






Case Report

Fatal, Acute Subdural Hematoma Following Spinal Anesthesia In A Postpartum Patient: A Case Report With A Mini Literature Review

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ABSTRACT

The authors report a case of fatal postpartum acute subdural hematoma after multiple attempts at spinal anesthesia related to cesarean delivery. A 22-year-old primigravida was admitted to the Obstetrics and Gynecology Department due to the throes of childbirth. The presence of threatening intrauterine hypoxia indicated a C-section with the usual lumbar anesthesia. However, the anesthesia proved insufficient, necessitating the administration of intratracheal narcosis, which occurred without complication. A healthy, mature boy was born with Apgar scores of 10/1 and 10/5. During the first 8 h of the postpartum period, the primipara exhibited stable vital parameters without neurological symptoms. After 8.5 h, a grand mal seizure was observed following a period of consciousness and spontaneous breathing that soon ceased. The CT scan examination revealed a significant left fronto-temporo-parietal acute subdural hematoma. All brainstem reflexes were absent, lacking corneal, trigemino-facial, and oculo-vestibular reflexes, with submaximal dilated pupils, and unresponsive to direct and consensual light stimuli. Despite an urgent neurosurgery operation and 4 days of intensive therapy, follow-up brain CT examinations showed a massive midline shift and compression of the supratentorial ventricle system. No trauma or other malformations of the brain were detected. According to the primary brain damage protocol, after a 12-hour observation period, brain death was declared, and she was deemed suitable for organ donation. Our mini-review identified 12 published cases of postpartum subdural hematoma following spinal anesthesia between 1995 and 2021. The data highlight the importance of early neuroimaging and multidisciplinary assessment when postpartum headaches or seizures occur.

1. Introduction

Spinal and epidural anesthesia is a common method used in the routine daily practice of obstetrics and gynecology. This includes procedures such as urinary tract operations, surgeries on lower body parts like the pelvis, and treatment of long bone fractures. Both methods are effective and safe as neuraxial techniques [1–3]. However, like other medical interventions, they also have complications, with postdural puncture headache (PDPH) being one of the most common and benign side effects, along with nausea, vomiting, spinal hematoma, arachnoiditis, and potentially fatal acute or chronic subdural hematoma [4–8]. The authors report a case involving a primipara who developed an acute, fatal subdural hematoma (SDH) after attempts at spinal anesthesia for cesarean delivery [9]. Although this is a rare but serious

complication, early recognition during the postpartum period is essential to prevent fatal outcomes. As of 2021, approximately 50 cases have been documented in the literature, but the prevalence may be higher [6]. The authors present a fatal case and briefly summarize selected reported cases for context. See Table 1.

2. Case report

A 22-year-old primigravida was admitted to the hospital due to uterine activity. Her medical history indicated diet-controlled gestational diabetes, which was monitored through continuous observation. As cervical progression occurred, amniotomy was performed, revealing meconium-stained amniotic fluid. The presence of fetal distress necessitated a cesarean section. Due to multiple inadequate spinal anesthetics,

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Table 1
Summary of postpartum subdural hematoma cases following spinal anesthesia.

Author(s)/ year/ country	Age of the gravida (years)	Relevant prepartum clinical data/ cause of cesarean delivery	Postpartum symptoms after spinal anesthesia	Outcome
Ajith et al. (2013) India [17]	24	primigravida without comorbidities, 38 weeks pregnant, cesarean section due to absence of foetal movement 25G Quincke Babcock needle	On the 3rd day, a moderate frontal headache with no neurological deficits or neck rigidity. On the 6th postoperative day, with a severe headache extending to the occipital and neck region, with hypertension and bradycardia. CT and MRI were performed to prove an acute subdural hematoma. Conservative treatment and a 3- month follow-up period were administered.	Recovery
Bekele et al. (2021) Ethiopia [6]	28	An Ethiopian pregnant (G2, P1), cesarean section because of a previous cesarean scar and „big baby”, without any known previous illnesses	31 days after elective cesarean section, with 3 days of fatigue and worsening headache, malaise, and nausea, without trauma or fall accident, with a fully conscious and oriented state, without mental status change. A CT scan revealed a large, left, frontoparietal, 10 mm thick chronic subdural hematoma with acute components, with a 13 mm midline shift; and hematoma evacuation was needed using burr- hole placement.	Recovery
Bhatt et al. (2018) India [10]	36	post in vitro fertilization (IVF), twin pregnancy, pre-eclampsia cesarean section on 36 weeks 6 days of pregnancy	primipara 19 days after delivery, left-sided headache and blurring of vision were observed. CT scan revealed a left fronto-temporo- parietal acute on chronic subdural hematoma. First, conservative and after neurosurgical craniotomy, with the drainage of the hematoma, were applied.	Recovery
Cohen et al. (1995) Argentina [1]	18	normal pregnancy uneventful labor and delivery	No history of trauma, coagulation abnormalities, or neurologic	Recovery

