

Subdural haematoma due to dural metastases from bronchogenic carcinoma in a previously well patient: an unusual cause of non-traumatic recurrent intracranial haematomata

Zheng J X, Tan T K, Kumar D S, Lim L C, Loh H L

ABSTRACT

Subdural haematomata (SDH) are usually traumatic in aetiology. Non-traumatic instances of SDH are uncommon, and can rarely be due to metastases involving the dura. Computed tomography or magnetic resonance imaging can be misleading, as the underlying aetiology may be masked by the SDH, or the appearance can simulate meningiomas. A high index of suspicion for SDH is thus required. Under such circumstances, when no overt cause is identified, dural tissue should be sent for histological analysis and blood clot for cytology, even if the appearances are grossly normal at surgery. We present a rare case of a 42-year-old woman who was previously well, but presented with progressive weakness due to acute spontaneous SDH. She required repeated surgical evacuations for SDH and for subsequent recurrent extradural haematomata. After extensive investigations, the cause was identified to be secondary dural metastases from a primary lung carcinoma.

Keywords: dural metastasis, lung carcinoma, subdural haematoma

Singapore Med J 2011;52(4):e66-e69

INTRODUCTION

Subdural haematomata (SDH) are characterised by bleeding occurring in the spaces between the dura and the arachnoid membranes surrounding the brain. The common causes include trauma, anticoagulation therapy or blood disorders. Spontaneous non-traumatic acute SDH is rare. Research has shown that it accounts for 2.6% of all cases.⁽¹⁾ Possible causes include vascular disorders, coagulopathy, intracranial hypertension, meningitis and neoplasms.⁽²⁾ Major classes of neoplasms associated with SDH include primary brain and primary

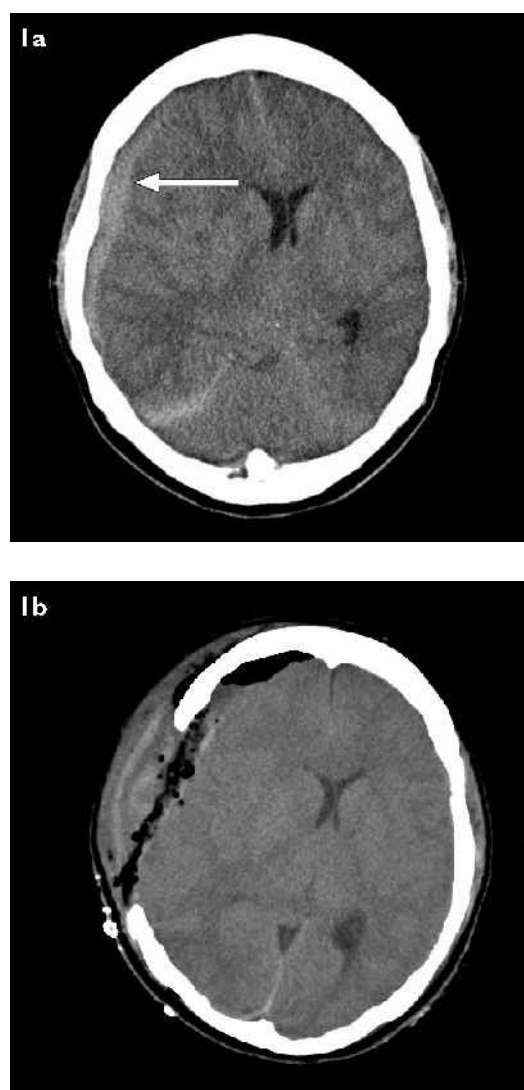


Fig. 1 CT images show (a) right acute subdural haematoma (arrow) and (b) evacuation of the acute subdural haematoma post craniectomy.

meningeal tumours, multicentric tumours (lymphomas) and metastatic dural neoplasms.⁽³⁾ SDH secondary to dural metastases is very rare. We present a case of acute SDH secondary to dural metastases from bronchogenic carcinoma in a patient who was previously well.

