

# Spinal Subdural Hematoma Caused Following Spinal Anesthesia in a Woman with HELLP Syndrome, A Case Report

Mohammad Samini<sup>1</sup>, Fariborz Samini<sup>1</sup>, Saman Mohazzab-Torabi<sup>1,\*</sup>

1. Department of Neurosurgery, Mashhad University of Medical Sciences, Mashhad, Iran.

## ABSTRACT

**Background:** HELLP syndrome is defined as hemolysis, elevated liver enzymes, and thrombocytopenia. It has been known as a catastrophic situation that eventually occurs in the third trimester of pregnancy. **Case presentation:** We present a rare case of neurological complicated post-partum HELLP syndrome. A 35-year-old woman underwent a cesarean section in 34 weeks of gestation with spinal anesthesia since for worsening preeclampsia with HELLP syndrome. Although full recovery from the spinal anesthetic was achieved, on the first postoperative day she felt numbness on the distal of her lower extremities, and then it was progressively continuing to the proximal parts. On the second day, she noticed insensitive to bladder fullness and had mild paraparesis, and in the third day, she was completely flaccid paraplegic. Magnetic resonance imaging(MRI) revealed a spinal intradural subarachnoid hematoma with extensive compression of cauda equina from L2-L5. Due to acute thrombocytopenia, she was consulted for emergent hematological management. Due to persistent thrombocytopenia and after the correction of platelet counts in 3 post-operative days, she underwent L2-L5 laminectomy and intradural hematoma evacuation. **Conclusions:** Generally, the occurrence of spinal subarachnoid hematoma following local anesthesia has a very low frequency even in a coagulopathic state patient, and, to our knowledge, this is the third reported case of subdural hematoma event in an obstetric setting. Interestingly, clinicians must actively address and meticulously evaluate the neurological signs and symptoms of spinal subarachnoid hematoma to anticipate and manage potential consequences leading to life-long neurological deficits.

**Keywords:** Foreign Bodies Paranasal Sinuses Transanal Endoscopic Surgery

**Cite as :** Mohammad Samini, Fariborz Samini, Saman Mohazzab-Torabi. Spinal Subdural Hematoma Caused Following Spinal Anesthesia in a Woman with HELLP Syndrome, A Case Report. Canon Journal of Medicine. 2023 December; 4(4), XX-XX.

## INTRODUCTION

Iatrogenic symptomatic subdural hematoma (SDH) is an exceedingly rare condition. Underlying causes of atraumatic, or traumatic SDH consist of preeclampsia, cocaine abuse, and severe coagulopathic state(1). Local anesthesia has increasingly been employed in various surgical operations, specifically labor and cesarean, due to both patient requests and the low risk of mortality and morbidity(2). However, the risk of central nervous system hematoma occurrence after spinal anesthesia and spinal cord compression even in coagulopathic patterns is extremely rare. HELLP syndrome is defined as hemolysis, elevated liver enzymes, and thrombocytopenia, which are prevalent in 0.5% to 0.9% of all pregnancies specifically in the third trimester(3). HELLP is a catastrophic maternal situation that is devastating to both the mother and fetus and relates to concurrence conditions such as eclampsia, acute renal failure, cerebral hemorrhage, and neonatal thrombocytopenia(4). We report a known case of complicated HELLP syndrome in a 34-month pregnant woman, who presented as progressive lower extremities

weakness following spinal anesthesia for cesarean delivery.

## CASE PRESENTATION

A thirty-year-old man was brought to the emergency department with a rebar impaled through left side of his face just above to the orbital rim, through the orbital cavity, adjacent to medial canthus (Figure1).

