Original Article

Intracranial subdural haematomas: a rare but disabling complication of spinal anaesthesia

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Abstract

Background: Intracranial subdural haematomas (SDH) after subarachnoid blocks (SAB) are a very rare complication, which results in persistence of post procedure headaches and neurologic deterioration. Acute change in CSF pressure dynamics resulting in tears of bridging veins has been implicated.
Aim: To highlight our findings of intracranial SDH following SAB in the period 2018 to 2023 in Port Harcourt.
Methods: Patients who had persistent headaches with neurologic deterioration after SAB had brain imaging done. Those with SDH were recruited. They had burr hole evacuation of haematomas.
Results: Twelve patients (11 females), with a mean age of 41.0±9.8 years were recruited.
Ten patients had SAB, and 2 had Combined spinal epidural (CSE) anaesthesia. SAB was done with size 22G spinal needle in 3 patients and 24G in 5 patients. Confusion, headaches, alteration in consciousness, and paresis occurred in 66.7%, 100%, 75% and 83.3% of patients respectively. 16.7% patients were Mark-Walder grade IV, 8.3% grade III, 41.7% grade II, and 33.3% with grade I. 41.7% patients had bilateral SDH and 33.3% had left SDH. Chronic SDH was noted in 41.7% patients and others had subacute SDH. Mean interval between onset of symptoms to surgery was 6.3±7.3 days. Clinical recoveries were noted in all patients with postoperative modified Rankin Scale (mRS) scores at 14 days of 0.
Conclusion: Intracranial subdural haematomas may be rare but are a major cause of headaches with neurologic deteriorations after subarachnoid blocks. A high index of suspicion and prompt management results in good outcomes.

Keywords: Subdural haematoma, subarachnoid block, CSE, Mark-Walder grading, burr hole haematoma evacuation, mRS

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INTRODUCTION

Spinal and Epidural anaesthesia are safe and effective alternatives to general anaesthesia for surgeries in the lower abdomen, lumbar, sacral and lower limb regions of the body.[1, 2] Although regarded as low risk, they are not without complications. Common complications include hypotension, post-dural puncture headache (PDPH), and transient neurological symptoms.[3, 4] Intracranial subdural haematomas are a rare but life-threatening complication following spinal/epidural anaesthesia. A possible explanation for this is the alteration in CSF pressure dynamics with continued CSF leak from the subarachnoid space following spinal dural puncture. This leads to lower intracranial pressure, tearing of bridging dural veins, which results in subdural haematoma.[5, 6, 7, 8] This explanation mirrors the aetiology of post-dural puncture headache (PDPH), which is benign and self-limiting, usually managed with bed rest, hydration, and simple analgesics, and the incidence and severity correlate well with the needle size and tip design.[9, 10] However, if features of PDPH are prolonged or if there is prolonged alteration in consciousness, development of personality changes, onset of seizures, or other features of a focal neurologic deficit, the presence of the rarer but more fatal intracranial subdural haematoma or other intracranial haemorrhages should be considered.[11, 12] A search through the literature revealed that fewer than one hundred such cases have been reported.[13, 14] It is believed that this is below what it should be, as some cases may not be radiologically diagnosed. Due to its potentially fatal implications, a high index of suspicion should be maintained. PDPH and post-neuraxial anaesthesia intracranial subdural haematoma could be prevented by using the smallest possible spinal pencil-point needles.[15]

This study aimed to bring to the fore our experience with spinal anaesthesia complicated by intracranial subdural haematoma between the years 2018 and 2023.

