Clinical Practice

Complications of continuous epidural infusions for postoperative analgesia in children

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To determine the incidences of side effects and complications associated with the use of epidural analgesia for infants and children at the Alberta Children's Hospital, we reviewed our experience over a two-year period. A database was established for recording management, side effects and complications of each epidural, and this is a retrospective review of that database. Problems were identified as complications if there was a need for medical intervention related to the patient complaint, and if the intervention was documented in the patient record. Continuous epidural analgesia with bupivacaine 0.125% or bupivacaine 0.1% with epinephrine was used for managing postoperative pain in 190 children with mean age 5.6 yr (range 1 mo to 18 yr) and the mean weight 22 kg (range 4–88 kg). Mean duration of the epidural infusions was 4.7 days (range 1–16 d). In 127 patients, 203 complications were recorded. Complications, in order of frequency, were nausea and vomiting (23% of patients), motor blockade (15.8% of patients), oversedation (6.3% of patients), and pruritus (5.2% of patients). Four patients had complications which were potentially related to toxic effects of, or resistance to, bupivacaine, and serum levels of bupivacaine were measured at 3.86, 5.5, 2.1 and 2.34 $\mu g \cdot ml^{-1}$. Early discontinuation of the epidural occurred in 41 cases, technical problems with the epidural catheter being the commonest reason (21 cases). Although three potentially serious complications were identified (one catheter site infection, one seizure, one respiratory depression) none was associated with lasting consequences. The majority of complications associated with the use of epidurals were minor and easily remedied. With increased experience using continuous epidurals, technical problems should diminish and consistency and reliability of the technique should improve.

Nous déterminons l'incidence des effets secondaires et des complications associées à l'analgésie épidurale chez les bébés et les enfants à l'hôpital pédiatrique d'Alberta en revoyant notre expérience sur une période de deux ans. Des données de base avaient été définies et enregistrées pour l'installation, les effets secondaires et les complications de chaque épidurale. Nous faisons une étude rétrospective de ces données. Les complications s'identifient par la nécessité d'une intervention médicale en rapport avec une plainte du patient à condition qu'elle soit documentée dans le dossier du patient. On a utilisé une analgésie épidurale continue avec de la bupivacaïne 0,125% ou 0,1% adrénalinée pour traiter la douleur post-opératoire chez 190 enfants d'âge moyen de 5,6 ans (1 mois à 18 ans) et de poids moyen de 22 kg (4–88 kg). La durée moyenne de la perfusion épidurale est de 4,7 jours (1 à 16 jours). Deux cent trois complications sont enregistrées chez 127 patients. Par ordre de fréquence, les complications sont les nausées et vomissements (23% des patients), le bloc moteur (15,8% des patients), la sédation exagérée (6,3% des patients) et le prurit (5,2% des patients). Quatre patients ont manifesté des complications en rapport avec la possibilité d'une intoxication ou d'une résistance à la bupivacaïne, et les niveaux sériques de la bupivacaïne ont été mesurés à 3,86, 5,5, 2,1 et 2,34 $\mu g \cdot ml^{-1}$. Un arrêt précoce de l'épidurale s'est produit pour 41 cas, la raison la plus commune étant des problèmes techniques avec le cathéter épidural. Bien

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que trois raisons potentiellement sérieuses aient été identifiées (une infection au site du cathéter, une convulsion, une dépression respiratoire), aucune n'a été responsable de séquelles. La majorité des complications associées à l'épidurale continue sont mineures et traitées facilement. Avec une expérience accrue de l'épidurale continue, les problèmes techniques devraient diminuer, tandis que l'efficacité et la fiabilité de cette technique devraient s'améliorer.

Epidural opioids and local anaesthetics are now used in a number of centres for the management of postoperative pain in children, but the acceptable frequency of complications is unknown. Until recently, the management of postoperative pain in children has been based on the intermittent administration of parenteral opioids. It is widely accepted that this approach does not provide optimum analgesia. Parenteral opioids provide improved tolerance of pain, but they do not eliminate the experience of pain. Because of limitations, complications and side effects associated with the use of parenteral opioids, epidural analgesia has become an attractive alternative therapy for the treatment of postoperative pain.

