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Day surgery - coming to and leaving hospital on the day of surgery, is becoming increasingly popular and there are a number of factors promoting its growth. Reducing the costs associated with in-patient hospital care is, without doubt, one powerful driving force. An increasing understanding of the pathophysiology associated with surgical trauma is, however, another important factor. The introduction of minimally invasive, minimally traumatic surgical techniques is also of huge importance. The introduction of new drugs is also claimed to have an impact promoting its growth. One may argue, however, that of greater importance is *how* the drugs are used rather than what drugs are chosen. The goal of day surgery anaesthesia is to achieve good, stable intra-operative conditions while providing a rapid return of body function, enabling an early and safe discharge. Minimising well-known postoperative problems such as pain, nausea and dizziness, and fatigue are of the utmost importance. Finally, successful achievement of day surgery requires good planning and optimisation of logistics.

**PRE-OPERATIVE PREMEDICATION**

Good pre-operative preparation and information and minimising waiting times may diminish the need for anxiolytic or sedative premedication. If needed, a small dose of a benzodiazepine is the preferred choice of agent and does not seem to have a major impact on delaying the time to 'eligible for discharge' [1]. During the pre-operative waiting period (which should be kept as short as possible) a loading dose of 'peripheral analgesics' is frequently provided; paracetamol and a NSAID (or when there is a risk of bleeding a COX-2 inhibitor) have proven benefits on postoperative pain [2-4]. It is arguable whether these drugs have any impact on the intra-operative course. All efforts should, however, be focused on minimising the overall peri-operative need for morphine-like substances. The value of pre-operative opioids is questionable and oral opioid premedication has been shown to have no significant per- or postoperative effects [5].

**INDUCTION AGENTS AND TECHNIQUE**

In adult patients intravenous induction has become the 'gold standard'. Inhalational induction, for example by vital capacity breathing of sevoflurane, is an option in patients with needle phobia [6]. Co-induction - the combination of two or more agents such as an opioid and an intravenous induction agent reduces the requirement of each component and facilitates a smooth and rapid induction of anaesthesia [7, 8]. Propofol is the most popular induction agent but thiopental can be used [9].

**INTRA-OPERATIVE ANALGESICS**

The choice of intra-operative opioid is a matter of personal choice. Small doses of fentanyl, alfentanil or a continuous infusion of remifentanyl are all suitable alternatives [9, 10]. However, every attempt should be made to minimise the need for opioids throughout the peri-operative period.

Local anaesthesia should be used whenever possible to reduce the need for further analgesia. Which local anaesthetic technique used - local, regional or central neuraxial block, is of less importance. When feasible, a fast-acting local anaesthetic should be applied prior to incision to reduce the nociceptive inflow and the need for intra-operative analgesia and anaesthesia. The addition of local anaesthesia is also of value when patients are receiving general anaesthesia in order to reduce the need for intra-operative anaesthetic agent. The use of local anaesthesia has proven beneficial effects on postoperative pain [11]. Steroids have become increasingly popular as they possess well-documented antiemetic, analgesic and antihyperaesthetic properties [12]. The earlier the steroid can be administered, the better.

**MAINTENANCE OF ANAESTHESIA**

There has been a long and intense debate about the optimal drug and route of delivery for maintenance of anaesthesia for day surgery. All the presently available alternatives are suitable with propofol, sevoflurane and desflurane all having certain benefits [13]. The interaction between opioids and the main anaesthetic agent is useful in the day surgery setting. For example, small doses of fentanyl profoundly reduce the need for the main anaesthetic agent [14]. Titration of the main anaesthetic agent to each individual patient's unique need, balanced against the surgical stimulation in real time, is of huge importance in day surgery anaesthesia.

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The currently available brain monitors such as BIS (Aspect Medical Systems, Inc. Norwood, USA), AAI (AEP Monitor/2™, Danmeter A/S Odense, Denmark), or CSI (Cerebral State Monitor™, Danmeter A/S Odense, Denmark) are 'effect' tools used to improve drug delivery and dosing. The optimisation of administration facilitates recovery and may have an impact on PONV [15].

Maintenance of anaesthesia with a propofol infusion has become popular and target-controlled infusion (TCI) pumps have improved dosing. The inhaled anaesthetics sevoflurane and desflurane are easy to use, the end-tidal concentrations can be monitored in real time, they have low inter-individual variations in response and they are rapidly eliminated providing quick emergence [13]. The composition of the fresh gas has been the subject of extensive discussion. The potential benefits of high inspired concentrations of oxygen on PONV have been described. The impact on surgical site wound infection may not be relevant for day surgery [16]. The use of nitrous oxide remains an option and reduces the need for a 'second, main anaesthetic' [17]. Both sevoflurane and propofol consumption are significantly reduced when nitrous oxide is used. The influence of nitrous oxide on PONV is limited. In a large analysis of various factors on PONV by Apfel et al no significant difference was shown between fresh gas consisting of oxygen and air compared with oxygen and nitrous oxide [18].

