

Microbiological Cultural Test After Prolonged Peridural Catheterization: Report of 50 Cases

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Abstract

The administration of analgesic drugs via peridural catheter, despite of an excellent pain control, makes the patient vulnerable to iatrogenic complications, such as infection or contamination. Our study is based on the systematic microbiological cultural test of this device; in 50 investigations no case of symptomatic infection occurred, while 3 catheters resulted positive for bacterial contamination (in literature 0-54%); it was attributed to the normal bacterial population, therefore of no clinical relevance.

This proves both the correctness of the procedures and of the material used to keep sterility during the positioning and the management of the peridural catheter. We do not believe it is essential to perform the microbiological test on all catheters; however, this investigation should be carried out in those cases in which, on the basis of clinical symptomatology and of the hematochemical tests, we suspect a peridural infective process.

INTRODUCTION

During the last years an ever increasing number of clinicians and researchers have focused their attention on the analgesic treatments, in order to prevent the rising or, however, to reduce the incidence and the intensity of postoperative pain. In the past, postoperative pain was conceived as inevitable and as a necessary component of a normal postoperative period: it was only occasionally subject to treatment and, furthermore, with approximate and not encoded formality.

Many reasons have convinced us to use a rational method when treating postoperative pain:

- unequivocal demonstration of postoperative complications more or less correlated to important pain consequent to surgical procedures;
- major attention to life quality of the surgical patient, considered as central figure of an operational process: his discomfort is to be reduced, especially if pain related;
- best acquaintances of the physiopathological processes responsible of the genesis and the entity of pain;
- availability of many drugs, as well as several

innovative ways of administration (e.g. peridural, wound infiltration etc.).

On the basis of the above considerations, the administration of analgesic drugs via peridural catheter has become of ample use and of good reliability, especially in thoracic, abdominal and orthopaedic surgery (1). The peridural space is divided into discontinuous compartments and separated into zones, in which the dura touches the walls of the vertebral canal, and therefore are empty. The posterior compartment of the epidural space is covered by fat, and is located between the dura and the yellow ligament and upwards it stretches slightly to the caudal portion of the foil: as it is not adherent to the near structures, the catheters and liquids can flow over the fat surfaces, the walls of the canal and the dura. Therefore, drugs act on the nervous roots, on the spinal cord and on the segmentary nerves.

The peridural analgesia causes complete pain relief by interrupting pain links from internal organs and by blocking efferent fibres, it also reduces muscle spasm reflex, ileum sympathetic hyperactivity, diaphragmatic inhibition (favouring the reflex of cough), and neuroendocrine responses caused by stress. There are, undoubtedly, many positive aspects which make this procedure widely used and appreciated in the analgesic therapy, but we must also

consider the possible complications, more or less severe, especially because this clinical procedure is not always strictly necessary for the survival of the surgical patient: we have to consider the ratio between risks and benefits.

The possible complications include, first of all, the accidental perforation of the dura mater during catheter introduction (often with consequent cephalalgia), the breaking of the peridural catheter, bone marrow or nerve root lesions, and the accidental injection of drugs at subaracnoid level or in vein, which can cause pharmacological toxicity reactions up to cardiorespiratory arrest.

Late complications are also to be considered, such as urinary retention, lombalgia, neuropathies and, above all, serious infectious phenomena: meningitis, peridural and spinal abscesses, spondylodiscitis, fistula and simple colonization of the catheter. Only a few cases are documented: 5 of spondylodiscitis and 3 of vertebral osteitis since 1948 (data of French and Anglo-Saxon literature); the danger and threat of such infective phenomena imply the operator maximum attention in keeping sterily while working.

The infective agents reported in literature as responsible of such pathological evolutions are above all *Pseudomonas Aeruginosa*, *Staphylococcus Aureus*, *Staphylococcus Epidermidis* and various kinds of *Streptococcus*; possible reasons of contamination are the following:

- direct injection of the infective agent while catheterization;
- contaminated anaesthetic solution;
- use of non-sterile syringes;
- bacterial migration through wounds.