There are very few descriptions of complications associated with the use of epidural bupivacaine combined with fentanyl in children. Previously documented problems associated with the use of epidural opioids in children include nausea and vomiting, urinary retention, and pruritus.[1-5] In particular, delayed respiratory depression has been reported after the administration of a single dose of morphine into the epidural space.[6] With the development of narrow gauge catheters, epidural infusions are commonly used to provide continued analgesia into the late postoperative period, thereby introducing additional potential hazards associated with the prolonged presence of an epidural catheter and infusions of bupivacaine or fentanyl. Recently, convulsions have been described as a manifestation of toxicity secondary to the continuous infusion of bupivacaine.[7] Bupivacaine toxicity has also been described secondary to continuous caudal epidural infusions.[8] Venous air embolism has been described in an infant during placement of an epidural catheter under general anaesthesia,[9,10] and a complication of common peroneal nerve palsy has been described in association with epidural analgesia.[11] Although some of these more serious complications are being reported as individual case reports, the broad spectrum of complications associated with the use of continuous epidural analgesia in children has not been documented. This review, therefore, identifies complications which we have encountered in our use of epidural infusions in children for management of postoperative pain in the ward environment.

Methods

In July 1990, an acute pain service was set up at the Alberta Children's Hospital incorporating the use of continuous epidural infusions. From the initiation of the service, a database was established and any side effects or complications of treatment were recorded. This report is a retrospective review of all problems identified with patients who were treated with continuous epidural analgesia over the first 18 mo of the service.

When epidural analgesia has been contemplated for any child, it has been our practice to discuss preoperatively our plan with the surgeon. Verbal consent from the parents and, if appropriate, the child is obtained. Patients considered suitable for the placement of epidural catheters are those who would be expected to experience moderate to severe pain in thoracic, lumbar, or sacral dermatomal distribution, lasting more than 24 hr.

With the exception of one epidural catheter used for the treatment of reflex sympathetic dystrophy, all epidural catheters were used for postoperative care and were inserted immediately after the induction of anaesthesia but before the start of surgery. Using betadine solution for preparation, 20G (without stylet) or 24G (with stylet) epidural catheters (Preferred Medical Products®, Thorold, Ontario) were inserted, using an aseptic technique. Intraoperative use of the epidural medications varied according to the nature of the surgery and the preferred onset time, intensity, and duration of intraoperative blockade.

All epidural catheters were secured by looping the catheter at the entry site and covering with a clear plastic dressing (Tegaderm®). They were then routed either over the shoulder or around to the abdomen, and fixed to the skin with either plastic or cloth tape (Hypafix®). A butterfly steel needle (Terumo® number 25 or 27 gauge) was used to connect the catheter to the infusate tubing. The butterfly needle was shielded with a plastic cover, it was placed on a gauze sponge, and then fixed to the skin on the abdomen or chest with a plastic dressing (Tegaderm®), as recommended by McIntyre and Kuwahara.[12]

A continuous epidural infusion was commenced in the postoperative recovery area, using a standardized initial solution of either bupivacaine 0.125% with epinephrine 1:400,000, or bupivacaine 0.1% with 1:500,000 epinephrine, both containing fentanyl 1 $\mu g \cdot ml^{-1}$. Preparation of a standardized solution in a standardized bag was established as the responsibility of the Pharmacy Department. Initial rate of the epidural infusion depended on the site and nature of the surgical procedure but with a maximum of 0.5 $ml \cdot kg^{-1} \cdot hr^{-1}$.

