Case report

Spontaneous acute subdural hematoma in dengue fever: Case report and review of the literature

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1. Introduction

Dengue fever is a tropical infection caused by the dengue virus \cite{1}. Although dengue has several complications, subdural hematoma is a rare complication in dengue fever \cite{2}. Thrombocytopenia and higher aspartate transaminase (AST) and alanine transaminase (ALT) in dengue have been shown to be part of the risk factors for plasma leakage \cite{3,4}. There are currently no precise guidelines for the timing of radiological imaging and neurosurgical surgery for subdural hematoma in dengue \cite{5}.

We report the case of a 65-year-old man who presented with dengue fever symptoms and, after two days in the hospital, developed altered consciousness and focal neurological deficits. The test results revealed thrombocytopenia, elevated AST and ALT, and positive anti-dengue IgG, and brain imaging revealed a subdural hematoma. Emergency surgical procedures were successfully performed after monitoring the thrombocytopenia. This work is reported according to the SCARE criteria and the revised 2020 SCARE guidelines \cite{6}.

2. Case presentation

A 65-year-old man went to the emergency room with three days of extensive body pain and high fever (maximum recorded temperature of 39 degrees Celsius). He was previously a healthy man without a history of cardiovascular or neurological conditions, and he had never undergone surgery. On physical examination, he was discovered to be conscious, with a blood pressure of 135/70 mmHg and a heart rate of 108 beats per minute. No active bleeding or rash was observed. The results of a general physical examination were normal. Initial laboratory results were as follows: haemoglobin (Hb) 12.8 g/L, haematocrit (Hct) 36.4 %, white blood cells (WBC) 5 K/L, platelet count (PC) 42 K/L, aspartate aminotransferase (AST) 245 U/L, and alanine aminotransferase (ALT) 252 U/L. Dengue was verified by the presence of dengue-NS1-antigen and anti-dengue antibody (IgG). Fluid treatment per

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https://doi.org/10.1016/j.ijscr.2022.107512

Received 5 July 2022; Received in revised form 7 August 2022; Accepted 11 August 2022
Available online 13 August 2022

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WHO recommendations and symptomatic medications were administered. The timeline of the reported incident is depicted in Fig. 1.

Two days after admission, the patient experienced an abrupt loss of consciousness with a Glasgow Coma Scale (GCS) score of 9/15 (E2V5M2), accompanied by left hemiparesis and right eye anisocoria. A head CT scan revealed a 1 cm thick subdural hematoma on the left side, with a 5 mm midline displacement (Fig. 2).

The chest X-ray and abdomen ultrasound were normal. Compared to initial laboratory results (42 K/L), laboratory examinations revealed a little drop in platelet count (40 K/L, Fig. 3A), but a notable rise in AST and ALT levels (439 and 364, respectively, Fig. 3B). Routine haemorrhagic screening tests (PT, APTT, and TT) were normal, but the D-dimer result was elevated (1200).

A general neurosurgeon performed a craniotomy as a result of increasing loss of consciousness and evidence of intracranial bleeding. Two units of apheresis thrombocyte were administered, one prior to surgery and the remainder during surgery. There was no evidence of cortical bleeding, indicating that the source of the bleeding was a cortical bridging vein. Following surgery, the post-operative period was uneventful. The patient improved gradually over the next few days and regained full consciousness (GCS 15/15) five days following surgery. On day three, the platelet count was >100,000/mm3, and until day twelve, the AST/ALT level gradually decreased. Twelve days after his discharge, he was neurologically normal with no motoric weakness, but he complained mild headache. On follow up, one month after his discharge, he was neurologically normal with no deficits.

3. Discussion

Dengue virus is a flavivirus that is transmitted by urban-dwelling Aedes aegyptus and Aedes albopictus. There are four recognized serotypes of dengue virus, DENV 1–4 [5,7]. Neurological signs are uncommon, occurring in <1 % of patients with dengue fever, but intracranial haemorrhage may develop due to thrombocytopenia [8,9]. Intracerebral haemorrhage associated with dengue remains complex, however the postulated cause is mostly associated with haemostatic problems.