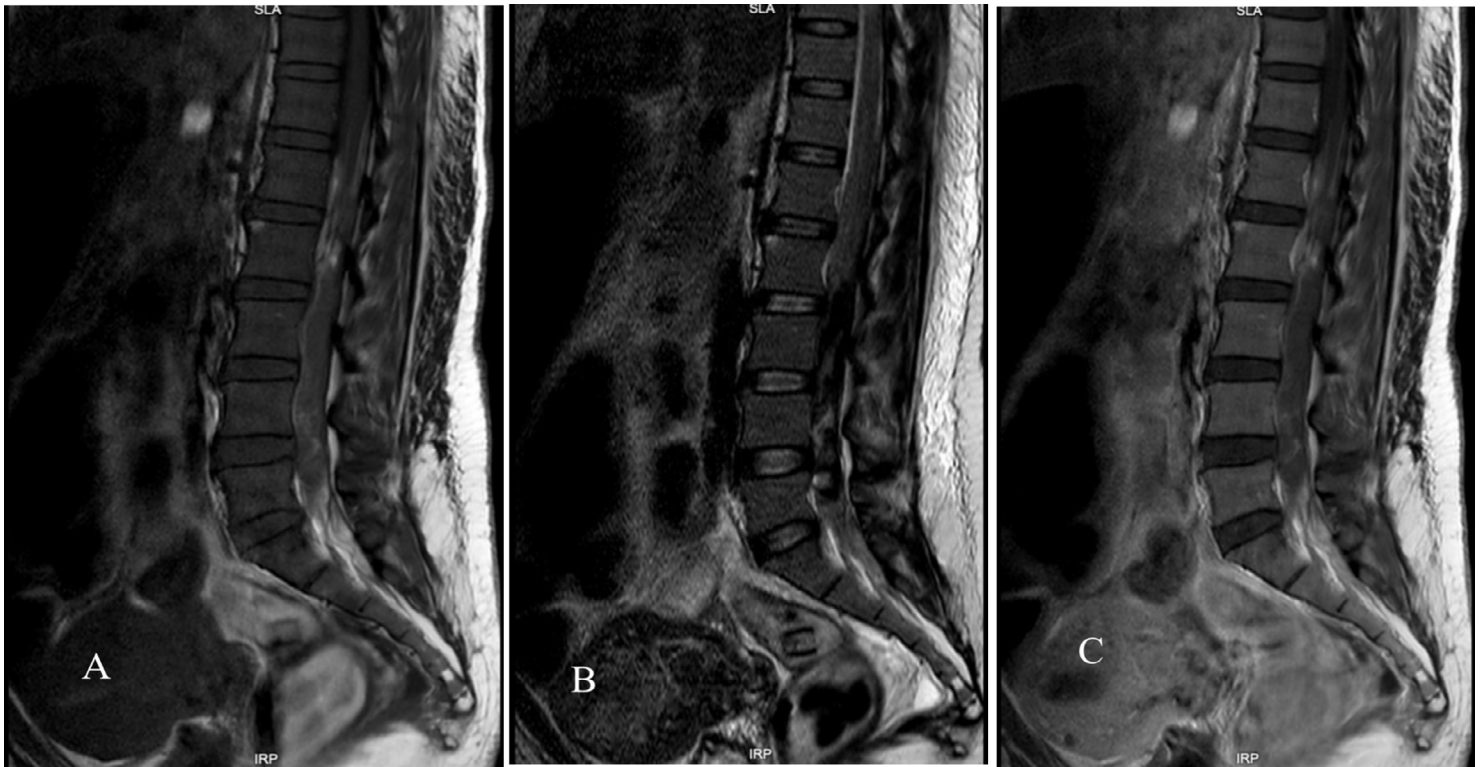
The patient was conscious and vital signs were stable. On examination, eye movements and visual acuity on the left side was not amenable to testing. The rod was completely lodged. Maxillofacial computed tomography scan showed a metallic rod extending from area near medial canthus up to pterygoid plates (Figure 2).

