

Incisional Administration of Local Anesthetic Provides Satisfactory Analgesia following Port Access Heart Surgery

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ABSTRACT

Aim of the study: To evaluate the new method of postoperative pain relief following port access (PA) heart surgery.

Methods: Patients scheduled for PA heart surgery under cardioplegic arrest were enrolled in the study. At the end of the operation an epidural catheter was placed in the surgical wound. Analgesia was started with a bolus of 20 mL 0.75% ropivacaine through the catheter followed by 0.15% ropivacaine administered via patient control analgesia pump. Metamizol was also given to the patient every 12 hours intravenously (IV), and, in the case of inadequate analgesia, the rescue analgetic piritramid IV was used. The variables recorded were the visual analogue scale (VAS), the number of bolus applications of local anesthetic, and the number of bolus applications of rescue analgetic piritramid.

Results: The pain control at the end of the operation was satisfactory with all patients who were extubated on the table. In the first 24 hours the mean VAS pain score was 2.5, the number of bolus applications of local anesthetic was 2.0, and the number of applications of rescue medication was 1.5. There were no wound infections related to the catheter and no complications related to local anesthetic.

Conclusion: The incisional administration of local anesthetic provides satisfactory pain control after PA heart surgery.

INTRODUCTION

As surgeons looked toward less invasive surgical techniques, endoscopic heart operations were developed [Vanermen 1998]. This new surgical approach requires modification of the anesthetic technique. A minor tissue injury occurring during an operation can lessen an organism's stress response to an operation [Grossi 1999], ensuring greater hemodynamic stability after the operation [Glomer 1998]. Postoperative pain with classic heart surgeries is alleviated by large doses of opioid analgetics, which cause undesired side effects such as respiratory depression, vomiting, and proneness to fainting. These effects prolong the time of intubation, arti-

cial ventilation, time in the intensive care unit (ICU), and time of hospitalization. Less invasive surgical techniques offer faster extubation following the operation due to less postoperative pain.

Wound infiltration with local anesthetic (LA) and placement of an epidural catheter in the surgical wound is not a new technique for providing pain relief in other medical fields [Vintar 2002, Bay-Nielsen 1999, Pettersson 1999, Erichsen 1995], but the procedure has not been used for cardiac operations. Placing a catheter in the surgical wound enables the application of LA continuously and also allows for the application of boluses.

The aim of our study was to find out if satisfactory postoperative pain relief can be achieved with incisional administration of LA.

METHODS

Sixty-eight patients underwent cardiac operations using the video-directed technique at our hospital between November 2002 and January 2004. All patients extubated on the operating table were enrolled in the study after approval was received from the Slovenian Committee on Medical Ethics. All procedures were performed by the same surgeon and anesthesiologist. Types of procedures are listed in Table 1; demographic data and perioperative characteristics are given in Table 2.

The patients were admitted to the hospital with preoperative evaluation completed 1 day before the planned surgery. For the operation, intravenous anesthesia with ultra-short-acting opioid remifentanyl and anesthetic propofol were used. Muscle relaxation was achieved with vecuronium. The patients were intubated with a double lumen tube and transesophageal echocardiography (TEE) was used. After the incision, the right lung was deflated and 1-lung ventilation was initiated. To establish cardiopulmonary bypass (CPB), the standard cannulas for the port-access technique were used, and for heart protection cold-blood antegrade cardioplegia was employed. The patients were cooled to 29°C. Before the discontinuation from CPB, the patients were actively rewarmed to 37°C. At the end of procedures, anesthetics were switched off. The reversal of muscle relaxation was confirmed with the use of a relaxometer.

Before closing the surgical wound (the length of the skin incision was 2.5-3 cm), a multihole epidural catheter (Portex clear G 18 epidural catheter with three lateral eyes; Smith's Medical, Kent, UK) was placed between the muscles alongside the wound through a Touhy needle inserted at a distance

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Table 1. Type of Procedure*

MVR or PVM	26	47.2%
MVR or PVM+PVT	24	43.8%
ASD	3	5.4%
Tumor removal	2	3.6%

*MVR indicates mitral valve replacement; PVM, mitral valve repair; PVT, tricuspid valve repair; ASD, atrium septal defect.

of 4-5 cm from the wound. The catheter was tunneled 4-5 cm subcutaneously by the surgeon, sutured, and firmly secured to the skin with sterile transparent dressing. By use of an antiseptic technique, the catheter was connected to the PCA.

Ten milliliters of 0.75% ropivacaine was administered through the catheter, and all other smaller surgical wounds on the thorax and in the groin were infiltrated with 10 mL of 0.75% ropivacaine as well. Continuous infusion of 0.15% ropivacaine was started after the patient was admitted to the intensive care unit (ICU). Fifteen minutes after the last stitch was made, patients were extubated on table if they fulfilled the extubation criteria (Table 3). Otherwise they were reintubated with a single lumen tube, transferred to the ICU, and excluded from the study.