Vascular activity, capillary leakage, increased fibrinolysis, and release of mediators with bleeding could be resulted from the infection of dengue virus [4,10].

The initial suspicion of dengue is usually based on the demonstration of thrombocytopenia and leucopenia [5,11]. NS1 antigen test is commonly used to detect the virus in the early phase while IgG is detectable at high levels during secondary infection and IgM is higher at early primary infection and lower during secondary infection [12]. In this case, the test results showed positive NS1 antigen and positive IgG but negative IgM, showed a secondary infection of dengue. Unfortunately, due to limitation of facility in our hospital, we did not perform PCR as confirmatory test.

Since ICH in patients with dengue is rarely reported, it is very helpful to prevent ICH in patients with dengue before both the surgery and medical interventions can no longer be preserved [5]. A study in India found biphasic fever patterns, haemoconcentration, thrombocytopenia (<50,000/mm3), and increased ALT had a positive predicting value and a negative predicting value, 70 % and 75 % respectively, in predicting spontaneous bleeding in dengue [4]. Talukdar et al. reported three factors that are associated with plasma leakage, including Body Mass Index(BMI) >25.0 kg/m², platelet count <100,000/mm³ and elevated AST and ALT (≥100 U/I) [3]. A study reported a cerebral haemorrhage with thrombocytopenia (40,000/mm³) and elevated AST and ALT (666 and 312, respectively) [13]. However, a study reported spontaneous subdural hematoma secondary to dengue fever without thrombocytopenia [1]. Another study found that three patients with positive IgG emergency surgery and all of them died while two patients with negative IgG did not have ICH requiring surgery and survived [5]. Therefore, secondary infections may be associated with severe ICH. In this case, the patient had thrombocytopenia, increased AST and ALT, and positive IgG antibody test. Elevated AST and ALT can be the risk factors of intracranial haemorrhage in dengue fever while positive IgM may be associated with severity of ICH. To demonstrate these aspects, though, more study needs to be done.

So far, there are no guidelines on when to perform a brain computed tomography (CT) scan. Patients with suspected ICH with dengue fever may have symptoms such as headache, fever, and vomiting [5]. Since it

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**Fig. 1.** Timeline of the reported case.
is not possible to advise screening Computed Tomography (CT) head in every dengue patients, CT should be considered only there is high index of suspicion based on clinical findings [14]. A study reported patients with secondary dengue infections with early detection of IgG and negative IgM are at higher risk of ICH carrying poor prognosis and should be monitored with lower thresholds for diagnostic CT of the brain when suspicion of ICH present [5]. Thus, based on study we found, we did CT immediately after the patient were showing a suspicion symptoms of ICH and had positive IgG antibody test.

Neurosurgical intervention in ICH patients with dengue remains questionable due to vascular disorders, coagulation disorders, and platelet dysfunction which require correction of platelets and other coagulation parameters by blood transfusion [5]. Many factors affect the outcome of patients [15,16]. Timely surgical interventions performed within 8 h of bleedings were also associated with improved outcomes [17]. The advised recommendation for platelet counts for neurosurgical methods is $100 \times 10^9/L$. [18] In dengue patients, it is hard to preserve the perioperative platelet levels as recommended. Furthermore, it is proven that a perioperative platelet count below $100 \times 10^9/L$ in patients who failed to respond to platelet transfusions had a higher risk of haemorrhagic complication after surgery [19]. A recent study reported a successful emergency subdural hematoma evacuation in dengue patients with thrombocytopenia, while platelet counts were monitored and transfused [20]. However, Sam et al. reported that two surgical patients died due to excessive bleeding during the procedure [5]. We did the emergency evacuation in this patient due to the subdural hematoma while monitoring the platelet counts by administering 2 units of apheresis thrombocytes. Post-operative platelet counts were gradually increased to normal and the patient regained consciousness 5 days after surgery and was sent home 5 days later.

