

Bacterial contamination of epidural catheters used for perioperative analgesia

A Trojanowski, P Janicki

Citation

A Trojanowski, P Janicki. *Bacterial contamination of epidural catheters used for perioperative analgesia*. The Internet Journal of Anesthesiology. 2008 Volume 20 Number 2.

Abstract

Purpose: We investigated the frequency of bacterial colonization of epidural catheters used for intra and postoperative pain control for longer than 24 hours in abdominal and orthopedic surgery. **Patients & methods:** This prospective, observational study was performed in 95 consecutive patients in the setting of general ward and intermediate care unit of the community hospital. The epidural catheters were used during surgery as well as in postoperative period for analgesia. The insertion site was covered by the transparent occlusive dressing checked daily, and was not changed, if undisturbed. Microbiological testing of the tips of the epidural catheters removed from the patients was performed after completion of postoperative epidural analgesia. Frequent daily checks for adequacy of pain control and signs of neurological deficit were performed. **Results:** Nine (9.5%) of catheter tips were contaminated by bacteria. Of those nine contaminated tips, 5 were identified as skin flora contaminants, with less than 15 bacterial colonies being present. Neither clinical signs of inflammation in the puncture site nor the presence of epidural abscess were observed in any of the investigated patients. **Conclusion:** The routine, meticulous clinical care produced a relatively low level of bacterial contamination of epidural catheters applied for postoperative pain treatment greater than 2 days.

INTRODUCTION

The contamination rates of epidural catheters are reported to occur in 4 to 55 % of all catheters used for postoperative analgesia^{1,2,3,4,5}. The potential for infection arising from the use of epidural catheters is a major source of anxiety, which often precludes the subsequent use of these catheters for prolonged analgesia, repeated neuroaxial anesthesia or as well as using them for blood patch in selected patients to treat inadvertent post-dural puncture headache. It was suggested that the meticulous management of the postoperative epidural catheters could significantly reduce the rate of contamination. As a part of hospital- wide quality improvement we investigated the frequency and time-course of bacterial colonization of epidural catheters used for postoperative pain treatment in the routine clinical settings (no additional treatment of the insertion site postoperatively). Bacteriological analysis of the catheters tips in general surgical and orthopedic patients was performed on consecutive patients.

The aim of this study was to evaluate the clinical relevance of routine microbiological culture of epidural catheter tips after use in acute pain management, and to identify patterns of culture result with respect to both indications for, and duration of, epidural catheterization.

PATIENTS AND METHODS

The clinical and microbiological results in this report were prospectively analyzed as part of hospital quality improvement initiative. This prospective observational study was approved by the institutional review board of Houlton Regional Hospital (Houlton, ME, USA, author's previous work place from January to November 2004). No informed consent of the patients was necessary to obtain for this study. In this study we performed the routine cultures of the subsequent 95 epidural catheters, which were used for postoperative pain treatment for more than 24 hours. Epidural catheters were inserted aseptically in accordance with a standardized protocol, immediately before induction of anesthesia, by a single investigator at the level suitable to provide surgical anesthesia. Insertions of the epidural catheters were performed in the left lateral decubitus position. Standard protocol included using sterile gloves, gowns and wearing caps and face mask by the anesthesiologist performing the insertion of the epidural catheter. Skin preparation was with preheated, warm 70% alcohol in order to diminish patients discomfort during its evaporation and allowing skin to dry before the epidural catheter insertion. Tuohy needle (17 gauge 3.5.dull tip, metal hub) and nylon, transparent 20 gauge closed-end epidural

catheter with 0.22 micron filter (Spinal Specialties, Inc. San Antonio, TX) were used. A midline or paramedian approach and loss of resistance to 0.9% NaCl solution were used to identify the epidural space. The epidural catheters were inserted into the epidural space at least 5 cm but not more than 7 cm in the intended cephalad direction.

All catheters were tested for intravascular or subarachnoid placement using non-pharmacological meniscus test₆. The catheter at the puncture site was fixed in place by a clear, sterile transparent occlusive dressing (Tegaderm; 3M Comp, St.Paul, MN) which was not changed if undisturbed until the catheter removal, and adhesive tape (Medipore; 3M Comp.) over the patients back. Loading dose of local anesthetic was given before or soon after the induction of general anesthesia, to achieve a satisfactory surgical epidural anesthesia. Continuous infusions, including boluses delivered by anesthesiologist, if required, were commenced at the end of surgery. Epidural medications were preservative-free, single use local anesthetics with or without fentanyl 50 - 100 mcg added in sterile normal saline prepared by anesthesiologist under sterile conditions.

Each patient was examined by a staff member once daily or whenever there were any calls for pain management, malfunction of catheter or infusing pump, and evaluation of catheter-related infection. Patients were instructed to report any problems related to the use of epidural analgesia such as pain at the site of epidural catheter insertion, or weakness in the lower extremities. Nursing staff was requested to report if there was any soiling or peeling of the epidural dressings, catheter disconnection, and presence of discharge from the insertion site.

