CASE REPORT

Spinal anaesthesia in a patient with post-spine surgery dural ectasia


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Abstract Dural sac ectasia is a very infrequent anatomical abnormality, usually caused by connective tissue diseases, as Marfan syndrome. Very few cases have been described being a consequence of a previous spine surgical procedure. We describe the case of an elderly patient who should be operated on twice due to subocclusive colon disease. Surgery was performed under spinal anaesthesia. A dural sac ectasia was suspected after the first procedure and the abdominal X-ray was reviewed. The characteristics of the anatomical alteration and the course of both anaesthetic procedures were described. X-ray and CT images were provided.

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Key Words
Anaesthesia; Spinal; Surgical procedures; Aged; Aged 80 and over; Frail elderly; Anatomic variations

PALABRAS CLAVE
Anestesia subaracnoidea; cirugía general; anciano, anciano de 80 o más años, anciano frágil; variaciones anatómicas

Introduction

It has been estimated that more than 325,000 spinal anaesthesia procedures are performed in the UK per annum.1 Despite that spinal anaesthesia was introduced more than
100 years ago, and experience spreads all around the world, several types of failures appear in daily practice. Among the general causes of failures reported (failed lumbar puncture, solution injection errors, inadequate intrathecal spread, ineffective drug action, and failure of adequate management after the puncture) inadequate spread has been attributed to anatomical abnormalities, and this possibility includes a larger than usual cerebrospinal fluid (CSF) volume. It is known that the primary determinant of block extent of a spinal anaesthetic is CSF volume in normal patients. Related with this can be dural ectasia, a rare malformation consisting in a dilatation of the dural sac, most of times localized in the lumbar or low thoracic-lumbar spine, and associated with several diseases. However this is usually occult and, during a spinal anaesthetic, a sensory block level lower than required for surgery could be obtained, needing additional interventions.

We present the case of a patient sustaining an undiagnosed dural ectasia who presented for emergent abdominal surgery that was operated on under spinal anaesthesia.

**Case report**

A male patient, 88 years old, 60 kg, 155 cm, ASA physical status III, presented in the emergency department with acute abdominal pain and subocclusive colon disease. The patient had had several previous admissions, and in this occasion surgery was indicated.

Associated diseases were global respiratory insufficiency due to chronic obstructive airway disease (treated with inhaled steroids, ipratropium bromide, and salbutamol), atrial fibrillation (treated with warfarin, which was withdrawn 72 h before in a previous emergency department admission), thoracoabdominal spine surgery due to a severe trauma several years ago (no more data were available of this procedure), left lower limb thromboflebitis, and age-related general deterioration. The patient sustained a megacolon with colonic volvulus having previously deemed to need no scheduled surgery due in part to the health status of the patient.

Apart from the clinical aspect of frailty, exploration showed moderate abdominal distension, and diminished respiratory sounds on auscultation. Blood analysis showed anaemia (haemoglobin 8 g/dL), and no other alterations (including coagulation profile). The ECG showed sinus tachycardia at 110 bpm; a chest X-ray showed basal left atelectasis, and an abdominal X-ray showed the volvulus and the colon with extensive aeration.

The surgical procedure consisted of an open left haemicolectomy with colostomy (Hartmann procedure) via midline infraumbilical incision. Antibiotic prophylaxis was administered.

Spinal anaesthesia with sedation was chosen. We use 4 mg of hyperbaric bupivacaine (0.8 ml of 0.5% hyperbaric bupivacaine diluted with saline to 1.5 ml). The lumbar puncture was performed in the lateral decubitus position. On back palpation no spinous process references were noted except at a very low lumbar level. A long longitudinal midline scar was observed in the patient’s back. The puncture was made by paramedian approach at the presumed L2-L3 interspace, with a 25G pencil point spinal needle. Free flow of CSF was obtained at the second attempt, and the spinal drug injected. Cutaneous sensory level checked by pinprick was T5–T6.

Oxygen with nasal prongs was delivered. Sedation consisted of midazolam 3 mg in separate boluses, and two boluses of 20 mg of ketamine. An infusion of midazolam plus ketamine (1–2 mg h⁻¹ and 20–40 mg h⁻¹, respectively) was started and maintained throughout the procedure.

Surgery proceeded uneventfully until min 60 when the patient complained from pain on small bowel traction, additional midazolam 1 mg, ketamine 10 mg and bupivacain 0.1 mg were injected. Surgery lasted 90 min. No haemodynamic alterations were observed. The patient was discharged to the ward.

Consent of the relatives was requested for the case report and images publication.

After reviewing the abdominal X-ray a radiolucent image was observed in the midline (Fig. 1), and together with the antecedent of spine surgery, dural ectasia was suspected. Review of an abdominal X-ray from three years ago showed the same image.

Four days afterwards, acute abdominal pain developed again with fever and general status deterioration. Blood analysis showed anaemia, leucocytosis, and increased lactate and reactive C protein. A suture dehiscence with peritonitic reaction was suspected.

For confirmation surgeons requested a pelvic CT scan with contrast (Fig. 2). This showed a small dehiscence in the sigmoid bowel suture. In addition the dural ectasia was observed with accumulation of contrast and absence of the posterior structures of the spine (part of the spinous process, laminae and part of the pedicles) from T12 to L4, without rod instrumentation. On careful inspection of the X-ray film, the dural ectasia could be seen from almost T8 to L4.