All children who had epidurals *in situ* were nursed on one of several designated wards where the nursing

- All pain management orders are to be written by Anaesthesia.
- Patient is receiving a Continuous Epidural Infusion as follows:
  Bupivacaine __%, with Epinephrine _____ in Normal Saline.
  Fentanyl _____mcg/ml.
  Reservoir is _____ mls.
  Rate is _____ mls/hr (maximum = 20 mls/hr).
- Pump Security Code is 123.
- Orders valid for _____ days.
- Maintain IV with heplock. Flush with 1 ml Heparin (10 i u/ml) Q12H.
- Hypoventilation:
  MILD: Administer oxygen and notify Anaesthesia.
  SEVERE: have available NALOXONE
  (Narcan) _____. (5 micrograms/kg) for IV PUSH.
  Call CODE 99.
- For nausea and/or vomiting:
  Dimenhydrinate _____ mg (_____ mg/kg) I.V.,
  P.O. or P.R. Q4H, P.R.N. (multiples of 12.5 mg)
- In and out Urinary Catheter x 3, P.R. N. for Urinary Retention.
- Glycerin Suppository x 1, P.R.N. if no BM by day 3 post-op.
- Tylenol _____ mg (10 - 15 mg/kg), P.O. or P.R., Q4H,
  P.R.N. (oral-multiples of 10 mgs, rectals-multiples of 30 mgs)

FIGURE 1 Standardized postoperative orders used for children receiving continuous epidural analgesia.

staff had received training in the management and complications associated with epidural infusions. Postoperative orders were standardized (Figure 1). They included instructions for treating nausea or vomiting, urinary retention, and respiratory depression. Nursing observations included routine pulse, blood pressure, respiratory rate, and temperature q15 min × one hour, q30 min × two hours, hourly for 24 hr and then two hourly for the duration of the epidural infusion. Nurses were also requested to check the insertion site with each shift change. Children were assessed at least twice daily by a non-physician member of the pain service (KK) and by a designated physician of the anaesthetic department. The anaesthetic staff person carried out any necessary alterations to the epidural prescription and was responsible for the management of related problems. When analgesia could appropriately be managed using simple oral preparations, the epidural was discontinued.

From July 1, 1990, the date of initiation of the postoperative pain service, a database was established detailing patient age and weight; the nature of surgery; the size of epidural catheter; the duration of the epidural infusion; changes in the prescription; complications related to catheter use, solutions, or surgical care; days on the service; and reasons for unplanned discontinuation of the epidural infusion.

The database records of all children who had received an epidural infusion over an 18 mo period (July 1, 1990 to December 31, 1991) were reviewed and the complications were noted. Categories of surgery for which epidural analgesia was used were grouped by specialty (Table I), complications were identified by frequency (Table II), reasons for early discontinuation of epidurals were specified (Table III), and rates of occlusion and leak by catheter size were correlated (Table IV).

TABLE I Categories of surgery for which epidural analgesia was used, grouped by speciality

Urological surgery	90
Abdominal surgery	49
Orthopaedic surgery	44
Thoracic surgery	6
Gynaecological surgery	2
Chronic pain	1
Total	190

Problems associated with epidural analgesia were identified as complications if there was a need for medical intervention related to the patient complaint, and if the intervention was documented in the patient record. This may have been simply an adjustment to the rate or formulation of the epidural infusion (e.g., for excessive motor block), or specific treatment for a complication, such as an antiemetic for nausea. Any epidurals that were discontinued prematurely for reasons not associated with a complication were identified, along with the specified reason.

An epidural was identified as having a site infection if the insertion site manifested erythema, swelling, and discharge, whether or not the patient was febrile.

When patients were identified as having signs or symptoms suggestive of bupivacaine toxicity (such as tremor, irritability, or seizure), blood was collected and centrifuged, and serum was stored at −20°C until analysis for total bupivacaine concentration using HPLC, according to the technique of Ha.[13]

Results

The records of 190 children who received continuous epidural analgesia were examined. Categories of surgery for which epidural analgesia was used were grouped by specialty (Table I), complications were identified by frequency (Table II), reasons for early discontinuation of epidurals were specified (Table III), and rates of occlusion and leak by catheter size were correlated (Table IV). One epidural was used to supplement the management of a child with reflex sympathetic dystrophy and this epidural was inserted in the operating room under sedation. All others were used to assist with the management of post procedural pain, and were inserted under general anaesthetic, as previously described.