We must also consider predisposing conditions such as patients' immunodepression, immunosuppressive treatments, congenital deficit, diabetes, drug or alcohol abuse (3).

According to our clinical experience, based on over 800 surgical cases with postoperative peridural

analgesia, clinically important superficial or deep infection has never occurred (we remind that the catheter has been kept for 80 hrs); nevertheless a silent bacteric colonization cannot be excluded, so we have always sent a small sample of these devices to microbiological culture, also to prove the

accuracy and efficiency of our techniques, methods and attention in keeping sterility during peri- and postoperative catheter management.

MATERIALS AND METHODS

The study is based on 50 patients, whose anthropometric details are listed in Table I; exclusion criteria were the following:

- blood coagulation alterations;
- immunological deficit;
- spinal cord and brain pathologies;
- hypersensitivity to local anaesthetics;
- local infections and systemic sepsis;
- patient's refusal.

All patients underwent major urological surgery (see Table II), in literature considered as at a medium and high algogenicity level; surgeries were carried out with xifo-navel-pubic or posterior -lateral -lumbar incision, with resection of the twelfth rib, and patients were positioned supine or laterally, always with their back curved.

As soon as the patient entered the pre-anaesthesia room, a peripheral venous access with a 16 Gauge catheter was positioned and then the patient was sit on the surgical plan in order to proceed to the insertion of the peridural catheter. All the material and devices necessary for this procedure were prepared: both the anaesthetist and the nurse wore special uniforms and footwear, Gore-Tex sterile gown, surgical disposable mask (with three layers and drawstrings), head covering with ties in green Spunbound, with fixed drawstrings. After an accurate hands and forearm washing with antiseptic liquid, the anaesthetist wore sterile surgical gloves and took from his collaborator with sterile opening technique the material for the procedure:

- 2 sterile napkins in micro fibre (1 of which to cover the trolley);
- 2 sterile syringes (5 ml and 20 ml capacity, respectively filled with 40 mg of 2% Lidocaine and 10 ml of physiological solution);
- 10 cotton gauzes (5 of which soaked with Iodopovidone);

- peridural catheter kit “Becton and Dickinson Mini-Perisafe Plus”.

The anaesthetists proceeded first disinfecting the patient's posterior lumbar quadrants, the skin was cleaned with cotton gauzes soaked with Iodopovidone, starting from the central region of the spinal column and then outwards until the posterior armpit line. This sequence was repeated three times and then the skin of the lumbar zone (where the injection had to be performed) was dried with a sterile cotton gauze.

A micro fibre sterile napkin was then positioned transversally near the sacral region; local anaesthesia was performed with 40 mg of 2% Lydocaine injected with a 5 ml BD Plastik syringe in the chosen intervertebral space, in order to make the subsequent insertion of the peridural needle less painful. The research of the epidural space (L1-L2 or L2-L3 or L3-L4) was performed with the liquid mandril technique (20 ml Icogramma plus syringe) and after the catheter had been properly positioned, it was fixed to the skin right at the insertion point with opsite Post-op (Smith & Nephew) sterile medication and the remaining parts with open-air and radiotransparent Soffix plaster.

The analgic protocol consisted of peridural infusion in bolus of a mixture of local anaesthetic and morphine followed by the insertion of an elastomer to the antibacteric filter of the catheter, containing local anaesthetic liquid with slow and constant release: this therapy was repeated 24 and 48 hrs after surgery. During this period the patient stayed in a sub-intensive care unit, assisted by the anaesthetist and the urologist, who controlled the proper application of the analgic therapy.

