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*Case Report*

# Spinal adhesive arachnoiditis after spinal anesthesia complicated by communicating hydrocephalus – A case report

Abdulrahman Marzouq AlMutairi[1], Mubasher Ahmed[2], Abdulaziz Abdullah Basurrah[2], Fayez Dhafer Alshehri[3], Zaina Brinji[4], Naseem Albargi[4], Ahmed Adel Farag[2]

[1]Department of Neurosurgery, King Abdulaziz University Hospital, Jeddah, [2]Department of Neurosurgery, King Abdullah Medical City, [3]Department of Neurosurgery, King Abdulaziz Medical City, Ministry of the National Guard-Health Affairs, King Abdullah International Medical Research Center, [4]Department of Neuroradiology, King Abdullah Medical City, Makkah, Saudi Arabia.

E-mail: *Abdulrahman Marzouq AlMutairi - abdulalmutiri1@gmail.com; Mubasher Ahmed - mir.m@kamc.med.sa; Abdulaziz Abdullah Basurrah - abdulazizbasurrah@hotmail.com; Fayez Dhafer Alshehri - mhm88823@gmail.com; Zaina Brinji - z.brinji@hotmail.com; Naseem Albargi - albarginm@gmail.com; Ahmed Adel Farag - farag.a@kamc.med.sa

***Corresponding author:**
Abdulrahman Marzouq AlMutairi,
Department of Neurosurgery, King Abdulaziz University Hospital, Jeddah, Saudi Arabia.

abdulalmutiri1@gmail.com

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## ABSTRACT

**Background:** Adhesive arachnoiditis (AA) is a debilitating condition characterized by chronic inflammation of the arachnoid membrane, leading to the formation of intrathecal scars and dural adhesions. The etiology of AA is multifactorial, including factors such as infections, trauma, and iatrogenic damage. We present a case of a female patient who developed communicating hydrocephalus after spinal anesthesia complicated by severe AA.

**Case Description:** A 33-year-old female underwent a cesarean section with epidural anesthesia. Five hours postoperatively, she experienced transient difficulty standing, which was resolved with assistance. Weeks later, she developed a severe holocephalic headache accompanied by nausea, vomiting, photophobia, and phonophobia. Imaging revealed hydrocephalus and pronounced AA. Lumbar puncture provided symptomatic improvement. The patient underwent ventriculoperitoneal shunt insertion, resulting in further symptom improvement and successful shunt function.

**Conclusion:** AA is a challenging condition associated with inflammation and scarring of the arachnoid membrane. The development of hydrocephalus following epidural anesthesia, in this case, highlights a rare manifestation of arachnoiditis. Further research and documentation are needed to understand better the underlying mechanisms and risk factors contributing to hydrocephalus in the context of AA following epidural anesthesia.

**Keywords:** Adhesive arachnoiditis, Complications, Epidural anesthesia, Hydrocephalus

## INTRODUCTION

Adhesive arachnoiditis (AA) is an incapacitating pathological state distinguished by enduring inflammation of the arachnoid membrane, resulting in the formation of intrathecal scars and dural adhesions.[3,6,7] The clinical presentation of AA exhibits considerable heterogeneity, ranging from asymptomatic cases to individuals experiencing painful radicular syndromes and, in severe instances, resulting in profound disability like paraplegia. The etiology is multifaceted, encompassing a range of factors such as infections, trauma, spinal tumors, meningitis, and

intrathecal hemorrhage. Notably, iatrogenic damage resulting from neurosurgical interventions, administration of oil-based contrast agents, and epidural anesthesia, among other factors, represents a significant risk factor for the development of AA. We want to present an obstetric case developed communicating hydrocephalus after she had spinal anesthesia complicated with severe spinal AA.

## CASE REPORT

We present the case of a 33-year-old female patient who underwent a cesarean section procedure under epidural anesthesia. Five hours after the surgery, she experienced transient difficulty standing, which was resolved with assistance. She was discharged from the hospital after two days without any other complaints. However, several weeks later, she developed a severe holocephalic headache that was unresponsive to analgesics and persisted throughout the day, significantly impacting her sleep. The headache was accompanied by symptoms such as nausea, vomiting, photophobia, and phonophobia, prompting her to seek medical attention.