## **MUSCLE RELAXANTS**

Muscle relaxation should be avoided as far as possible. An appropriate dose of a short-acting agent should be used when there is no alternative. In order to reduce the risk of residual block, neuromuscular monitoring is mandatory during day surgery [19].

## **EMERGENCE AND PAIN MANAGEMENT**

At the end of surgery a procedure-specific plan for optimising the postoperative course should be adopted, including adequate pain management. The aim is to minimise the postoperative use of strong opioid analgesics to avoid side effects but maintain an adequate quality of care [20].

A multi-modal pain strategy has become the 'gold standard' [21]. When there are no contra-indications local anaesthetic agents should be applied either to the wound area or to the nerves supplying the operative area by a block. A low concentration of a long-acting agent in order to achieve good postoperative pain relief but as little motor block as possible is recommended [11]. Catheter techniques for continuous or intermittent local anaesthetic administration in order to prolong the duration of action have become popular [22]. Adding adjuncts to the local anaesthetic solution may prolong the action for more extensive surgical procedures [23]. Paracetamol and NSAID/COX-2 inhibitors should be used whenever there is no contra-indication to their use. Such multi-modal pain management, including the use of weak opioids and, when needed, strong opioids, is the basis of the analgesic ladder for most day surgical procedures [22, 24].

## **POSTOPERATIVE CARE**

Patient preoperative information should include details about the postoperative course as well as the surgical procedure. A motivated and well-informed patient, aware of the pain pattern, rehabilitation plan and pain medication strategy, results in better overall satisfaction. Patients should be informed about early mobilisation and discharge and not to expect a protracted bed rest after emergence.

## **MANAGEMENT OF PONV**

Postoperative nausea and vomiting is the second most common and, perhaps, the most important side-effect after day surgery. Every effort should be made to avoid the occurrence of PONV and to provide early treatment if a patient exhibits symptoms. Pre-operative risk stratification is mandatory and prophylaxis should be given if more than two risk factors are present. A multi-modal strategy is recommended for the prevention and the treatment of PONV: steroids, metoclopramide, phenothiazines and 5-HT<sub>3</sub> blockers are all effective. It may be advisable to start prophylaxis with steroids, adding small dose of droperidol intraoperatively (~ 1 mg) in order to allow the patient to be monitored for some time after administration because of the small risk of ECG abnormalities (in particular QT prolongation). Metoclopramide may also be used. The 5-HT<sub>3</sub> antagonists are retained for use as treatment rather than prevention of PONV. Current literature favours drug rotation: if a patient exhibits symptoms after receiving prophylaxis, a drug from a different class should be chosen [18, 25].

## **CONCLUSIONS**

Well-planned procedure-specific peri-operative management is of great importance. Individual drug titration is strongly recommended. A multi-modal analgesic as well as, when needed, an anti-emetic strategy and combination of analgesics and anaesthetics in order to maintain adequate anaesthesia with a minimum of side effects is recommended.

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## KEY LEARNING POINTS

- Both anaesthesia and postoperative pain protocols should be procedure-specific
- Well recognised and established drugs should be chosen
- Administration of anaesthetic agents should be based on the patient's individual and real-time requirements
- Use a multi-modal analgesia technique pre-, per- and postoperatively
- The risk of PONV should be determined (using risk stratification algorithms) and prophylaxis given accordingly

