Monitored anesthesia care with remifentanyl for femoro-femoral bypass graft patients

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The choice of anesthesia in patients with peripheral artery occlusive disease (PAOD) is often challenging for anesthesiologists and surgeons because most of these patients have coronary artery disease and/or other co-morbid diseases. Many such patients also take anticoagulation agents. Van Damme et al. [1] reported that the factors affecting postoperative mortality include chronic renal failure, hypertension, and myocardial infarction. Mangano [2] reported that 5–15% of all patients with PAOD also demonstrate perioperative acute myocardial infarction, with a postoperative mortality rate of 2–15%. In a retrospective study of 14,788 patients who underwent infrainguinal bypass, Singh et al. [3] observed that patients who received general anesthesia showed the highest rates of myocardial infarction, pulmonary complications and re-operation. Unfortunately, many patients with PAOD are prescribed anticoagulants which make it difficult to administer regional anesthesia. Monitored anesthesia care (MAC) with remifentanyl through target-controlled infusion and local infiltration is a safe and useful alternative to general anesthesia for infrainguinal vascular surgery. In this report, we describe a patient who was treated by femoro-femoral bypass graft for a left common iliac artery occlusion under MAC.

A 70-year-old man 163 cm in height and 63 kg in weight was admitted to our institution due to severe resting pain in both legs. He had severe right coronary artery occlusive disease, which had been treated with the placement of a coronary stent 2 years prior. The patient was on a medication regimen of aspirin and clopidogrel. He exhibited severe stenosis of the left anterior descending and left circumflex coronary arteries

on coronary CT, and hypokinesia of the anteroseptum and akinesia of the inferior wall on echocardiography. The patient also had a 3-year history of hypertension and diabetes. A femoral artery angiogram showed right external iliac artery stenosis and complete obstruction of the left common iliac artery (Fig. 1). A stent was inserted into the right iliac artery, but femoral-to-femoral bypass graft surgery was scheduled for

Fig. 1. Lower abdominal aortography shows non-visualization of left common iliac artery to left common femoral artery by complete obstruction (single arrow), stent state of right external iliac artery and non-visualization of right internal iliac artery by obstruction (double arrows). And enlargement of both lumbar arteries are also noted.

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revascularization of the left common iliac artery. The placement of a coronary stent was delayed until after the femoral bypass graft due to intractable leg pain.

The anesthesiologists explained the patient's general condition, combined diseases, risks of anesthesia, and MAC method to the patient, his family members and the surgeon. All parties understood the circumstances and agreed to the performance of MAC.

Upon arrival at the operating theater, the patient's BP was 120/70 mmHg, heart rate was 80 beat/min, and O₂ saturation was 99% through a simple facial mask with 4 L/min of oxygen. Oxygen was administered continuously during surgery. We monitored direct arterial pressure, lead II and V5 EKG, bispectral index (BIS, Aspect[®] Medical Systems, Norwood, MA, USA), pulseoximetry, and end tidal CO₂ via nasal cannula to assess the patient's respiratory rate. Remifentanyl was given at a dose 1.0 ng/ml of effect site concentration (EC) by infusion pump (Orchestra Base Primea[®], Fresenius Vial, France) for 5 minutes, and then increased first to 1.5 and then 2.0 ng/ml at 5 minute intervals before local infiltration to minimize patient discomfort and respiratory depression. A 1% lidocaine and 0.25% ropivacaine mixture (1 : 1, 20 ml) was infiltrated at both the inguinal incision site and the subcutaneous tunneling area. We increased the remifentanyl EC to 2.5–3.5 ng/ml when painful surgical stimulation occurred, such as femoral artery dissection, subcutaneous tunneling and vascular clamping. When the stimulation ended, the EC was readjusted. We administered isosorbide dinitrate 0.5 µg/kg at the time we started the MAC.

We were prepared to decrease the remifentanyl EC to 0.3 ng/ml immediately if the patient experienced respiratory depression (less than 7 breaths/min or more than 15 seconds of apnea). Fortunately, no special events such as hypotension, tachycardia, cardiac events, patient complaints, respiratory depression, or apnea occurred during the procedure. When the remifentanyl EC was 3.5 ng/ml, the patient's respiratory rate was 10 breaths/min. When necessary, we encouraged the patient to take a deep breath, allowing him to be ventilated sufficiently without requiring assisted ventilation.

During the operation, the EC range of remifentanyl was 2.0–3.5 ng/ml, the BIS score was greater than 90, and the modified observer assessment of the patient alertness/sedation score was 5 (indicating that the patient was able to promptly open his eyes when an observer whispered his name). The patient stated that he did not feel discomfort or anxiety. He was discharged on postoperative day 4 without any complications, and 1 week after discharge he underwent coronary stent insertion without incident.

MAC is usually performed with short acting hypnotics and opioids, which provide excellent anxiolytic and analgesic effects. However, the use of combined hypnotics and opioids may result in respiratory depression, apnea and hypoxia even in healthy volunteers [4]. For this reason, we used only remifentanyl in our patient, and increased EC as slowly as possible to prevent hypotension, hypercapnea, or hypoxia from occurring due to respiratory depression. The EC of remifentanyl is easily controlled for each level of surgical pain because it has a short context-sensitive half life, does not accumulate and provides rapid, predictable analgesia. Remifentanyl is not usually used alone, but when previously used in fiber optic bronchoscopic awake intubation, it yielded excellent patient cooperation and comfort within the 2.4 ± 0.8 ng/ml range [5]. The choice of anesthesia is complex in patients with PAOD, who usually combine coronary artery disease conditions demanding treatment by coronary stent with other complications such as hypertension, diabetes, and antiplatelet medications, like our patient. Surgeons are also often required to provide complex postoperative care for such patients. We decided to use MAC for our patient due to its many advantages over general or regional anesthesia. First, MAC allows clinicians to avoid intubation and hemodynamic instability, and is free from the risks of spinal hematoma and hypotension, urinary retention, and many other complications. Hemodynamic stability is essential to the management of coronary patients, and may also avoid pulmonary complications.

In conclusion, surgery was performed successfully under MAC without the occurrence of respiratory depression or cardiac events in our patient, who tolerated the procedure well and was satisfied with the anesthesia.

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