WHICH POSTOPERATIVE ANALGESIA
FOR DAY-CARE SURGERY?

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INTRODUCTION

Day-care surgery is often performed for non-painful conditions, the patients are elective with stable health and the procedure is usually minimal or medium extensive. Progress in surgery towards less invasive methods (eg. by scopic techniques) may also reduce the need for postoperative analgesia. However, whereas surgery for a specific procedure may evolve towards less invasiveness, the surgical repertoire considered appropriate for day-surgery is continuously evolving towards including more extensive procedures [1], such as laparoscopic cholecystectomies and cruciate ligament repair [2]. With the new very shortacting anaesthetic agents; such as sevoflurane, desflurane and remifentanil, the patient wake up shortly and rapidly after end of surgery and the need of supplemental analgesia may be increased [3].
1. PAIN PROBLEMS AND NEED OF POSTOPERATIVE ANALGESICS IN DAY-CARE SURGERY

We also have extensive documentation for pain as one of the major problems after day-care surgery [4, 5], other problems including nausea, vomiting, drowsiness and surgical complications [5]. In a study of Meeks [6], pain was one of the three main reasons for unplanned admission to overnight stay after day-care surgery, whereas other have reported pain as the number one reason [7]. In a study of why patients took contact with the health care system after discharge for day-care surgery, pain was the most frequent reason [8]. In our own study, 10 % of the day-care patients had medium or strong pain upon arrival in the recovery unit [9]. After discharge 24 % of our patient had medium pain for the next 24 h, whereas 10 % had strong pain. As much as 52 % had some pain interfering with normal sleep during the first post-operative night [9].

Apart from improving the patient comfort, proper pain management may also add to improved somatic health and better overall economy in day-care surgery. Analgesia may prevent untoward strains and reflex movements in the wound area, which may provoke haematoma formation and slow down wound healing [10].

On the other hand, reliable analgesia is a prerequisite of mobilization; which is important in order to prevent venous trombosis and may be crucial for joint physiotherapy and muscle training after some orthopedic procedures. Efficacious dealing with pain may also release concomitant nausea, which often accompanies pain [11]. Although extra analgesia is associated with extra drug costs, pain treatment may still result in overall cost-reduction by reducing length of recovery room stay and workload [8], as well as reducing the frequency of unplanned admissions.

2. ISSUES OF PAIN PHYSIOLOGY AND PHARMACOLOGY

Understanding of pain physiology is the basis of proper pain management in the day-care setting as well as in general. Some principles, such as the principles of pain prevention, a multilevel approach, a multimodal approach and non-opioid analgesia, are highly useful. Others, such as preemptive analgesia are controversial, although with potentials for usefulness.

The principle of pain prevention applies both to level of analgesic effect and to timing. Whereas subjective pain sensation is mainly of cerebral cortical origin, pain stimuli and humoral mediators are mediated from the peripheral area of surgical trauma and modulated at a spinal level before transmission to higher centers within the central nervous system. Thus, reducing the pain stimuli in the periphery or before entering the spinal cord is very effective, such as when a local or regional analgesic method is used. NSAIDs [12, 13] were also thought to act in the
periphery, but evidence as to central nervous system effects are increasing [14]. The opioids have strong effects in the spinal cord, but also within the brain and in the periphery [15]. Although the number of opioid receptors in peripheral tissue is low, they increase in number and importance during inflammatory stimulation [15].

Whether preventive analgesia also reduce the pain generating mechanisms with clinical effects after the drug effect has vanished, eg. preemptive analgesia, is highly controversial. There are extensive animal data showing a preemptive effect [16, 17], especially with local anaesthesia. However, only few clinical studies have been able to confirm this principle in vivo [18, 19]; most have been negative [20].

Timing is important as to tailor analgesia to be present when the analgesic effects of the peroperative drugs vanish and to ensue a rapid effect when the patient is in pain. Intravenous administration, in general, provides a fast action; although the peak effect of morphine (eg. at 5-10 min) are slower than with fentanyl and meperidine (3-5 min). With injectable NSAIDs the peak effect is slow, occurring at 15-30 min [21]. Rectal administration usually provides faster, but more unreliable action compared with the oral route. Still faster, and comparable to the iv route, may the intranasal (eg. fentanyl) and sublingual route be (eg. buprenorphine). In Scandinavia, rectal administration is much used, but patient acceptability of this method may be considerably less in other cultures [22]. However, the rectal route is available also during general anaesthesia, and may be used peroperatively in order to have analgesic effect present when the patient wakes up.

