

CASE REPORT

1. Obstetrics and Gynecology Service, Hospital Central "Dr. Urquinaona", Maracaibo, Venezuela
 - a. Specialist in Gynecology and Obstetrics. ORCID 0009-0004-2035-7389
 - b. Doctor in Clinical Medicine. Specialist in Gynecology and Obstetrics. ORCID 0000-0002-5433-7149

Declaration of ethical aspects

Acknowledgement of authorship: The authors declare that they have contributed to the idea, study design, data collection, data analysis and interpretation, critical review of the intellectual content, and final approval of the manuscript we are submitting.

Ethical responsibilities: Protection of persons. The authors declare that the procedures followed conformed to the ethical standards of the responsible human experimentation committee and in accordance with the World Medical Association and the Declaration of Helsinki.

Confidentiality of data: The authors declare that they followed the protocols of the Hospital Central de Maracaibo on the publication of patient data.

Right to privacy and informed consent: The authors have obtained the informed consent of the patient and/or subject referred to in the article. This document is in the possession of the corresponding author.

Funding: The authors certify that they have not received financial support, equipment, personnel or in-kind support from individuals, public and/or private institutions for the study.

Use of artificial intelligence. The authors declare that they have not used artificial intelligence in the preparation of this article.

Received: 1 April 2024

Accepted: 25 May 2024

Online publication: 27 June 2024

Corresponding author:

Dr. Eduardo Reyna-Villasmil

📍 Hospital Central "Dr. Urquinaona" Final Av. El Milagro, Maracaibo, Venezuela

☎ +58162605233

✉ sippenbauch@gmail.com

Cite as: Sarmiento-Piña M, Reyna-Villasmil E. Pneumorrhachis as a complication of epidural anesthesia during the puerperium. *Rev peru ginecol obstet.* 2024;70(2). DOI: <https://doi.org/10.31403/rpgo.v70i2630>

Pneumorrhachis as a complication of epidural anesthesia during the puerperium

Neumorraquis como complicación de anestesia epidural durante el puerperio

Maira Sarmiento-Piña^{1,a}, Eduardo Reyna-Villasmil^{1,b}

DOI: <https://doi.org/10.31403/rpgo.v70i2630>

ABSTRACT

Epidural analgesia is a common procedure for pain relief, especially in obstetric practice. Pneumorrhachis and pneumocephalus are rare complications of unintentional dural puncture and injection of air into the subarachnoid or subdural space. The presence of air within the spinal canal is a rare and usually benign condition known as pneumorrhachis. The causes may be traumatic, non-traumatic or iatrogenic. Pneumorrhachis secondary to epidural anesthesia is associated with needle insertion using the loss of air resistance technique. Because it is usually asymptomatic and most cases with symptoms have non-focal neurological manifestations, it is usually treated conservatively. This is because it usually resolves spontaneously within hours or days. However, in some cases it may be related to serious underlying pathology and become symptomatic, requiring active diagnosis and treatment depending on the intensity of the symptoms. A case of pneumorrhachis as a complication of epidural anesthesia during the puerperium is presented.

Key words: Pneumorrhachis, Anesthesia, Epidural space.

RESUMEN

La analgesia epidural es un procedimiento común para aliviar el dolor, especialmente en la práctica obstétrica. El neumorraquis y el neumocéfalo son complicaciones poco frecuentes de la punción dural involuntaria y la inyección de aire en el espacio subaracnoideo o subdural. La presencia de aire dentro del canal espinal es una condición rara y generalmente benigna conocida como neumorraquis. Las causas pueden ser traumáticas, no traumáticas o iatrogénicas. La neumorraquis secundaria a la anestesia epidural está asociada con la inserción de la aguja utilizando la técnica de pérdida de resistencia al aire. Debido a que suele ser asintomática y la mayoría de los casos con síntomas presentan manifestaciones neurológicas no focales, se suele tratar de forma conservadora. Esto se debe a que normalmente se resuelve espontáneamente en horas o días. Sin embargo, en algunos casos relacionarse con una patología grave subyacente y volverse sintomática, lo que requiere un diagnóstico y tratamiento activos dependiendo de la intensidad de los síntomas. Se presenta un caso de neumorraquis como complicación de la anestesia epidural durante el puerperio.