On admission for further evaluation, a computed tomography (CT) brain scan revealed the presence of acute hydrocephalus, as shown in Figure 1, leading to the subsequent investigation of the underlying cause. Further imaging with magnetic resonance imaging (MRI) of the brain and spine demonstrated pronounced AA, characterized by the adherence of cauda equina nerve roots to the thecal sac, as well as the presence of intradural multiloculations resembling cerebrospinal fluid (CSF) encapsulating the spinal cord, extending up to the cervical spine level as shown in Figure 2. These findings strongly supported the diagnosis of arachnoiditis and the subsequent development of communicating hydrocephalus.

To gain more insights into the underlying etiology, a lumbar puncture was performed, and CSF samples were obtained. The analysis of the CSF samples revealed normal results. Remarkably, following the lumbar puncture, the patient experienced symptomatic improvement.

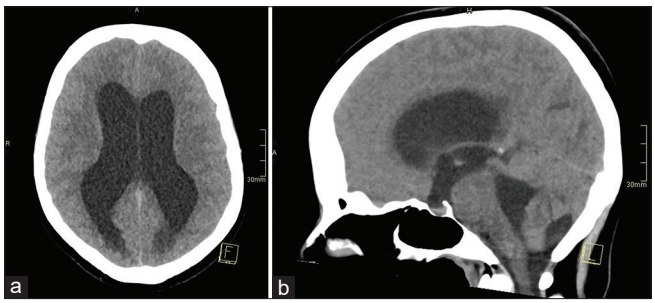


**Figure 1:** (a) Axial and (b) sagittal computed tomography (CT) scans reveal the presence of ventriculomegaly and hydrocephalus.

After confirming the diagnosis, the patient underwent ventriculoperitoneal shunt insertion. Following the procedure, her symptoms continued to improve, and a postoperative CT scan confirmed the satisfactory function of the shunt. Consequently, the patient was discharged home in a stable clinical condition.

## DISCUSSION

AA is an incapacitating pathological state distinguished by enduring inflammation of the arachnoid membrane, resulting in the formation of intrathecal scars and dural adhesions.[3,6,7] The precise incidence of AA remains uncertain, and the reported figures may significantly underestimate the actual prevalence of the condition.[1] The pathogenesis of AA involves the infiltration of fibrous tissue into the pia mater, which arises as a consequence of inflammation. This inflammatory process leads to the production of fibrous tissue and adhesions, resulting in the adherence of spinal roots to one another and/or to the thecal sac.[9] The arachnoid, lacking both vasculature and innervation, presents a challenging healing process akin to other serous membranes, such as the peritoneum or pleura. The continuous circulation of CSF further complicates this process by effectively removing phagocytes and enzymes that are instrumental in preventing the formation of scar tissue.[4] The etiology of AA is multifactorial and encompasses a diverse range of causes. Among the most prevalent factors contributing to its development are infections of bacterial, tuberculous, and syphilitic origin; traumatic events include complications arising from surgical procedures, contamination of the thecal sac resulting from intraspinal injections of various substances such as iodine-based contrast agents and corticosteroids, as well as the presence of spinal canal tumors.[1,2,5,8] MRI is diagnostic in these cases, and the findings include clumping, enhancing thickening and displacement of the nerve roots, presence of arachnoid cysts, arachnoid separations, spinal cord compression, and subsequent atrophy of the spinal cord with the formation of syrinx on chronic stage. MRI findings can be further categorized into three types – Type I: nerve roots are clumped together and distorted, Type II: nerve roots are adherent to the theca resulting in an empty thecal sac sign, and Type III: nerve roots and theca are clumped together into a single soft-tissue mass centrally within the spinal canal.

Interestingly, our patient presented with hydrocephalus after 5 h of the epidural anesthesia. Hydrocephalus is defined as the abnormal accumulation of CSF within the brain, and it is an infrequent complication observed in the context of adhesive spinal arachnoiditis subsequent to epidural anesthesia. This occurrence represents a rare manifestation of arachnoiditis, highlighting the challenges associated with its prediction in patients presenting with lower-limb weakness

