

Patient-controlled analgesia (PCA): Additions or Alternatives to Morphine

FRANÇOIS FUGÈRE MD, FRCPC

Intravenous patient-controlled analgesia (PCA) is frequently used as a means of easing postoperative pain. Morphine is the most commonly used opiate, but some patients have allergies or experience side effects, requiring the use of alternatives. Meperidine is not the best choice. It is associated with normeperidine intoxication and, if used, both the dosages and duration of administration should be limited. Hydromorphone, fentanyl and sufentanil have all been used successfully. It is recommended that alfentanil be administered by continuous infusion because it is short-acting. In comparison, none of the opiates proved to be significantly superior to the others. Morphine has been combined with ketamine, clonidine, and droperidol with mixed results, but the optimal dose of each combination is still unknown. The alfentanil-propofol combination looks promising for sedation during certain procedures.

INTRODUCTION

Since introduced in the late 1960s, patient-controlled analgesia (PCA) has become more widely used, particularly to ease postoperative pain. PCA is a technique allowing patients to give themselves a preprogrammed dose of analgesics. This method enables patients to obtain the dose they need, and thereby achieve optimal pain management. Compared to conventional analgesia, the advantages include better management of pain and greater patient satisfaction.¹ PCA primarily takes the form of intravenous administration, but it can also be done subcutaneously, epidurally, intranasally, transdermally, or with continuous nerve blocks. This article is limited to a discussion of intravenous administration.

When selecting which opiate to use for postoperative pain (including PCA), clinicians usually rely on their personal preferences and experience. Morphine remains the most widely used opiate² despite its delayed action, gradual sedation, and the release of histamine it triggers.³ Some patients, however, may have an allergic reaction or experience significant side effects with morphine, forcing the use of another opiate. Meperidine is prescribed less and less because of the side effects associated with its use, yet, it remains an alternative to morphine. Fentanyl, alfentanil, and hydromorphone, as well as, morphine-ketamine and morphine-droperidol combinations have also been used as postoperative analgesics for intravenous administration with a PCA pump. This article reviews the prescriptions for postoperative analgesia and the studies comparing the various solutions, from the standpoint of both analgesia and side effects.

**Committee for Continuing
Medical Education**
Department of Anesthesiology
University of Montreal

Pierre Drolet, MD
Chairman and Editor
Maisonneuve-Rosemont Hospital

Jean-François Hardy, MD
*Chairman of the
Department of Anesthesiology,*
University of Montreal

François Donati, MD
Maisonneuve-Rosemont Hospital

Edith Villeneuve, MD
Ste-Justine Hospital

Robert Blain, MD
Montreal Heart Institute

Normand Gravel, MD
CHUM

Robert Thivierge, MD
Vice-Dean
Continuing Education
University of Montreal

**University of Montreal
Department of Anesthesiology
Faculty of Medicine**

**Université 
de Montréal**
**Faculty of Medicine
Department of Anesthesiology**

The editorial content of *Anesthesiology
Rounds* is determined solely by the
Department of Anesthesiology of
the University of Montreal Faculty
of Medicine

**This issue and CME questionnaire
are available on the Internet
www.anesthesiologyrounds.ca**

THE DIFFERENT OPIATES

Meperidine

Meperidine is a μ -receptor agonist, a member of the phenylpiperidine family. It is 7 to 10 times less powerful than morphine when administered parenterally. Meperidine is characterized by the production of an active, potentially neurotoxic metabolite with a half-life of 15 to 40 hours.⁴ Used frequently in some places, routine administration of meperidine was called into question when cases of normeperidine intoxication in healthy patients⁵ or in those with pre-existing neurological problems⁶ began to be reported. In addition, the use of intravenous meperidine with a PCA pump was associated with a decline in neonatal neurobehavioural indicators when this analgesic was used on nursing mothers after a cesarean.⁷

Simopoulos et al⁸ carried out a retrospective evaluation of the relationship between dose and the occurrence of side-effects on the central nervous system in 355 patients receiving meperidine by PCA. The patients were divided into 4 groups based on their daily dosage and 600 mg was considered a high dose. Among the participants receiving higher doses, those with the highest doses (16.9 mg/kg, 95% confidence interval (CI), 14.7-19.2 mg/kg) showed more symptoms than those with lower doses (13.3 mg/kg, 95% CI, 12.1-14.4 mg/kg). The authors therefore suggested that 10 mg/kg a day was the maximum safe dose of meperidine for a maximum of 3 days when administered intravenously with a PCA pump. Daily evaluation, however, is necessary and patients with kidney failure should be excluded.