Patient was transferred to the operation room immediately. Under general anesthesia, the globe was examined and surprisingly there was no injury to the globe except for some hemorrhage. Preoperative shrinkage of the nasal mucosa was performed using with gauze strips soaked in adrenaline (1:100000). Uncinectomy and wide antrostomy was performed via an endoscopic approach with 0 degree Hopkins rod endoscope. Blood clots were suctioned out



Receive Date: 13 January 2024  
 Revise Date: 14 February 2024  
 Accept Date: 18 February 2024  
 Publish Date: 24 February 2024  
 Editor: MA. Pourhoseingholi (Conflict of Interests: None)  
 Reviewers: S. Karkon Shayan (Conflict of interest: None), Z. Karimi (Conflict of Interests: None).  
 \*Correspondence to: Saman Mohazzab-Torabi, M.D., Residents of Neurosurgery, Department of Neurosurgery, Mashhad University of Medical Sciences, Mashhad, Iran.  
 Email: smntrb@gmail.com  
 ORCID ID: 0000-0002-4943-6767





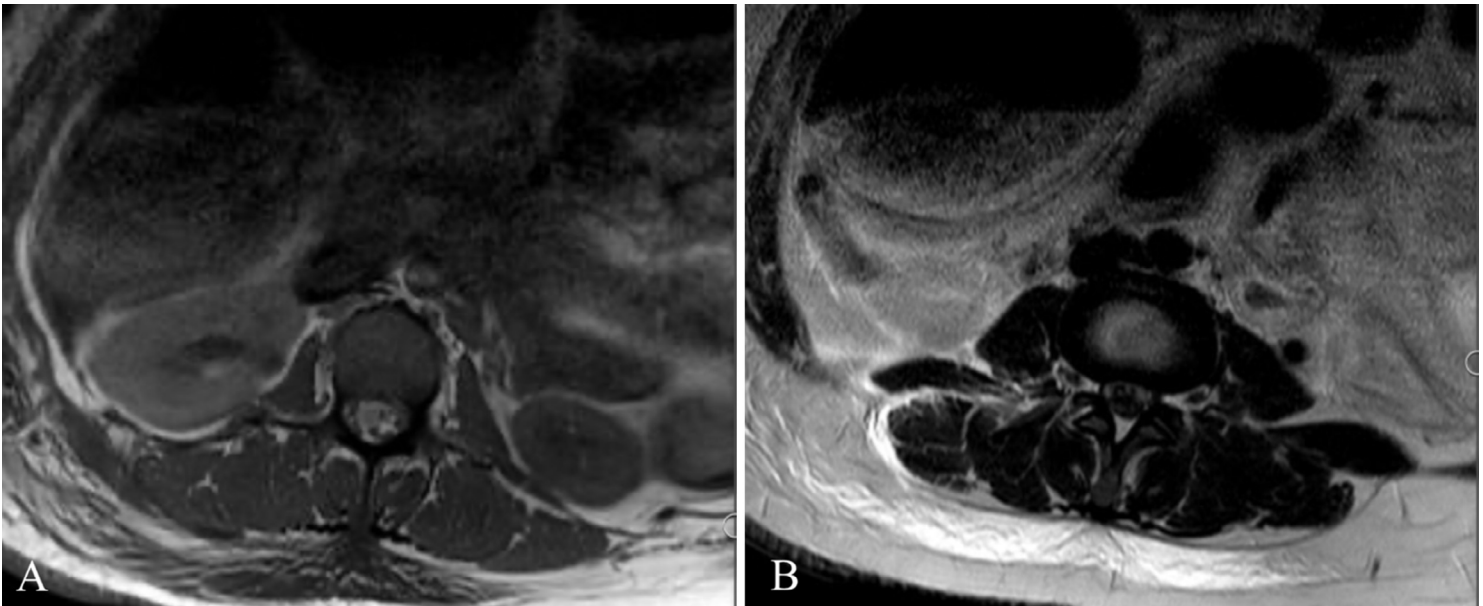
**Figure 1.** Sagittal T1W (A), T2W (B) and T+GAD (C) images show space-occupying lesions in the subdural compartment of the spinal canal from L1- L5.

from the maxillary sinus. The posterior wall of left maxillary sinus was resected completely using 0 degree and 30 degree Hopkins rod endoscopes. Pieces of medial pterygoid plate were removed from pterygoplatine fossa. After releasing of the rebar endoscopically, it was pulled out from the proximal portion (Figure 3). The site of penetration was sutured in multiple layers with 3-0 Vicryl and 4-0 nylon suture material. Patient had an uneventful surgery. On his post-operation examination his eye movements and visual acuity were normal. Antibiotic and normal saline nasal irrigation were prescribed as post-operative care. Endoscopic sinus examination one month post-operation revealed a maxillary sinus with a wide middle meatal antrostomy, normal nasal cavity mucosa without any adhesion bands. A relatively acceptable facial scar was seen.

