Two in one: patient-controlled epidural analgesia (PCEA) to prevent erection and control pain in adult hypospadias-surgery patients

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SUMMARY. Following penile surgery, erections are painful and may prejudice the result, because the sutures may not withstand a rigid erection. Therefore, prevention of erection and management of pain are extremely important following hypospadias repair, especially in adult patients. In this prospective study, we aimed to achieve these goals by using an epidural block with patient-controlled analgesia. We allocated 20 adult patients scheduled for hypospadias repair randomly either to receive or not to receive epidural analgesia. Postoperative pain was scored according to a standardised scoring system, based on a 10 point visual analogue scale. In group I (n= 10), analgesia was provided by a 3 ml h⁻¹ continuous infusion of fentanyl (2 µg) and bupivacaine solution (0.125%) in 1 ml saline via an epidural catheter for the first 3 days. Patient-controlled epidural analgesia was administered with an additional 5 ml of the same solution when the pain score was high (> 4). After 3 days, fentanyl was excluded from the treatment protocol, and analgesia was maintained with bupivacaine (0.125%). In group II (n = 10, control group), an epidural catheter was not inserted, and analgesia was maintained with pethidine (1 mg kg⁻¹). Pain management was found to be more effective in group I. No erections occurred in group I, but the erection rate in group I! was mean ± s.d. = 1.7 ± 0.2. The differences were found to be statistically significant (P <0.05). We highly recommend the technique described here, which offers efficient analgesia and control of erection in adult hypospadias patients. © 2002 The British Association of Plastic Surgeons

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Hypospadias is one of the most common congenital anomalies in boys. Numerous surgical procedures have been described to correct the deformity, depending on its severity, with a variety of single and two-stage operations recommended. Patient factors, such as pulling out the catheter, urinary obstruction and blocked catheter, erections, straining due to constipation and interference with dressings, negatively influence the surgical outcome following hypospadias surgery. The most common complications after hypospadias surgery vary according to the technique, but may be summarised as follows: fistula formation (3%–15%), stricture formation (7%–16%), infection (3%) and haematoma (4%).

Primary or secondary hypospadias is commonly seen in adult patients in developing or underdeveloped countries. Fistula formation is one of the most common complications after hypospadias repair, with a reported incidence of 3%–15% for all forms of hypospadias. Postoperative erection seems to be one of the most significant causes of fistula formation in adults, and so prevention of erection remains an important challenge after hypospadias surgery in adults.

In recent years, advances in anaesthesia have extended into the fields of chronic pain and the control of pain in labour. However, acute pain, and in particular postoperative pain, has received less attention. Acute pain is an extremely complex sensation that extends beyond simple nociceptor input, the central processing of which is modulated strongly by emotive elements, such as fear, anxiety or depression, and by previous experience of pain. Assessment of the severity of the pain is difficult, and may require complex multi-dimensional scoring techniques.

The goal of postoperative pain management is to provide continuous effective analgesia that is safe and free of side effects. Patient-controlled analgesia, which permits the patient to self-administer small doses of opioid analgesic intravenously or epidurally at frequent intervals, often provides more effective and sustained analgesia after major surgery.

The aim of this prospective study was to examine the effectiveness of a pain and erection control regimen called patient-controlled epidural analgesia (PCEA) in adult hypospadias-surgery patients. PCEA was provided by a portable device, and the patient injected himself when he felt pain or an impending erection. In order to evaluate the effectiveness of this approach, we monitored erections and recorded the pain reported by the patients. PCEA was used successfully to control postoperative pain and erection.

Patients and methods
After approval from the institutional ethical committee and written informed parental consent we included 20 consecutive primary hypospadias patients in this prospective study. Their ages ranged from 15 years to 21 years.
(mean ± s.d. = 18.3 ± 1.2 years). Physical examination revealed distal penile hypospadias in six patients, mid-shaft hypospadias in eight patients and proximal hypospadias in six patients. While the patients with distal hypospadias were managed by the flip-flap technique, those with more proximal hypospadias were managed by the use of a preputial island flap. No additional medication was prescribed to any patient, and all procedures were carried out under general anaesthesia.

