CASE REPORT

Isolated Femoral Nerve Neuropathy After Intra-aortic Balloon Pump Treatment

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Intra-aortic balloon pump (IABP)-related neuropathy is an infrequent complication, and the development of motor deficits is even rarer in such cases. We report a 37-year-old man with anterior ST-elevation myocardial infarction who received emergent percutaneous coronary intervention and IABP counterpulsation. Weakness and numbness developed after IABP removal despite lack of evidence of ischemia in the involved extremity. Nerve conduction velocity study and electromyogram led to the diagnosis of femoral nerve neuropathy. The neurologic deficits recovered after 6 months of rehabilitation. This case illustrates the importance of bedside neurologic examination of the involved extremity for early detection of possible injury to the femoral nerve in patients after IABP treatment and insertion of larger bore catheter. [J Formos Med Assoc 2007;106(3 Suppl):S29–S32]

Key Words: femoral nerve, IABP, neuropathy

Since its advent 30 years ago, intra-aortic balloon pump (IABP) counterpulsation device has been regarded as the last resort to save acutely ill patients suffering from cardiogenic shock.1,2 As the clinical experience and evidence expanded, IABP was used to treat more conditions, such as mechanical complications related to acute myocardial infarction, postinfarct angina, and high-risk patients undergoing coronary revascularization. Despite improvements in its design, IABP still causes significant complications, which are mostly vascular-related. Here, we report a case of the rare complication of IABP-related femoral neuropathy.

Case Report

A 37-year-old man, chain smoker of height 173 cm and weight 70 kg, presented to our emergency room (ER) 1½ hours after sudden onset of chest tightness. He collapsed at the ER and emergent resuscitation was performed. The initial electrocardiographic tracing showed ventricular tachycardia. Direct-current cardioversion succeeded in restoring the patient’s spontaneous circulation in a few seconds. Hemodynamic status was maintained with inotropic therapy. Complete 12-lead electrocardiogram showed hyperacute T-wave in V1–V5 and ST-segment depression in II, III, and aVF. Under the impression of Killip IV acute ST-segment elevation myocardial infarction over the anterior wall, emergent cardiac catheterization was performed within 2 hours of arrival. Adjunctive medication with aspirin and intravenous heparin were given before the intervention.

IABP counterpulsation was given prophylactically. Under fluoroscopic guidance, an 8-Fr 40 mL intra-aortic balloon catheter with 9.5-Fr

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introducing sheath (Arrow International Inc., Reading, PA, USA) was smoothly inserted through the right common femoral artery. The puncture was achieved with “one-shot” and was 2 cm below the right inguinal ligament. Coronary angiography via the left common femoral artery disclosed total occlusion of the left anterior descending artery and patent left circumflex and right coronary arteries. Coronary intervention was done with balloon dilatation and stent deployment, which resulted in complete revascularization. The counterpulsation pump functioned normally throughout the procedure. The hemodynamics was maintained by intravenous dopamine and noradrenaline. His condition remained uneventful after the intervention and he was subsequently transferred to the coronary care unit. Echocardiogram showed fair left ventricular contractility (ejection fraction, 56%). Ventricular tachycardia did not recur after successful reperfusion.

The patient’s right toes were noted to be clammy and cyanotic 4 hours after the intervention. The IABP catheter was shifted to the left femoral route immediately. The cyanosis soon resolved and there was no obvious compromise of the distal pulsation, which was documented by vascular duplex. Hemostasis of the right femoral artery was achieved by manual compression, and soft-tissue sonography did not reveal any hematoma over the right inguinal area. As the clinical condition stabilized on the 4th day of hospitalization, the IABP catheter was removed from the left side. However, the patient complained of numbness and weakness over the right thigh a few hours after ambulation was allowed. Neurologic examination disclosed impaired right hip flexion and knee extension, and total absence of right knee jerk. Sensory impairment with paresthesia over the right inguinal area, anterior thigh, and medial leg was also noted. Further nerve-conduction velocity (NCV) study showed reduced compound muscle action potential in the right femoral nerve and absence of sensory action potential in the right saphenous nerve. Electromyogram (EMG) did not detect any problem of the involved muscles. Local soft-tissue sonography found no compressive lesion over the inguinal area. Follow-up angiogram on the 14th day of hospitalization revealed intact right external iliac and superficial arteries (Figure). Based on these findings, femoral nerve neuropathy related to the prior IABP was diagnosed. The neurologic deficits of the right lower extremity recovered 6 months after starting rehabilitation, during which the quadriceps muscles showed reversible atrophy without cyanosis or other trophic changes.