Department of Anaesthesiology, Singapore General Hospital, Outram Road, Singapore 169608

Zheng JX, MBBS
Medical Officer

Tan TK, FRCA
Senior Consultant

Department of Neurosurgery

Kumar DS, MRCS
Registrar

Department of Haematology

Lim LC, FRCP
Senior Consultant

Department of Pathology

Loh HL, FRCPath
Consultant

Correspondence to:
Zheng Jin Xi
Tel: (65) 6225 0488
Fax: (65) 6557 2138
Email: jinxi@gmail.com



Fig. 2 Chest radiograph shows right midzone opacification (arrow).

CASE REPORT

A 42-year-old Chinese woman was suffering from headache, vomiting, limb weakness and drowsiness for several days. She had been well previously and possessed no history of significant medical problems or head trauma. Her Glasgow Coma Scale (GCS) score on admission was E3V5M5, and her pupils were unequal with sluggish response to light. Computed tomography (CT) imaging of the brain revealed a right frontoparietal SDH with a maximal thickness of 1.4 cm, which was associated with mass effect and midline shift, and no evidence of vault fracture (Fig. 1).

The patient underwent emergency decompressive craniectomy and evacuation of the acute SDH. During surgery, the surgical field was noted to be generally oozy, but the meninges appeared grossly normal. No definite aetiology for SDH was identified. The platelet counts, prothrombin time, activated partial thromboplastin time and screen for disseminated intravascular coagulopathy were normal. A cerebral angiogram did not indicate the presence of abnormalities. A right midzone opacification on chest radiography was noted (Fig. 2), and CT imaging of the thorax revealed a 2.2 cm × 2.5 cm right hilar mass, which was suspected to be a bronchogenic carcinoma. The patient eventually recovered and was discharged two weeks later with a full GCS score. She was ambulant but had mild residual limb weakness, and was thus given a follow-up appointment to investigate her pulmonary lesion.

Two days following discharge, she was re-admitted for headache, nausea and drowsiness. There was bleeding

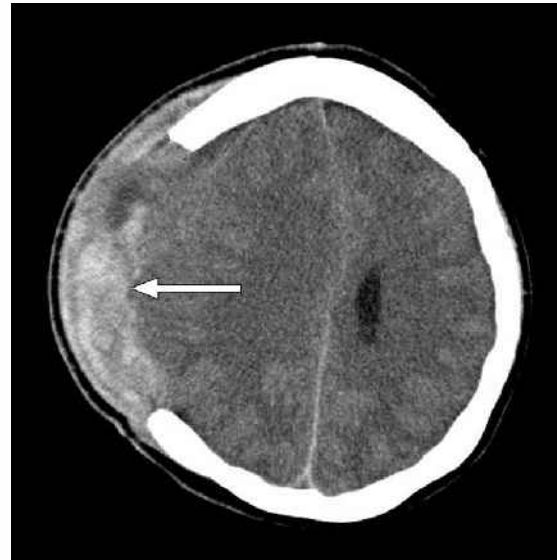


Fig. 3 CT image shows the acute extradural haematoma at a previous craniectomy site (arrow).

from her scalp at the surgical wound site. Her GCS score was E3V4M6 and her right pupil was dilated. CT imaging revealed a large extradural haematoma (EDH) at the right craniectomy site (Fig. 3). An emergency re-opening of the scalp flap and evacuation of the EDH was performed. No obvious sources of bleed or abnormalities were noted intraoperatively. The patient recovered well post operation. Magnetic resonance imaging of the brain did not reveal any focal parenchymal lesions or abnormal enhancing leptomeninges (Fig. 4). A repeated cerebral angiogram was carried out, which again revealed no abnormalities. Detailed haematological investigations, including fibrinogen, factors VII, VIII, XIII, vWF antigen, ristocetin cofactor, thrombin time, platelet aggregation tests, peripheral blood film and flow cytometry for Bernard Soulier's syndrome, were all normal and indicated no obvious haematological disorder to account for the patient's recurrent intracranial bleeding.