An epidural catheter was inserted prior to the induction of general anaesthesia in all patients. The catheter was inserted using an 18 gauge Touhy needle (Braun, Melsungen AG, Germany) at the L3–L4 or L4–L5 level. The catheter was pushed to the upper level, checked with a test dose of 3 ml prilocaine (Citanest, Eczacibasi, Turkey) in 2 ml saline solution and secured with a suture.

The patients were allocated randomly into two groups, one of which received epidural analgesia while the other did not. In group I, the patients had an epidural catheter and were given the medications described in the protocol (see below). In group II, the patients were given pethidine (Aldolalan, Liba, Turkey) at a rate of 1 mg kg⁻¹ for pain control. If more analgesia was needed, the same dose of pethidine was repeated after 4 h.

Protocol

**Group I.** To provide analgesia in the early postoperative period, 5 ml bupivacaine (0.125%) (Marcaine, Abbott, Turkey) and 50 μg fentanyl (Fentanil, Abbott, Turkey) in 10 ml saline solution was administered 15 min before the end of the operation. Analgesia and prevention of erection were maintained by a continuous infusion of 2 μg fentanyl mixed with 0.125% bupivacaine in 1 ml saline solution at a rate of 3 ml h⁻¹. However, PCEA was also administered, with an additional 5 ml of the same solution, in patients who felt erection or had a visual analogue pain score of greater than 4. Fentanyl was included from the protocol after 3 days, and bupivacaine infusion was continued for a further 4 days. When more analgesia was required, more bupivacaine, by way of PCEA, was added by the patients themselves. For this purpose, the lockout time of the PCEA device was 30 min, and the maximum dose was 30 ml in 4 h.

Nocturnal erections were monitored by the 'stamp test' and clinical observation every 3 h. Stamps measuring 1.5 × 1 inch were wrapped around the penis. If the stamps were broken along the perforations, it was assumed that an erection had occurred.

The quality of analgesia was assessed in the postoperative period by a visual analogue scale, on which pain was graded from 0 to 10 (Table 1). Patients were asked to rate the severity of pain at regular time intervals according to this scale. The severity of pain and the rate of erections were monitored at intervals of 2 h for the first 3 days, and four times a day thereafter. Monitoring was continued for 7 days. Analgesia was administered with the PCEA device (Abbott, Chicago, IL, USA), and each patient was trained in its use so that he could prevent pain and erection by himself. All patients in both groups were monitored by pulse oximetry in the postoperative period. Oxygen (4 L min⁻¹) was administered if arterial oxygen saturation fell below 93%.

Postoperative recordings also included side-effects, such as nausea, vomiting, hypotension, pruritis, respiratory depression, urine retention and motor blockage in the lower extremity. At the end of the study, the tips of the epidural catheters were sent for bacteriological analysis.

**Group II.** No catheter was inserted in this group. Pethidine was given intramuscularly at a rate of 1 mg kg⁻¹ for pain control. The same dose was repeated 4 h later if necessary. The severity of the pain and the rate of erection were monitored as in group I.

### Statistical analysis

The daily mean pain scores were evaluated separately for each patient in group I. These values were compared with the control group for each day of the study using Student's t-test. Data were evaluated using SPSS v. 10.0 (SPSS Inc. Co, Chicago, IL, USA), and P < 0.05 was considered statistically significant.

### Results

All of the patients used the PCEA device without difficulty. They were allowed to mobilise on the second postoperative day by handling the portable PCEA device.

The pain scores of all patients in both groups were compared for each postoperative day. The differences between the groups were statistically significant on all days except the seventh (P < 0.05). Figure 1 shows the results as daily mean values for each group.

No erections were observed in the patients in group I, but the daily erection rate in group II was mean ± s.d. = 1.7 ± 0.2. This difference is statistically significant (P < 0.05).

In group II, one patient experienced wound dehiscence, which required secondary repair. In addition, fistulae were

<table>
<thead>
<tr>
<th>Pain score</th>
<th>Degree of pain</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–2</td>
<td>none</td>
</tr>
<tr>
<td>3–4</td>
<td>minimal, needs no medication</td>
</tr>
<tr>
<td>5–6</td>
<td>needs medication</td>
</tr>
<tr>
<td>7–8</td>
<td>severe</td>
</tr>
<tr>
<td>9–10</td>
<td>extremely severe</td>
</tr>
</tbody>
</table>

![Figure 1](attachment:image.png)
both the patients and the surgeons. Minor complications uneventfully, although minor strictures developed in both patients 6 months later.

