Case Report

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Use of TAP block in a patient with poor CPEX testing during major abdominal surgery

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Abstract

The transversus abdominis plane (TAP) block provides anaesthesia to the anterior abdominal wall. It can be performed using landmark techniques via the Triangle of Petit or using ultrasound guidance. It is an effective tool in postoperative pain management for patients undergoing anterior abdominal wall surgery. It produces a significant reduction in postoperative pain scores, thereby reducing opioid consumption and the incidence of associated side-effects.

Cardiopulmonary exercise (CPEX) testing provides a non-invasive method of assessing combined pulmonary, cardiac and circulatory function. It quantifies patient's functional ability to respond to the increased metabolic demands of major surgery and is commonly used to assess mortality risk preoperatively. The use of CPEX testing to predict postoperative complications is not fully defined. We report the case of a patient with poor functional capacity and a CPEX test indicating high risk, who underwent uneventful intra-abdominal surgery with the use of bilateral TAP blocks.

Case report

A 78 year old man was admitted for re-fashioning of a prolapsing colostomy. Nine months previously he had undergone a juxtarenal aortic aneurysm repair complicated by ischaemic colitis, for which he had a sigmoid colectomy and a further laparotomy for refashioning of the stoma.

His past medical history consisted of anaemia, stable angina, superficial bladder cancer, Stage 4 chronic kidney disease, type 2 diabetes mellitus and osteoarthritis. He weighed 77 kg and his exercise tolerance was 100 yards, with the aid of a stick. His medications included doxazosin, quinine sulphate, perindopril, simvastatin, ferrous sulphate, isosorbide mononitrate and aspirin.

On examination, he was apyrexial with a blood pressure of 170/70 mm Hg, a heart rate of 65 bpm, a respiratory rate of 14 bpm and $Sa0_2$ of 98% on room air. Serum laboratory tests showed a prothrombin time of 13.4 sec (normal range 9.0 – 13.0 sec), haemoglobin 10.2 g/dL (13.0 – 16.7 g/dl), platelets 131 $x10^9$/L (150 – 400 $x10^9$/L), sodium 139 mmol/L, potassium 4.2 mmol/L, urea 15.7 mmol/L (2.5 – 7.0 mmol/L), creatinine 196 umol/L (50 – 130 umol/L) and eGFR 29 ml/min/1.73m^2 (>60ml/min/1.73m^2).

His preoperative pulmonary function tests showed an FVC of 2.78L (93.8% predicted), a reduced FEV1 of 1.66L (75.2% predicted) and FEV/FVC of 59.87%. His ECG showed normal sinus rhythm. A CPEX test taken 12 months previously showed moderately reduced peak aerobic capacity, with a peak $V0_2$ of 11 ml/kg/min and an anaerobic threshold (AT) of 7 ml/kg/min.

In the anaesthetic room, the patient was connected to standard monitoring in accordance with AAGBI Guidelines and venous access secured with an 18 g biovalve cannula. Following pre-oxygenation, anaesthesia was induced using fentanyl 200 mcg, midazolam 2 mg, propofol 120 mg and atracurium 50 mg. Tracheal-intubation was achieved (grade 1 view) using an 8.0 mm cuffed endotracheal tube (lo-contour). A TAP block was administered following induction using ultrasound guidance (Sonosite 'micromax'). A 50 mm insulated Stimi-Plex needle was used to inject a total of 40 ml levobupivacaine 0.375% bilaterally. Anaesthesia was maintained using a mixture of air, oxygen and sevoflurane (1.3 – 2.3 ETAA range). Intravenous (IV) paracetamol 1 g was given intraoperatively. The prolapsing colon was dissected through a circumstomal incision. A 10 cm length of colon was resected after ligation and division of the mesenteric vessels. The new end colostomy was fashioned with interrupted mucocutaneous sutures. Blood loss was minimal and there were no intraoperative complications. The duration of surgery was 1.5 hrs.