#### CASE PRESENTATION:

A 35-year-old healthy woman, G2P0, at 34 weeks of gestation was referred to our hospital due to severe preeclampsia with bilateral lower extremity rash, which progressed during the last 3 days. At the time of admission, her height and weight were respectively 161 cm and 53 kg (BMI 20.2 kg/m<sup>2</sup>). In her first pregnancy, she had undergone normal cesarean section at 41 weeks and successfully delivered a 3150-g infant. In this third pregnancy, she visited her obstetrician because of an uncomfortable pain in the epigastric region. Within hours, she presented abdominal pain with increased blood pressure (210/111 mmHg), and this condition was concurrence with low platelet count and intra-urine protein >1, which was highly correlated with HELLP syndrome without disseminated intravascular coagulation (DIC). Severe asymmetrical intra-uter-

ine development and oligohydramnios with the late deceleration of fetal heart rate were shown by ultrasound. Therefore, an emergency cesarean section decision was made due to the maternal condition. 4 hours after the initial administration of steroids, the patient underwent the operation, which was insufficient for lung maturation. In the operation room, the patient's platelet count was 86,000 without DIC presentation, which is suitable for regional spinal anesthesia. Procedure consent was achieved after a comprehensive discussion regarding the consequences of local anesthesia including intra-cranial hematoma or any central nervous system lesion. Cesarean section was performed with spinal anesthesia inserting the 23-gauge needle at the L3-L4 level. While clear cerebrospinal fluid (CSF) was observed, 2.5 mL of 0.5% hyperbaric bupivacaine was injected into the intradural space., and after that, the surgery was initiated. In addition, after 40 minutes, complete hemostasis was achieved with a total blood loss of 350 mL. Subsequently, the baby was delivered and referred to the Neonatal Intensive Care Unit (NICU). Finally, the patient regained full consciousness, and the effects of local anesthesia resolved within 4 hours after surgery. The patient was then admitted to the Intensive Care Unit (ICU), and post-operative blood tests uncovered normal hemoglobin levels and a low platelet count without any evidence of Disseminated Intravascular Coagulation (DIC). On the first post-operative day, she complained of acute numbness in the distal of her lower extremities, which was progressively continuing to proximal. On second day, she noticed insensitive to bladder fullness with urgency and mild paraparesis, and on



**Figure 2.** Computed tomography (CT) scan showing foreign body penetrating left maxillary sinus towards left petrygopalatine fossa

the third day, she was completely flaccid paraplegic. On examination, her right hip was 1/5 and at the right knee, ankle, and toes 1/5. Power in her left hip and knee was 1/5 and at the left ankle and big toes was 2/5 based on muscle strength grading. Sensory level was detected in the inguinal with a hypothesis pattern her both legs. Her blood results showed a persistent reduction of platelet count (48,000) without DIC considering the transfuse of 10 units of platelets (Table 1.).

MRI of the spine depicted the presence of a spinal subarachnoid hematoma dorsal to the spinal cord spreading from the L2 to L5 caused cauda equina compression (Fig. 1). Therefore, due to the acute neurological deterioration, urgent spinal surgical management was scheduled for hematoma evacuation. The patient was referred to the neurosurgical operation room after the correction of the platelet number. She underwent general anesthesia in the prone position. an incision was made from L2-L5 and after stripping up the anatomical level, laminectomy was performed in costume method, and there was no evidence of epidural hematoma. Furthermore, the dura mater was tense .and the intradural hematoma could be seen through the transparent dura (Figure – 3A). Surprisingly, at the beginning of the spinal dura incision, dark high-pressure liquid with the oiling-jet pattern as far as the dorsal side was exited (Figure – 3B). The dura opened vertically, and evidence of a blood clot within the cauda equina was observed (Figure – 3C). The clot was removed gently, and complete hemostasis was achieved. Interestingly, the patient's lower extremities power significantly improved in recovery room, and she showed a gradual improvement in the motor function. In the ICU ward, she was treated with intravenous labetalol for hypertension and other supplements, such as Vitamin B1 and physiotherapy for the best outcomes. In addition, the drain was withdrawn on the third postoperative day. By day 7 postoperative, her lower extremities forces were 3/5, and platelet count and liver enzymes were now within the normal range. After