Table 1 (continued)

Author(s)/ year/ country	Age of the gravida (years)	Relevant prepartum clinical data/ cause of cesarean delivery	Postpartum symptoms after spinal anesthesia	Outcome
			disorders. On day 6, she was discharged with a mild left frontoparietal headache. On day 14, the headache remained, with no other abnormalities. On day 42 after delivery right Babinski’s sign and bilateral papilledema were observed. CT showed large, bilateral SDHs., patient underwent two bilateral burr holes with drainage, after 6 days the repeated CT showed marked resolution, correction of the midline shift.	
Dawley et al (2009) USA [18]	26	G2, P1 gravida, 35 weeks and 3 days of gestation, cesarean section due to fetal transverse lie stable placental abruption diagnosed at 18 weeks of gestation, and her family history was positive for maternal hypertension, diabetes, and „hole in the heart.” 24G Quincke needle	About 4 h after delivery, severe headache and vomiting were observed with tachypnea (24/min) and mental disturbances. 5 h after delivery, CT examination was performed, and a 6 mm thick subdural hematoma on the right side was proven. After 12 h of delivery, a repeated computed tomogram was applied, 8 mm subdural hematoma with a 7 mm right- to-left midline shift was observed. Right frontal craniotomy and hematoma evacuation were needed.	Recovery
Domoto et al. (2018) Japan [19]	41	2 gravida (G2) Scheduled cesarean delivery due to previous cesarean section MRI-proven unruptured, 3 mm cerebral aneurysm Epidural catheterization was attempted TH11/12 interspace, with an 18G Touhy needle, after spinal anesthesia	2 para (P2) Incisional pain after operation. On the 2nd postoperative day: slight neck stiffness. On the 4th postoperative day, MRI examination, because of her neck pain, revealed bilateral acute subdural hematoma- conservative therapy was administered.	Recovery

(continued on next page)

Table 1 (continued)

Author(s)/ year/ country	Age of the gravida (years)	Relevant prepartum clinical data/ cause of cesarean delivery	Postpartum symptoms after spinal anesthesia	Outcome
		was applied at L3/4. 25G Quincke needle	On the 9th postoperative day, due to a headache, CT examination showed progression with midline shift. On the 10th day epidural blood patch was performed, and after 1 day her headache disappeared. On the 11th postoperative day, the CT confirmed the decrease in the size of the hematoma. On the 18th day: discharge. There was no headache!	
Gioia et al. (2019) Italy [11]	40	primigravida, 38 weeks pregnant, elective cesarean delivery due to tocophobia suffered from anorexia nervosa	In the early postoperative period, a light headache was observed. 33 h after cesarean delivery, a sudden severe headache, consciousness, and coma were observed. CT revealed an acute, 15 mm-thick subdural hematoma on the left hemisphere, with 20 mm midline shift and cerebral tonsillar herniation. After 12 h of urgent decompressive hemicraniotomy, she was declared dead, and organ donation was performed.	Death
Moorthy et al. (2017) India [13]	23	primigravida without complications, and a cesarean section was applied to the term	On the third postoperative day, severe, progressive headache, vomiting, and blurring of vision were reported. Native CT scan revealed left frontoparietal convexity subdural hematoma without mass effect, which extended along the interhemispheric fissure and left tentorium. Conservative therapy was administered, and after 1 month, the repeat CT showed	Recovery

Table 1 (continued)

