Editorial

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Perioperative adrenergic response and the use of beta-blockers

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Perioperative Adrenergic Response and Its Attenuation

Intense adrenergic stimuli, such as tracheal intubation, can produce systemic hypertension and tachycardia, which might result in major cardiovascular and neurologic adverse complications. Therefore, pre-emptive anti-adrenergic agents, with or without increasing anesthesia-dosage, are applied to attenuate this adrenergic response. However, despite this strategy, insufficient attenuation of the adrenergic response can produce serious, sometimes fatal, adverse complications, such as intracranial hemorrhage, which results in various neurologic deficits, as demonstrated in several case studies reported in the current issue [1]. However, anti-adrenergic agents, or large doses of anesthetic agents, can paradoxically precipitate perioperative hypotension and bradycardia. For patients with autonomic neuropathy, or those vulnerable to reduced perfusion pressure, this suppressive response is particularly problematic and can produce serious adverse outcomes, as demonstrated in a case feature in the current issue [2].

Remote cerebella hemorrhage, due to massive loss of cerebrospinal fluid, represents a rare postoperative anesthesia-related complication of supratentorial or spinal surgical procedures [3]. As reported in a case included in this issue [4], early diagnosis of remote cerebella hemorrhage is extremely important for successful patient management, and to avoid further aggravating potentially fatal and permanent neurologic damage. However, its diagnosis, which relies on assessment of the patient's neurological symptoms and diagnostic brain imaging, is frequently delayed, especially during the immediate postoperative period: certain symptoms can be difficult to discern, or might be concealed, by residual anesthesia effects or postoperative surgical pain. Full recovery following neurologic evaluation, and discharge to a remote site for brain imaging, requires considerable time following the completion of surgical procedures. The recent introduction of low-soluble inhalation agents and ultra-short-acting opioids, in anesthesia practice, should facilitate post-anesthesia recovery and allow for significantly earlier post-operative diagnosis of neurologic complications [5,6].

Postoperative visual disturbance is a rare complication in non-ophthalmic surgical procedures. As with postoperative stroke and neurologic deficits, which can occur when intraoperative conditions compromise cerebral perfusion, conditions producing ischemia or embolic events in the retinal artery, or those increasing intra-ocular pressure, can induce visual disturbances or blindness [7,8]. To avoid perioperative neurologic deficits, intraoperative maintenance of intracranial homeostasis, as it pertains to regional and global cerebral perfusion, is necessary. The majority of post-operative neurologic deficits in adult patients are due to thromboembolic complications in the medium- or small-sized vascular system, and transient or persistent interruption of regional perfusion to a region subjected to a specific neurologic deficit. Therefore, the use of carbon dioxide (CO_2), to establish pneumoperitoneum, and its risk for producing gas emboli should be considered during laparoscopic surgery, even in patients who do not have underlying condition neurologic deficit, as per a report presented in the present issue [9]. In this case, greater intra-abdominal pressure, due to increased CO_2 insufflation pressure, impeded venous return, even in the cerebral venous system, dissolved CO_2 gas-generated intense vascular

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dilatation and a large number of embolic bubbles in the cerebrovascular system. Furthermore, reversed-Trendelenburg position for achieving superior exposure during laparoscopic cholecystectomy can aggravate the risk of cerebral air-embolism; and the intense Trendelenburg position for lower abdominal laparoscopic procedures can increase venous stasis and intracranial pressure. Both of these conditions compromise cerebral physiology, thereby producing post-operative neurologic deficits.

Perioperative Beta-blockers

Cardiovascular complications are regarded as one of the most-common factors increasing perioperative morbidity and mortality, and might be strongly associated with heart rate. Because beta-blockers have been widely recognized to possess cardio-protective properties, their perioperative use is important in managing thyroid storm, as demonstrated by a case presented in the current issue [1]. The use of beta-blockers has also been recommended to reduce postoperative complications [10-12]. However, the Dutch Echocardiographic Cardiac Risk Evaluation Applying Stress Echocardiography (DECREASE) 1 study, which had previously informed guidelines and strategies for the perioperative use of beta-blockers, was subsequently tainted by apparent misconduct and fraudulent research practices [10]. This prompted questions and controversy regarding the validity of the data underpinning the perioperative use of beta-blockers.

One recent study, aiming to respond to the controversy, did not state that controlling heart rate with acute beta-blockade is cardio-protective, and did not support the perioperative use of beta-blockers [13]. A large multi-center study (Perioperative Ischemic Evaluation study, POISE study), employing over 8,000 patients at low perioperative cardiac risk and undergoing non-cardiac surgery, provoked further controversy regarding the use of beta-blockers in a perioperative setting [14]. Furthermore, a recent meta-analysis demonstrated that preoperative initiation of beta-blockade increases perioperative mortality [15]. These discrepancies might relate to differences in study design, the variety of beta-blocker used, different administration routes, and the different time intervals of beta-blocker application observable between previous and recent studies [16].

It has been remains difficult to confirm whether perioperative beta-blockade is protective, safe or harmful. While markedly different algorithms and strategies, for selecting, starting and continuing perioperative use of beta-blockers, might need to be established in the future, the initiation of beta-blockers in patients due to undergo non-cardiac surgery should not be considered routine at present; beta-blockers are no longer recommended for patients scheduled for low- or intermediate-risk surgery, as stated by the American College of Cardiology/American Heart Association/European Society of Cardiology [17-20]. Updated guidelines are indeed to be released shortly, to address whether beta-blockers should be continued in patients scheduled for surgery, and also whether beta-blockers should be started in patients undergoing surgery who have never received them previously.

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