three months, there was a complete recovery of sensation, and the sphincter function was also restored, although her motor function remained limited.

## CONCLUSION

We presented a rare case of subarachnoid hematoma after spinal anesthesia for cesarean section in a patient with HELLP syndrome. HELLP which is prevalent in approximately 0.5 – 0.9% of all pregnancies was describes as the accumulation of clinical presentation .including hemolysis, elevated liver enzymes, and a low platelet count(5). Most commonly HELLP syndrome occurs in the third trimester less than 27 weeks gestational age (3). Preeclampsia and coagulopathic state regardless of gestational age is elicit delivery for effective treatment. Although HELLP syndrome is rarely related to DIC ,which is considered an absolute contraindication to general anesthesia complications ,such as airway hematoma for prompting delivery. Local spinal anesthesia isa preferable method to prevent complications of general anesthesia (6). Moreover, the American College of Obstetricians and Gynecologists defined platelet counts as 50-100.10<sup>9</sup>/L is an acceptable range considering local anesthesia (7). However, more precision is needed for the determination of lower-limit platelet counts and the coexistence of other coagulopathic states for the prevention of spinal hematoma after regional anesthesia. In our patient, the platelet count was 80.10<sup>9</sup>/L and coagulation tests were within the normal range and spinal anesthesia appears to be a suitable method. It seems there was no significant relation between thrombocytopenia and either epidural or subdural anesthesia in HELLP syndrome (8). However, Basaran suggested general anesthesia in less than 50.000 platelet counts to prevent neurological complications (9). Lee et al, determined in a multi-central study about the risk of epidural hematoma in thrombocytopenia for a platelet count of 0 to 49,000 mm, 50,000 to 69,000 mm, 70,000 to 100,000 mm were 11%, 3%, and



**Table 1.** Muscles Strength Grading.

Scale	Description
0	No muscle activation
1	Trace muscle activation, such as a twitch, without achieving full range of motion
2	Muscle activation with gravity eliminated, achieving full range of motion
3	Muscle activation against gravity, full range of motion
4	Muscle activation against some resistance, full range of motion
5	Muscle activation against examiner's full resistance, full range of motion

0.2%, respectively(10). Prevalence of subdural hematoma after lumbar puncture is extremely rare and only reviewed in case reports without identified etiological and underlying factors. Interestingly, spontaneous or traumatic intra-cerebral hematoma such as acute subdural hematoma and intra-cranial hematoma have been found in the literature. Gracia et al. found no neurological complication after regional anesthesia in HELLP syndrome(11). Syndrome with other complications, such as developing headache, is prevalent in about one-third of patients after lumbar puncture, however, the incidence may be higher, as early transient symptoms may not be reported(7). Routinely, spinal anesthesia is complicated with minor vascular trauma. For instance, CSF analysis obtained from regional anesthesia found over one-third had evidence of erythrocytes. Bleeding coagulopathic state including thrombocytopenia, leukemia, and DIC may induce an intradural hematoma after lumbar puncture assuming catastrophic conditions(12). Developing compress of cauda equina due to either intra or extra-dural hematoma causes gradual or acute neurological deficits. Noticeably, subarachnoid hemorrhage, which is nearly one-third of cases, related to brain aneurysm and acute headache or loss of alertness should be distinguished from subdural hematoma(13). Classically, patients with acute subdural hematoma present with a history of acute neurological deficits, such as extremities weakness, bladder and rectal dysfunction, and sensory complaint. Our patient presented gradually increasing numbness of distal lower extremities due to motor weakness and bladder dysfunction within 3 days. Levy reported radicular pain and a straight leg raising test as the primary manifestation of spinal subdural hematoma. (14). Hausmann et al. presented three cases of intradural hematoma with acute paraparesis and progressive motor weakness. Seemingly, significant hematoma volume and location based on conus medullaris are prognostic factors to presenting symptoms(15). Koyama et al. demonstrated a subdural hematoma after spinal anesthesia in HELLP syndrome which similar to our patient's symptoms gradually progressed within 3 postoperative days(16). In terms of acute and progressive neurological deficits, urgent appropriate surgical spinal cord decompression is essential for evacuation of the hematoma. We performed L2- L5 laminectomy for hematoma removal. Fujikuma et al. reported a case of subarachnoid hematoma that was a surgical management with wide laminectomy and