Author(s)/ year/ country	Age of the gravida (years)	Relevant prepartum clinical data/ cause of cesarean delivery	Postpartum symptoms after spinal anesthesia	Outcome
Rajbhandari et al. (2021) Nepal [12]	25	pregnancy without complication, no data (ND) about the cause of cesarean delivery 25 G needle	complete resolution. 16 days after cesarean section with 3 days of persistent, non-postural, progressive headache. CT scan revealed in the right frontoparietal-temporal convexity, 9 mm thick subdural hematoma with a 6 mm midline shift, right frontoparietal burrr hole, and evacuation of the hematoma was performed.	Recovery
Schweiger et al. (2013) Italy [2]	33	multigravida, 38 weeks pregnant, elective cesarean section because of previous laparoscopic myomectomy 25G Sprotte needle	On the 2nd day from delivery: nausea without vomiting, acute ascending back pain from the lumbar region to the occipital region of the head, bradypnoe, drowsiness, anisocoria (right > left). Acute CT revealed a 12 mm-thick, acute subdural hematoma (SDH) of the right hemisphere with a 10 mm midline shift. emergency right frontal craniotomy and hematoma evacuation were performed.	Recovery
Srivastava et al. (2014) India [14]	29	Pregnancy was uncomplicated. Medical history was unremarkable 25G Quincke needle	On the 1st post-operative day, a generalized headache with severe occipital focus was observed with vomiting, and it was resolved by the 4th day. It was returned on day 6, and on day 11 severe, incapacitating headache with extreme irritability, drowsiness, and vertigo. Urgent MRI was administered to prove a subacute SDH in the right fronto-temporo-parietal region, with 8 mm midline shift. Later, cerebral	Recovery

(continued on next page)

Table 1 (continued)

Author(s)/ year/ country	Age of the gravida (years)	Relevant prepartum clinical data/ cause of cesarean delivery	Postpartum symptoms after spinal anesthesia	Outcome
				angiography did not reveal an aneurysm or arteriovenous malformation. Urgent craniotomy was performed.

intratracheal anesthesia was administered. A mature, healthy male infant was delivered with an Apgar score of 10 at both 1 and 5 min. Surgical procedures and anesthesia proceeded without complications. The initial 8-hour postoperative period was uneventful under subintensive monitoring; however, after 30 min, the patient experienced grand mal seizures and loss of consciousness, despite spontaneous breathing. Hypertension and coma (Glasgow Coma Scale 1–1–1) developed, accompanied by the absence of brainstem reflexes, tachycardia, bradypnea, and submaximally dilated isocoric pupils without direct or consensual light reflexes. Computed tomography (CT) revealed a 20 mm-thick, acute, profuse subdural hematoma in the left fronto-parietal-temporal region, with a 15 mm midline shift and significant cerebellar herniation (Fig. 1a). The corneal, cough, trigeminal-facial, oculo-vestibular, and eyelash reflexes were also non-reactive. An urgent left craniotomy was indicated following intensive care. On repeated computed tomography (CT) scans, hypodense lesions indicative of subacute ischemia were identified after regression of the subdural hematoma and its effects (Fig. 1b). On the 3rd postpartum day, the second repeat CT revealed progression with significant edema and additional hypodense foci, similar to those in the pons and mesencephalon, causing compression of the left enlarged supratentorial ventricular system (Fig. 2a). The CT angiography revealed no arteriovenous malformations or aneurysms (Fig. 2b).

At that time, brainstem reflexes were absent. According to the primer brain damage protocol, a 12-hour monitoring period was initiated to establish brain death. After this determination, organ donation (heart, liver, and kidneys) was performed. During the autopsy, we preserved the integrity of the dura mater when the calvaria was removed. The dura mater was folded back from centimeters to centimeters to identify the ruptured bridging vein(s). Many vessels were observed, but they were not ruptured (Fig. 3). We could not detect the source after formalin fixation either. We assumed that it was removed during the craniotomy. See Fig. 4.

3. Discussion

Postpartum headache is a common occurrence, with hypertension, migraine, eclampsia, and preeclampsia being the most frequent causes. Notably, postdural puncture headache accounts for 16 % of relevant cases [10]. Subdural hematoma, although rare, is a potentially fatal complication of spinal anesthesia, occurring in approximately 1 in 500,000 to 1 in 1,000,000 obstetric procedures [2,11,12]. Its symptoms can overlap with other conditions, such as sinus venous thrombosis, postpartum leukoencephalopathy, pituitary apoplexy, idiopathic cerebral angiopathy, stroke, osmotic demyelination, aneurysm rupture, arteriovenous malformations, tension headache, and caffeine-withdrawal headache [10,13–17]. The incidence of postpartum SDH is heightened, possibly due to hormonal, physiological, and physical changes, along with cerebrospinal fluid (CSF) leakage via the puncture site, leading to pressure changes, intracranial hypotension, and rupture of the bridging veins [18]. The multiple spinal anesthesia attempts and the gauges of the needles (the smaller, thinner is better) also influence the prevalence of SDH [19]. Predisposing factors include hemolysis, elevated liver enzyme levels, low platelet levels (HELLP) syndrome, dehydration, multiple dural punctures, and brain atrophy [6,12]. Other clinical symptoms include drowsiness, vomiting, nausea, blurred vision, seizures, mental disturbances, diplopia, and coma. Early recognition is crucial to reducing the risk of a fatal outcome; thus, neurological disturbances necessitate the use of imaging technology.