Figure 2 shows the numbers of children in different age groups who were treated with epidurals. The mean

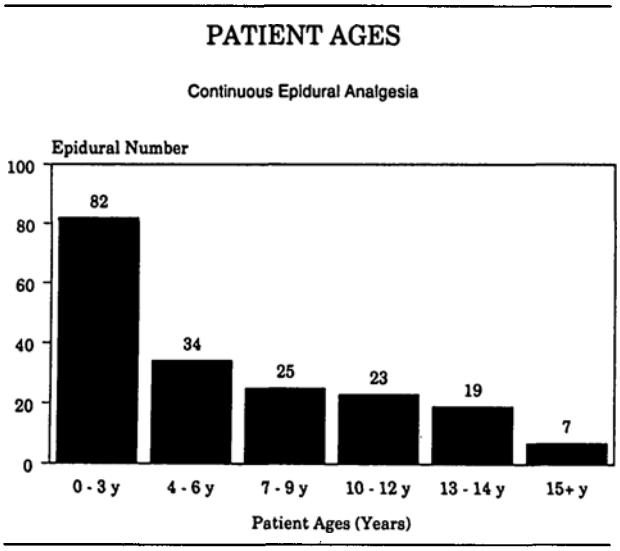

FIGURE 2 Age distribution of children for whom continuous epidural analgesia was used.

age of the children was 5.6 yr (range 1 mo to 18 yr) and the mean weight was 22 kg (range 4–88 kg). The mean duration of the epidural infusions was 4.7 days (range 1–16 days).

In 127 of the 190 epidurals, 203 complications were recorded (Table II). These complications led to the early discontinuation of the epidural infusion in 41 cases. Another four epidurals were abandoned because of early inadequacy of analgesia, and six were discontinued early for other reasons (surgical request, parental request, or unrelated medical problems). Table III shows the reasons necessitating early discontinuation of the epidural and change to an alternative form of analgesia. Table IV shows the frequency of catheter occlusion and leakage with different-sized epidural catheters.

One patient had an epidural catheter which was difficult to remove. To avoid excessive tension on the catheter during removal, the catheter was injected with radio-opaque dye, and it was removed uneventfully under fluoroscopic control.

Four patients had complications which were initially suspected as potentially related to the use of bupivacaine. Their complications are described as follows:

1 One two-year-old, 13-kg girl had a lumbar epidural catheter placed for the management of postoperative pain after surgery for ureteral reimplantation. She was initially started on an epidural continuous infusion containing bupivacaine 0.125% with epinephrine 1:400,000 and fentanyl 1 $\mu g \cdot ml^{-1}$ at 5 $ml \cdot hr^{-1}$, and she experienced some jitteryness (manifested as a spontaneous, unelicited startle response which occurred while the child was sleeping or resting, and involuntary tremor while awake) on day 2. On day 3, her pain control was poor. The infusion was stopped for four hours, and a suppository containing belladona and opioid was given. After an additional four hours, a 5 ml epidural bolus of the previously infused solution

TABLE II Complications related to the usage of continuous epidural analgesia for all patients, using both 24G and 20G epidural catheters

	Number	%
Nausea and vomiting	44	23.2
Local erythema	34	17.9
Motor block	30	15.8
Leak at catheter site	24	12.6
Catheter occlusion	17	8.9
Urinary retention	12	6.3
Over-sedation	12	6.3
Pruritus	10	5.3
Jitteriness	5	2.6
Skin erythema/breakdown	5	2.6
Suspected tachyphylaxis	4	2.1
Local infection	1	0.5
Seizure	1	0.5
Respiratory depression	1	0.5
Pump failure	1	0.5
Horners syndrome	1	0.5
Cracked filter	1	0.5
Total	203	