Plummer et al⁹ prospectively compared meperidine with morphine administering both analgesics intravenously with a PCA pump to relieve pain following major abdominal surgery. The pain when sitting, but not when resting, was significantly less in the morphine group. Meperidine was associated with poorer results in concentration tests and more mouth dryness. In conclusion, meperidine is not the first option for patients with morphine intolerance. When used, the dosage and duration of administration should be limited to avoid the side effects related to normeperidine.

Hydromorphone

Hydromorphone is approximately 7 to 8 times more powerful than morphine when administered

parenterally and its pharmacological profile resembles that of morphine.¹⁰ For almost a decade now, hydromorphone has been used for intravenous administration with a PCA pump. In 1994, Searle et al¹¹ demonstrated that PCA with hydromorphone could be superior to conventional analgesics administered after a coronary bypass. In this study, the PCA group received a continuous infusion of hydromorphone (0.1 mg/hr) with 0.2 mg bolus every 5 minutes, while the conventional analgesic group received 2.5 mg of morphine every 30 minutes as needed until the endotracheal tube was removed, followed by 1 mg/kg dose of meperidine every 4 hours. The intensity of the pain at extubation and on the third day following surgery proved to be significantly less in patients receiving hydromorphone by PCA.

Hydromorphone has also proven to be a good alternative to morphine for the relief of pain after lower abdominal surgery.¹² With a 5:1 morphine-hydromorphone dosage ratio, the analgesia was identical throughout the study. Morphine had less effect on cognitive performance, while hydromorphone resulted in a better mood.

Dunbar et al¹³ compared hydromorphone to morphine with PCA in patients who had received a bone-marrow transplant and required opiates to control severe oral mucositis. Contrary to what has been reported in the past, the equivalence ratio between morphine and hydromorphone could be 3:1 instead of 7:1 when PCA is used for an extended period.

Fentanyl

Fentanyl is a synthetic opiate in the phenylpiperidine family. It is 75 to 125 times more potent than morphine.¹⁴ Compared to morphine, it exhibits high liposolubility that explains its quick onset and brief duration of action. PCA was used for both intravenous and epidural administration¹⁵ to ease the pain during labour¹⁶⁻¹⁸ or following surgery.¹⁹ Camu et al²⁰ compared different doses of fentanyl administered intravenously with a PCA pump for postoperative pain after major abdominal surgery. The reported optimal dose was 40 μ g, with 20 μ g associated with less relief from pain and 60 μ g associated with more side effects, including respiratory depression.

Ginsberg et al² compared PCA with fentanyl (0.2-0.3 μ g/kg) and morphine (0.02-0.03 mg/kg) using different lockout intervals, namely 5 and 8 minutes

for fentanyl and 7 and 11 minutes for morphine. The pain relief was identical and few side effects were reported with either drug. Yet, the selection of opiate influenced the use of the PCA because initially a lower ratio between the number of demands and bolus administered was observed with fentanyl. The lockout interval chosen had no influence on pain or anxiety levels. Therefore, the results with PCA can be influenced by the dosage chosen, as well as, by the accumulation of active metabolites such as morphine-6-glucuronide.

