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Severe perioperative low blood pressure in a patient with chronic heart failure: case report and review of the literature

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OBSERVATION

A 77 year old patient was admitted for a pre-anesthetic consultation in prevision of a knee replacement surgery revision. His total knee replacement occurred in 2000 without complication. His past medical history encompassed chronic high blood pressure, Basedow's disease, type 2 diabetes, overweight, sinus bradycardia with junctional rhythm treated with a double-chamber pace-maker implantation, and a severe chronic heart failure (Left ventricular ejection fraction (EF) of 20 % in 2012). One episode of acute decompensation of his heart failure occurred in 2010, and was caused by atrial fibrillation (AF). This acute episode resolved within a few days with the adjunction of beta blockers and anticoagulants to his heart medications including angiotensin converting enzyme inhibitors, aldosterone antagonists and diuretics. The patient had no cardiac symptoms, a New York Heart Association (NYHA) dyspnea score of 2, no edema, and no orthopnea. His physical examination revealed a mild systolic murmur (2/6). The patient was sent to the cardiology Department for a preoperative assessment of his cardiac function. The electrocardiogram (ECG) showed a regular sinus rhythm, and signs of a left bundle branch block. Echocardiography showed a dilated left ventricle with severe dysfunction, an estimated EF at 25 %, a discreet mitral valve insufficiency and no signs of pulmonary arterial hypertension (PAH). The cardiologist concluded to a severe but stable chronic heart failure, with an optimal medical treatment. On the day of surgery, the patient was prepped for surgery and monitored using ECG, pulse-oximetry, and non-invasive blood pressure. A peripheral intravenous line, as well as an invasive blood pressure (BP) arterial line was also placed. A femoral and sciatic nerve block with 20 mL of 0.5 % ropivacaïne per nerve was instituted to help postoperative pain management. At that point, the patient blood pressure droped to 55/40 mmHg. The patient was still conscious, had no dizziness, no chest pain, no desaturation, and no shortness of breath. Dobutamine was administered at a dose of 5 ng/Kg/min, and the patient recovered an average blood pressure of 100/50 mmHg within 15 minutes. Surgery was postponed and the patient transferred to the intensive care unit (ICU). Upon arrival in the ICU, physical examination was normal, and a new echocardiography showed a hypovolemic state, most probably caused by preoperative fasting, limited vascular filling, and vasodilation induced by local anesthetic agents. Dobutamine withdrawal was made possible by optimizing the intravascular volume status. After discussion with the cardiologists, it was decided to try and improve his cardiac output by placing a triple chamber pace-maker, which happened 3 weeks later under general anesthesia (GA) with no complications. A few weeks later, the patient falled and broke his tibia and fibula, displacing the knee prosthesis. 'A minima' surgery was required, considering his high cardiac risk. A third pre-operative echocardiography showed no changes, with an EF at 25 % and no PAH. On the day of surgery, the patient was monitored and norepinephrine (NE) was ready for injection. Surgery occured under continuous spinal anesthesia using 0.5 % levobupivacaïne . The total received dose was 10mg total. Adequate blood pressure was maintained using an infusion of NE and 5 mg boluses of ephedrine when needed. The patient stayed in the ICU for postoperative surveillance. NE withdrawal took 2 days and cautious fluid filling. The patient was discharged 10 days later with no other complications.

