet.* 1986; 2: 1401-1402.
19. Johansen K, Murphy T, Pavlin E, et al. Digital ischemia complicating pneumococcal sepsis: reversal with sympathetic blockade. *Crit Care Med.* 1991; 19: 114-116.

¹Department of General Surgery, Akdeniz University, Antalya Turkey

²Department of Dermatology, Akdeniz University, Antalya Turkey

Corresponding Author: Taner Çolak, MD

Akdeniz University, Department of General Surgery, Antalya-Turkey

E-mail: taner85@e-kolay.net