## REFERENCES

1. Smith AF, Pittaway AJ. Premedication for anxiety in adult day surgery. *Cochrane Database Syst Rev* 2003; 1: CD002192.
2. Reuben SS. Update on the role of nonsteroidal anti-inflammatory drugs and coxibs in the management of acute pain. *Curr Opin Anaesthesiol* 2007; 20: 440-50.
3. Reuben SS, Ekman EF, Charron D. Evaluating the analgesic efficacy of administering celecoxib as a component of multimodal analgesia for outpatient anterior cruciate ligament reconstruction surgery. *Anesth Analg* 2007; 105: 222-7.
4. Toivonen J, Pitko VM, Rosenberg PH. Etoricoxib pre-medication combined with intra-operative subacromial block for pain after arthroscopic acromioplasty. *Acta Anaesthesiol Scand* 2007; 51: 316-21.
5. Jokela R, Ahonen J, Valjus M, Seppala T, Korttila K. Premedication with controlled-release oxycodone does not improve management of postoperative pain after day-case gynaecological laparoscopic surgery. *Br J Anaesth* 2007; 98: 255-60.
6. Lewis MC, TerRiet M, DeLaCruz L, Matadial CM, Gerenstein R, DeSouza G, Chidiac GJ. Rapid sevoflurane induction compared with thiopental. *J Clin Anesth* 2004; 16: 271-5.
7. Jakobsson J, Rane K. Anaesthesia for short outpatient procedures. A comparison between thiopentone and propofol in combination with fentanyl or alfentanil. *Acta Anaesthesiol Scand* 1995; 39: 503-7.
8. Whitwam JG. Co-induction of anaesthesia: day-case surgery. *Eur J Anaesthesiol* 1995; 12(Suppl.): 25-34.
9. Jakobsson J, Oddby E, Rane K. Patient evaluation of four different combinations of intravenous anaesthetics for short outpatient procedures. *Anaesthesia* 1993; 48: 1005-7.
10. Chinachoti T, Werawatganon T, Suksompong S, Techanivate A, Kitsampanwong W, Tansui R, et al. A multicenter randomized double-blind comparison of remifentanyl and alfentanil during total intravenous anaesthesia for outpatient laparoscopic gynaecological procedures. *J Med Assoc Thai.* 2000; 83: 1324-32.
11. Ong CK, Lirk P, Seymour RA, Jenkins BJ. The efficacy of preemptive analgesia for acute postoperative pain management: a meta-analysis. *Anesth Analg* 2005; 100: 757-73.
12. Romundstad L, Breivik H, Roald H, Skolleborg K, Romundstad PR, Stubhaug A. Chronic pain and sensory changes after augmentation mammoplasty: long term effects of preincisional administration of methylprednisolone. *Pain* 2006; 124: 92-9.
13. Gupta A, Stierer T, Zuckerman R, Sakima N, Parker SD, Fleisher LA. Comparison of recovery profile after ambulatory anaesthesia with propofol, isoflurane, sevoflurane and desflurane: a systematic review. *Anesth Analg* 2004; 98: 632-41.
14. Assareh H, Anderson RE, Uusijarvi J, Jakobsson J. Sevoflurane requirements during ambulatory surgery: a clinical study with and without AEP-index guidance. *Acta Anaesthesiol Scand* 2002; 46: 495-9.
15. Nelskyla KA, Yli-Hankala AM, Puro PH, Korttila KT. Sevoflurane titration using bispectral index decreases postoperative vomiting in phase II recovery after ambulatory surgery. *Anesth Analg* 2001; 93: 1165-9.
16. Chura JC, Boyd A, Argenta PA. Surgical site infections and supplemental perioperative oxygen in colorectal surgery patients: a systematic review. *Surg Infect (Larchmt)* 2007; 8: 455-62.
17. Smith I. Nitrous oxide in ambulatory anaesthesia: does it have a place in day surgical anaesthesia or is it just a threat for personnel and the global environment? *Curr Opin Anaesthesiol* 2006; 19: 592-6.
18. Apfel CC, Korttila K, Abdalla M, Kerger H, Turan A, Vedder I, et al. A factorial trial of six interventions for the prevention of postoperative nausea and vomiting. *N Engl J Med* 2004; 350: 2441-51.
19. Bettelli G. Which muscle relaxants should be used in day surgery and when. *Curr Opin Anaesthesiol* 2006; 19: 600-5.
20. Kehlet H, Wilkinson RC, Fischer HB, Camu F, Prospect Working Group. PROSPECT: evidence-based, procedure-specific postoperative pain management. *Best Pract Res Clin Anaesthesiol* 2007; 21: 149-59. (<http://www.postoppain.org/frameset.htm>)
21. Myles PS, Power I. Clinical update: postoperative analgesia. *Lancet* 2007; 369: 810-2.
22. Rawal N. Postoperative pain treatment for ambulatory surgery. *Best Pract Res Clin Anaesthesiol* 2007; 21: 129-48.
23. Ng HP, Nordstrom U, Axelsson K, Perniola AD, Gustav E, Rytberg L, Gupta A. Efficacy of intra-articular bupivacaine, ropivacaine, or a combination of ropivacaine, morphine, and ketorolac on postoperative pain relief after ambulatory arthroscopic knee surgery: a randomized double-blind study. *Reg Anesth Pain Med* 2006; 31: 26-33.
24. McQuay HJ, Moore RA. Postoperative analgesia and vomiting, with special reference to day-case surgery: a systematic review. *Health Technol Assess* 1998; 2: 1-236.
25. Kovac AL. Meta-analysis of the use of rescue antiemetics following PONV prophylactic failure with 5-HT3 antagonist/dexamethasone versus single-agent therapies. *Ann Pharmacother* 2006; 40: 873-87.

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**TABLE 1. LIST OF DRUGS SUITABLE FOR DAY SURGERY ANAESTHESIA**

<p><i>Preoperative anxiolysis/sedation and analgesia</i> Midazolam Paracetamol/NSAID/COX-2 inhibitor</p> <p><i>Induction</i> Anti-emetic prophylaxis: steroid (betamethasone or dexamethasone), droperidol, 5-HT<sub>3</sub> receptor blocker, metoclopramide Propofol Fentanyl/alfentanil/remifentanyl Short-acting local anaesthetic: lidocaine</p> <p><i>Maintenance</i> Sevoflurane/desflurane/propofol Long-acting local anaesthetic: bupivacaine, levobupivacaine, ropivacaine</p> <p><i>Muscle relaxants</i> Suxamethonium A short-acting non-depolarising agent</p> <p><i>Postoperative care</i> Paracetamol/NSAID/COX-2 inhibitor Weak opioid, rescue strong opioid 5-HT<sub>3</sub> receptor blocker Ephedrine</p>
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