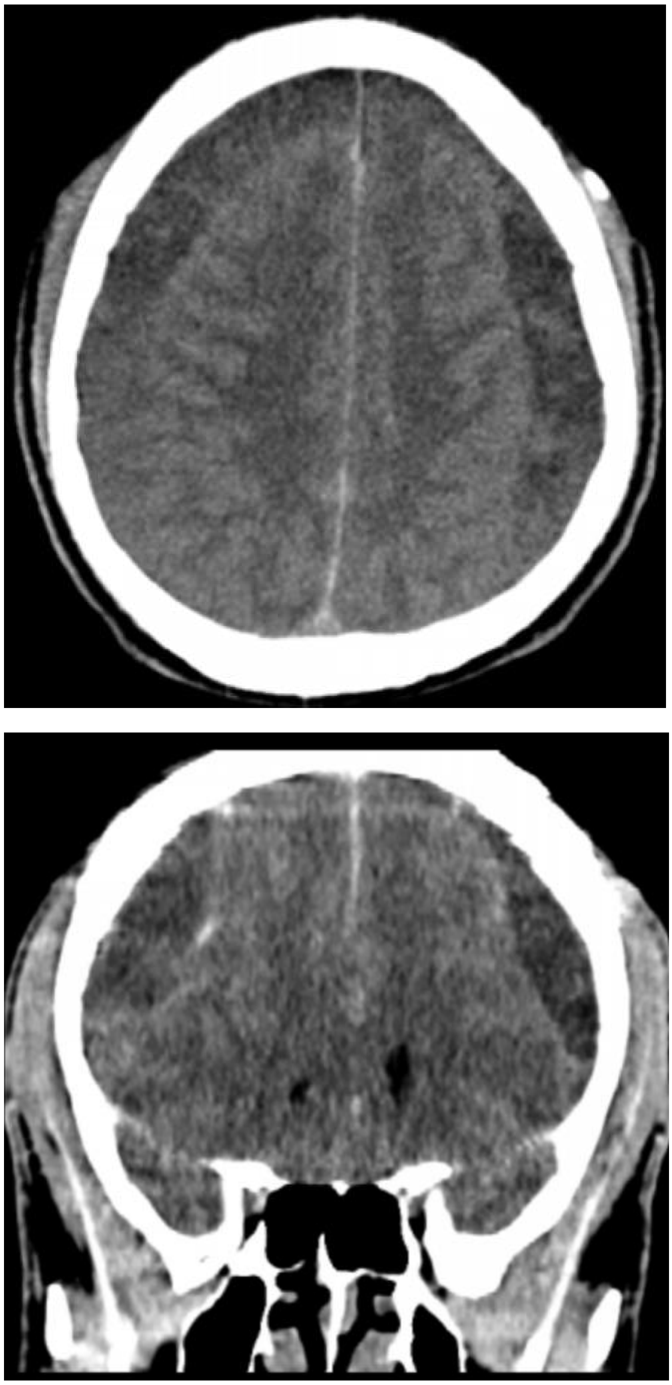


Figure 1. Brain CT scan showing bilateral chronic subdural haematoma in axial (A) and coronal (B) views.

MATERIALS AND METHODS

Study design

This research employed a retrospective descriptive design involving a review of existing hospital records. The approach was suitable for examining documented cases of intracranial subdural haematoma (SDH) that occurred following neuraxial anaesthesia, allowing for the identification of patient characteristics, risk factors, management, and outcomes over time.

Study location

The study was conducted in Rivers State, Nigeria, across selected secondary and tertiary healthcare facilities where neuraxial anaesthesia is routinely performed for surgical, obstetric, and orthopaedic procedures. These facilities were chosen based on their availability of detailed anaesthetic and neurosurgical records.

Study period

Hospital data were reviewed for a six-year period, spanning January 2018 to December 2023. This timeframe was selected to ensure adequate case retrieval and to observe any trends in the occurrence and management of subdural haematomas following neuraxial anaesthesia.

Study population

The study population consisted of patients who developed intracranial subdural haematoma after receiving subarachnoid (spinal) or epidural anaesthesia during the study period. Only patients who required surgical intervention for the haematoma were included in the study.

Inclusion criteria

This study included patients with available and legible hospital records who underwent subarachnoid or epidural anaesthesia between 2018 and 2023 with documented complication of intracranial subdural haematoma confirmed by CT or MRI imaging, who required and received surgical management for the haematoma.

Exclusion criteria

Patients excluded were those with pre-existing intracranial pathology before the anaesthetic procedure, incomplete, missing, or illegible medical records, and cases where the diagnosis of subdural haematoma was not confirmed radiologically.

Data collection procedure

Eligible cases were identified through the anaesthetic, neurosurgical, and medical records departments of the participating hospitals. Relevant information was retrieved from theatre logs, anaesthetic charts, patient case notes, and radiology reports.
A structured data collection form was used to extract information on:
Demographic data: age, sex, and indication for anaesthesia.
Anaesthetic details: type of neuraxial block, level of puncture, and size of spinal needle.
Clinical data: comorbid illnesses, anticoagulants use, onset and type of neurological symptoms, timing of diagnosis, and imaging results.
Management details: type of surgical intervention, perioperative complications, and outcomes.
Each case record was assigned a unique code to ensure confidentiality and prevent duplication.