Sufentanil

Sufentanil is a relative of fentanyl in the phenylpiperidine family. It is 5 to 10 times more powerful than fentanyl due to a greater affinity for μ -receptors.²¹ It is a narcotic with high liposolubility, a latency period of 1 to 2 minutes, and a quick redistribution that makes it shorter-acting than morphine.²² Sufentanil is rarely used for intravenous PCA. Lehmann et al,²³ using sufentanil for intravenous administration with a PCA pump, found good analgesia in 40 patients who had undergone major gynecological surgery. Following an average loading dose of $19.1 \pm 35.7 \mu\text{g}$, a continuous infusion of $1.15 \mu\text{g/hr}$ and bolus doses of $6 \mu\text{g}$ with a refractory period of 1 minute were used.

Ved et al²² compared sufentanil and alfentanil to morphine with intravenous PCA. No continuous infusion was used and, for morphine, sufentanil, and alfentanil, the bolus doses used were 1 mg, $2 \mu\text{g}$ and $100 \mu\text{g}$ respectively, with refractory periods of 8, 8, and 5 minutes. The number of boluses administered with sufentanil and alfentanil was 2 to 2.5 times higher than with morphine, reflecting a shorter duration of action. No significant difference was found in terms of analgesia and the occurrence of side effects.

Equivalent analgesia was reported when intravenous morphine by PCA was compared to sufentanil administered by PCA, either epidurally or intravenously.²⁴ Continuous infusion was used in both groups, specifically $8 \mu\text{g/hr}$ for sufentanil in addition to a $4 \mu\text{g}$ bolus every 6 minutes, whether administered epidurally or intravenously, and 0.5 mg/hr plus a 1 mg bolus every 6 minutes for intravenous morphine. The sufentanil, however, was faster-acting than the morphine.

TABLE 1: Characteristics of the ideal analgesic for PCA

- Instant-acting and intermediate duration of action
- High potency with no ceiling effect at small doses
- Few side effects

Coda et al²⁵ compared morphine, hydromorphone, and sufentanil administered intravenously by PCA to treat oral mucositis following a bone-marrow transplant. More patients complained of insufficient analgesia with sufentanil than with morphine or hydromorphone, but this could be due to the dose ($0.015 \mu\text{g/kg}$) or lockout interval (10 min.) used.

Alfentanil

Alfentanil is also related to fentanyl, yet, 5 to 10 times less powerful. It begins acting in 1.3 to 3 minutes and lasts for 11 to 15 minutes.²² Since alfentanil is short-acting,²² it is hardly surprising that a high-failure rate is reported for the use of PCA with alfentanil alone without infusion.²⁶

Intravenous PCA with alfentanil has been proven effective from an analgesic standpoint for the treatment of urinary lithiasis by extracorporeal shock-wave lithotripsy²⁷ and dressing changes in burn victims.²⁸

Benefits have been reported from combining morphine with alfentanil.²⁹ In a randomized double-blind study, Ngan Kee et al²⁹ compared intravenous PCA with morphine (1.5 mg dose) to a morphine (0.75 mg) – alfentanil (0.125 mg) combination to relieve postcesarean pain under spinal anesthesia. The patients receiving the combination reported an earlier onset of action and greater effectiveness after bolus administration.

DISCUSSION

In the quest for the ideal analgesic for PCA (Table 1),³⁰ it is difficult to see any significant benefits from any one of the opiates used. The pharmacological profile of hydromorphone resembles that of morphine and, at equivalent doses, the analgesia is identical and the side-effects are similar.^{12,13} Fentanyl, sufentanil, and alfentanil have the advantage of being fast-acting, but their limited duration is associated with a higher number of boluses administered.²²

TABLE 2: Intravenous PCA recommendations for different opiates

Opiate	Concentration	Loading dose	Bolus	Lockout interval	Continuous infusion
Morphine	1 mg/ml	3 - 10 mg	0.5 - 1.5 mg	6 - 8 min	0.5 - 1.5 mg/hr
Meperidine	10 mg/ml	25 - 50 mg	5 - 15 mg	6 - 8 min	not recommended
Hydromorphone	0.2 mg/ml	0.5 - 1 mg	0.1 - 0.3 mg	6 - 8 min	0.1 - 0.3 mg/hr
Oxymorphone	0.1 mg/ml	0.3 - 1 mg	0.1 - 0.2 mg	6 - 8 min	0.1 - 0.2 mg/hr
Fentanyl	20 mg/ml	30 - 100 µg	10 - 40 µg	5 - 6 min	10 - 20 µg/hr

This observation has led some experts to recommend continuous infusion, at least for alfentanil.²⁶ Further studies are necessary to determine the optimal doses that should be used.