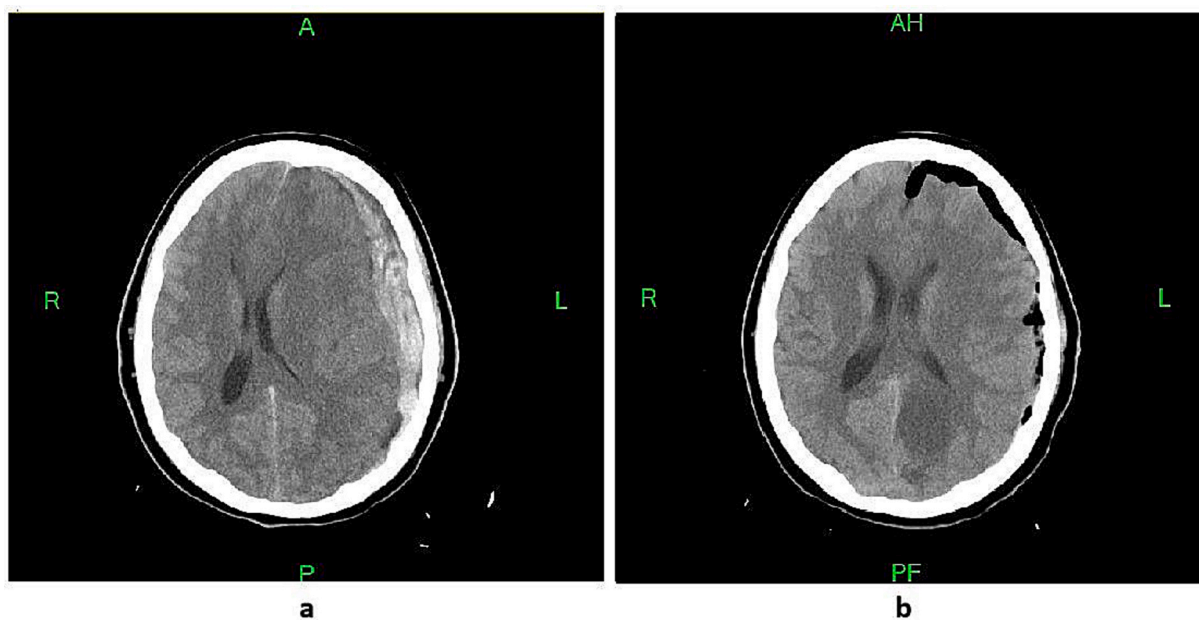


Fig. 1. **A:** Initial non-contrast CT scan reveals an acute subdural hematoma in the left fronto-parieto-temporo region, with a maximum thickness of 20 mm. There is a midline shift from left to right measuring approximately 15 mm. The supratentorial ventricular system is compressed, as is the fourth ventricle, and a 10 mm cerebellar herniation is evident. No intracerebral hemorrhage is observed. **b:** The subsequent CT, conducted the following day post-craniotomy, indicates a residual hemorrhage of 5 mm thickness in the temporal region, accompanied by pneumocephalus. The supratentorial ventricular system is displaced 5 mm to the right. Multiple hypodense foci, ranging from 14 to 38 mm, are observed in the pons, mesencephalon, left temporal region, basal ganglia, and, as depicted in the image, the occipital lobe. (A/AH: anterior; P/PF: posterior; R: right; L:left).