TABLE III Reasons identified for premature discontinuation of epidural catheters

Leak at catheter site	16
Catheter occlusion	4
Inadequate analgesia	4
Local erythema	2
Motor block	2
Local infection	1
Seizure	1
Jitteriness	1
Skin breakdown	1
Tachyphylaxis	1
Over-sedation	1
Cracked filter	1
Parental request	1
Surgeon's request	1
Inappropriate ward	1
No *iv* access	1
Diarrhoea	1
Pyrexia? cause	1
Total	41

TABLE IV Rates of occlusion and leakage with different sized epidural catheters

Catheter size	*Number*	*Occlusions*	*Leaks*
20G	64	1 (2%)	11 (17%)
24G	126	16 (13%)	13 (10%)

was given, and the infusion was restarted at 5 ml · hr^{-1}. That evening (11 hr later), she was uncomfortable and was given an epidural bolus of 5 ml. When she did not respond with relief of pain, blood was collected for bupivacaine analysis, and the epidural catheter was removed. Tachyphylaxis to bupivacaine (not catheter migration) was the suspected cause of inadequate analgesia, because of the increasing requirements with only partial response to bolus administration. Analysis of her serum demonstrated a bupivacaine concentration of 3.86 μg · ml^{-1} (the safe range in adults is believed to be 2–4 μg · ml^{-1}).[14]

2 A 1.5-yr-old, 10 kg boy had ureteral reimplantation, after which he received continuous epidural analgesia using bupivacaine 0.125% with epinephrine 1:400,000 and fentanyl 2 μg · ml^{-1} at a rate of 5 ml · hr^{-1}. On the second postoperative day he became drowsy and would not interact with his environment. The fentanyl was removed from the solution, and blood was collected for bupivacaine analysis. His drowsiness improved. Bupivacaine 0.125% at 5 ml · hr^{-1} was continued and he demonstrated restlessness, but good analgesia. Although his serum bupivacaine concentration was 5.5 μg · ml^{-1}, his drowsiness was presumed to be secondary to fentanyl.

3 A 1.6-yr-old, 12.5 kg boy had surgery for ureteral reimplantation. Continuous epidural analgesia was commenced, using a solution containing bupivacaine 0.125% with fentanyl 1 μg · ml^{-1} at a rate of 6 ml · hr^{-1}. On the first postoperative day, he was febrile, with a temperature of 39.2°, during which he experienced a self-limiting tonic/clonic convulsion lasting <30 sec. The epidural infusion was immediately discontinued, and blood was collected for analysis. The serum bupivacaine concentration was 2.1 μg · ml^{-1}, higher than levels recorded in earlier series of epidural infusions in children[6] but was in the same range as reported after an epidural bolus without any signs of toxicity.[5] The convulsion was presumed to be febrile in origin.

4 A one-year-old, 10 kg boy who underwent surgery for ureteral reimplantation received continuous infusion epidural bupivacaine 0.125% with fentanyl 1 μg · ml^{-1} at a rate of 5 ml · hr^{-1}. He subsequently had the epidural rate decreased to 4 ml · hr^{-1}. On the fourth postoperative day, following multiple episodes of discomfort related to bladder spasms, intravenous access was lost. The epidural was stopped, because of the ineffectiveness of the analgesia and the lack of venous access. Blood was collected for analysis of bupivacaine to determine retrospectively whether a toxic serum level of bupivacaine had been achieved, and narcotic analgesics and acetominophen were used for pain control. The serum bupivacaine concentrate was 2.34 μg · ml^{-1}.

One patient was suspected of having developed a catheter site infection of a lumbar epidural site after three days, diagnosed by insertion site erythema, swelling, and purulent discharge. On removal of the catheter, the discharge was cultured, and intravenous cloxicillin was administered. The culture report identified Corynebacterium species, and coagulase-negative Staphylococci. The child remained constitutionally well.

There was, in addition, one case of short-lasting respiratory difficulty in a 14-mo-old child after nephrectomy, and this was identified as respiratory depression in the medical record. On the first postoperative day, this child's oxygen saturation decreased to levels of 85% as measured on a pulse oximeter. The sleeping child was aroused easily, and asked to sit up. He was administered oxygen by mask, but no supplemental medications were given. His monitored oxygen saturation improved and his respiratory rate remained consistent at 20–30 per minute. The epidural prescription remained unchanged, and it was continued uneventfully for another three days.

