In conclusion, this study demonstrated that the use of selective spinal anaesthesia (SSA) as an alternative to propofol for the maintenance of GA for short-duration outpatient gynaecological laparoscopy was associated with shorter times to achieve certain milestones of recovery. Future studies need to address the safety of bypassing the PACU after SSA and the feasibility of performing other surgical procedures with SSA.

References


Analgesic efficacy of tramadol 2 mg kg$^{-1}$ for paediatric day-case adenoidectomy

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We studied the analgesic efficacy of tramadol 2 mg kg$^{-1}$ for post-operative analgesia after day-case adenoidectomy in children aged 1-3 yr. Eighty children were allocated randomly to receive tramadol 2 mg kg$^{-1}$ i.v. or placebo immediately after induction of anaesthesia. Anaesthesia was induced with alfentanil 10 μg kg$^{-1}$ and propofol 4 mg kg$^{-1}$ followed by mivacurium 0.2 mg kg$^{-1}$ for tracheal intubation. Anaesthesia was continued with sevoflurane in nitrous oxide and oxygen. All children were given ibuprofen rectally at approximately 10 mg kg$^{-1}$ before the start of surgery. Post-operative pain and recovery assessments were performed by a nurse blinded to the analgesic treatment using the Aldrete recovery score, the pain/discomfort scale and measurement of recovery times. Rescue medication (pethidine in increments of 5 mg i.v.) was administered according to the pain scores. A post-operative questionnaire was used to evaluate the need for analgesia at home up to 24 h after operation. Rescue analgesic at home was rectal or oral ibuprofen 125 mg. Children in the tramadol group required fewer pethidine doses than those in the placebo group ($P=0.014$). Forty-five per cent of children receiving tramadol did not require post-operative analgesia at all compared with 15% of children receiving placebo ($P=0.003$). Recovery times and the incidence of adverse effects were similar in the two groups in the recovery room and at home. The requirement for rectal ibuprofen at home did not differ between groups.


Keywords: analgesia, paediatric; pain, post-operative; anaesthesia, day-case; analgesics opioid, tramadol

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Pain is a common sequela after adenoidectomy both in hospital and at home. Commonly, intraoperative non-steroidal anti-inflammatory drugs (NSAIDs) or paracetamol are used to control post-operative pain, but their analgesic effect is often insufficient. Opioids provide effective analgesia but fear of their side-effects, especially respiratory depression, emesis and sedation, have restricted their use in day-case anaesthesia.

Tramadol has a low affinity for opioid receptors but also exerts its effect by direct modulation of central monoaminergic pathways. In children over 1 yr, tramadol was well tolerated and an effective analgesic after operation, with adverse effects similar to those of other opioids. Because of its negligible effect on respiration, it may offer an advantage over traditional opioids for relief of post-operative pain in day-case surgery. Although tramadol has been used extensively in the adult surgical population, its role in paediatric day-case surgery, especially in the 1–3 yr age group, remains to be evaluated further. Therefore, we designed this double-blind, placebo-controlled parallel-group study to determine the efficacy of tramadol 2 mg kg\(^{-1}\) as an adjuvant to a traditional dose of rectal ibuprofen (10 mg kg\(^{-1}\)) for post-operative pain control after day-case adenoidectomy in small children. We especially sought to evaluate its effect on the speed and quality of recovery.

**Methods and results**

After obtaining approval from the local hospital ethics committee and written informed consent from parents, we studied 80 children, ASA I–II, aged 1–3 yr, undergoing day-case adenoidectomy. No premedication was used. General anaesthesia was induced with i.v. alfentanil 10 \(\mu\)g kg\(^{-1}\) and lidocaine 10 mg followed by propofol 4 mg kg\(^{-1}\) and mivacurium 0.2 mg kg\(^{-1}\). According to a computer-generated table of random numbers, each child was allocated randomly to receive i.v. either tramadol 2 mg kg\(^{-1}\) (Tramal; Grünenthal GmbH, Germany) diluted in 2 ml of saline \((n=40)\) or placebo (saline 2 ml) \((n=40)\) during a 10 min period immediately after tracheal intubation. Both study drugs were prepared and administered by a nurse who did not otherwise participate in the care of the child. All patients were also given rectal ibuprofen 125 mg (approximately 10 mg kg\(^{-1}\)) before the start of surgery. Anaesthesia was maintained with 2–4% sevoflurane and 70% nitrous oxide in oxygen with controlled ventilation. Standard monitoring was used throughout anaesthesia.