Three days (80 hrs) after the operation, the peridural catheter was removed with the following procedure: the medication was displaced by the nurse and the doctor wearing sterile Goretex dress, sterile gloves and surgical mask; the point of the catheter was cut (5 cm) with a sterile blade, put into a sterile test tube and immediately sent for the microbiological test. All patients underwent antibiotic prophylaxis the day before surgery with Ceftrizoxime 1 gr im., continuing with the same antibiotic 1 gr. X 2 a day, from the operation to the removal of the drainages (approximately from day 5 to day 7); the patients then continued with oral antibiotic prophylaxis with Amoxicilline + Clavulanic Acid 875 mg twice a day or Levofloxacin 250 mg once a day.

This therapy was maintained until the end of hospitalization and carried on by the patient at home if anything promoting

a possible thermal rise happened while in hospital.

The following conditions have defined the premature removal of the peridural catheter:

- local or systemic infection;
- front-occipital cephalalgia with suspect of dura mater perforation;
- intravascular, subcutaneous or subarachnoid dislocation of the catheter;
- relevant side-effects (breathing difficulty, uncoercible nausea or vomiting, paraesthesia or motor nerve blocks of the legs);
- accidental removal of the catheter during patient's movements.

The point of the catheter was spread on a solid culture field using Columbia and Mac Conkey agar and liquid enrichment field, Brain Heart broth, plates and test tubes were incubated for 48 hrs at 35°C in 5% CO₂ atmosphere (3,4,5).

The plates were firstly observed and after 24 hrs and in case of positiveness, the number of colonies were counted. If there were at least 15 colonies, the catheter was considered colonized, while if there were at least 2 types of colonies, it was considered contaminated. The sample was considered negative if after 48 hrs of incubation no bacterial growth was observed.

RESULTS

50 peridural catheters have been analyzed in major urological surgeries, all of them having been performed by the same surgical and anaesthesiological equipments. Table I summarizes anthropometric characteristics of the patients, while Table II refers to the type of surgery performed. The average age of the patients has resulted 64.9 yrs (range 33 – 82), the average weight was of 73.15 kg (range 49 – 107 kg); all four A.S.A. anaesthesiological risk classes were represented, with prevalence of class II patients (29 cases), but also with 2 patients affected by severe permanent mortal disease risk (A.S.A. IV).

Surgeries taken into account had a medium – high algogenicity degree and were prevalently radical nephrectomy and orthotopic cystectomy; kidney surgery particularly requires analgic coverage until last thorax dermatomers: with the lumbar positioning of the catheter, we have

exploited the hydrophilous property of morphine and its capacity of rising the analgesia levels towards the head: despite the lumbar injection, the drug widely covers the kidnal adferences. We also exploit the diluition of the local anaesthetic in order to sperad the dermatomeric level of analgesia, until the inferior thoracic adferences.

No patient has shown symptoms or evidence of an infective process in act, including those cases in which a bacterial contamination of the specimen had been found; cultures were all negative and the incidence of contamination has been 6% (Table III): only 3 specimen have been found positive for growth of a mixed microbial colony and the isolated species have been identified as normal microbiological skin population, therefore with no clinical relevance. As for the contaminating etiological agent, in our study the most representative ones were the Staphilococcus Epidermidis, Staphilococcus Xylosus and Colinebacterium SPT.

We have never given up catheterizing because of unpredictable technical difficulty and early catheter removal has never occurred for any reason.

Figure 1

Table 1: Patients' Characteristics

	Range	Average
AGE	33-82	64,85
WEIGHT	49-107	73,15

A.S.A.	I	9
	II	29
	III	10
	IV	2

Figure 2

Table 2: Surgeries

NEFRECTOMY	18
ORTOTOPIC CISTECTOMY	18
"BRICKER" CISTECTOMY	11
NEPHRO-URETERECTOMY	2
VESICAL ENLARGEMENT	1

Figure 3

Table 3

Samples	Positive		Negative	Total
	Monomicrob	> 2 species		
Catheters	0	3	47	50

DISCUSSION AND CONSIDERATIONS

Anthropometric data of the study indicate that the technique of the postoperative peridural anthalgic catheter is equally effective on patients of every age with various characteristics and can be applied both to healthy patients (ASA I) and

particularly, to patients in very bad postoperative clinical conditions, due to senile age together with the frequent presence of severe pathologies.

