Bacterial contamination of needles used for spinal and epidural anaesthesia

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We have investigated prospectively the incidence of bacterial contamination of 114 spinal and 20 epidural needles collected immediately after lumbar puncture of the subarachnoid or epidural space. Bacteriological examination revealed bacterial contamination of 24 (17.9%) of the needles, mainly coagulase-negative staphylococci (21; 15.7%) followed by yeasts (2; 1.5%), enterococcus (1; 0.8%), pneumococcus (1; 0.8%) and micrococcus (1; 0.8%). Our results suggest that even during aseptic puncture for lumbar anaesthesia, there is a significant rate of needle contamination.

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Puncture of the skin during administration of spinal–epidural anaesthesia damages the most important barrier of the human body against infection of the central nervous system. Although large prospective and retrospective studies found spinal and epidural anaesthesia to be safe with regard to infectious complications,1, 2 serious infections after central neuroaxial block have been described.3 Skin disinfection before puncture according to aseptic guidelines and sterile handling of invasive devices used for regional anaesthesia are routine, but clinical data on the efficacy of these guidelines are rare.

The bacterial colonization rate of epidural catheters has been investigated previously,4 but there are no studies on the contamination rate of needles used for spinal–epidural anaesthesia.

Methods and results

After obtaining approval from the Institutional Review Board, data on 134 consecutive spinal–epidural anaesthetic procedures (one-attempt punctures only) performed for elective orthopaedic or urological surgery were collected prospectively. None of the patients was receiving perioperative antibiotic prophylaxis at the time of lumbar puncture. Spinal–epidural punctures were performed in the operating room by staff anaesthetists or residents wearing operating room dress and hats. The aseptic technique included skin preparation with 10% polyvidone–iodine (Braunol 2000) and the use of sterile gloves and sterile drapes. The needles were G-22 spinal (Yale Spinal; Becton-Dickinson; E) and G-18 Tuohy-type epidural (Perifix; Braun-Melsungen; D). Immediately after puncture, the needle was incubated in a sterile tube and transferred to the laboratory.

The needles were rinsed with tryptic soy broth 5 ml (Merck, 6100 Darmstadt, Germany), vortexed for approximately 20 s and incubated under aerobic conditions at 37°C for 24 h. To determine the colony and to concurrently differentiate between micro-organisms, each sample was spread out on Columbia blood agar (Fa. Becton Dickinson, Cockeysville, USA) and incubated at 37°C for 48 h. Differential analysis of micro-organisms was performed after incubation using morphological, physiological and serological criteria. Plasma coagulase-negative and coagulase-positive staphylococci were identified using a commercial test kit (Pastorex Staph Plus, Sanofi Pasteur Diagnostics, Chaska, USA) and the classical tube coagulation test. Other gram-positive cocci, gram-negative rods and yeasts were identified using commercially available test kits (API, Bio Merieux, Marcy Letoile, France). Aerobic spore-forming bacteria, microscopically examined as gram-positive rods, were identified by catalase production and aerobic endospore formation.

In a total of 134 patients (73 males, aged 42–87 yr, weight 58–104 kg and 61 females, aged 39–84 yr, weight 49–88 kg), we performed 114 spinal and 20 epidural punctures. Bacteriological examination revealed contamination in 24 (17.9%) of all needles, mainly coagulase-negative staphylococci (21; 15.7%) followed by yeasts (2; 1.5%), enterococcus (1; 0.8%), pneumococcus (1; 0.8%) and micrococcus (1; 0.8%) (Table 1). No patient developed infectious complications after puncture.
In patients with infectious diseases, an increased tendency was reported at a single institution for meningitis or epidural abscess after epidural puncture, has not been significant of this finding was supported by a Medline search for the years 1990–1998 which revealed numerous case reports of meningitis or epidural abscess after spinal–epidural anaesthesia.

Although infectious complications may occur after both single-shot and continuous central neuroaxial block, only catheters used for continuous lumbar spinal or epidural anaesthesia have been studied previously, showing a microbial colonization rate in epidural catheters of 29% in adult patients. However, the possible infection-triggering influence of the needles used for puncture, has not been investigated.

In 1995, an incidence of local infection of 4.3% and an incidence of meningitis or epidural abscess after epidural catheterization of at least 0.7% was reported at a single institution. In patients with infectious diseases, an increased tendency to develop epidural abscesses has been assumed, and the use of central nervous block techniques has been judged to be relatively contraindicated. All patients in our study underwent elective surgery without signs of local or systemic infection. Thus it is unlikely that bacterial contamination of the needles during the short puncture phase was endogenous in origin (i.e. subcutaneous infection, bacteremia).

When interpreting the results of studies concerning longer indwelling catheters, it must be remembered that antibiotics administered in the perioperative period often make it more difficult to demonstrate colonization of catheters. Hence, contamination rates for tissue, catheters or needles used for epidural or spinal anaesthesia may be erroneously reduced in the presence of effective antimicrobial tissue concentrations. Thus the role of needle contamination during skin perforation may have been underestimated in previous studies. As we are the first to study isolated needle contamination in the absence of systemic antimicrobials, our data have elucidated further the mechanism of occurrence of catheter-related infections.

The vast majority of these infections are caused by micro-organisms that colonize the skin of patients, such as staphylococci, both coagulase-negative and coagulase-positive (S. aureus), Candida, Corynebacterium and Bacillus species. In one study, staphylococci and gram-negative bacilli accounted for almost 70% of CNS infections between 1986 and 1992; if all CNS infections were considered, coagulase-negative staphylococci were the most frequent pathogens (31%) compared with gram-negative bacilli (27%), S. aureus (11%), yeasts (4%) and others (9%).

Generally recognized guidelines are in place for correct aseptic administration of regional anaesthesia, but even strict adherence to these guidelines does not guarantee sterile puncture of the spinal–epidural space. In clinical practice, asepsis is often equated wrongly with sterility. Despite the uncertain relationship between contaminants and clinical infection, all efforts should be directed towards minimizing potential sources of infection.

Our results showed clearly that despite using an aseptic technique, lumbar puncture may contaminate spinal–epidural needles. Although no patient developed signs of local or central nervous infection, we recommend further improvement of hygienic measures to prevent the introduction of bacteria at the time of needle insertion. Future studies on the efficacy of these measures are warranted.

**References**