Another study compared different opiates administered by intravenous PCA pump. Woodhouse et al³¹ compared morphine, meperidine, and fentanyl. In each of the 3 groups, most of the patients were very satisfied with the post-operative analgesia and the use of PCA. The power ratios used were 1 mg morphine = 10 mg meperidine = 0.01 mg fentanyl. There was no significant difference in the incidence of side effects with the exception of pruritus, which was higher in the morphine group. Patients who experienced vomiting and pruritus reported these effects as more intense with morphine and fentanyl than with meperidine. A consultant was unable to determine precisely which agents were used. These findings suggest that, while there may be subtle differences in patient response, no opiate proves to be significantly superior to the others.

Since no opiate has been proven clearly superior, the most important thing to do, undoubtedly, is to become familiar with an opiate by using it as often as possible as an alternative to morphine. A summary of the recommended doses of the various opiates for intravenous PCA can be found in Table 2.

COMBINATIONS

Morphine-ketamine

Administered in combination with morphine, ketamine produced conflicting results that appear related to the dose used. Javery et al³² found benefits from combining morphine and ketamine administered intravenously in a

PCA pump to ease pain following a discectomy. In comparing a morphine solution (1 mg/ml) with a morphine (1 mg/ml) – ketamine (1 mg/ml) solution, the authors observed better analgesia, a reduction in the dose of morphine used, and fewer side effects with the morphine-ketamine combination. Subsequently, Burstal et al³³ compared the intravenous administration by PCA pump of morphine (1 mg/ml) to the morphine (1 mg/ml) – ketamine (2 mg/ml) combination for relieving pain after an abdominal hysterectomy. The authors were unable to demonstrate a decline in the use of morphine when ketamine was added and a large number of patients given the morphine-ketamine combination were removed from the study due to side effects. Murdoch et al³⁴ studied the same population with PCA using intravenous morphine (1 mg/ml) or a morphine (1 mg/ml)-ketamine (0.75 mg/ml) combination as analgesic. Here too, the authors were unable to prove better relief from pain or lower morphine consumption.

Morphine-clonidine

Clonidine is an adrenergic alpha-2 agonist with analgesic properties that offer the potential of reducing the required doses of morphine.^{35,36} Using PCA, Jeffs et al³⁷ compared a bolus of morphine (1 mg) – clonidine (20 µg) to a bolus of morphine (1 mg) alone for relieving pain after lower abdominal or gynecological surgery. The quantity of morphine used was identical in both groups, but the pain was less intense during the first 12 hours with the morphine-clonidine combination. The incidence of nausea and vomiting was less during the first 24 hours and there was greater satisfaction among patients in the morphine-clonidine group.

Morphine-droperidol

Studies combining antiemetics with opiates have produced contradictory results. Munro et al³⁸ studied the incidence of nausea and vomiting in children following an appendectomy. They were unable to show any benefits from combining ondansetron or droperidol with morphine (20 µg/kg) in a PCA pump compared to just morphine. This might be due to an insufficient dose for that population. Gan et al³⁹ studied the addition of droperidol (0.16 mg) to a dose of morphine (1 mg) for intravenous administration through a PCA pump to ease the pain after major orthopedic surgery. The combination was compared to morphine alone or associated with an initial 1.25 mg dose of droperidol. The morphine-droperidol combination significantly reduced the postoperative incidence of nausea/vomiting. It made no difference, however, whether the droperidol was administered after the surgery in a single dose or mixed with morphine in the PCA pump. Moreover, the morphine-droperidol PCA combination was associated with more sedation, which led the authors to advise against its use.