Palabras clave. Neumorraquis, Anestesia epidural, Espacio epidural

INTRODUCTION

Epidural analgesia/anesthesia is commonly used in obstetric anesthesia for pain management. Identification of the epidural space by loss of air resistance is a widely applied technique during epidural catheter placement. Although it is a routine procedure, there are complications associated with its use, such as subcutaneous emphysema, venous air embolism, pneumocephalus, spinal cord and nerve root compression⁽¹⁾.

Pneumorrhachis is a clinical entity characterized by the presence of air/gas within the extra- or intradural compartments of the spinal canal and is secondary to traumatic, non-traumatic or iatrogenic causes. Most iatrogenic cases secondary to epidural analgesia are incidental to dural puncture and inadvertent air injection into the subarachnoid or subdural space⁽²⁾. They are usually asymptomatic and usually resolve radiographically within hours or days by reabsorption of the air into the bloodstream⁽³⁾. Rarely, it may be associated with pain and/or neurological deficits. There are no treatment guidelines and treatment standards⁽²⁾. A case of pneumorrhachis as a complication of epidural anesthesia during the puerperium is presented.

CASE REPORT

In a 21-year-old female patient, gestation 2, with a previous caesarean section for cephalopelvic disproportion and 38 weeks' gestation, it was decided to perform a cesarean section as the cause of the cesarean section was recurrent. Once the lumbar epidural space was identified with the patient seated, bupivacaine 0.25% (10 mL) was administered aseptically after confirming that the Tuohy 18G needle was in the L2 - L3 epidural space in a midline approach with loss of resistance. Segmental analgesia was obtained. The patient remained stable during the procedure without complications. A 3,250 g live male was delivered with Apgar scores 7 and 9, respectively, at 1 minute and 5 minutes. Adequate reversal of the anesthesia was observed in the recovery room.

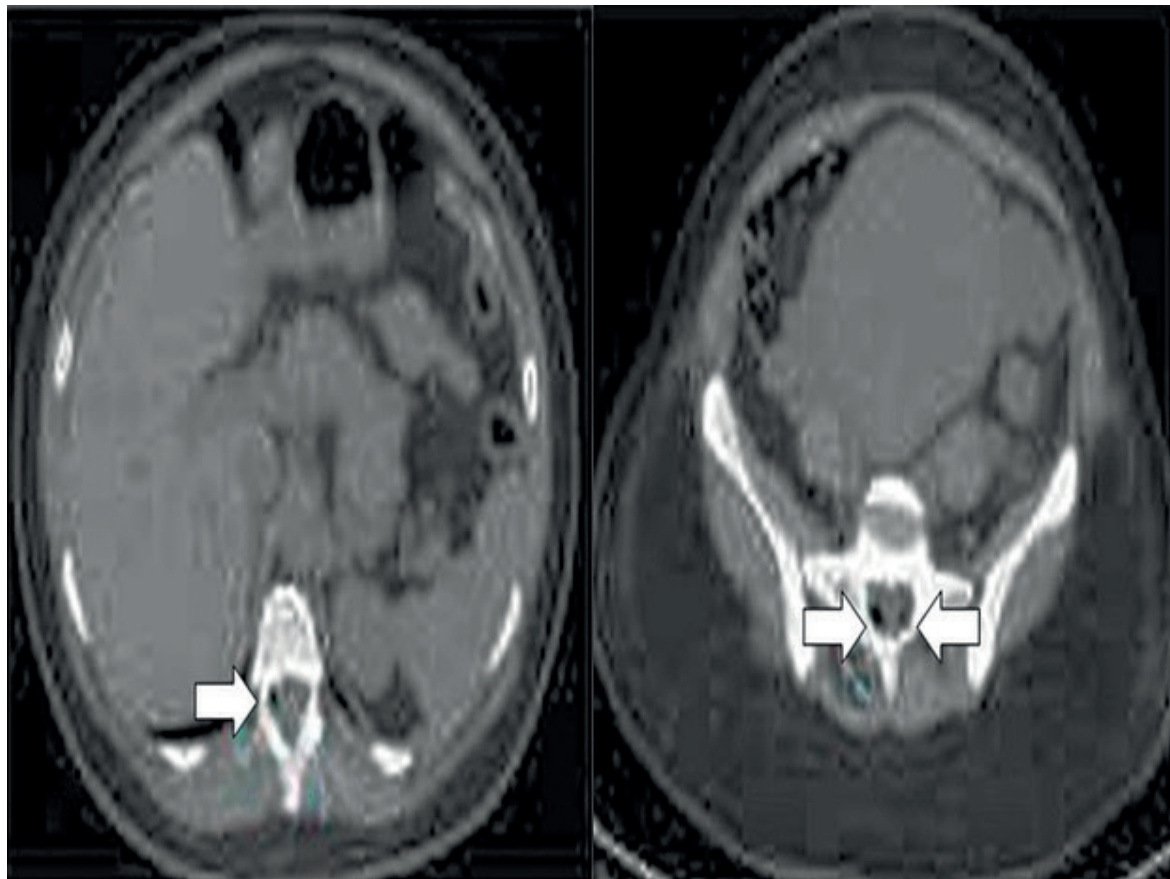
At 5 hours postoperatively, the patient complained of severe, excruciating and continuous pain in the lumbar area, which was refractory to treatment with nonsteroidal analgesics and

