Opioid Sparing Anaesthesia for Living-Donor Renal Transplantation-A Case Report

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Abstract

Introduction: Opioids have been the mainstay for perioperative analgesia. Non-opioid drugs with analgesic properties improve intraoperative multimodal analgesia and lead to a decrease in analgesic consumption, reduction in pain scores, postoperative rescue analgesia and in postoperative nausea and vomiting. We report a case of a patient with Alport Syndrome and End Stage Renal Disease (ESRD) proposed for elective Living-Donor Renal Transplantation, with reported allergies/intolerance to opioids.

Case report: 30-year-old male patient, American Society of Anesthesiologists physical status IV, medical history of Alport Syndrome, ESRD treated with peritoneal dialysis, allergy to tramadol and morphine intolerance. A general intravenous anaesthesia and TAP block was performed. Remifentanil and propofol were used until loss of consciousness. Propofol infusion was then started for effect-site concentration. Maintenance of anaesthesia was achieved with remifentanil infusion to target effect-site, dexmedetomidine infusion and a bolus of ketamine. An ultrasound guided TAP block was performed, using ropivacaine. Analgesia was complemented with paracetamol. Surgical procedure lasted 2 h during which patient was stable, with no record of any adverse events. Emergence of anaesthesia was smooth and painless, and there were no analgesic needs during the time-spent in the recovery unit. Postoperative analgesia plan was PCA pump of morphine with ketamine, and paracetamol every 6 h. During the first 48 h, acute pain team reported no PCA pump requirements, no important discomfort and no complications. Patient improved uneventfully, with a total length of hospital stay of 8 days.

Discussion and learning points: Patients proposed for renal transplantation surgery, with ESRD, present significant challenges for the anaesthesiologist and alternatives to use of opioids could be an option. An opioid sparing technique using regional anaesthesia combined with several drugs with analgesic properties was performed and good analgesic control was accomplished, with no adverse effects, providing a good and fast recovery after a renal transplantation.

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Perioperative pain management is important for successful outcome of any surgery. Opioids have been the mainstay for both intraoperative and postoperative analgesia. Meanwhile, the analgesic properties of non-opioid drugs increased the practice of intraoperative multimodal analgesia and lead to a decrease in analgesic consumption, reduction in pain scores, postoperative rescue analgesia and in postoperative nausea and vomiting. We report a case of a patient with Alport Syndrome and End Stage Renal Disease (ESRD) proposed for elective Living-Donor Renal Transplantation, with reported allergies/intolerance to opioids.

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controlled analgesia (PCA) with opioids, while less effective for pain control than epidural block, is an option. However, for the patient having a renal transplantation surgery, other implications of opioid therapy must be taken into account, specifically the renal excretion of their active metabolites, which might be delayed until the graft, is fully functional [4].

We report a case of a patient with Alport Syndrome and ESRD scheduled for Living-Donor Renal Transplantation, with several documented allergies to drugs, including tramadol. We proposed a balanced intravenous anaesthesia complemented with TAP block and PCA of morphine with ketamine for postoperative pain control.

Case Report

A 30-year-old male patient, classified as ASA (American Society of Anesthesiologists) physical status IV, weighing 66 kg, BMI of 21.6 kg/m², had a medical history of Alport Syndrome, with bilateral hearing loss (with hearing aid use), ESRD with proteinuria and documented allergies to drugs, including tramadol. We proposed a haemoglobin 9.1 mg/dL and renal function impairment, creatinine 16.10 mg/dL, without further relevant changes.

The patient was monitored according to ASA standards. Depth of anaesthesia combined General anaesthesia and TAP block. The patient was monitored according to ASA standards. Depth of anaesthesia was monitored with BIS® (Bispectral Index Monitor) and muscle relaxation with Train-of-Four (TOF). Induction was performed with a bolus of remifentanil (20 µg/mL) 35.8 µg, followed by 40 mg of droperidol 0.625 mg were administered. Analgesia was completed with lidocaine 1% and 100 mg of propofol 1% to loss of consciousness, using a Target-Controlled Infusion (TCI) pump.

A propofol 1% infusion was then started using the Schnider model for effect-site concentration. A bolus of 60 mg of rocuronium was administered for muscle relaxation. The airway was approached with a Macintosh blade number 3, and secured with an orotracheal tube number 7.5. Maintenance of anaesthesia was achieved with remifentanil infusion to target effect-site using the Minto model, dexmedetomidine infusion (4 mcg/mL) 16 mcg/h and a bolus of ketamine 25 mg, followed by antibody prophylaxis with cefoxitin. After induction, an ultrasound guided TAP block was performed on the right abdominal wall, using 75 mg of ropivacaine (20 mL).

For nausea and vomiting prophylaxis, dexamethasone 4 mg and droperidol 0.625 mg were administered. Analgesia was completed with 1000 mg of paracetamol. Surgical procedure lasted 2 h, at the end of which a PCA pump containing morphine (1 mg/mL) and ketamine (1 mg/mL), associated with paracetamol every 6 h and PRN antiemetic.

The acute pain team visited him for two straight days during the postoperative period, no complications and no important discomfort were reported and he had no PCA pump requirements. During the postoperative follow-up, the patient improved uneventfully, with a total length of hospital stay of 8 days.