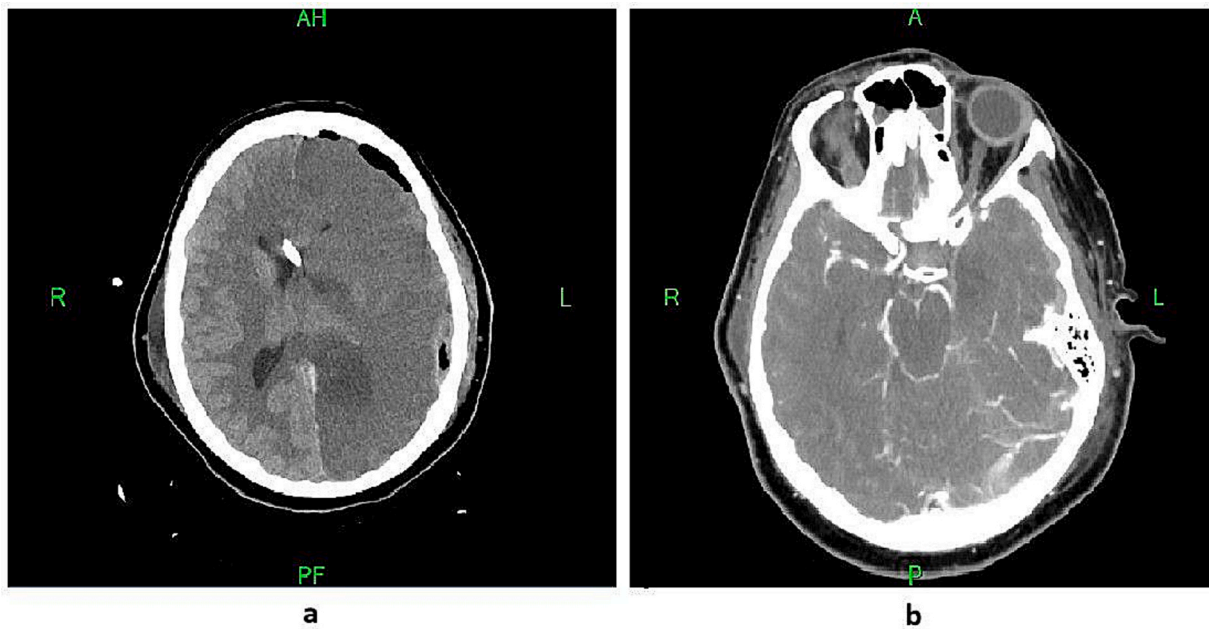


Fig. 2. A: Residual subdural hemorrhage measuring 6 mm in thickness is evident, and pneumocephalus decreased in size. The left hemisphere demonstrates substantial generalized edema, and the previously identified hypodense foci have advanced. The supratentorial ventricular system is compressed, exhibiting leftward predominance, and the ventricular drain terminates in the left frontal cornu. **b:** Angio-CT reveals no aneurysms, intracranial artery dilation, or other venous malformation. (A/AH: anterior; P/PF: posterior; R: right; L:left).