intradural blood clot evacuation and washed out(17). It is suggested to minimally invasive insertion of intradural catheter for high-risk patients such as resistant coagulopathic state(17). However, Domenicucci et al. found a poorer neurological outcome in minimally invasive patients, whose hemorrhage was co-existence with subarachnoid in nature(18). In contrast, anterior spinal hematoma could be treated medically with precise neurological examination and following MRI. Koyama et al. medically managed HELLP syndrome manifested with paraparesis after spinal anesthesia(16). The outcome and prognosis are conversely associated with the duration of the cord compression and blood clot volume. Meanwhile, the improvement possibility to return neurological function is exceedingly related to prompted evacuation of hematoma before occurred of irreversible spinal cord injury. Somehow, in our case, since pregnancy and HELLP syndrome were considered as chief problems, diagnosis of the cause of the neurological symptoms paraplegic manifested was delayed due to persistent thrombocytopenia, which was corrected by Intravenous Immunoglobulin (IVIG). Laminectomy was thus performed at about 96 hours after the appearance of neurological symptoms and 36 hours after the detection of her lower extremity weakness. Fortunately, moderate motor and sphincter function improvement was achieved three months after surgery.

Finally, it is extremely rare for a subdural hemorrhage to form a clot after spinal anesthesia. Consequently, awareness of the possibility of intradural hematoma in low platelet patterns or coagulopathic states, such as HELLP syndrome, should be raised. In other words, in the lack of alternative methods, performing local anesthesia requires following precise neurological examination and attention to the patient sensory or motor deficit. We suggest open surgical management for the acute neurological deficit to remove cord compression.

## ETHICAL CONSIDERATION

The patient consented to using data for publication. This study was registered in the ethics committee in biomedical research of Mashhad University of Medical Sciences with the code IR.MUMS.REC.1401.072

## CONFLICT OF INTERESTS

All authors have no any conflict of interest.

## AVAILABILITY OF DATA AND MATERIALS

All data are available.

## ABBREVIATIONS

HELLP syndrome; Hemolysis, Elevated Liver Enzymes, and Thrombocytopenia, SDH; Sub-Dural Hematoma, BMI; Body Mass Index, DIC; Disseminated Intra-Vascular Coagulation, CSF; Cerebrospinal Fluid, NICU; Neonatal Intensive Care Unit, ICU; Intensive Care Unit, MRI; Magnetic Resonance Imaging.

## REFERENCES

1. Singleton JM, Hefner M. Spinal cord compression. 2020.
2. Caughey AB, Wood SL, Macones GA, Wrench IJ, Huang J, Norman M, et al. Guidelines for intraoperative care in cesarean delivery:



- enhanced recovery after surgery society recommendations (part 2). American journal of obstetrics and gynecology. 2018;219(6):533-44.
3. Tolunay HE, Kahraman NC, Varli EN, Reis YA, Celen S, Caglar AT. Can first-trimester AST to platelet ratio index scores predict HELLP syndrome. *J Coll Physicians Surg Pak*. 2021;31(2):188-92.
  4. Barnhart L. HELLP Syndrome and the Effects on the Neonate. *Neonatal network*. 2015;34(5):269-73.
  5. Chiasakul T, Cuker A. Clinical and laboratory diagnosis of TTP: an integrated approach. *Hematology 2014, the American Society of Hematology Education Program Book*. 2018;2018(1):530-8.
  6. Ecoffey C, Bosenberg A, Lonnqvist P, Suresh S, Delbos A, Ivani G. Practice advisory on the prevention and management of complications of pediatric regional anesthesia. *Journal of Clinical Anesthesia*. 2022;79:110725.
  7. Hailu S, Milkias M, Girma T. Spinal anesthesia for a preeclamptic patient with HELLP syndrome in the resource-limited area: a case report. *International Journal of Surgery Open*. 2021;35:100402.
  8. Vercauteren M, Jacquemyn Y. Anaesthesia for caesarean section in patients with preterm HELLP syndrome: literature review, personal experience and possible guidelines. Romania. 2008.
  9. Başaran B, Çelebioğlu B, Başaran A, Altınel S, Kutlucan L, Martin Jr JN. Anesthetic practices for patients with preeclampsia or HELLP syndrome: A survey. *Journal of the Turkish German Gynecological Association*. 2016;17(3):128.
  10. Lee LO, Bateman BT, Kheterpal S, Klumpner TT, Housey M, Aziz MF, et al. Risk of epidural hematoma after neuraxial techniques in thrombocytopenic parturients: a report from the multicenter perioperative outcomes group. *Anesthesiology*. 2017;126(6):1053-63.
  11. Vigil-De Gracia P, Silva S, Montufar C, Carrol I, De Los Rios S. Anesthesia in pregnant women with HELLP syndrome. *International Journal of Gynecology & Obstetrics*. 2001;74(1):23-7.
  12. Losseff N, Adams M, Brown MM, Grieve J, Simister R. Stroke and Cerebrovascular Diseases. *Neurology: A Queen Square Textbook*. 2016:133-85.
  13. Fugate JE. Complications of neurosurgery. *CONTINUUM: Lifelong Learning in Neurology*. 2015;21(5):1425-44.
  14. Duke BJ, Levy AS, Lillehei KO. Cavernous angiomas of the cauda equina: case report and review of the literature. *Surgical neurology*. 1998;50(5):442-5.
  15. Wostrack M, Shiban E, Obermueller T, Gempt J, Meyer B, Ringel F. Conus medullaris and cauda equina tumors: clinical presentation, prognosis, and outcome after surgical treatment. *Journal of Neurosurgery: Spine*. 2014;20(3):335-43.
  16. Koyama S, Tomimatsu T, Kanagawa T, Sawada K, Tsutsui T, Kimura T, et al. Spinal subarachnoid hematoma following spinal anesthesia in a patient with HELLP syndrome. *International Journal of Obstetric Anesthesia*. 2010;19(1):87-91.
  17. Miyazaki S, Fukushima H, Kamata K, Ishii S. Chronic subdural hematoma after lumbar-subarachnoid analgesia for a cesarean section. *Surgical Neurology*. 1983;19(5):459-60.
  18. Domenicucci M, Ramieri A, Ciappetta P, Delfini R. Nontraumatic acute spinal subdural hematoma: report of five cases and review of the literature. *Journal of Neurosurgery: Spine*. 1999;91(1):65-73.

**Acknowledgements:** None.

© **Canon Journal of Medicine 2023**. This is an open-access article distributed under the terms of the Creative Commons Attribution-Noncommercial 4.0 International License (CC-BY), which permits unrestricted use, distribution, and reproduction in any medium, including commercial gain.

**Author Contribution:** S. M.T. handled data, designed experiments, provided study materials and equipment, participated in drafting the manuscript, contributed to writing and reviewing, and administered the project. F. S. conceptualized the study, validated the findings, supervised the project, and provided study consultation. M. S. presented the data and participated in drafting the manuscript. All the authors have equally contributed to the manuscript and approved the final version.

**Funding statement:** There is not any fund support.