In our survey, the incidence of bacterial contamination has been 6% of the total investigated samples, while in literature percentages oscillating between 0% and 54% are reported (², ³, ⁴, ⁵, ⁶); as far as the number of patients with symptomatic infection is concerned (never appeared in our study), bibliographic data report percentages between 0% and 0.06%; Kane et al. have found no case among 50000 investigated samples (⁷) and also Dahlgren et al. among 9000 peridural catheters (⁸).

In contrast to these cases a perspective Danish study (17372 cases) has counted 9 episodes of peridural abscesses (⁹), as well as a research of Kindler et al., where 2 catheter points among 13000 samples showed the same pathology. (¹⁰)

Strasser et al. have incurred into 4 contaminations on 100 catheters in situ for 23 hrs, after gynaecological surgery (¹¹), while Bauer et al. report 5.7% after obstetric operations, where actually catheterizing is limited to the first 21 hrs.

Further data can be taken from the studies of Harakuni et al.(17%) (¹²) and from the ones of Holt et al.: the latter authors published a work with 78 positive catheters on 147, corresponding to 57% of the whole amount. (¹³)

In literature, according to Darcy et al., Staphilococcus Epidermidis is the main cause of undesidered contaminations, as well as in other works Staphilococcus Aureus, Pseudomonas Aeruginosa and Streptococcus Pyogenes; a lower incidence of contamination of lumbar catheter rather than thoracic ones stand out from further studies (¹⁴), probably correlated to a more frequent difficulty in positioning the first ones.

The contamination of caudal catheter is more frequent (McNeely et al., 9 positive cases among 445 investigations) (¹⁵) probably because it is positioned near to the anal region. Bacteric contamination occurs fundamentally because of an inadequate disinfection of the skin during positioning, but we also have taken into great consideration the imperfect sterility during its removal and transport to the laboratories; also blood contamination has been pointed out mainly from adjacent infected parts or during postoperative drug somministration.

The incidence of permanent neurological sequences after peridural analgesia oscillates between 0% and 0.03% in

many surveys (_{11,12,13,14,15, 16}) and the incidence of intratecal and / or endovenous migration of the catheter between 0.15% and 0.18% (_{17,16,18}); none of these eventualities appeared in our study, but we could have to face them with a wider number of cases.

The choice of Iodopovidone as disinfective agent has been dictated from studies completed in the 80's and in the 90's, which showed better antiseptic propriety compared to other products, such as Etanole or Clorexidine.

The results evinced in our study are coherent with the results from the bibliographical notes; the absence of symptomatic peridural infections, neurological problems and complications as far as 80 hrs after surgery is comforting: in particular, this is an extremely important evidence of how all the procedures carried out and all materials and devices used to keep sterility during positioning and management of the peridural catheter have been adequate.

Our data confirm the safety and effectiveness of the investigated technique; such procedure is often essential in order to reduce pain, especially in an invasive abdominal surgery as for example urological surgery, where diaphragmatic inhibition, intestinal canalization and peripheral oxygenation are extremely fundamental for the outcome of the patient, especially when he is elderly and affected by several concomitant pathologies.

In this way, despite we are certainly aware that to draw definitive conclusions, a wider number of cases would be auspicious, but it's appropriate to mark out what we consider unnecessary to perform microbiological cultural test on every peridural catheter, both for the high costs this procedures involve and for the low predictive value of spinal infection in the contaminated catheters. Investigations should however be carried out in those cases in which a certain symptomatology (hyperemia, tumefaction, suppuration of the injection site, fever, indisposition, lumbar and radicular pain, weakness and/or paraesthesia of legs, sphincter deficit) or modified blood tests occur (high leucocytes amount, reactive C- protein) as to make us suspect the developing peridural infection.

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