4. Conclusion

Subdural hematoma is a rare complication of dengue fever. Elevated AST and ALT can be predictor for bleeding in dengue fever. Radiological imaging should be done if the test results show positive IgG and intracranial haemorrhage symptoms. Neurosurgical intervention should be done immediately while maintaining the platelet counts.
Fig. 3. Trend in laboratory results. There were no significant variations in haemoglobin and haematocrit (A). There was a considerable increase in white blood cell count following surgical operation, which decreased few days later (B). Prior to the operation, there was no substantial increase in platelet count (C). The AST and ALT levels were elevated for the first two days after admission, but had not returned to normal by the time of discharge (D).

**Funding**

None.

**Ethical approval**

None declared.

**Consent for publication**

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

**Guarantor**

Andre Marolop Pangihutan Siahaan, who had access to the data and is in charge of the publication decision, accepts full responsibility for the work and/or study’s conduct.

**Provenance and peer review**

Not commissioned, externally peer reviewed.

**CRediT authorship contribution statement**

Andre Marolop Pangihutan Siahaan, Steven Tandean, Edwin Batara Saragih = Patient management (including surgery), study concept, data collection.

Bahagia Willibordus Maria Nainggolan and Andre Marolop Pangihutan Siahaan = Writing- original draft preparation.

Bahagia Willibordus Maria Nainggolan and Andre Marolop Pangihutan Siahaan = Editing and writing.

Andre Marolop Pangihutan Siahaan, Steven Tandean, Edwin Batara Saragih = senior author and manuscript reviewer.

All the authors read and approved the final manuscript.

**Declaration of competing interest**

None.

**References**

[1] V. Maheshwari, S. Kumar, A. Kumar, A. Kumar, Spontaneous subdural hematoma of dorsal spine secondary to dengue fever: a rare case report with review of literature, Asian J. Neurosurg. 14 (2) (2019) 550, https://doi.org/10.4103/ajns.AJNS_228_18.

[2] R. Kumar, O. Prakash, B.S. Sharma, Dengue hemorrhagic fever: a rare presentation as atypical acute subdural hematoma, Pediatr. Neurosurg. 44 (6) (2008 Jan) 490–492, https://doi.org/10.1159/000180306.

[3] S. Talukdar, V. Thanachartwet, V. Desakorn, K. Chamananchanunt, D. Sahassananda, M. Vangveeravong, et al., Predictors of plasma leakage among dengue patients in Thailand: a plasma-leak score analysis, PLoS One 16 (7) (2021 Jul 1), https://doi.org/10.1371/journal.pone.0255555.

[4] S. Sunder, R. Prasad, Acute subdural hematoma in a patient with dengue – case report and review of literature, Apollo Med. 5 (2) (2008 Jun) 125–129, https://doi.org/10.1016/S0976-0016(11)60134-8.
[5] S.J. Ee, G.T. Sheng, N.A. Wahab, Deadly intracranial bleed in patients with dengue fever: a series of nine patients and review of literature, J. Neurosci. Rural Pract. 7 (3) (2016 Jul 1) 423, https://doi.org/10.4103/0975-3147.152777.

[6] R.A. Agha, T. Franchi, C. Sohrabi, G. Mathew, for the SCARE Group, The SCARE 2020 guideline: updating consensus Surgical Case REport (SCARE) guidelines, Int. J. Surg. 84 (2020) 226–230.

[7] M.A. Kabir, H. Zilouchian, M.A. Younas, W. Asghar, Dengue detection: advances in diagnostic tools from conventional technology to point of care, Biosensors 11 (7) (2021 Jul 1), https://doi.org/10.3390/bios11070206.