Antibiotic treatment was started as well. Surgical repair was indicated. Haemodynamic status showed moderate arterial hypotension. The same anaesthesia team performed
The same anaesthetic procedure as before. Initially the midline infraumbilical approach was chosen for surgery, but an 8 cm supraumbilical incision extension was needed. The clinical characteristics of the subarachnoid block were the same as in the first surgical procedure.

The bowel dehiscence in the sigmoid cul-de-sac was repaired and some localized peritoneal purulent fluid washed. An additional bolus of ketamine 20 mg and fentanyl 0.1 mg was again needed because the procedure lasted 90 min. The patient was discharged to the recovery room, and to the surgical ward the following day. No severe haemodynamic deterioration developed, only two boluses of ephedrine 5 mg were needed, one during surgery and one on arriving to the recovery room. Blood analysis showed progressive improvement of the infection-related parameters with neither anaemia nor acidosis next day. However the patient status worsened four days afterwards and he died at day 18th after admission for pneumonia, suspected pulmonary thromboembolism and septic shock.

Discussion

We present the case of a patient with dural sac ectasia. Although this alteration can be a normal anatomic variation, cases related to several diseases has been described, as ankylosing spondylitis, type I neurofibromatosis, idiopathic juvenile scoliosis, Ehlers–Danlos syndrome, and homocystinuria. However, the disease with more cases described is Marfan syndrome, in which is highly prevalent ~80–90% and is one of its major diagnostic criteria. Moreover, dural sac anteroposterior diameter has been proposed as a diagnostic parameter for dural ectasia in Marfan syndrome, this being not applicable to other dural ectasia causes. From a pathophysiologic point of view, these entities have in common being connective tissue diseases that explain the dilatation of the lumbosacral dural sac due to the pressure the altered structures should support by the standing attitude (bipedism) for years. Tumours and trauma have been related in rare instances with dural ectasia. We have found only two reports of dural ectasia caused by postspine surgery. In all the cases described the diagnosis was made after long-lasting unspecific symptoms that prompted neuroimaging studies.

Regarding neuraxial anaesthesia in patients with dural ectasia, we have found a few reports. Epidural anaesthesia was successfully used for caesarean section in a pregnant patient with Marfan syndrome and dural ectasia. There are several cases where subarachnoid anaesthesia failed or a lower than expected sensory level was reached needing additional anaesthetic interventions or procedures, notwithstanding this is not the rule and a usual dose can reach a "normal" sensory level.

A disparity between the volume of CSF and the amount of drug injected is the most probable cause of the low sensory level reached sometimes, especially if the local anaesthetic is hyperbaric and the injection was made in the sitting position. Theoretically a higher than usual drug mass (or volume) would be needed to reach adequate surgical anaesthesia, as indirectly evidenced by the relationship of the sensory level with the CSF volume, but this has not been carefully investigated.

Although it can be supposed that only this 'technical' problem exists in dural sac ectasia, it has been reported a case of transient bupivacaine local toxicity after a mistaken caudal analgesia injection, the patient sustaining a dural ectasia. The question of whether this was due to direct toxicity by local anaesthetic accumulation in the ectasic dural sac is speculative. On the other hand, is should be not forgotten that some Marfan patients sustain Arnold–Chiari malformation and this should be taken into account if a dural puncture is indicated.

In our patient, the high pressure in the dural sac for years could have been the reason of the dural ectasia. To our knowledge the patient never had received spine rod instrumentation, so the posterior wall of the low thoracic and lumbar spine were compliant. An additional possibility was that the patient carried out an undiagnosed connective tissue disease. Supporting this are the bowel elongation, megacolon and the dural ectasia formation, but this is speculative.

Regarding the anaesthetic technique used, we chose low dose spinal anaesthesia because we usually use it in old patients under lower limb (unpublished data, abstract in: Peiró CM, Errando CL, Soriano JL, Bocos J, Gimeno A, Murcia M, de Andrés JA. Single shot spinal anaesthesia with low dose hyperbaric bupivacaine (3.75 mg), for hip fracture repair surgery in the elderly. Reg Anesth Pain Med 2007; 32 (5 Suppl. 1: 47) and emergency surgery abdominal procedures, together with sedation, due to the haemodynamic stability provided. In this case, the low bupivacaine dose used was sufficient to reach a surgical sensory block level but in other instances it cannot be reached due to the anatomical malformation. In our experience this use to be enough (3–5 mg diluted hyperbaric bupivacaine), and, in fact, the initial sensory level was adequate until near the end of the procedure. The diluted drug remains hyperbaric (unpublished data, mean density >1.00900 mg ml⁻¹). However, apart from...
general anaesthesia, other regional anaesthetic techniques could have been chosen in order to inject a low amount of local anaesthetic with moderate haemodynamic repercussion, as combined spinal-epidural anaesthesia (with the high possibility of failure of the epidural component) or continuous spinal anaesthesia. The later has not proven superior to low single spinal dosing.16

In conclusion, some failures of spinal anaesthesia can be due to anatomical alterations of the dural sac (i.e. dural ectasia) that can or cannot be suspected from patient’s antecedents or associated diseases.

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Conflict of interests

CL Errando is Editor-in-Chief of Revista Española de Anestesiología y Reanimación. This article has been independently edited by the Co-editor-in-chief. The remaining authors declare no conflict of interests.

References