The principle of non-opioid or opioid-reducing analgesia is important because opioids have somnolescense and nausea as frequent, dosedepending side-effects [23]. This also implies to peroperative use of opioids, if too large doses of fentanyl are used close to the end of surgery, recovery may in addition be complicated by respiratory depression. Thus the use of weak, non-opioid analgesics may be beneficial even with strong pain because the need of opioid may be reduced [24].

The arguments for a multimodal approach fall into two categories [25]. First, some of the analgesics are weak and have a ceiling effect making them insufficient as monotherapy for medium or strong pain. Secondly, if different agents with analgesic effect in common, but with a different pattern of side-effects are combined, the dose of each drug may be reduced. Since side-effects usually are dose dependant, the total risk of side-effects with a multimodal low-dose approach may be lowered, whereas the analgesic effect may be additive. If the drugs act analgesic by different sites and mechanisms of action, they often have a synergistic analgesic effect when used together [26].

3. METHODS OF POSTOPERATIVE ANALGESIA

The methods of analgesic prophylaxis and treatment may be categorized as to site of application, mode of application and type of analgesic drug or principle.
The more complicated and extensive pain preventing measures, such as continuous epidural or spinal, interpleural technique or PCA are rarely used in the day-surgery setting. After all, one of the main criteria for discharge of a day-care patient is a level of pain controllable by non-injection methods [27]. However, there may be an issue for a short-lasting period of opioid or opioid+NSAID PCA after more extensive procedures in order to control initial pain [28]. This may specially be applicable if the definition of day-care is extended up to 23 h, as in the USA.

3.1. LOCO-REGIONAL ANAESTHESIA

The use of spinal or epidural anaesthesia for the surgical procedure may have important benefits in terms of excellent pain control in the initial postoperative phase where pain stimuli may be strong. Some data indicate an analgesic effect lasting for longer than the block itself [29]. Whereas the patient may be awake and non-nauseated by such a technique; the circulation instability, bed confinement and risk of urinary retention may provide extra workload for the recovery personnel [29]. Thus it is important to use shortacting agents [eg. lidocaine] for these blocks. With children, however, these problems are not a major concern and diluted bupivacaine may be used caudally for prolonged postoperative analgesia in the outpatient setting.

For the use of local anaesthetic topically, the longacting agents bupivacaine or ropivacaine (best; lower toxicity) should be used, since prolonged side-effects are not a concern. The use for wound infiltration is well documented and positive [30], whereas the beneficial use in joints and the peritoneal cavity is more disputed [31]. With other regional blocks, such as axillary plexus or ankle blocks; longacting local anaesthetics may be used without delaying discharge. However, for many procedures the pain may readily be treated with weak analgesics when a lidocaine block wears off.

3.2. NSAIDS

The NSAIDs have a «ceiling» of analgesic effect and are less efficacious than the opioids [32]. However, they do have an opioid sparing effect and may thus facilitate recovery and decrease the time to discharge after day-care surgery [32]. The potential of side-effects; such as renal failure, allergic reactions and gastric ulcer necessitates an individual evaluation of indication and dose in each patient before NSAID is given. Increased tendency of post-operative bleeding have been claimed in plastic surgery and demonstrated after tosilectomy [33], but are not well documented for other procedures [32]. The risk of gastric ulcer during a short post-operative treatment periode is probably quite different from the risk seen with chronic treatment for inflammatory diseases. The different NSAIDs have a different profile as to inhibition of cyclooxygenase type I versus type II enzyme. Naproxen, diclofenac and ibuprofen have a stronger type II inhibitory action, which may imply less interference with the beneficial physiological actions of cyclooxygenase type I [34].
Whether this should have practical clinical implications in the choice between different NSAIDs remains to be seen.