[8] T. Solomon, N.M. Dung, D.W. Vaughn, R. Kneen, L.T.T. Thao, B. Raengsakulrach, et al., Neurological manifestations of dengue infection, Lancet 355 (9209) (2000 Mar 25) 1053–1059, https://doi.org/10.1016/S0140-6736(00)02036-5 (London, England).

[9] R. Kulkarni, S. Pujari, D. Gupta, Neurological manifestations of dengue fever, Ann. Indian Acad. Neurol. 24 (5) (2021 Sep 1) 693, https://doi.org/10.4103/aians.AIAN_157_21.

[10] M. Puccioni-Sohler, C. Rosadas, M.J. Cabral-Castro, Neurological complications in dengue infection: a review for clinical practice, Arq. Neuropsiquiatr. 71 (98) (2013) 667–671, https://doi.org/10.1590/0004-282X20130147.

[11] T.J. Schaefer, P.K. Panda, R.W. Wolford, Dengue fever, BMJ Best Pract. (2021 Nov 18) 5–6. Available from: https://www.ncbi.nlm.nih.gov/books/NBK430732/.

[12] World Health Organization, Comprehensive guidelines for prevention and control of dengue and dengue haemorrhagic fever. https://apps.who.int/iris/handle/10665/204894, 2011.

[13] N.S. Jayasinghe, E. Thalagala, M. Wattegama, K. Thirimavjalavan, Dengue fever with diffuse cerebral hemorrhages, subdural hematoma and cranial diabetes insipidus, BMC Res. Notes 9 (1) (2016 May 10) 1–4, https://doi.org/10.1186/s13104-016-2068-5.

[14] K. Chang, C.H. Huang, T.C. Chen, C.Y. Lin, P.L. Lu, Y.H. Chen, Clinical characteristics and risk factors for intracranial hemorrhage or infarction in patients with dengue, J. Microbiol. Immunol. Infect. 54 (5) (2021 Oct 1) 885–892, https://doi.org/10.1016/j.jmii.2021.03.009.

[15] A. Singh, V. Balasubramanian, N. Gupta, Spontaneous intracranial hemorrhage associated with dengue fever: an emerging concern for general physicians, J. Fam. Med. Prim. Care 7 (3) (2018) 618, https://doi.org/10.4103/jfmpc.jfmpc_56_18.

[16] R. Kumar, O. Prakash, B.S. Sharma, Intracranial hemorrhage in dengue fever: management and outcome: a series of 5 cases and review of literature, Surg. Neurol. 72 (4) (2009 Oct) 429–433, https://doi.org/10.1016/j.surneu.2009.01.021.

[17] A.D. Mendelow, B.A. Gregson, E.N. Rowan, G.D. Murray, A. Ghokkar, P. M. Mitchell, et al., Early surgery versus initial conservative treatment in patients with spontaneous supratentorial lobar intracerebral haematoma (STICH II): a randomised trial, Lancet 382 (9890) (2013) 397–408, https://doi.org/10.1016/S0140-6736(13)60986-1 (London, England).

[18] L.J. Estcourt, J. Birchall, S. Allard, S.J. Bassey, P. Hersey, J.P. Kerr, et al., Guidelines for the use of platelet transfusions, Br. J. Haematol. 176 (3) (2017 Feb 1) 365–394, https://doi.org/10.1111/bjh.14423.

[19] D. Li, T. Gior, G.A. Jones, Thrombocytopenia and neurosurgery: a literature review, World Neurosurg. 1 (106) (2017 Oct) 277–280, https://doi.org/10.1016/j.wneu.2017.06.097.

[20] M. Ashraf, S.S. Husain, M. Farooq, L. Fatima, N. Majeed, N. Ashraf, Isolated subdural hematoma due to dengue hemorrhagic fever: surgical intervention and review of the literature, Surg. Neurol. Int. 13 (2022 Jun 10) 244, https://doi.org/10.25259/SNI_304_2022.