Discussion

Intraoperative amnesia, analgesia, and control of autonomic responses, followed by rapid emergence, are primary objectives for surgical anaesthetic management. Balanced anaesthesia using multiple synergistic agents can attain these goals while minimizing the side effects that may result from high doses of a single agent [1,3]. Opioids are fundamental drugs to achieve a balanced anaesthesia, however, there are clinical situations in which their use is relatively contraindicated, such as opioid intolerance and allergy [1].

On the other hand, patients proposed for renal transplantation surgery, with ESRD, present significant challenges for the anaesthesiologist in the perioperative period. Specifically, opioids given during the perioperative period, or their active metabolities, depend on renal excretion and may accumulate depending on the perfusion and function of the new graft [1]. Therefore, alternatives to use of opioids should be used.

In this case report, a patient with allergy to tramadol and previous described morphine intolerance was proposed for renal transplantation, presenting therefore both, intolerance to opioids and an ESRD. For this reason, an opioid spiring technique using regional anaesthesia combined with several drugs with analgesic properties was chosen, to achieve good analgesic control during both, intraoperative and postoperative periods.

TAP block

Renal transplant recipients are ideally suited to gain maximum benefit from TAP block as the incision classically involves the lower abdomen, providing analgesia to the parietal peritoneum as well as the skin and muscles of the anterior abdominal wall. It has a high margin of safety and is technically simple to perform, especially under ultrasound guidance [5,8]. The TAP block decreases the need for intraperative analgesia, but due to the long duration of surgery, the analgesic effect of the block fades, and it does not reduce morphine requirements postoperatively, according to randomized controlled trials [9,10].

Therefore, it must still be complemented in the postoperative period. For this reason, some authors advocate the use of a continuous infusion of local anaesthetic via the TAP catheter, placed preoperatively. This presents some technical problems: difficulty inserting the catheter into the TAP space, low success rate in terms of catheter placement and possible interference with the surgical field [11]. Other studies still advocate that TAP block provides significant pain relief in the first 24 h after operation which, coupled with the ease of performing the block and the good safety profile, makes it an appealing choice for this group of patients [8,12].
Remifentanil and dexmedetomidine perfusions

Perioperative analgesics should be administered with care in ESRD patients undergoing transplantation, given that these agents, or their active metabolites, depend on renal excretion and may accumulate. Morphine is metabolized in the liver to morphine-6-glucuronide (M6G), morphine-3-glucuronide and normorphine, all of which are excreted in the kidneys. M6G is the only active metabolite, which accumulates in renal failure and mediates central nervous system and respiratory depression [6]. Similarly, meperidine is metabolized in liver to normeperidine, also excreted by the kidneys. Fentanyl is metabolized in the liver with only 7% excreted unchanged in urine making it suitable and safe for short-term use during surgery.

However, if used for a long period, the pharmacodynamic effects should be monitored in view of parent compound accumulation. The clearance and half-life of sufentanil are not significantly altered in patients with reduced renal function. The use of rapidly metabolized potent opioids is one common method of achieving a balanced anaesthesia. Remifentanil is mainly metabolized by blood and tissue esterases while its main metabolite is excreted in the kidney [6]. In our case, a bolus of remifentanil 35.8 µg (20 µg/mL) was given, followed by a perfusion using the Minto model in a TCI pump.

A dexmedetomidine perfusion of 4 mL/h (4 µg/mL) was added to the remifentanil perfusion. Dexmedetomidine is a selective α2- adrenoceptor agonist with analgesic and sedative properties and minimal impact on respiratory parameters, providing effective postoperative analgesia and reducing postoperative morphine requirements without increasing the incidence of side effects, in spite of its less effective analgesic properties when compared with remifentanil [2,13,14].

Ketamine

In addition to remifentanil and dexmedetomidine, a bolus of 25 mg of ketamine was given to the patient after induction of anaesthesia. Ketamine is a unique intravenous anaesthetic with analgesic properties in subanaesthetic doses [15]. Analgesia induce by ketamine alone is not equivalent to the opioid analgesic effects, but its action as a non-competitive antagonist N-methyl-D-aspartate (NMDA) receptors can reduce hyperalgesia, prevent opioid tolerance and lower morphine consumption [15,16]. This drug appears to have an opioid-sparing effect, and is gaining acceptance both by patients and physicians because of the decreased incidence of side-effects [17]. The opioid-sparing effect of a single dose of ketamine of 0.1-0.15 mg/kg has also been demonstrated after major orthopaedic and intra-abdominal surgeries with no increase in side effects [18,19].

PCA of morphine with Ketamine

In order to minimize the adverse effect of opioids in our patient, ketamine (1 mg/mL) was added to morphine (1 mg/mL) and administered via PCA. Clinical trials have found contradictory results regarding the use of ketamine for this purpose. A qualitative review of randomized trials concluded that, for thoracic surgery, adding ketamine to opioid for i.v PCA was superior to i.v PCA opioid alone, but the benefit of this addition remained unclear for abdominal surgery [16]. A 1:1 ratio with a lockout interval of 8 min, such as the one used in this case, has been described with positive effects after major orthopaedic procedures [20].

Conclusion

Sparing analgesia anaesthetic technique proved to be efficacious in a patient with intolerance to opioids, and proved to have few or no adverse effects, providing a good and fast recovery after a renal transplantation. This case supports the literature regarding the use of different anaesthetics to reduce their cumulative dose, and therefore reducing the patient's analgesic needs and the drugs' side effects.

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