In the ICU, the analgesia was supplemented with metami-zol IV on a regular basis. Intensity of the pain in the ICU was evaluated with visual analogue scale (VAS) score (0 = no pain, 10 = worst pain imaginable), which was recorded every 4 hours for the first 24 hours. If the VAS pain score was greater than 3, and the pain had maximum intensity in the area of catheter, a bolus of 5 mL 0.15% ropivacaine was given. However, if pain originated somewhere else, a bolus of 3 mg of rescue analgetic piritramid, a potent opioid analgetic with a hypnotic effect, was given IV. The number of boluses of ropivacaine and piritramid were recorded. The side effects of local anesthetic were recorded as well.

In case any signs of wound infection appeared, the tip of the catheter was sent for microbiological analysis. In addition, we randomly chose 10 catheter tips and sent them for microbiological analysis.

STATISTICAL ANALYSIS

Descriptive statistics are reported as mean and standard deviation (SD).

Table 2. Demographic Data and Perioperative Characteristics*

Age, y	61±12.09
Sex, M/F	18/37
ASA	2.8±0.52
Euroscore	5±2.2
CPB time, min	146.7±37
Cross clamp time, min	87.6±24.3

*Data are mean ± standard deviation where appropriate. ASA indicates American Society of Anesthesiologists; CPB, cardiopulmonary bypass.

Table 3. Extubation Criteria*

Criteria	Suitability for Extubation
Hemodynamics	MAP 60-70 mm Hg, heart rate 50-90 beats/min, low inotropic support, no sign of myocardial ischemia
Ventilation	Spontaneous breathing, rate 10-18, tidal volume ≥8 mL/kg
Consciousness	Ability to obey simple command
Muscle strength	Ability to lift head, reversal of muscles relaxation confirmed with relaxometer
Body temperature	37.0 < 36.0
VAS	> 3

*MAP indicates mean arterial pressure; VAS, visual analogue scale.

RESULTS

Of 68 patients, 55 were extubated in the operating room and enrolled in the study. Descriptive statistics are reported as mean and standard deviation (SD).

Pain Assessment

The median VAS scores and median numbers of bolus applications of LA and piritramid in the first 24 hours are reported in Table 4. The mean VAS score was 2.5. The mean number of bolus applications of LA was 2.0 (10 mL) and the mean number of bolus applications of rescue analgetic piritramid was 1.5 (4.5 mg).

Side Effects

We did not observe any side effects that could be related to LA or the catheter placed in the wound.

Complications

In one patient the catheter was cut when removal was attempted, and the tip of the catheter was left in the wound. With consent of the patient, the remains were left in place without intervention. The wound healed completely uneventfully and as of this writing has caused no trouble.

Microbiological Analysis of Catheter Tips and Wound Healing

No catheter tips were sent for a microbiological analysis because of wound infection. Ten randomly chosen catheter tips were sent for microbiological analysis and proved to be sterile. There were no complications related to wound healing.

Table 4. Results (Mean ± SD)*

VAS	2.5±1.4
Number of bolus of LA	2.0±1.1
Number of bolus of piritramid	1.5±1.1

*VAS indicates visual analogue scale; LA, local anesthetic.

DISCUSSION

Our study shows that satisfactory pain relief can be achieved with incisional administration of LA. Because there is no need to use a large dose of opioid analgetic, the patients are awake and spontaneously breathing in the operating room (OR) immediately following the operation and can be extubated on table. Unpleasant side effects and complications of orotracheal intubation and mechanical ventilation can therefore be avoided. The VAS score in first 24 hours was less than 3, which is considered generally satisfactory.

One of the benefits of this method is that the analgetic acts at the place where the pain occurs without systemic effects. However, we believe that this method can be used only in an operation where the wound incision is small.

Of course, analgesia solely by LA is not enough because the patients also feel pain related to the orotracheal intubation, the position of the body during the operation, and the drainage tube. To cover other origins of pain, we decided to use the multimodal analgesic technique using LA, nonsteroidal antiinflammatory drugs, and opioid analgetics.

Because we wanted to avoid the possible cardiotoxic side effects of LA, we chose ropivacaine, which has the least cardiotoxic side effects known at this point. The administration of LA boluses in the ICU was nurse controlled: after transfer to the ward, patients were instructed to administer the boluses by themselves when they felt pain in the area where the catheter has been placed. The boluses can also be given before the respiratory physiotherapy, making the rehabilitation faster.

The negative microbiological results and classic wound inspections showed that there were no complications regarding delayed wound healing or infections related to catheter placement or use of LA. In fact, one study suggests that LA has antimicrobial and antibacteriostatic effects, taking into account that great concern must be paid to the antiseptic treatment of the catheter [Rosenberg 1985].

The catheter was removed 3 days after surgery, at which point peroral medication for pain relief was sufficient [Royse 1999, Reyes 1997, Gersak 2003].

Thirteen patients were excluded from the study because they did not fulfill the extubation criteria and were not extubated in the OR. They also had the catheter placed in the surgical wound and followed the same protocol for pain

relief, but the VAS score was difficult to measure at the time of extubation. When they were extubated and the contact was possible, the VAS score was also assessed.

Further studies are necessary to determine the optimal concentration and volume of LA and to consider which method of administration (continuous or boluses) is better in preventing postoperative pain.

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