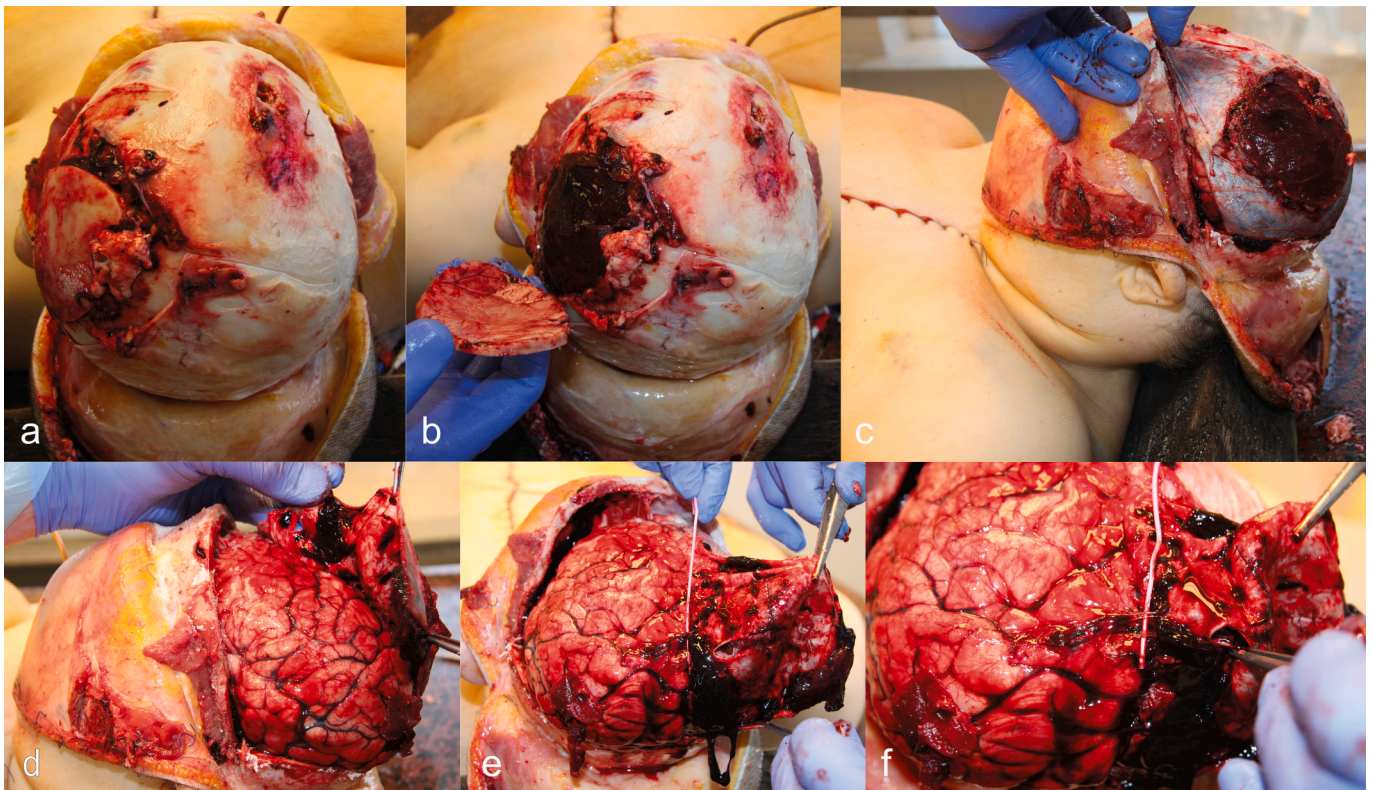


Fig. 3. A, b: Upon removal of the scalp, the position of the left craniotomy (“bone window”) and the burr hole for the external ventricular drain on the right side are visible. **c:** The calvaria is excised while preserving the integrity of the dura mater. **d, e, f:** With the careful retraction of the dura mater, the bridging veins are exposed, accompanied by residual subdural hemorrhage and edematous brain parenchyma.

The onset of symptoms following spinal anesthesia determines the type of SDH: acute, subacute, or chronic. CT examination is appropriate for acute cases, and angiography may be required. However, MRI might

be more effective in chronic cases because the density of normal brain tissue and older-stage hematomas can be similar [2]. Therapeutic strategies include conservative management, observation, or surgical