The patient spent 30 minutes in the postoperative recovery unit. He was awake, orientated and pain free throughout this period and clinical observations were stable. The patient remained pain-free on the ward and did not require any postoperative opioids. He was medically fit for discharge the following day.

Discussion

There are no previous case reports to our knowledge describing the use of TAP blocks in a patient with such poor CPEX testing preoperatively (AT = 7 ml/kg/min). CPEX testing has been shown to be an independent predictor of morbidity, mortality

and length of hospital stay after major abdominal surgery.[1] The anaerobic threshold marks the onset of anaerobic metabolism as a result of inadequate oxygen delivery. It is not affected by patient effort and therefore provides a reliable patient specific measurement of functional capacity.[2] An AT of at least 11 ml/kg/min is recommended to safely undertake major surgery.[2] A combination of an AT of <11 ml/kg/min with ECG evidence of myocardial ischaemia is associated with high mortality and poor outcome. [3]One study showed a mortality of 42% in those with ischaemic heart disease (IHD) and an AT <11 ml/kg/min, compared with just 4% in those with no IHD.[4]

Postoperative morbidity and mortality most often occurs in patients with pre-existing cardiorespiratory disease and a reduced functional capacity, due to their inability to withstand the additional physiological demands placed upon them by major surgery. Many of these patients develop features of organ hypoperfusion due to poor cardiorespiratory reserve.[5]

Our patient had an AT of 7 ml/kg/min and poor respiratory reserve (exercise tolerance of 100 yards, FEV/FVC 59.87% of predicted) but underwent uneventful intra-abdominal surgery with a good recovery and short length of hospital stay. Contributing factors may have been the anaesthetic technique used, as well as the surgical approach via a parastomal incision. Good intraoperative and postoperative control of cardiovascular parameters, temperature and pain are well known to reduce the surgical stress response and postoperative morbidity, and to improve postoperative outcome.[6]Our patient was cardiovascularly stable throughout the perioperative period. His pain was well controlled with no opioid requirements due to the use of bilateral TAP blocks, and this probably contributed to his uneventful recovery, with no critical care requirement.

CPEX testing is not universally accepted as a useful preoperative assessment tool. In studies assessing it as a reliable predictor of outcome, there is heterogeneity in the degree of clinician blinding used. Blinding was used in some studies,[1] whilst in other instances, clinicians were aware of the CPEX results and changed their management accordingly. This obscures the true relationship between patient outcome and CPEX-derived measures of risk.[7]

TAP blocks were first described in 2001[8] and have been shown to significantly reduce postoperative morphine consumption following abdominal surgery by up to 70%. They reduce pain scores at rest and during mobilisation in the early postoperative period (0-6 hours), and in the first 24 hours.[9] The reduced requirement for morphine also leads to a reduction in postoperative nausea, vomiting and sedation.[9] It may be possible that the ultrasound guided TAP block confers advantages in procedures with moderate surgical trauma to minimize pain and reduce opioid usage, thereby promoting faster recovery and discharge.[8] TAP blocks were the chosen method of analgesia in our patient as they would elicit the least physiological disturbance, but would provide good postoperative analgesia, without opioid-related side effects. This was particularly beneficial, as his pre-existing renal impairment put him at increased risk of opiate toxicity. TAP blocks eliminate somatic pain relating to the surgical incision but do not treat visceral pain. However, our patient tolerated a 10 cm bowel resection with bilateral TAP blocks and intravenous paracetamol. A similar effect has been observed in other studies but the mechanisms behind it are unclear. One theory is that there is an analgesic effect due to high systemic levels of local anaesthetic.[10]

The use of CPEX testing to determine fitness for surgery should be interpreted with caution as newer anaesthetic and surgical techniques develop. Our patient had IHD and an AT which showed a significantly increased level of risk. However, a combination of regional anaesthesia and a cardio stable general anaesthetic with minimally invasive surgery, allowed a rapid and uneventful recovery with no opioid requirements and a short length of hospital stay.

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Competing Interests
None declared
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