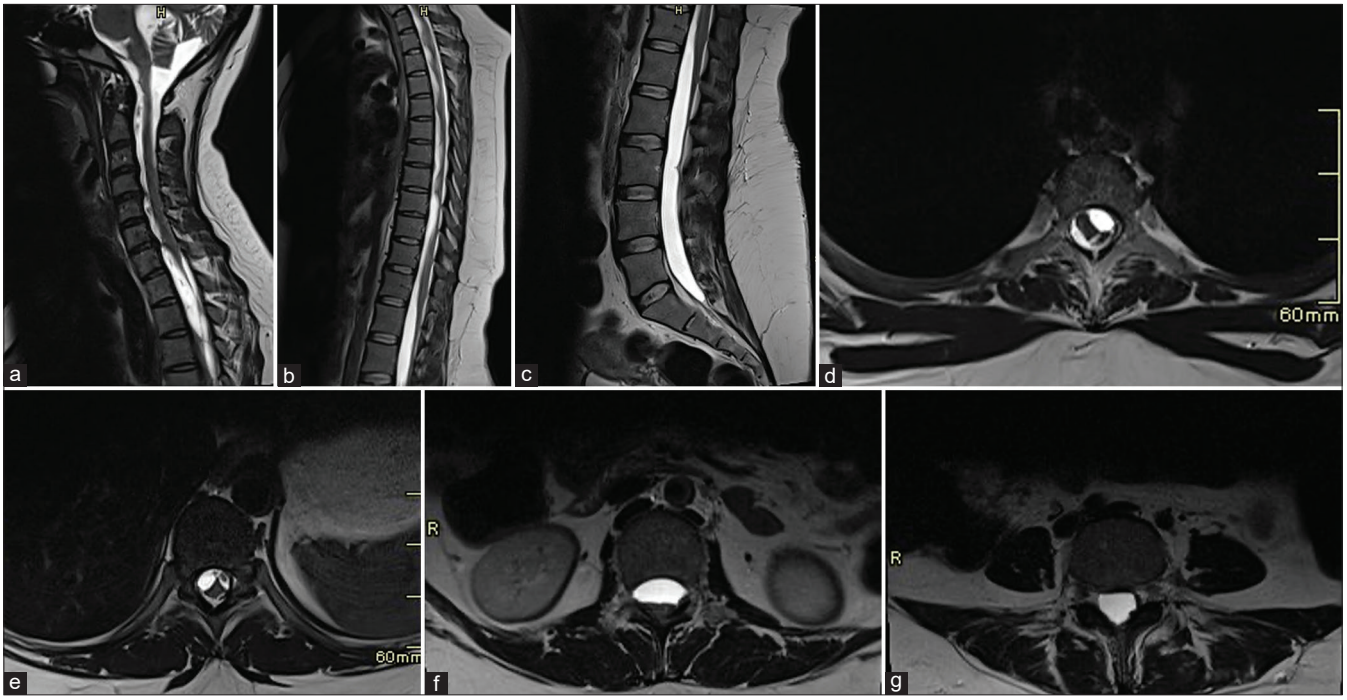


**Figure 2:** (a-g) Findings suggestive of Adhesive Arachnoiditis. Sagittal and axial magnetic resonance imaging of the spine without contrast reveals adherent cauda equina nerve roots to the thecal sac, associated with extensive intradural cerebrospinal fluid-like multiloculations extending up to the lower cervical spine encasing the thoracic cord.

following epidural anesthesia and complaints suggestive of increased intracranial pressure. Given the atypical nature of this presentation, further investigation and documentation of similar cases are warranted to enhance our understanding of the underlying mechanisms and potential risk factors contributing to the development of hydrocephalus in the context of adhesive spinal arachnoiditis following epidural anesthesia.

## CONCLUSION

AA is a complex condition characterized by chronic inflammation and the formation of scar tissue in the arachnoid membrane. Its true incidence is uncertain and often underestimated. The condition is multifactorial, with various causes, including infections, trauma, and iatrogenic factors. It poses challenges in diagnosis and treatment due to the avascular nature of the arachnoid and the continuous circulation of CSF. Hydrocephalus, while rare, can occur as a complication in some cases. Further research is needed to understand the underlying mechanisms better, predict such complications, and improve patient outcomes.

### Ethical approval

Institutional Review Board approval is not required.

### Declaration of patient consent

Patient's consent not required as patient's identity is not disclosed or compromised.

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### Conflicts of interest

There are no conflicts of interest.

### Use of artificial intelligence (AI)-assisted technology for manuscript preparation

The authors confirm that there was no use of artificial intelligence (AI)-assisted technology for assisting in the writing or editing of the manuscript and no images were manipulated using AI.

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