Alfentanil-propofol

Alfentanil has been successfully combined with propofol for intravenous administration with a PCA pump as a sedative during colonoscopy⁴⁰ or extracorporeal shockwave lithotripsy.⁴¹ The bolus doses used for the combinations were propofol (5 mg) – alfentanil (125 µg) for the colonoscopies and propofol (0.25 – 0.8 mg/kg) – alfentanil (5-8 µg/kg) for the lithotripsies.

OTHER COMBINATIONS

Aside from ketamine, magnesium sulfate has been used in combination with analgesics to improve pain relief. It has been assessed for easing pain after major abdominal surgery. Adding magnesium or ketamine to tramadol for intravenous administration with a PCA pump significantly improves analgesia over a PCA pump with only tramadol.⁴² Tramadol is not yet available in Canada, but these combinations could eventually prove to be interesting options for treating acute pain.

CONCLUSION

When used for intravenous PCA, it is difficult to determine, generally speaking, the superiority of one opiate over another. Individual pharmacological and pharmacodynamic differences, however, may make one opiate more attractive than another one for a particular patient. Hydromorphone, fentanyl, and sufentanil are valuable alternatives to morphine and familiarity of the clinicians with each of these alternatives remains one of the most important factors to consider. Meperidine is the last choice, due to the risk of normeperidine intoxication and the need to limit doses. Alfentanil should be administered by continuous infusion because of its brief action and the combination with propofol looks promising as a sedative for certain procedures. There does not seem to be any obvious advantage to combining, in the same syringe, an antiemetic and morphine to prevent nausea. For patients with greater needs, such as those suffering from a chronic pain syndrome or drug addiction, it might be better to combine morphine with ketamine or clonidine. The optimal doses, however, remain to be determined. In the future, other drugs such as magnesium sulfate could be combined with morphine to provide, potentially, better pain-relief.

François Fugère MD, FRCPC is an anesthesiologist and a specialist in the treatment of pain at the Centre Hospitalier Universitaire de Montréal.

References

1. Langlade A. Analgésie contrôlée par le patient. Bénéfices, risques, modalités de surveillance. *Ann Fr Anesth Réanim* 1998;17(6):585-98.
2. Ginsberg B, Gil KM, Muir M, Sullivan F, Williams DA, Glass PS. The influence of lockout intervals and drug selection on patient-controlled analgesia following gynecological surgery. *Pain* 1995; 62(1):95-100.
3. Sinatra RS, Harrison DM, Sibert K, et al. A comparison of meperidine, morphine and oxymorphone for use in PCA following cesarean delivery. *Anesthesiology* 1989;70:585-589.
4. Armstrong PJ, Bersten A. Normeperidine toxicity. *Anesth Analg* 1986;65(5):536-538.
5. Kussman BD, Sethna NF. Pethidine-associated seizure in a healthy adolescent receiving pethidine for postoperative pain control. *Paediatric Anaesthesia* 1998;8(4):349-352.
6. McHugh GJ. Norpethidine accumulation and generalized seizure during pethidine patient-controlled analgesia. *Anaesth Intensive Care* 1999;27(3):289-291.
7. Wittels B, Glosten B, Faure EA, Moawad AH, et al. Postcesarean analgesia with both epidural morphine and intravenous patient-controlled analgesia: neurobehavioural outcomes among nursing neonates. *Anesth Analg* 1997;85(3):600-606.
8. Simopoulos TT, Smith HS, Peeters-Asdourian C, Stevens DS. Use of meperidine in patient-controlled analgesia and the development of a normeperidine toxic reaction. *Arch Surg* 2002;137(1):84-88.

