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REVIEW

Laparoscopic cholecystectomy perioperative management: an update

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Abstract: Laparoscopic cholecystectomy is one of the most common general surgical procedures. The aim of the present paper is to review current evidence and well-established practice for elective laparoscopic perioperative management. There is no firm evidence for best anesthetic technique, further high quality studies assessing short as well as more protracted outcomes are needed. Preventive multi-modal analgesia, combining non-opioid analgesics, paracetamol, nonsteroidal anti-inflammatory drugs or coxib, and local anesthesia, has a long history. Local anesthesia improves postoperative pain and facilitates discharge on the day of surgery. Whether transversus abdominis plane-block has clinically important advantages compared to local infiltration analgesia needs further studies. Single intravenous dose steroid, dexamethasone, reduces postoperative nausea and vomiting, pain, and enhances the recovery process. Multi-modal analgesia is reassuringly safe thus having a positive benefit versus risk profile. Adherence to modern guidelines avoiding prolonged fasting and liberal intravenous fluid regime supports rapid recovery. The effects of CO_2 insufflation must be acknowledged and low intra-abdominal pressure should be sought in order to reduce negative cardiovascular/respiratory effects. There is no firm evidence supporting heating and humidification of the insufflated gas. The potential risk for CO_2/gas entrainment into vasaculture, gas emboli, or subcutaneous/intra-thoracic into the pleural space must be kept in mind. Laparoscopic cholecystectomy in ASA 1-2 patients following a multi-modal enhanced recovery protocol promotes high success rate for discharge on the day of surgery.

Keywords: laparoscopic cholecystectomy, CO_2 insufflation, complications, side effects, review, meta-analysis

Background

Laparoscopic cholecystectomy is one of the most common general surgical procedures. It is commonly performed as ambulatory surgery. A huge number of studies around perioperative care have been published and there are today a series of systematic reviews and/or meta-analyses describing the compiled evidence. The aim of the present update is to summarize the available best evidence and well-established practice around the perioperative care of elective laparoscopic cholecystectomy.

Anesthesia

General anesthesia is the most common anesthetic technique. Still, both spinal and epidural anesthesia may be used and have been found feasible.[1,2] The need for intraoperative rescue analgesia and conversion to general anesthesia when spinal is used, in up to 8% of patients, should however be acknowledged.[3,4]

There are insufficient data to support any main anesthetic, intravenous (IV) or inhaled (desflurane or sevoflurane), as more effective. There are no high quality studies explicitly

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assessing whether there are significant differences between the standard short-acting opioids, fentanyl, alfentanil, sufentanil, and remifentanil. The hemodynamic stress response seen associated with CO_2 insufflation may be blunted by increasing depth of anesthesia, bolus dose of short-acting opioid, or the addition of preoperative clonidine (off-label use). Doses of 1 and 2 μg/kg clonidine have been shown safe and effective in stabilizing intraoperative hemodynamics.[5,6]

Intubation and muscle relaxation is still best practice although there are reports around the successful use of laryngeal mask airway, eg, the LMA ProSeal®.[7,8] There is however lack of properly powered studies around the safety associated with the use of laryngeal mask airway. The use of muscle relaxation reduces the abdominal muscle tone which facilitates visibility.

Gas insufflation

Carbon dioxide is the most commonly used gas for insufflation during laparoscopy. Nitrous oxide and helium have been studied as alternatives but their safety needs further studies.[9] Low pressure carbon dioxide is preferred to abdominal wall lift and drainage does not improve postoperative pain.[10,11] Intra-abdominal pressure 12 to 16 mmHg is common practice and the lowest effective intra-abdominal pressure should be sought. Decreased pressure may however delay surgery and jeopardize safety and the benefit/risk should be assessed on an individual basis.[12] There is a recent paper suggesting benefits from "deep neuromuscular block" decreasing the intra-abdominal pressure to create good visibility.[7]

Insufflation of gas in order to create a "gaseous cushion" for surgical visibility is of importance but causes a series of physiological effects. The venous return is decreased. A relative increase in intracranial pressure is commonly seen especially if the insufflation of gas is combined with Trendelenburg positioning. The diaphragm is shifted cranially and thus ventilation perfusion matching in the lung is impaired. Cardiac after-load is increased and subsequent cardiac output and oxygen delivery may, in patients with marginal reserve, become critically compromised. Insufflation of CO_2 causes a small increase in arterial CO_2 that also should be taken into account. Patients with preprocedure increased arterial carbon dioxide tension, eg, COPD, need special attention after surgery to avoid respiratory compromise.[13]

The risk for gas entrainment into the vasculature or surrounding tissues should also be acknowledged.[14,15] Gas emboli may cause serious cardiovascular collapse. The benefits of heating and humidification of the insufflated CO_2 is still debated. A meta-analysis from 2008 suggested that CO_2 should, if possible, be heated and humidified for reducing pain and discomfort after surgery.[16] An updated meta-analysis from 2011 could not verify any positive effects.[17] There are increasing data suggesting alternatives to traditional laparoscopic technique; natural orifice transluminal endoscopic surgery (NOTES) and trans-vaginal assisted cholecystectomy have been suggested to improve postoperative recovery.[18]