Data analysis

All collected data were entered and analysed using the Statistical Package for the Social Sciences (SPSS), version 29.0 (IBM Corp., 2023, Armonk, New York, United States of America). Descriptive statistics (frequencies, percentages, means, and standard deviations) were computed to summarize patient characteristics and clinical variables.

Ethical considerations

Ethical approval for this study was obtained and further permissions were granted by the management of the participating hospitals.
All patient identifiers were removed during data extraction, and confidentiality was strictly maintained. The study adhered to the principles outlined in the Declaration of Helsinki (2013) regarding ethical standards for research involving human data.

RESULTS

This case series consisted of twelve (12) reports and while 11(91.7%) were female, 1 (8.3%) person was a male with a mean age of 41.0±9.8 years (range 28 to 62 years), and whereas 8(66.7%) persons were less than 40years of age, 3(25.0%) were in the 40 to 60years age group and 1(8.3%) person was older than 60years.

Ten patients had SAB, and 2 had Combined spinal epidural (CSE) anaesthesia. SAB was done with size 22G spinal needle in 3 patients and 24G in 5 patients.

Headaches as a presenting complaint were reported by all 12(100%) patients, and other complaints included confusion and loss of consciousness, as shown in Figure 1.

Two (16.7%) cases reported symptoms after epidural anaesthesia with a 16-gauge (16G) needle while 9(75.0%) developed symptoms after spinal anaesthesia with a 22G Quincke needle in 3(25.0%) and a 24G Quincke needle in 5(41.7%) females, however, the size of the needle used for anaesthesia in one person was unknown. The only male case reported symptoms after a caudal block and the size of the needle was also unknown. The interval from symptom onset to brain imaging ranged from 1 day to 25 days with a mean of 8.1±6.5 days and a median of 7days (IQR was 4.25 to 11.0 days) and while all the patients were eventually referred for neurosurgical review, there was a delay in this referral with a median of 5.5 days (IQR of 2.0 to 9.5 days) before referral (range 1 to 22 days) (mean 6.8±6.2days).

The result of brain imaging revealed bilateral subdural haemorrhage in 5(41.7%) persons while the remaining patients had unilateral subdural haemorrhage as shown in Table 1.

Half of the participants (6 persons) were hypertensives, but no person was living with diabetes mellitus or was on anticoagulants or antiplatelets in any form. None of the participants gave a prior precipitating history of a road traffic accident, fall or assault.

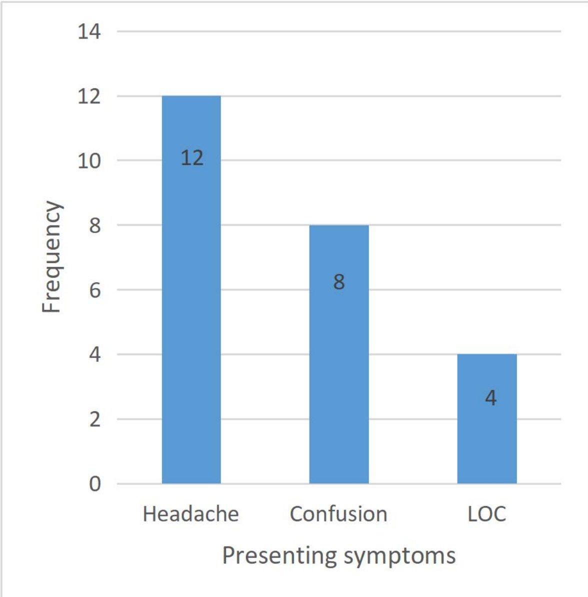
On examination of the patients at neurosurgical consultation, the mean GCS score was 11±6.6, with a range of 3 to 15 (median =13.0, IQR= 10.0 to 15.0), 6 (50.0%) persons had cranial nerve VII weakness, 6(50.0%) had hemiparesis (3 on the right side and 3 on the left side) and 4(33.3%) had tetraparesis, while 2(16.7%) persons did not have any limb weakness. The Mark Walder grading at presentation of the cases is shown in Table 2.

All the patients had a burr hole with a drain inserted. Five (41.7%) persons had bilateral burr holes, 7(58.3%) had unilateral burr holes (4 on the left and 3 on the right).