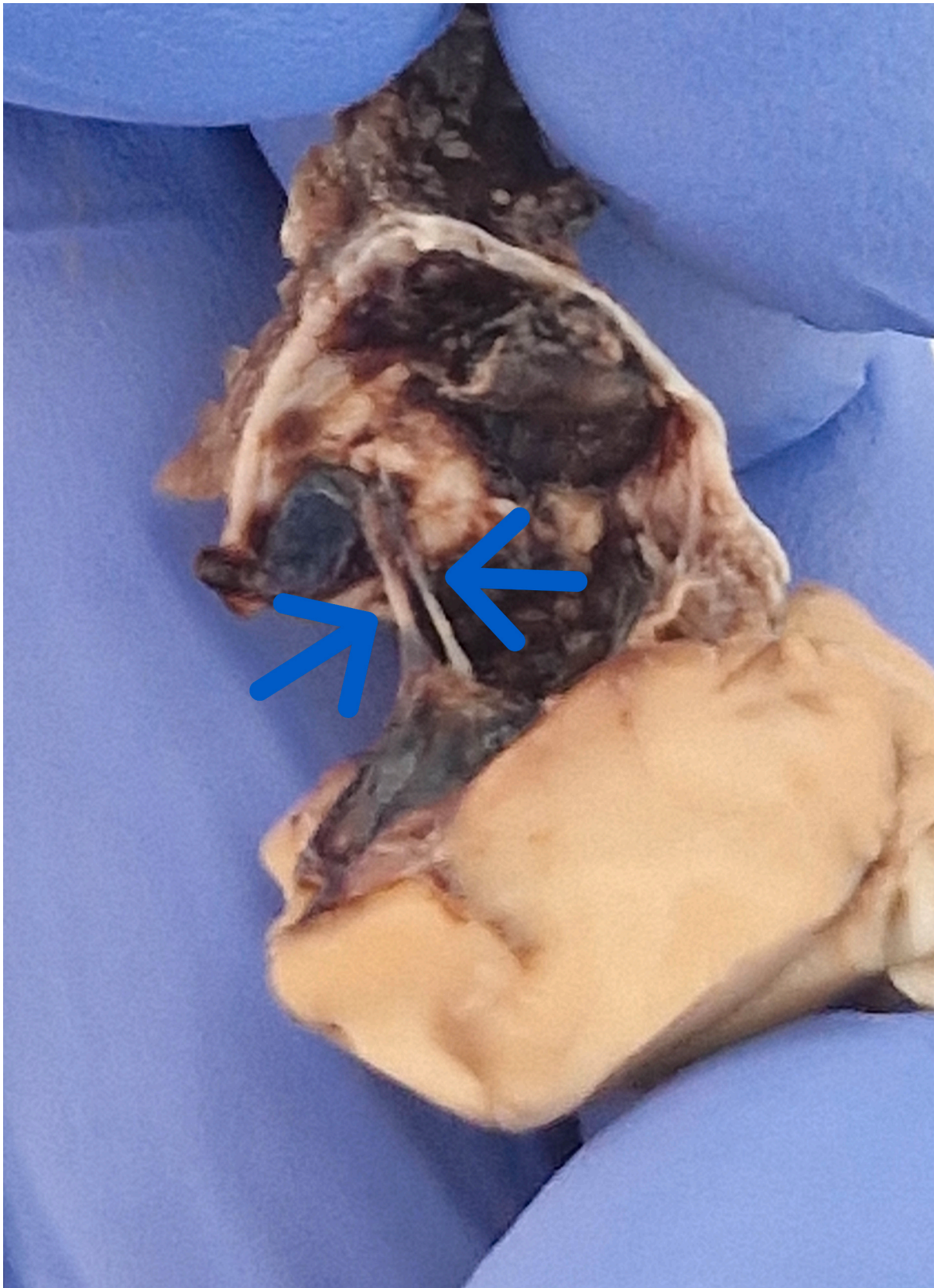


Fig. 4. Some intact bridging veins after formalin fixation (arrows). Residual subdural hemorrhage is observed beneath the dura mater.

intervention, such as hematoma evacuation or burr holes, epidural blood patches, or a combination of these methods.

Generally, acute bleeding results in rapid symptom onset, whereas subacute or chronic hemorrhage manifests over days, weeks, or months.

In this mini-review, the onset of symptoms varied from 4 h to 42 days postpartum. The study identified seven acute cases (occurring within six days postpartum), one subacute case, and four chronic cases, with only one acute case being bilateral. Surgical intervention was employed for all chronic and subacute cases, whereas conservative treatment was deemed suitable for only two acute cases. The ages of the patients ranged from 18 to 41 years, with a median age of 29. Notably, only one acute case resulted in fatality, and in only one acute case, the headache was absent [11,19].

In the present case, the onset of symptoms occurred 8.5 h after labor. The first event was a grand mal seizure, followed by a loss of consciousness. Despite rapid medical intervention, acute SDH proved fatal. In this situation, the 22-year-old primipara exhibited no alarming signs, and the most characteristic headache was absent.

SDH is uncommon, but it represents a serious complication of spinal anesthesia, as it is not a classical traumatic form. Headaches, as a prodromal phenomenon, may indicate the presence of a non-traumatic intracranial hemorrhage. Early diagnosis and appropriate therapy can save lives. Multidisciplinary cooperation among obstetricians, neurologists, radiologists, and anesthesiologists is essential.

Ethical Approval

According to the 40. § (3) of the Hungarian Act of Forensic Experts (2016. XXIX), the data of the report can be utilized freely for scientific educational purposes without special ethical permission by the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Funding Declaration

This case report did not receive any specific grants from funding agencies in the public, commercial, or not-for-profit sector.

Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work, the author(s) used Paperpal in order to improve the language and readability. After using this tool, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

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Data Availability Statement

All data generated or analyzed during this study are included in this published article.

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