intravenous opioids. She had no medical history of importance. The patient denied fever, chills, nausea, neck pain and/or stiffness, focal weakness or numbness, visual changes or incontinence. On examination, temperature was 36.8°C, heart rate 95 beats per minute, respiratory rate 16 breaths per minute, blood pressure 146/85 mmHg and oxygen saturation 99% on room air. Complete physical examination, including a thorough neurological examination, was normal.

Laboratory tests were within normal limits. A thoracolumbar computed tomography scan was requested in which a single epidural air bubble was detected at the level of L2-L3 on the right side of the lumbar epidural canal, without significant mass effect, leading to the diagnosis of epidural pneumorrhachis (Figure 1). No evidence of other lumbar or pelvic alterations was found.

In view of the clinical and imaging findings and the stability of the symptomatology, expectant management with supportive care and adequate

FIGURE 1. AXIAL COMPUTED TOMOGRAPHY IMAGES. ARROWS INDICATE THE PRESENCE OF AIR IN THE EPIDURAL SPACE OF THE SPINAL CANAL.





analgesia was decided. The patient received another dose of intravenous morphine and a bolus of 1 liter of 0.9% saline solution, presenting clinical improvement and disappearance of pain after 8 hours. She was discharged on the third day with instructions to return if she presented any warning signs. During outpatient follow-up, the patient remained without pain or neurological alterations. Follow-up CT scan 15 days later showed complete resolution of the pneumorrhachis.

DISCUSSION

Pneumorrhachis is the presence of air in the intra- or extradural compartment within the spinal canal⁽⁴⁾. The epidural space is not covered by fascial planes, so it communicates with the intervertebral foramina. Air can also enter from the retroperitoneum. It can move freely through the vertebral foramen and accumulate in the posterior epidural space, due to less resistance compared to the anterior epidural space (which has a large vascular network)⁽⁵⁾. Air trapped in the cerebrospinal compartment may cause intracranial and intraspinal hypertension and hypotension secondary to increased or decreased pressure⁽⁶⁾. Such injected air can act as a space-occupying lesion and exert pressure on nerve structures within the spinal canal. Therefore, trapped air could cause pneumorrhachis and pneumocephalus with nerve tissue compression⁽⁵⁾.