In the recovery room, the recovery of the children and the need for rescue analgesia were assessed by a trained nurse who was blinded to the analgesic treatment used. Pain was assessed using the three objective components (crying, movement and agitation) of the pain/discomfort scale of Hannallah and colleagues, each variable scoring 0–2 points (best to worst). If the child was in pain (pain score >3), i.v. pethidine was administered in increments of 5 mg every 5 min until the child was comfortable. The time to administering the first dose and the total amount of analgesic needed were recorded. Any post-operative adverse effects were recorded. Recovery of the child was assessed with the Aldrete scoring system and by measuring predetermined recovery times. The criteria for discharge were: fully awake, stable vital signs for at least 30 min, no bleeding, no signs of excessive pain, no vomiting, and able to ambulate according to age.

At home the rescue analgesic was always rectal or oral ibuprofen 125 mg, which was supplied to the parents upon discharge. The parents of the children were asked to record, using a post-operative questionnaire, the well-being (pain, use of ibuprofen, vomiting, tiredness, sleep) of the child at home until 24 h after anaesthesia. Analyses were performed using Students’ \(t\)-test, the Mann–Whitney \(U\)-test and the \(\chi^2\) test as appropriate. Values are expressed as mean (sd) and 95% confidence interval or number (%). \(P<0.05\) was considered significant. Group size was calculated on the basis of detecting a 30% decrease in pethidine consumption, to give 80% power and significance of 0.05. A minimum of 38 patients was required in each group.

The two groups were comparable in age, weight, duration of anaesthesia and surgery. The mean (sd) rectal dose of ibuprofen was 10.1 (1.6 and 1.7) mg kg\(^{-1}\) in the tramadol...
and placebo groups respectively. Children in the tramadol group required fewer pethidine doses than those in the placebo group \( (P=0.014) \) (Fig. 1). Eighteen (45%) children receiving tramadol did not need a rescue analgesic as opposed to 6 (15%) receiving placebo \( (P=0.003) \). Seven (18%) children receiving tramadol and 17 (43%) children receiving placebo needed at least two doses of pethidine post-operatively \( (P=0.005) \). The mean (SD) dose of pethidine administered was 4.12 (5.1) mg kg\(^{-1}\) in the tramadol group versus 6.6 (3.9) mg kg\(^{-1}\) in the placebo group \( (P=0.002) \). Aldrete recovery scores and all recovery times were similar in the two groups (Table 1). Post-operative airway problems (desaturation, laryngospasm) occurred in an equal number of patients in the two groups. One child (3%) receiving tramadol vomited in the recovery room. At home ibuprofen was given to 22 (59%) and 28 (74%) children in the tramadol \( (n=37) \) and placebo \( (n=38) \) groups respectively (not significant). Vomiting occurred in five (15%) children with tramadol and two (5%) children with placebo (not significant). There were no differences between groups in drinking ability, tiredness, bad temper or quality of sleep.

**Comment**

Because of its relative lack of sedative action and respiratory depression, tramadol has been a subject of keen interest as an alternative to traditional opioids for post-operative pain control. However, in many adult studies, data on the efficacy and optimal dose of tramadol in producing adequate pain relief after surgery have been conflicting. Fewer studies have been done in the paediatric population, in which it has been shown to be beneficial for post-operative pain control when administered in varying doses and by different routes.2 3 5

The recommended dose of tramadol for children is 1–2 mg kg\(^{-1}\) three or four times daily (package insert). We chose to use 2 mg kg\(^{-1}\) as this dose has been shown to be more efficacious than 1 mg kg\(^{-1}\), with no increase in adverse events.3 Forty-five per cent of the children in our study who received tramadol did not need a rescue analgesic in the recovery room. However, although this difference was significant compared with placebo, 55% of the children still required additional analgesia in the immediate recovery period. In adults, the optimal initial dose of tramadol would appear to be 3 mg kg\(^{-1}\) for acute pain of moderate to severe intensity. The pharmacokinetics of i.v. tramadol in children has only recently been investigated, and it appears that children require the same body weight-related doses as adults.6 Therefore, it is possible that children also need a higher initial bolus dose of tramadol for effective pain relief. Whether higher doses of tramadol improve analgesia without increasing adverse events in the paediatric population warrants further investigation.