Discussion

The Pain Service at the Alberta Children's Hospital was established in July 1990, incorporating the use of opioid infusions, patient-controlled analgesia, continuous epidural infusions, and peripheral nerve blocks for the management of postoperative pain on designated general wards. The service was, and continues to be, supervised by medical staff from the Department of Anaesthesia, assisted by the multidisciplinary Pain Service Committee which assists in establishing standards for teaching, drug preparation, and clinical intervention by nurses.

In this series, the commonest surgical categories for which children received continuous epidural analgesia were urological surgery (mostly ureteric reimplantation), and abdominal surgery (including Nissen fundoplication and surgery for imperforate anus). Epidural analgesia was considered to be appropriate for use in these groups because these children required prolonged postoperative analgesia, their postoperative treatment incorporated the use of a urinary catheter, and they generally fell into the younger age groups for whom patient-controlled analgesia was not suitable.

This report documents the frequency of complications of epidural analgesia in 190 patients, using continuous infusion bupivacaine with fentanyl. Although 67% of patients who received epidural infusions experienced one or more complications, the majority of these were comparatively minor and easily managed. Complications that could be considered potentially serious occurred in three patients (one seizure, one case of respiratory depression, one severe insertion site infection). None of these complications resulted in either short- or long-term patient

disability. The commonest problems necessitating a change to an alternative form of analgesia involved technical problems with the epidural catheter (in 21 out of 41 discontinuations). In this type of review, we are unable to determine whether this technical problem is related to either the diameter of catheter used or a lack of familiarity with the skills required in using this form of analgesia.

The most frequent complication experienced was nausea and vomiting, occurring in 23% of patients. This is comparable to earlier series in which epidural morphine was used (22–40%)[2,4] and compares with an overall incidence of nausea and vomiting of 25% in children after surgery. It is also consistent with the frequency with which nausea and vomiting has been previously described in children under two years of age who have undergone abdominal (31%) and orthopaedic (23%) procedures.[15] We did not see a higher incidence of nausea and vomiting than that which would be expected for similar surgery using alternative analgesia.

Motor blockade occurred in 15.8% of our patients, and has been viewed as a serious problem because of the potential for patients to develop pressure sores. While only one patient developed a pressure sore of unknown origin on the bottom of her heel, 2.6% of our patients did develop red patches which were treated with sheepskin blankets, heel protectors or Tegaderm dressings, as indicated. Accordingly, we continue to treat motor blockade aggressively by either adjusting solution concentration, adjusting epidural rate, or stopping the infusion until motor function returns.

Many of the patients in our series had undergone urological procedures and had urinary catheters *in situ*. The frequency of occurrence of urinary retention in this series is, therefore, not a reasonable reflection of the expected frequency of urinary retention in uncatheterized patients who have epidurals in place.

Oversedation occurred in 6.3% of patients, and has been attributed to accumulation of fentanyl. For that reason, it has been treated by reducing either the epidural rate or the concentration of fentanyl in the solution, consistently with acceptable results.

The occurrence of pruritus in patients receiving epidural opioids is well described but incompletely understood. It may be relieved by the administration of antihistamines, naloxone, or nalbuphine. Previous reports of the use of epidural morphine in children have documented a frequency of pruritus of 20 to 89%.[2,4,16] In one of these series, pruritus occurred even when epidural local anaesthetic agents alone were administered.[2] Although many of the children in our series were too young to voice any complaints of itching, the attending staff were attentive to the needs of any child who appeared to be scratching excessively. Nevertheless, the incidence of treated pruritus in this series was low (5.2%). This may reflect our use of fentanyl, which produces less histamine release than morphine, although previous comparisons of different epidural opioids in Caesarean section patients have failed to show a difference between fentanyl and morphine.[17,18]

Jitteryness occurred in 2.6% of patients, manifested as a spontaneous, unelicited startle response which occurs while the child is sleeping or resting, and involuntary tremor while awake. In one of these patients, a high serum concentration of bupivacaine suggests that this complication could have been a manifestation of a toxic effect of bupivacaine, but a direct causal relationship has not been established. The addition of epinephrine to the epidural solution may have contributed to the tremor experienced by these patients, through its effects on heart rate and sympathetic receptors, but no laboratory confirmation of this possibility is available.