The surgical results were judged to be satisfactory by both the patients and the surgeons. Minor complications due to the epidural block included nausea (one patient), vomiting (one patient) and hypotension (two patients). Pruritis and respiratory depression were not seen during the follow-up period. All the complications occurred in the early postoperative period and lasted until the end of the first postoperative day. During epidural blockade, a decrease in peripheral oxygen saturation necessitating oxygen supply was not observed in the treatment group.

Microbiological examination of the catheter tips revealed no positive cultures.

Discussion

Hypospadias repair is best done in early childhood, usually in a single operation and with few, if any, complications. However, hypospadias repair in adulthood differs from that in childhood because of the problems of unwanted erections and pain. Prepubertal boys and adult men have between three and eight nocturnal erections during REM sleep.

Uncontrolled nocturnal erections can place excessive tension on the repair site, which will subsequently interfere with successful wound healing. Therefore, erection is one of the most important factors leading to complications following hypospadias surgery in adults. There are several suggestions for preventing postoperative erections in the literature. Oestrogens may hinder erections, but are unacceptable because of their possible thromboembolic effects. Orally administered chlorpromazine has been tried without convincing effect. The administration of high doses of antiandrogens, in the form of cyproterone acetate 300 mg daily, started at least 10 days preoperatively, has been reported to be helpful in preventing postoperative erections. If this regime proves to be inadequate, desipramine, up to 150 mg daily, has been suggested as a worthwhile adjunct. It has a more rapid onset of effect, but the effective dose may lead to anticholinergic side effects. As a further measure, it is also possible to use a sharp icy blast from a can of freeze spray, kept in a locker, to reverse unwanted erections. Johansen et al reported using noradrenaline, given as a continuous intracavernous injection by a microinfusion pump, in 20 patients. They concluded that this is effective in preventing nocturnal erections. However, most of these treatments can have side-effects related to the drugs.

The technique described here is simple, practical and extremely effective, without significant side effects or complications. Since we did not observe any erections during the blocking period in the treatment group, we conclude that epidural block is an effective and promising method of preventing erection. Moreover, epidural analgesia with bupivacaine may reduce blood loss and improve surgical conditions during hypospadias repair. However, the hospitalisation period lasts longer than with other techniques, which is the most important drawback of this method. This disadvantage must be balanced against the decreased complication rate following surgery.

The concept of PCEA may be regarded as a simple closed-loop system. Moreover, pain is an internal subjective experience, and therefore patients are best able to decide whether the degree of analgesia is adequate. If further analgesia is required, PCEA allows patients to assume control of their analgesia administration without the need for nursing intervention and with no delay in re-establishing analgesia. The amount of the anaesthetic agent delivered can be controlled by the patient himself using this technique. The patients are allowed to mobilise early in the postoperative period.

Nocturnal erections have been variously measured using mercury strain gauges, stamps and sophisticated instrumentation that measures penile tumescence and rigidity continuously during sleep. In this study, we used the stamp test because it is a simple, safe and efficient way of monitoring.

The rationale for combining opioids (fentanyl) and local anaesthetics (bupivacaine) is that these two types of drugs eliminate pain at two distinct sites, the local anaesthetic at the nerve axon and the opioid at the receptor site in the spinal cord. PCEA may improve analgesia, patient satisfaction and safety compared with the epidural technique using bolus administration or infusion. Since the elimination, distribution and absorption of the agent may vary from patient to patient and the same concentration of an agent can cause different responses in different tissues, it is hard to standardise the amount of the anaesthetic agent. PCEA can overcome these problems and can also prevent anxiety arising from the fear of pain, since the patients control their pain themselves with a simple injection. We obtained excellent results in the early postoperative period in this respect. The patient could be mobilised earlier, and patient satisfaction was superior to other techniques. The complication rate decreased significantly.

In conclusion, the technique described here can effectively prevent postoperative erections and control the acute postoperative pain in adult hypospadias-surgery patients.

References


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