The interval from symptom onset to neurosurgical intervention ranged from 1 to 28 days, with a mean of 6.3±7.3 days and a median of 4 days (IQR was 2.25 to 6.75 days). All 12 cases had excellent outcomes and were alive after intervention with no new signs and symptoms, normal speech, full power in all limbs and a GCS of 15. All patients were able to perform basic activities of daily living, with a modified Rankin Scale score of 0, at discharge from hospital after a mean duration of hospital stay of 5.3±1.1 days (range was 4 to 7 days).

Follow up consultation was done until 6 months. All 12(100%) patients were fully healthy and returned to normal daily routines with no reported history of confusion up to 6 months post-neurosurgical intervention.

Figure 2. Frequency of various presenting complaints



***Key: LOC= loss of consciousness**

Table 1. Brain imaging findings in the study population

Brain image finding	Frequency	Percent
Bilateral CSDH	1	8.3
Bilateral SASDH	4	33.3
Left CSDH	3	25.0
Left SASDH	1	8.3
Right CSDH	1	8.3
Right SASDH	2	16.7
Total	12	100

Table 2. Mark Walder grade at presentation of the patients

Grade	Frequency	Percent
I	4	33.3
II	5	41.7
III	1	8.3
IV	2	16.7
Total	12	100

DISCUSSION

Subarachnoid and Epidural blocks are safe methods of anaesthesia; they have the advantage of avoiding airway manipulation, polypharmacy and early bonding with baby in obstetrics, but have complications such as hypotension, post-dural puncture headache, nerve damage, meningitis, and intracranial haematomas. Intracranial subdural haematoma is a rare complication that can occur after spinal anaesthesia and epidural anaesthesia. This can also follow lumbar puncture, myelography, epidural steroid injection, and after implantation of an intrathecal drug delivery device and a spinal cord stimulator. It could be acute, subacute or chronic, and all could be potentially fatal.[16, 17, 18, 19]

This study included twelve participants, eleven of whom were females. This female predominance may be related to the increased number of females who have neuraxial anaesthesia for obstetric and gynaecologic procedures in Port Harcourt. The mean age was 41.0±9.8 years, also in keeping with a young population, although chronic subdural haematoma is known to be more common in the elderly population who have brain atrophy.[20, 21]

The mechanism of PDPH and intracranial subdural haematoma is unknown, but it is postulated to be from leakage of cerebrospinal fluid (CSF) from the dural puncture hole. CSF loss is thought to reduce both intraspinal and intracranial pressures, leading to a caudally directed movement of the spinal cord and brain. The sudden reduction in the CSF volume may activate adenosine receptors, leading to arterial and venous vasodilatation, presenting with symptoms of PDPH. If the traction exerted on the bridging veins is significant, it may cause a rupture, leading to haematoma formation.[14, 22]

Moore *et al* attributed the occurrence of intracranial subdural haematomas to the size of the neuraxial anaesthesia needle used with larger needle sizes associated with increased risk of post-neuraxial anaesthesia sequelae.[14] Bos *et al* also reported that larger spinal needles were more likely to result in increased spinal CSF leak that could result directly or indirectly in intracranial subdural haematoma.[23] The size of needles used was documented in 10 out of the 12 patients. Five patients had 24G needles, three had 22G needles, and others had 16G needles used. Flaaten *et al* reported no occurrence of headaches in their study with 29G needles, compared with 26G needles.[24] Halpern *et al* reported that the smallest needles should be used for spinal anaesthesia, and noncutting needles should be used in patients at risk for PDPH.[25] The difficulties experienced by the anaesthetists, viz-a-viz number of attempts with neuraxial anaesthesia were not reported.

All twelve patients had headaches of varying severity. This is similar to what Bos *et al* observed were virtually all patients reported headaches.[23] The differential diagnoses of severe headache after spinal anaesthesia include post-dural puncture headache, subdural haematoma, migraine, meningitis, drug-induced headache, and intracranial pathologies (sinus venous thrombosis, arteriovenous malformations). Maintaining a high index of suspicion and performing early neuroimaging for patients with persistent headaches can be lifesaving. The International Headache Society developed a list of criteria to differentiate PDPH from other fatal complications of dural puncture.[26] In PDPH, the headache starts within 15 minutes of sitting upright and improves on lying down, or within 5 days after the puncture and resolves spontaneously in a week, or up to 48 hours after an epidural blood patch is administered. If the presentation does not follow these criteria, and the patient develops other neurologic symptoms like vomiting, blurring of vision, drowsiness, and disorientation, then imaging modalities like brain CT scan, MRI, and angiography should be considered. Eight (66.7%) patients presented with confusion, four (33.3%) patients presented with loss of consciousness, six patients had facial nerve palsy, six patients had hemiparesis, and four patients were tetraparetic. All these neurologic features prompted neuroimaging in our patients.