Pain management

The concept of multi-modal analgesia, combining non-opioids aiming for additive or synergistic analgesic effect and subsequently reducing the risk for morphine-related side effects, was introduced more than 20 years ago for laparoscopic cholecystectomy by Michaloliakou et al.[19] There is still strong support for the concept of multi-modal pain management facilitating intermediate recovery and discharge on the day of surgery.[20] Paracetamol and nonsteroidal anti-inflammatory drugs (NSAID) as basic components and administered prior to surgery as "preventive analgesia" has become well-accepted. However a recent meta-analysis called for further high quality studies. Studies that present results from not only short/intermediate but also more protracted clinical outcomes such as time to becoming street fit, time to return to work, and quality of life.[21] Intraperitoneal local anesthesia has effects reducing pain but further studies are warranted to determine more protracted outcomes.[22,23] Port infiltration does reduce postoperative pain and improve recovery, eg, number of patients discharged on the day of surgery. Still further studies are warranted assessing more protracted effects. Long-acting local anesthetics are preferred.[24]

There is increasing interest in transversus abdominis plane block (TAP block) for pain management after abdominal surgery. There is however still insufficient data available to support routine use of TAP-block.[25,26] TAP-block prior to surgery may act additive to general anesthesia and reduce anesthetic need and thus become cost effective.[27] Further studies are needed in order to better define whether TAP-block would impact the recovery after laparoscopic cholecystectomy, when, and how it should be administered.

Steroids – single dose IV dexamethasone

There is reassuring support for the beneficial effects of a single preoperative IV dose of dexamethasone decreasing risk for PONV and pain.[28,29] There is support for a 0.1 mg/kg dose for PONV prevention and as part of multi-modal pain management.[30] There are two recent papers supporting the safety for single IV dose of dexamethasone with regard to the

increase in blood glucose.[31] The surgical stress per se does provoke an insulin resistance and raise in blood glucose and blood glucose should be managed in an adequate manner regardless of dexamethasone use.[32]

Analgesics for postoperative pain

Oral regular paracetamol and NSAID in standard doses are basics. Slow-release oxycodone has been shown effective in reducing postoperative pain[33] but may cause side effects if provided as premedication. Opioids may be better suited for rescue than for prevention. Pregabalin (off-label use) has been shown effective as 150 mg preoperative without side effects while 600 mg in two preoperative doses was found effective in reducing pain but at the cost of more dizziness.[34,35] Magnesium infusion (off-label use) has been studied but the effects are limited and side effect of slower awakening has been seen.[36,37] IV lidocaine (off-label use) may be as effective, 1.5–2 mg/kg, followed by 2 mg/kg/h, which has been shown to reduce anesthetic need and postoperative pain.[38,39]

PONV

Female sex, age, non-smoking, prior experience of PONV (and possibly motion sickness), and need for postoperative opioids are risk factors for PONV.[40] Laparoscopic cholecystectomy per se is associated with postoperative emesis. Thus, structured and proper PONV prophylaxis and management is essential.[41] Avoidance of prolonged preoperative fasting and a liberal fluid regime has been shown to improve recovery avoiding nausea. Holte et al suggested a regime of 40 mL/kg preoperatively.[42,43] Whether preoperative oral carbohydrate drinks have added value requires further studies.[44]

Summary discussion

The literature around cholecystectomy is most extensive and the aim of this update paper is to compile and discuss preferentially meta-analyses and systematic reviews with implication for the perioperative management, benefits, and risks. There is an obvious need for further high quality prospective randomized blinded studies taking not only short-term but more protracted outcome measures into account. There are standardized tools that could be used providing more robust evidence around short as well as more protracted multi-dimensional outcomes, eg, the Postoperative Quality of Recovery tool.[45] Laparoscopic cholecystectomy is a high volume general surgery standard procedure. It is commonly done as ambulatory surgery. There is today reasonable evidence to support best practice: Multi-modal analgesia; combination of non-opioid analgesics, paracetamol and NSIADs or coxib premedication, avoidance of prolonged fasting, standard general anesthesia (there is insufficient data to support the choice of one main anesthetic propofol or inhaled agents over the other), intubation and surgical site infiltration with local anesthesia, single IV 0.1 mg/kg dose dexamethasone prior to surgery, local anesthesia intraperitoneal and in the troachar sites at end of surgery, effective evacuation of CO_2 from the abdominal cavity. Use of lowest effective intra-abdominal pressure creating adequate working field should be used, awareness of the effects from capnoperitoneum and vigilant monitoring in order to maintain physiology, oxygenation, and oxygen delivery and potential gas entrainment to surrounding tissues and/or vascular space. Patients should be provided with pain medication–paracetamol, NSAID, and rescue opioid. Proper written information around postoperative pain management, convalescence, and recovery should be provided. All patients discharged on the day of surgery should be properly informed where and how to act in case of emergency.

Disclosure

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