Although 55% of the children receiving tramadol still needed pethidine in the recovery room, the total amount of pethidine required was significantly reduced compared with the placebo group. Only 18% of children in the tramadol group required at least two doses of pethidine compared with 43% in the placebo group. This opioid-sparing effect of tramadol and its apparent lack of sedative effect may have been the reason for the equally rapid recovery in both study groups and, in our opinion, emphasizes the advantage of tramadol in day-case surgery.

The overall incidence of adverse events with tramadol in the 1–3 yr age group was low. Even the concomitant use of another opioid (alfentanil) during anaesthesia in our study, which would have been expected to increase the opioid effects of tramadol, did not delay the return of spontaneous ventilation or increase post-operative vomiting compared with placebo. Our findings are in accordance with the study by Bösenberg and Ratcliffe, who reported a similar low incidence of post-operative nausea and vomiting in older children with tramadol 2 mg kg\(^{-1}\).3 These investigators also demonstrated only minor respiratory depression with tramadol during spontaneous ventilation with halothane.3

Eighty-five per cent of the children who received only rectal ibuprofen needed additional pethidine doses in the recovery room. The low efficacy of ibuprofen in providing analgesia may have been partly a result of the slow absorption of rectal ibuprofen or an inadequate dose in some children. However, our findings confirm that NSAIDs alone are often unable to provide sufficient analgesia after adenoidectomy even when given intravenously during surgery.1 In this respect, the intraoperative administration of tramadol may offer a useful addition to post-operative pain control after surgery.

Because of the comparatively long elimination half-life of tramadol (6.4 h) and its metabolite M1 (10.6 h) in children,6 we expected it to reduce the need for analgesia at home. However, although the number of children given ibuprofen at home during the first 24 h after surgery was lower in the tramadol group (59% versus 74% in the placebo group) the difference did not reach statistical significance. The incidence of children requiring analgesia at home is consistent with the findings of Nikanne and colleagues1 on post-operative pain after adenoidectomy, and confirms the importance of regular analgesic treatment on the first few days after surgery.

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Reduced haemostatic factor transfusion using heparinase-modified thrombelastography during cardiopulmonary bypass

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We set out to determine if the heparinase-modified thrombelastogram using anticoagulated blood from patients during cardiac surgery could guide treatment with haemostatic components. In 60 patients a simple algorithm predicted a possible 60–80% decrease in the use of haemostatic components. In a second series, 30 patients were allocated to receive components using this intra-operative algorithm and 30 using clinical criteria and laboratory-based tests. Ten patients in the clinical group received a total of 16 units of fresh frozen plasma and nine platelet concentrates compared with five patients transfused with five units of fresh frozen plasma and one platelet concentrate in the algorithm group. Twelve-hour chest tube losses [algorithm group 470 (295–820) ml, clinically managed group 390 (240–820) ml (median, quartile values)] were not different between groups despite the threefold reduction in the use of haemostatic products, showing that intra-operative monitoring of coagulation in the anti-coagulated patient can be used to guide treatment.

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surgery, cardiac; blood, coagulation

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Haemostatic blood components contribute significantly to the overall transfusion burden in patients having major surgery and especially cardiac surgery. The thrombelastogram measures the rate and strength of clot formation.1 Initiation of clot formation is defined as the reaction or r-time and the strength of the clot by the maximum amplitude of the trace. During cardiopulmonary bypass, the heparinase-modified thrombelastogram will develop despite anticoagulation with heparin in doses of 300 IU kg⁻¹ and gives the same results as those obtained using blood when heparin has been antagonized with protamine.2

Previous reports3 4 have described algorithms that reduce the need for haemostatic blood component therapy and re-exploration. However, these studies waited until microvascular bleeding occurred before starting testing and intervention.

In this pilot study we investigated the predictive value and use of an algorithm using thrombelastogram measurements made during heart surgery using anticoagulated blood. The principal end-point for efficacy was reduced total exposure to haemostatic component therapies.

**Methods and results**

We studied two groups of 60 patients, who gave consent to the study. Ten per cent of the patients in each group had a heart transplantation and were taking aspirin and/or...