

Meningitis treatment through an epidural catheter

Case Report

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ABSTRACT

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Intrathecal drug administration extends beyond the purposes of anaesthesia, to therapeutic applications. Here, we describe the case of a patient with severe Systemic Lupus Erythematosus having affected multiple organs and had a meningococcal infection. She was treated with intrathecal antibiotic therapy resulting in a successful outcome.

INTRODUCTION

It is well known that spinal drug injection extends beyond anaesthesia and analgesia. Indeed, the subarachnoid space has also served as a therapeutic window to the Central Nervous System. Spinal administration of baclofen for the treatment of severe spasticity, and of methotrexate, cytarabine and hydrocortisone for chemotherapy is approved and widely used^{1,2}. Moreover, in several case reports since the 1950s the subarachnoid space was used for the administration of antibiotics³.

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CASE REPORT

A 37 year-old female was admitted to the Internal Medicine Department of our hospital, complaining of dyspnea and tachypnea. She was undergoing hemodialysis every second day for chronic renal failure due to Systemic Lupus Erythematosus (SLE). The CNS was also affected by her disease, causing paraplegia. Her dyspnea proved to be caused by bilateral pleural effusion and interstitial lung involvement. Before the laboratory search could be completed, the patient was treated with prednisolone 1mg/kg/d but her dyspnea did not respond, and a few hours after her admission (Day 1) she was transferred to the ACU with

clinical findings of pulmonary oedema and respiratory failure.

On Day 2 persistent severe hypoxaemia (pO_2 :50 mmHg on FiO_2 :0.60) and a respiratory rate of 30 per minute led to intubation and mechanical ventilation. After five days (Day 7), the patient's status was improved and weaning from mechanical ventilation was attempted. However, a rise of temperature (38,9 °C) and a drop of consciousness level [Glasgow Coma Scale (GCS) 6], along with neck stiffness were observed; a lumbar puncture was then performed. The cerebrospinal fluid (CSF) analysis revealed neutrophils (Neut) 500 cells/ μ L, glucose (Glu) 10mg/dL and Protein 300 mg/dL suggesting a bacterial meningitis. The patient continued on mechanical ventilation and intravenous (I.V.) colistin (1.000.000 IU t.i.d.) and gentamicin (80mg t.i.d.) were empirically started, pending culture results. Although CSF cultures were positive for *Pseudomonas Aeruginosa*, sensitive to both colistin and gentamicin after two days (Day 9) of intravenous antibiotic therapy, no improvement was noted. At this time, an anaesthetist was asked to insert a spinal catheter in order to administer intrathecal treatment. The International Normalized Ratio (INR) was 1,1, activated Partial Thromboplastin Time (aPTT) was 41,8 but platelets (PLT) measured 23.000, therefore 5 units of hemapheresis platelets were transfused prior to catheter insertion. An epidural catheter

(Portex Spinal/Epidural Minipack, Pencil Point Needle 26G/18G) was inserted in the subarachnoid space through a Tuohy needle.

At level of L3-L4 the epidural space was located by loss of resistance technique with air (LOR). Tuohy needle was armed with the epidural catheter, and punctured dura mater. Epidural space was located at 6cm, dura mater punctured at 6,5cm and epidural catheter inserted another 3cm intrathecally. Antibiotic treatment with colistin 125.000 I.U. diluted in 2 ml of normal saline, twice daily and gentamicin 5 mg once daily, was initiated. On Day 11 the patient was awake and well-orientated (GCS:15) with a temperature of 36,9 °C. She was extubated next day and transferred to the Department of Internal Medicine, receiving antibiotics intrathecally for 11 more days. No signs of Central Nervous System (CNS) Toxicity were observed. Finally, on Day 23 having administered spinal treatment for a total of 16 days and the patient being in good clinical condition (afebrile, GCS:15), the catheter was removed. with the following laboratory tests, International Normalized Ratio (INR): 1,2, activated Partial Thromboplastin Time (aPTT): 47 and platelets (PLT): 55.000 without complications. The patient's condition remained stable, with no further complications, and she was discharged from the hospital on Day 28.

DISCUSSION

Nosocomial meningitis is predominantly caused by different pathogens than community-acquired meningitis⁴. Gram-negative bacteria are usually the cause in such cases and certain underlying conditions are identified. These include invasive procedures in the CNS, complicated head trauma or metastatic infection in patients with hospital-acquired bacteremia⁵. Furthermore, risk factors include age more than 50 years and impaired cellular immunity^{6,7,8}. Our patient was less than 50 years old and had not previously undergone any invasive procedure in the CNS. Thus, the infection was attributed to a previously unidentified colonization with *Pseudomonas Aeruginosa*. Additionally, long-term treatment for SLE and Chronic Renal Failure induced immunodeficiency which contributed to the development of meningitis.

Several authors in the literature have reported the use of intrathecal antibiotics to treat nosocomial meningitis^{3,9,10}. In the majority of these cases the infection was attributed to previous neurosurgical procedures and in the majority of cases an intraventricular device already existed. In our patient the administration of subarachnoid treatment required the insertion of a catheter. This procedure, requires normal haemostasis status. However, our patient was already paraplegic, therefore the risk of an epidural hematoma, due to thrombocytopenia was

disregarded. Nevertheless, 5 units of platelets were transfused prior to catheter insertion.

In addition to the above, in our hospital special subarachnoid catheters are not available, therefore our sole option was to use an epidural catheter 18G. In case of elevated intracranial pressure, the risk of central herniation was further increased. Thus, the anaesthetist decided to locate the epidural space with the LOR technique initially. Immediately afterwards the syringe was detached and the catheter was armed to the Tuohy needle, resulting in a lesser extent of CSF leakage. Indeed, CSF leakage was estimated to be less than 1 mL.

Another issue requiring clarification is the dosage of regimens. According to literature references the daily colistin dose ranges from 50.000 to 125.000 I.U., although there are few reports for 250.000I.U. In the case presented here, the attending physicians intended to use 125.000 every 24h for subarachnoid administration. However, assuming that the infusion was in the epidural space, they doubled the dose to 125.000 every 12h. This fact, along with the early initiation of subarachnoid therapy, could justify the rapid response to the treatment, which resulted in a drop of temperature and rise in mental status within 2 days of intrathecal therapy. Literature references concerning spinal use of gentamicin exist for doses 2-10 mg per day. In our patient the selected dose was 5mg every 24 hours, without

any adverse effects or signs of CNS irritation. Renal toxicity was not a problem since the patient was on hemodialysis.

CONCLUSION

Intrathecal route may serve as a therapeutic window in cases of severe nosocomial meningitis. However, multi-centered studies are needed to define the exact dose for each antibiotic.

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Key words: meningitis, epidural catheter

Author Disclosures:

Authors Stamatakis E, Aroni F, Loukeri A, Valsamidis D have no conflicts of interest or financial ties to disclose.

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