When epidural pain control was terminated the catheters were removed by the same anesthesiologist (A.T.), and the tip sent for microbiological culture. Prior removal of the epidural catheter skin at the insertion site was treated with sprayed 70% alcohol, which was allowed to evaporate from the skin surface in order to prevent catheter contamination with the skin bacterial flora during its removal. The catheter tips were placed in sterile dry containers and delivered immediately to the hospital microbiology laboratory where they were placed on the agar plates and cultured at 35 C. All bacterial isolates were identified and reported by organism type, low grade/moderate/heavy growth and number of colonies for catheter tip culture at 1 week. The epidural catheter tip was considered to be colonized if the culture yielded at least 15 colony forming units of an organism. All patients were instructed to report any discomfort in the

epidural insertion site, headache, lower limb weakness or fever. The statistical analysis of results involved Mann-Whitney test (ordinal data) and Fisher s Exact test (nominal data). The level of significance was set at $p < 0.05$.

RESULTS

A total of 86 of the 95 catheter tips were found to be sterile, whereas 9 catheter tips were contaminated by bacteria (Table 1). The rate of contamination was thus 9.47%. The leading organisms were various staphylococcus species. No statistically significant differences ($p > 0.05$) in the frequency of the catheter contamination were found in relation to the patient age, gender and type of surgical procedure. The catheterization time was not statistically different ($p > 0.05$) in groups with sterile and contaminated catheter tip. Neither clinical signs of inflammation in the puncture site nor the presence of epidural abscess was observed in the investigated patients.

Figure 1

Table 1: Demographics and catheter related variables

| | Cath. tip sterile | Cath. tip contaminated | P value |
|-----------------------|-------------------|------------------------|---------|
| N | 86 | 9 | |
| Age in years | 72 (23) | 74 (7) | 0.375 |
| Female/male | 44/42 | 5/4 | 0.99 |
| Surgical group: | | | 0.72 |
| thoracic/abdominal | 30 | 4 | |
| orthopedic | 56 | 5 | |
| Catheterization time: | | | 0.098 |
| 0-48 hrs | 23 | 1 | |
| 48-72 hrs | 22 | 1 | |
| 72-96 hrs | 21 | 4 | |
| 96-120 hrs | 11 | 2 | |
| >120 hrs | 9 | 1 | |

Values are numbers or medians (interquartile range in brackets)

DISCUSSION

We concluded that a small proportion of epidural catheter tips may be “culture positive” after removal. It is suggested that this probably represents colonization of the skin at the catheter insertion site and subsequent contamination of the catheter tip on removal of the catheter. In addition, the routine, meticulous clinical care produced a relatively low level of bacterial contamination of epidural catheters applied for postoperative pain treatment greater than 2 days. The small number of “culture positive” tips in the absence of clinically identifiable epidural space infection suggests that routine culture of epidural catheter tips is clinically irrelevant in the vast majority of cases, and that it is not a good predictor of the presence of an epidural space infection

CORRESPONDENCE TO

Dr. A. Trojanowski, Department of Anesthesiology, Penn

State College of Medicine, Penn State Milton S. Hershey
Medical Center, 500 University Drive, Hershey, PA 17033
E-mail address: atrojanowski@hmc.psu.edu

References

1. Steffen P, Seeling W, Essig A, Stiepan E, Rockemann MG. Bacterial contamination of epidural catheters: microbiological examination of 502 epidural catheters used for postoperative analgesia. *J Clin Anesth* 2004; 16:92-7
2. McNeely JK, Trentadue NC, Rusy LM, Farber NE. Culture of bacteria from lumbar and caudal epidural catheters used for postoperative analgesia in children. *Reg Anesth* 1997; 22: 428-31.
3. Seth N, Macqueen S, Howard RF. Clinical signs of infection during continuous postoperative epidural analgesia in children: the value of catheter tip culture. *Paediatr Anaesth*, 2004; 14: 996-1000.
4. Kostopanagiotou G, Kyroudi S, Panidis D, Relia P, Danalatos A, Smyrniotis V, Pourgiezi T, Kouskouni E, Voros D. Epidural catheter colonization is not associated with infection. *Surg Infect (Larchmt)*, 2002; 3: 359-65.
5. Simpson RS, Macintyre PE, Shaw D, Norton A, McCann JR, Tham EJ. Epidural catheter tip cultures: results of a 4-year audit and implications for clinical practice. *Reg Anesth Pain Med*, 2000; 25: 360-7.
6. Trojanowski A, Murray WB. A test to prevent subarachnoid and intravascular injections during epidural analgesia. *S Afr Med J*, 1995; 85: 531-4.

Author Information

Andrzej Trojanowski, MD, FFARCS, EDAA

Assistant Professor, Department of Anesthesiology, Pennsylvania State College of Medicine

Piotr K. Janicki, MD, PhD

Professor, Department of Anesthesiology, Pennsylvania State College of Medicine