Pneumorrhachis can be classified according to the anatomical location of the air: internal (intradural, subdural or subarachnoid) or external (extradural, intraspinal or epidural). Epidural pneumorrhachis may be iatrogenic, spontaneous or traumatic⁽⁶⁾. Traumatic cases may be secondary to intracranial, cervical, thoracic, abdominal, pelvic traumatic injuries or a combination of all of the above⁽⁷⁾. Non-traumatic etiologies include bronchial asthma, elevated intrathoracic pressure observed during delivery, forced emesis due to diabetic ketoacidosis, epidural abscesses, bowel perforation, intense physical exercise, tumor invasion, post-radiation changes, inhaled drug abuse, Boerhaave's syndrome, foreign body ingestion and cardiopulmonary resuscitation⁽⁸⁾.

Iatrogenic causes are the most frequent and include chest tube placement, iatrogenic spinal durotomy, craniotomy, nasotracheal intubation,

subarachnoid pleural fistula following thoracic spine surgery, bronchopleural fistula following lobar resection, epidural anesthesia and diagnostic lumbar puncture. In cases secondary to epidural analgesia/anesthesia, the direct mechanism is the iatrogenic introduction of air into the spinal canal through the needle. Its incidence is extremely low, estimated between 0.001% and 0.02%^(3,9). These cases are considered frequent but asymptomatic since air does not tend to migrate and is spontaneously and completely reabsorbed^(5,10). Sometimes it can lead to tension pneumocephalus, a potentially fatal condition⁽⁹⁾. There is no definitive consensus on the minimum volume of air that can cause clinical repercussions.

However, in some cases it may become symptomatic and be associated with discomfort, pain and even neurological deficits. Severe manifestations may include meningeal irritation and radicular pain in the cervical and lumbar regions. In addition, more severe presentations include unilateral or bilateral lower extremity weakness, cauda equina syndrome and tetraplegia^(3,11). Symptoms of pneumocephalus, such as headache, elevated intracranial pressure, vomiting, seizures and unstable vital signs, depend on the distribution and amount of intracranial air⁽¹²⁾. However, the volume of air that can be safely injected into the epidural space has not yet been established and the association between the amount of intracranial air and headache is not clear^(13,14). On the other hand, it is essential to differentiate them from those caused by degenerative, malignant, inflammatory and infectious diseases by gas-forming organisms⁽¹⁰⁾.

Pneumorrhachis is a difficult condition to diagnose with plain radiography, as there must be a significant volume of air within the spinal canal to detect it⁽⁹⁾. Computed tomography is the diagnostic tool of choice, not only to identify the condition but also for any coexisting lesions. However, in some cases it may be difficult to differentiate between epidural and subarachnoid air⁽¹⁵⁾. Other diagnostic modalities, such as MRI or myelography, offer more sensitive diagnostic possibilities⁽⁷⁾.

Since pneumorrhachis is a rare complication with different pathologies and etiologies, there are no specific indications for treatment. Depending on the origin, it may be associated



with increased mortality, so it is necessary to adequately treat the cause^(10,11). Treatment modalities consist of observation with serial neurological examination, bed rest, high flow oxygen therapy to remove air from the epidural space, antibiotics, treatment of the primary cause and active therapy to evacuate the air^(8,16). Cases with decreased intraspinal pressure have a benign course, whereas intraspinal air trapped under pressure entering the craniospinal compartment may cause pneumorrhachis and pneumocephalus with nerve tissue compression, necessitating a surgical therapeutic approach. In cases secondary to epidural analgesia/analgesia, this complication can be prevented by using saline instead of air for localization of the epidural space⁽²⁾.

In conclusion, pneumorrhachis is an uncommon complication of epidural anesthesia/analgesia in the puerperium and occurs when air passes through the fascial planes into the epidural space. It is generally a benign and incidental finding, although it may be associated with high morbidity and mortality. Neurological symptoms are rare, and most patients experience reabsorption of epidural air without long-term complications. Cases caused by benign etiologies may be treated conservatively and resolve spontaneously.

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