We have been concerned about the potential risk of respiratory depression associated with the epidural administration of fentanyl. Respiratory depression in one of our patients may have resulted from either the systemic effect of fentanyl or rostral migration of fentanyl through the cerebrospinal fluid to the respiratory centre in the medulla. Fentanyl is lipophilic, and is thus less likely to spread cephalad; however, high cervical cerebrospinal fluid fentanyl concentrations have been demonstrated within ten minutes of lumbar epidural administration.[19] In adults, decreased ventilatory response to carbon dioxide (with no changes in resting tidal volume, expired minute volume, end tidal CO_2, or respiratory rate) has been demonstrated with an epidural infusion of 1 $\mu g \cdot kg^{-1} \cdot hr^{-1}$ of fentanyl.[20] It is important to note that this change in CO_2 response occurred within one hour of the start of the infusion and then remained constant. It is more likely that the episode of respiratory depression which we have described occurred as a result of fentanyl and not the bupivacaine. It is unclear, however, whether respiratory depressant effects of fentanyl are from systemic effects or from the direct effects of fentanyl in the cerebrospinal fluid on the respiratory center.

Initial experience of respiratory complications associated with epidural opioids in children was described after the use of caudal epidural morphine. It was suggested on the basis of this experience that the risk of respiratory depression was greater in patients <12 mo old and when additional parenteral opioids had been given.[21] In our patients, epidural morphine was not used. Parenteral opioids were not given during the use of epidural opioids. The maximum dose of fentanyl administered in our series was 0.5 to 1 $\mu g \cdot kg^{-1} \cdot hr^{-1}$. We acknowledge that respiratory depression is likely an infrequent com-

plication (i.e., <1:1000) associated with the use of epidural opioids, and that the small numbers in our series are insufficient to identify accurately the magnitude of risk.

Technical problems with catheters are related to size, flexibility, tensile strength, and hole placement. The most common reasons for premature discontinuation of epidural infusions were technical problems with the catheters; the most frequent cause was leakage of solution around the entry site of the catheter. Leakage at the catheter site generally presented as bubbles of solution under the Tegaderm dressing. This occurred with 17% of the 20G catheters, which were "multiorifice" catheters with no "end-hole"; and 10% of the 24G epidural catheters which were "end-hole" only catheters (Table IV). Catheter occlusion, on the other hand, was a problem more commonly related to the use of 24G epidural catheters. With each type and size of catheter, there are advantages and disadvantages associated with their use.

Summary

Epidural infusions have previously been shown to provide good postoperative analgesia in children, and the infusions are associated with a minimum of haemodynamic complications.[1-6] We report the use of continuous epidural analgesia for postoperative pain relief in children for 18 mo in 190 patients. The high frequency of complications associated with the use of this analgesic modality necessitates close follow-up of patients and regular daily visits for evaluation and monitoring of success. We have attempted to provide, on the basis of our early experience, an indication of expected complications and side effects associated with the use of continuous epidural analgesia in children, using catheters of varying size and an epidural solution starting with bupivacaine 0.125% containing epinephrine 1:500,000 and fentanyl 1 $\mu g \cdot ml^{-1}$ infused up to a rate of 0.5 $ml \cdot kg^{-1} \cdot hr^{-1}$. The majority of complications associated with the use of epidurals are straightforward and easily remedied. With increased experience in the use of continuous epidurals, technical problems may diminish, and consistency and reliability of the technique should improve.

The establishment of a database from the initiation of our pain service has permitted us to review easily the complications which we have encountered in managing patients with continuous epidural analgesia. Those individuals contemplating initiation of an epidural service for children should take into account their ability to monitor and deal with the complications which we have identified.

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