9. Plummer JL, Owen H, Ilsley AH, et al. Morphine patient-controlled analgesia is superior to meperidine patient-controlled analgesia for postoperative pain. *Anesth Analg* 1997;84(4):794-799.
10. Mahler DL, Forrest WH Jr. Relative analgesic potencies of morphine and hydromorphone in postoperative pain. *Anesthesiology* 1975; 42(5):602-607.
11. Searle NR, Roy M, Bergeron G, et al. Hydromorphone patient-controlled analgesia (PCA) after coronary artery bypass surgery. *Can J Anaesth* 1994;41(3):198-205.
12. Rapp SE, Egan KJ, Ross BK, et al. A multidimensional comparison of morphine and hydromorphone patient-controlled analgesia. *Anesth Analg* 1996;82(5):1043-8.
13. Dunbar PJ, Chapman CR, Buckley FP, et al. Clinical analgesic equivalence for morphine and hydromorphone with prolonged PCA. *Pain* 1996; 68(2-3):265-270.
14. Castro J, van de Water A, Wouters L, et al. Comparative study of cardiovascular, neurologic and metabolic side effects of eight narcotics in dogs. *Acta Anaesthesiol Belg* 1979;30(1):55-69.
15. Glass PSA, Estok P, Ginsberg B, et al. Use of patient-controlled analgesia to compare the efficacy of epidural to intravenous fentanyl administration. *Anesth Analg* 1992;74:345-351.
16. Gavelin RJ, Janzen JA. IV fentanyl PCA during labour. *Can J Anaesth* 1992; 39(10):1116-7.
17. Nikkola EM, Ekblad UU, Kero PO, Alihanka JJ, Salonen MA. Intravenous fentanyl PCA during labour. *Can J Anaesth* 1997;44(12):1248-55.
18. Morley-Forster PK, Reid DW, Vandenberghe H. A comparison of patient-controlled analgesia fentanyl and alfentanil for labour analgesia. *Can J Anaesth* 2000;47(2):113-9.
19. Laitinen J, Nuutinen L. Intravenous diclofenac coupled with PCA fentanyl for pain relief after total hip replacement. *Anesthesiology* 1992;76:194-198.
20. Camu F, Van Aken H, Bovill JG. Postoperative analgesic effects of three demand-dose sizes of fentanyl administered by patient-controlled analgesia. *Anesth Analg* 1998;87:890-895.
21. Stahl KD, van Bever W, Janssen P, Simon EJ. Receptor affinity and pharmacologic potency of a series of narcotic analgesic, anti-diarrheal and neuroleptic drugs. *Eur J Pharmacol* 1977;46:199.
22. Ved SA, Dubois M, Carron H, Lea D. Sufentanil and alfentanil pattern of consumption during patient-controlled analgesia: A comparison with morphine. *Clin J Pain* 1989;5(Suppl 1):S63-70.
23. Lehmann KA, Gerhard A, Horrichs-Haermeyer G, et al. Postoperative patient-controlled analgesia with sufentanil : analgesic efficacy and minimum effective concentrations. *Acta Anaesthesiol Scand* 1991; 35(3):221-226.
24. Sinatra RS, Sevarino FB, Paige D. Patient-controlled analgesia with sufentanil: a comparison of two different methods of administration. *J Clin Anesth* 1996;8(2):123-9.
25. Coda BA, O'Sullivan B, Donaldson G, Bohl S, Chapman CR, Shen DD. Comparative efficacy of patient-controlled administration of morphine, hydromorphone, or sufentanil for the treatment of oral mucositis pain following bone marrow transplantation. *Pain* 1997;72(3):333-46.
26. Owen H, Currie JC, Plummer JL. Variation in the blood concentration/analgesic response relationship during patient-controlled analgesia with alfentanil. *Anaesth Intensive Care* 1991;19(4):555-560.
27. Chin CM, Tay KP, NG FC, et al. Use of patient-controlled analgesia in extracorporeal shockwave lithotripsy. *Br J Urology* 1997;79(6):848-851.
28. Sim KM, Hwang NC, Chan YW, Seah CS. Use of patient-controlled analgesia with alfentanil for burns dressing procedures: a preliminary report of five patients. *Burns* 1996;22(3):238-41.