3.3. PARACETAMOL (ACETAMINOPHEN) [35]

Paracetamol acts on the cyclooxygenase enzyme by a mechanism somewhat different from the NSAIDs, and may be administered as a routine to virtually all patients, due to a low incidence of side-effects in clinical doses. In many comparative studies paracetamol have been less effective than NSAIDs, but most of these studies have been done with paracetamol in a dose less than optimal, which probably is about 1-1.5 g in adults. Whether paracetamol acts additive or synergistic to NSAIDs when given in maximum doses is not clear, but some studies suggest a «NSAID-sparing» effect of paracetamol which may be beneficial in terms of reducing side-effects [36]. The introduction of the injectable paracetamol prodrug propacetamol in recent years have increased the versatility of paracetamol.

3.4. OPIOIDS

The opioids may be divided into partial agonists and pure agonists. Whereas the former has a ceiling of effect which may make them more safe in terms of inadvertent strong sedation and respiratory depression, they still have a high frequency of nausea associated with them [37, 38]. The pure agonists are more easy to titrate and the effect versus side-effect profile seems quite similar [39]. Thus, the choice among them should be from a pharmokinetic point of view as to route of administration, onset time and duration of action. Rapid action and thus good titrability is important as minimal effective dose should always be the goal. Codeine is still the preferred opioid for oral administration due to high bioavailability (eg. about 2/3 of the dose), which is beneficial in terms of less intra- and inter-individual variation in dose-response.

3.5. NEW DRUGS AND METHODS

Basic pain science have provided us with a lot of methods very effective in experimental conditions or controlled animal studies; still waiting to be tested or proven efficacious in the postoperative setting.

Ketamin is a strong analgesic with a promising, but unconfirmed, longlasting opioidsparing effect after a 0.2 mg/kg dose in inpatient cholecystectomy [40]. At this doselevel side-effects, such as hallucinations and nausea, do not seem to be a problem.

From a theoretical point of view, corticosteroids should be efficacious inhibitors of the cyclooxygenase, thus providing analgesia at least as well as the NSAIDs. And additional advantage may be the possibility of prolonged effect from depot formulations and the absence of NSAID side-effects such as bleeding, allergy and renal toxicity. Studies of dental surgery have confirmed the promising analgesic effect of these drugs [41].

The alfa-2 agonists, such as clonidine and the more specific dexmedethomidine, have a well proven analgesic and opioidsparing effect [42]. However, reluctance as
to their use in the day-care setting comes from their sedative action and the occurrence of incidental bradycardia which may occur hours after administration [43].

An interesting new concept is the transdermal fentanyl which may be administered in a PCA-like fashion via an electronic disposable skinpad [44]. By pushing a button, a small current of iontophoresis of fentanyl into the skin is supplied when the patient feels pain.

Quite extensive research involves the use of traditional or new agents directly into the operation site or epidurally/spinally. So far, local application of local analgesia and opioid into joints after more extensive procedures seems quite established, whereas most of the other suggestions in this field should be considered experimental, so far.

SOME PERSONAL CONCLUSIONS: HOW TO I DO IT?

We do not give analgesic premedication, unless the patient have preoperative pain. Regional anaesthesia with lidocaine is used quite extensively for surgery, as well as local infiltration into the wound with bupivacaine afterwards. General anaesthesia is based on propofol induction and propofol + nitrous oxide maintenance, supplied with fentanyl at the start and alfentanil for maintenance. Intravenous NSAID (eg. ketorolac) is supplied peroperatively or by the end of the procedure to all cases where postoperative pain is expected and no contraindications are present. By the end of surgery all the patients receive paracetamol rectally. When the patient have pain during the first 1-2 postoperative hours, small titrated doses of either meperidine or fentanyl are given iv. If pain occurs later, additional NSAID or codeine+paracetamol is considered. By discharge, all the patients receive 4 paracetamol+codeine tablets (eg. recommended dose until the next morning) and a receive of 20 more tablets. All the patients receive a phone call from the anesthesiologist the day after, and further adjustments may be made.

CHALLENGES FOR THE FUTURE

We think further refinement of non-opioid analgesia and the multimodal approach is possible. At present projects with ketamine enantiomers and corticosteroids are going on in our unit. The introduction of ropivacaine may further extend the use of local infiltration, as higher doses may be used with less toxicity than bupivacaine. Pain treatment after discharge have been an area of little interest in research so far. In our experience, pain is the most important complaint after discharge and a lot more interest and vigour should be put into this phase in the future.
REFERENCES BIBLIOGRAPHIQUES