PREVENTION OF POSTOPERATIVE PAIN BY BALANCED ANALGESIA

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SUMMARY
Fourteen patients undergoing colorectal surgery received an intraoperative afferent neural block with combined intrathecal and extradural local anaesthetics plus a balanced postoperative low-dose regimen of extradural bupivacaine 10 mg h⁻¹—morphine 0.2 mg h⁻¹ and systemic piroxicam 20 mg/24 h. Postoperative pain, assessed repeatedly during the initial 48 h, was prevented during rest, mobilization from the supine to the sitting position and during walking, in all but one patient; slight pain was observed intermittently during coughing in four patients.

KEY WORDS

METHODS AND RESULTS
We studied 14 patients (four male), mean age 69 yr (range 42–80 yr), mean body weight 68 kg (range 47–98 kg) and mean height 166 cm (range 156–179 cm) undergoing colorectal surgery. All patients had a low midline incision, extended above the umbilicus during right hemicolectomy and when the splenic flexure had to be mobilized (six patients). All patients were ASA group I or II, without signs of endocrine disease. Patients with symptoms of infection within 2 weeks before operation or history of drug or alcohol abuse were not included. Informed consent was obtained and the study was approved by the local Ethics Committee.

On the evening before surgery and 1 h before surgery, the patients received piroxicam 40 mg by mouth. On the following two days, piroxicam 20 mg was administered rectally each morning. All patients received diazepam 5–10 mg by mouth as premedication. Before induction of anaesthesia, ephedrine 25 mg was given i.m., with increments of 5–10 mg i.v. during operation if the systolic arterial pressure decreased to less than 70 % of the value before operation. An extradural catheter was inserted at a level of T9–T12, depending on the site of operation and tested with 0.75 % bupivacaine 2 ml. In order to obtain a continuous spinal anaesthesia during the operation, a spinal catheter (Portex 18-gauge) was inserted at L3–4 and 5 % lignocaine 2 ml injected in order to provide sensory analgesia from T4 to S3. If
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necessary, incremental doses of lignocaine 25 mg were injected to obtain this level. Seven millilitre of 0.75% plain bupivacaine plus morphine 2 mg was then injected extradurally, followed by continuous extradural infusion of a mixture of 0.25% bupivacaine plus morphine 0.05 mg ml\(^{-1}\), 4 ml h\(^{-1}\) for 48 h using a Pharmacia Deltec pump. During operation, 5% lignocaine 0.5 ml was given every 45 min and 0.75% bupivacaine 4 ml every 60 min in the spinal and extradural catheters, respectively. The spinal catheters were removed at the end of surgery.

General anaesthesia was induced with thiopentone and maintained with 0.2–1% enflurane and nitrous oxide with oxygen. Tracheal intubation was facilitated with suxamethonium; no muscular blocking agents or systemic opioids were administered subsequently.

Pain scores on a four-point scale (no pain, mild pain, moderate pain, and severe pain) at rest, during cough and mobilization from the supine to the sitting position and during walking, and levels of sensory analgesia (pinprick bilaterally) and motor block on a scale (Bromage) 0 = no paralysis, to 3 = total paralysis were assessed 4, 8, 12, 24, 30 and 48 h after surgical incision by two of the authors. After operation, morphine 5 mg i.v. was given if requested by the patient. All patients had a bladder catheter inserted during surgery and subsequently for 48 h.

Blood samples for analysis of cortisol (radioimmunoassay) and glucose (glucose oxidase method) were taken before induction of anaesthesia, at surgical incision and 1, 4, 8, 24 and 48 h after surgical incision.

Changes in plasma cortisol and glucose concentrations were evaluated by Friedman's two-way analysis of variance. \( P < 0.05 \) was considered statistically significant.

Mean duration of surgery was 168 min (range 105–330 min). Administration of i.v. fluid (isotonic saline) amounted to 3400 ml (range 1500–5800 ml). Total mean dose of ephedrine was 57 mg (range 30–95 mg).

All patients were totally pain free during the initial 48-h postoperative period at rest, except one patient who had slight pain at two assessments (fig. 1). During cough three patients had slight, and one moderate, pain at six assessments. During mobilization in bed from the supine to the sitting position, all patients were pain free from 4 to 48 h after skin incision, except one patient with intermittent slight or moderate pain at 8, 30 and 48 h, and one patient with slight pain at 8 h. Walking was not possible 8 h after skin incision in one patient and at 24 h in another because of residual motor block (1–2 on the Bromage scale) and not at 12 h in two because of dizziness, in one with drainage and three with bluntness. Four patients walked pain free at from 4 to 8 h after skin incision. From 24 to 48 h, 11 patients were pain free during normal walking, but the three remaining patients who were pain free could not walk freely without assistance because of dizziness or drainage. None of the patients had muscular paralysis (0 on the Bromage scale) 24 h after the surgical incision.

Only one patient, a 42-yr-old man weighing 98 kg and with an extended supra-umbilical incision, received additional analgesics (morphine 5 mg on one occasion) during the 48-h period after operation. This was the patient who had slight pain during rest and slight to moderate pain during cough and mobilization.

Mean level of sensory analgesia was T3–S5 before operation. Sensory analgesia decreased slightly during the first days after operation, and 48 h after operation 12 patients had maintained sensory analgesia (mean level T6–T11), but two
patients had no detectable sensory analgesia to pinprick.

There was no significant change in plasma concentration of cortisol: mean 369 (SEM 22) nmol litre$^{-1}$ before operation compared with a maximum of 517 (83) nmol litre$^{-1}$ after operation. Plasma concentrations of glucose increased after induction of anaesthesia and before surgery, from 4.5 (0.2) to 5.3 (0.3) mmol litre$^{-1}$, values remaining increased ($P < 0.05$) throughout the study.

One patient developed a post-dural puncture headache; no other complications related to anaesthesia or postoperative analgesia were observed.

**COMMENT**

In the present study, complete pain relief during rest and mobilization, but not during cough, was achieved with a regimen of low-dose extradural bupivacaine plus morphine and systemic non-steroid anti-inflammatory agent (piroxicam) in almost all of the 14 patients studied during major abdominal surgery.

There may be several explanations for the success of this regimen. Preinjury neural block by nerve section or local anaesthesia has been shown to reduce post-injury pain hypersensitivity in experimental studies [4]. If confirmed in humans, these findings may suggest that reduction of post-injury pain hypersensitivity by effective intraoperative neural block may facilitate postoperative pain relief. Another explanation may be the concomitant use of a non-steroid anti-inflammatory agent which may have an additive or synergistic analgesic effect with the extradural analgesic regimen.

The regional anaesthetic regimen prevented the normal increase in plasma cortisol. This has not been observed before during colonic surgery [6] and suggests that the regimen provides good afferent block. The increase in plasma glucose observed before surgery may have been caused by ephedrine, although such an effect would not be expected to continue long into the postoperative period.

The reduced demand for analgesics with preservation of pain relief may be important in reducing side effects and thereby the need for postoperative surveillance. The concept of balanced analgesia may have an important impact on postoperative convalescence and morbidity, and warrants further study.

**REFERENCES**