The median interval from the onset of neurological features to the performance of neuroimaging was 7 days (range 1-25 days), and the median interval between symptom onset and patients' referral to a neurosurgeon was 5.5 days (range 1-22 days). The median interval from neurologic symptom onset to neurosurgical intervention was 4 days (range 1-28 days). These delays may have stemmed from initial management of PDPH by the anaesthetist, a low index of suspicion from medical practitioners who managed these patients primarily, patients' financial constraints and out-of-pocket payments for neuroimaging and care, delay in reporting brain scans due to the few radiologists available, and a reluctance to seek neurosurgical intervention, especially when practitioners felt patients would recover spontaneously. These delays could worsen brain injury and hamper good clinical recovery of patients because we know that TIME IS BRAIN.[27]

Subdural haematoma on the CT scan is seen as a crescent-shaped lesion across the hemispheric convexity, which could be hyperdense when acute, isodense when subacute and hypodense when chronic (Fig. 1). Brain MRI is more sensitive compared to brain CT for the detection of intracranial haemorrhage because with MRI, small tentorial and interhemispheric subdural haematomas can be seen. However, most of our patients had a brain CT scan because it is more readily available, it is cheaper, and the procedure can be done very fast, especially in unstable patients.[28] Our patients' brain scans revealed subacute and chronic subdural haematomas; five were bilateral, four were on the left side, and three were on the right side.

Management of SDH is either surgical or conservative. Subdural haematoma usually causes a progressive neurological deterioration, which requires a surgical evacuation of the haematoma by either craniotomy or burr holes to decrease the intracranial pressure and preserve brain function. Chronic haematoma without mental status changes, seizure activity, absent intracranial mass effect, and the haematoma less than 1cm in thickness causing a midline shift of less than 5mm can be managed conservatively,[29] or by surgical resection of the haematoma, epidural blood patch, or both surgical resection and epidural blood patch.[30, 31, 32, 33] All patients had burr hole haematoma evacuation as previously described. They were made to lie supine for up to 72 hours until the subdural drain was removed. These patients were all fully independent at the time of discharge from the hospital after a mean stay of 5.3±1.1 days, and at six months post op, all patients were fully healthy with a modified Rankin score of 0. This shows that with surgical evacuation of the subdural haematoma, patients stand a good chance of complete recovery. Remarkable outcomes post burr hole haematoma evacuation is not uncommon, and is in keeping with a study done by Markwalder *et al*.[34]

CONCLUSION

Intracranial subdural Haematomas following spinal anaesthesia are rare but potentially fatal disorders that can mimic PDPH. This case series highlights the need for medical practitioners to maintain a high index of suspicion for intracranial subdural haematomas in patients with prolonged headaches and neurologic deficits after neuraxial anaesthesia. Knowledge of the symptoms, ability to differentiate SDH from PDPH, and early neuroimaging will facilitate diagnosis for early intervention, which would avoid irreversible neurologic damage and death.

Audit of clinical practices with respect to neuraxial anaesthesia may need to be done to always ensure continued safety of the process. Smaller spinal needle sizes should be used as much as possible.

Furthermore, adequate interdisciplinary collaboration may shorten the time to neurosurgical interventions in these cases.

Limitation of this study

In this study, anaesthesia was performed by different anaesthetists with various levels of competences. Medical records available did not specify the number of attempts at spinal anaesthesia and the cadre of anaesthetist.

Furthermore, with out-of-pocket payment for medical services very common in Nigeria, not all patients with suspicion of post neuraxial anaesthesia intracranial subdural haematoma are able to afford the required neuroimaging for diagnosis. Perhaps, more patients may have been picked up. Also, patients not referred to the Neurosurgery service were not included in this study.

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Conflicts of interest

We declare no conflict of interest.

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