Discussion

The application of IABP counter pulsation has been broadened since its introduction. According to the registry data through the year 2003, IABP was most frequently indicated for cardiogenic shock (27.3%), hemodynamic support during catheterization and/or angioplasty (27.2%) or prior to high-risk surgery (11.2%), mechanical complication of acute myocardial infarction (11.7%), and refractory postinfarct unstable angina (10.0%). Major IABP complications occurred in only 2.7% of patients with a median usage of 3 days. The Benchmark registry defined female gender, peripheral vascular disease, body-surface area (< 1.65 m²), and age (≥ 75 years) as prominent
independent risk factors for major IABP complications. The most encountered complications of IABP were attributed to bleeding of vascular access and limb ischemia. A rare case of balloon-pump-related compartment syndrome of the leg was speculated to be partially explained by unrecognized peripheral vascular disease compounded by insertion of balloon catheter. However, our review found no mention of neurologic events in the large IABP registries, including the STS National Database (1996–1997) and Benchmark registry (1997–1999). Paresthesia over the anterior part of the involved thigh, in the distribution of femoral cutaneous nerve, has only been previously reported once. The authors also stressed that there was no evidence of limb ischemia during or after the removal of balloon catheter. McManis attributed the IABP-related complication of sciatic neuropathy in a six case surgical series to prolonged usage of the pump catheter, underlying severe symptomatic peripheral vascular disease, and prolonged perioperative hypoxia.

Our patient had none of the risk factors for IABP-related complications mentioned in the Benchmark registry. His condition primarily presented as motor weakness of the involved thigh with limited sensory disturbance. Mild and transient ischemia of the distal extremity was immediately relieved by removal of the balloon catheter (4 hours after the insertion). Subsequent neurologic laboratory studies, including NCV and EMG, provided clear evidence for the diagnosis of femoral nerve neuropathy. There was no damage to the muscle complex of the right thigh. Compression-induced neuropathy was not regarded as a possible etiology, because immediate and follow-up soft-tissue sonography showed no evidence of a space-occupying lesion in the inguinal area. Since the distal part of the extremity remained intact in pulsation, temperature, motor and sensory function, an ischemic mechanism was considered less likely to be responsible. Furthermore, vascular duplex and follow-up femoral angiography definitely excluded the contribution of vascular insufficiency. As the motor and sensory impairment was restricted to the distribution of the femoral nerve (i.e. weakness of quadriceps muscle group, paresthesia of anterior thigh, etc.), the anatomic adjacency of the femoral artery suggested that the femoral nerve had been damaged. Although femoral nerve injury is seldom encountered in daily practice of common femoral artery puncture, some nerve injuries may go unnoticed. Since the puncture site in our patient was typical and the procedure was guided by fluoroscopy, the size of the sheath may have played a role. In our patient, a 9.5-Fr sheath pierced the nerve, resulting in this complication. The outer diameter of the introducing sheath of the 8-Fr IABP catheter was 9.5-Fr. The disruption of the nerve fibers by the large-bore sheath resulted in dysfunction of the innervated muscles and dermatomes. The duration of several months required for the injured nerve fibers to recover seems reasonable considering the cause of this injury. Thus, this case may suggest the need for consideration of the potential risk of using a larger sheath size.

IABP can cause neurologic complications as a result of catheter manipulation. Routine examination of skin color, temperature, and distal pulse of the extremity, and bedside neurologic examination of the involved limb should also be included in the examination of such patients. The latter may not be routinely performed due to the request that the involved extremity remain motionless after the removal of the femoral sheath to promote hemostasis. The absence of vascular complications may also lead to lack of early identification of neurologic problems. The proximity of the femoral nerve to the target vessel increases the risk that vessel manipulation could unintentionally affect the femoral nerve. This case may serve as a reminder of the need for bedside neurologic examination after deployment of a large-bore catheter through the femoral artery.

References