29. Ngan Kee WD, Khaw KS, Wong EL. Randomised double-blind comparison of morphine vs morphine-alfentanil combination for patient-controlled analgesia. *Anaesthesia* 1999;54(7):629-633.
30. Mather LE, Owen H. The scientific basis of patient-controlled analgesia. *Anaesth Intensive Care* 1988;16:427-447.
31. Woodhouse A, Hobbes AF, Mather LE, Gibson M. A comparison of morphine, pethidine and fentanyl in the postsurgical patient-controlled analgesia environment. *Pain* 1996;64(1):115-21.
32. Javery KB, Ussery TW, Steger HG, et al. Comparison of morphine and morphine with ketamine for postoperative analgesia. *Can J Anaesth* 1996; 43(3):212-215.
33. Burstal R, Danjoux G, Hayes C et al. PCA ketamine and morphine after abdominal hysterectomy. *Anaesthesia and Intensive Care* 2001;29(3):246-251.
34. Murdoch CJ, Crooks BA, Miller CD. Effect of the addition of ketamine to morphine in patient-controlled analgesia. *Anaesthesia* 2002;57(5):484-8.
35. Benhamou D, Narchi P, Hamza J, et al. Addition of oral clonidine to postoperative patient-controlled analgesia with i.v. morphine. *Br J Anaesth* 1994;72:537-540.
36. Park J, Forrest J, Kolesar R, et al. Oral clonidine reduces postoperative PCA morphine requirements. *Can J Anaesth* 1996;43:900-906.
37. Jeffs SA, Hall JE, Morris S. Comparison of morphine alone with morphine plus clonidine for postoperative patient-controlled analgesia. *Br J Anaesth* 2002; 89(3):424-427.
38. Munro FJ, Fisher S, Dickson U, et al. The addition of antiemetics to the morphine solution in patient controlled analgesia syringes used by children after an appendectomy does not reduce the incidence of postoperative nausea and vomiting. *Paediat Anaesth* 2002;12(7): 600-603.
39. Gan TJ, Alexander R, Fennelly M, Rubin AP. Comparison of different methods of administering droperidol in patient-controlled analgesia in the prevention of postoperative nausea and vomiting. *Anesth Analg* 1995;80(1): 81-5.
40. Roseveare C, Seavell C, Patel P, et al. Patient-controlled sedation and analgesia, using propofol and alfentanil, during colonoscopy: a prospective randomized controlled trial. *Endoscopy* 1998;30(9):768-773
41. Taillly GG, Marcelo JB, Schneider IA, Byttebien G, Daems K. Patient-controlled analgesia during SWL treatments. *J Endourology* 2001; 15(5):465-471.
42. Unlugenc H, Gunduz M, Ozalevi M, Akman H. A comparative study on the analgesic effect of tramadol, tramadol plus magnesium, and tramadol plus ketamine for postoperative pain management after major abdominal surgery. *Acta Anaesthesiol Scand* 2002;46(8):1025-1030.

Upcoming Scientific Meetings

7-9 November 2003

Pediatric Anesthesia Conference

Toronto, ON

CONTACT: Lawrence Roy, MD

Tel: 416 813-7445

Fax: 416 813-7543

Email: office@anaes.sickkids.on.ca

13-16 November 2003

American Society of Regional Anesthesia and Pain Medicine Annual Fall Meeting on Pain

San Diego, CA

CONTACT: Gwen Wright

Tel: 804 282-0010

Fax: 804 282-0090

Email: asra@societyhq.com

5-7 December 2003

17th Annual Anesthesia and Critical Care Conference

Chicago, IL

CONTACT: CME University of Chicago

Tel: 773 702-1056

Fax: 773 702-1736

Email: mgoldber@uchicago.edu

Web site: <http://dacc.uchicago.edu/CME>

Change of address notices and requests for subscriptions to *Anesthesiology Rounds* are to be sent by mail to P.O. Box 310, Station H, Montreal, Quebec H3G 2K8 or by fax to (514) 932-5114 or by e-mail to info@snellmedical.com. Please reference *Anesthesiology Rounds* in your correspondence. Undeliverable copies are to be sent to the address above.

This is an English translation of the original French article.

This publication is made possible by an educational grant from

Organon Canada Limited