DISCUSSION

Chronic heart failure (CHF) is a common and debilitating condition. It has become a major public health issue. Population aging and modern therapeutic innovations explain the increasing prevalence of HF. In developed countries, this prevalence is 1–2 %, but rises to ≥ 10% among people over 70 years of age [1]. HF patients undergoing non-cardiac surgical procedures are at significant risk for perioperative complications. These include hypovolemia, arrhythmias, myocardial infarction, worsening HF with right ventricular failure and death [2]. In addition, elderly patients frequently have additional comorbid conditions that contribute to higher mortality and readmission rates [3]. Some studies even suggest that patients with HF have a significantly higher risk of postoperative death than patients with coronary artery disease (CAD) admitted for the same procedures [4].
Recommendations for a preanesthetic consultation include thorough medical history compilation, evaluation of symptom severity (reduced exercise tolerance, orthopnoea, nocturia, cough, and peripheral edema), physical examination (third heart sound, elevated jugular venous pressure, hepatomegaly, murmurs, wheezing, and diminished breath sounds), assessment of functional capacity/activity level using the New York Heart Association score and/or MET score, standard laboratory tests with electrolytes and renal function, and ECG [5].Transthoracic echocardiography (TTE) is a key element in the pre-operative assessment of patients with known or suspected heart failure [1]. BNP plasma concentration, chest X-ray, and pharmacological cardiac stress testing are not routinely recommended [6]. A consultation with a cardiologist is also recommended to optimize cardiac status as much as possible prior to surgery, by readjusting medical treatment and pace-maker checking-up. The European society of cardiology (ESC) Guidelines of 2012 for the diagnosis and treatment of acute and chronic HF, specifically for patients with mild to moderately symptomatic HF, strongly recommend cardiac resynchronization therapy (CRT). It is based on several randomized control trials that show reduced risk of the primary outcome endpoint of death or HF hospitalization with CRT [11]. They also suggest that CRT improves symptoms, quality of life, exercise capacity, and ventricular function.
Intraoperative management concerns all different aspects of surgery, such as hemodynamic monitoring, choice of anesthetic technique, optimal fluid management, and early diagnosis of perioperative complications. Invasive measurement of arterial blood pressure is recommended because it allows more efficient and early detection of intraoperative hypotension [7]. It is also useful for guiding the management of vasoactive drugs, and for obtaining frequent arterial blood gas measurements. The use of a pulmonary artery catheterization (PAC) is still debated. It is often recommended for patients with significantly diminished left ventricular systolic function. But more recent studies show no significant benefit with the use of perioperative PAC in non-cardiac surgery, putting a strain on with a higher risk of pulmonary embolism [8]. Transesophageal echocardiography (TOE) is recommended in case of acute and severe hemodynamic instability or life-threatening abnormalities occurring during or after surgery. It is a useful technique in the context of hypotension during non-cardiac surgery [1]. The anesthetic technique should be primarily guided by the requirements of the surgical procedure and the patient's preferences [3]. General anesthesia, neuraxial anesthesia, and postoperative analgesia should be carefully balanced for the management of patients with HF [1,6,9] Most studies show a significant lower risk of pneumonia using neuraxial anesthesia as compared to general anesthesia. However, there is no evidence of a cardioprotective benefit from using neuraxial anesthesia in those patients. A recent retrospective analysis, published in 2013, of patients undergoing

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total hip or knee arthroplasty, observed a significantly lower incidence of major morbidity and mortality in patients receiving neuraxial anesthesia [10.] The choice of the anesthetic technique has been considered to be of little importance in terms of patient outcome, provided that vital functions are adequately supported [6]. Most anesthetic techniques reduce sympathetic tone, leading to vasodilation and, therefore, decreased blood pressure. Regarding to intraoperative low arterial blood pressure, a mean arterial pressure decrease of more than 20 % or mean arterial pressure values lower than 60 mmHg for more than 30 minutes are associated with a significant increase in the risk of postoperative complications [1]. Therefore, intraoperative management must ensure proper maintenance of organ flow and perfusion pressure. Intraoperative fluid management of patients with HF can also be particularly challenging. A volume overload state can precipitate HF or decompensate a chronic, stable HF. Contrarily, adequate preload is necessary for maintaining adequate cardiac output. A hypovolemic state may have a negative effect on cardiac function [6]. Modified neuraxial anesthesia, such as continuous spinal anesthesia, can help decreasing fluid shifting throughout surgery, therefore ensuring hemodynamic stability. Special attention should be paid to patient intravascular volume status by means of monitoring heart rate, arterial blood pressure, peripheral oxygen saturation, urine output, and central venous pressure. TOE may be useful to adjust fluid administration and/or vasoactive drug administration [6] Dynamic parameters like stroke volume estimation or pulse pressure variation are also useful, if available, to assess fluid responsiveness.

CONCLUSION

Latest studies show that HF is present in almost 20 % of elderly non-cardiac surgery patients. HF remains a significant risk factor for perioperative morbidity and mortality, associated with costs to society and poor quality of life. It is our responsibility to detect early signs of HF. A better assessment of heart dysfunction and preoperative optimization can help us providing better outcome for our patients.
In HF patients, intraoperative severe hypotension is an anesthetic emergency. It is associated with adverse perioperative outcome such as stroke, myocardial ischemia, and renal failure. The most common cause is the use of anesthetic drugs. Therefore, the importance of thorough monitoring and early treatment is important.

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