Over the next two weeks, four separate episodes of re-accumulation of the EDH occurred, requiring repeated clot evacuation. During surgery, no visible bleeders were observed, and the brain parenchyma and dura appeared to be grossly normal. Samples of the blood clot, together with normal-looking dura and galea, were sent for histology. After the fourth re-opening, the patient experienced neurological deterioration, and we observed the formation of a new intra-axial haematoma measuring 4.8 cm × 4.0 cm in the right frontoparietal lobe, with perilesional oedema and midline shift. After discussions with the family, no further surgery was undertaken and comfort measures were instituted.

The likelihood of a dural metastatic disease

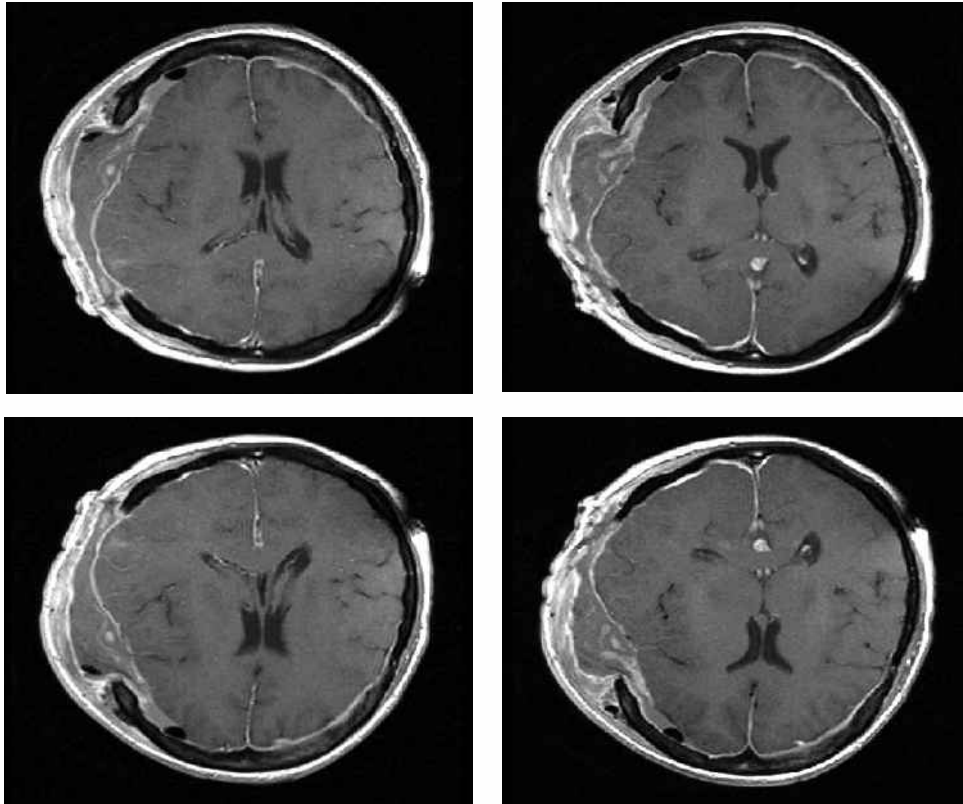


Fig. 4 Axial T1-W post-contrast MR images post craniectomy show no focal parenchymal lesions or abnormal enhancing leptomeninges.

causing recurrent haemorrhages was high in view of the likely presence of bronchogenic carcinoma, previously observed on the CT of the thorax. This was finally confirmed on histology from samples of the galea and dura (Fig. 5), which showed clusters of tumour cells; some were noted within the lymphovascular spaces, which were diffusely and strongly reactive for thyroid transcription factor-1 and surfactant protein A. This was consistent with metastases from primary non-small cell carcinoma of the lung.

DISCUSSION

SDH secondary to dural metastatic lesions is rare, and has never been formally reported in Singapore. In a series of 2,508 autopsied cases with malignant neoplasms arising in primary sites outside the central nervous system, 437 had metastases to the central nervous system. Of these, 38% involved only the dura, with only two of the instances being associated with SDH.⁽⁴⁾

Dural metastases are frequently associated with adenocarcinomas. Kunii et al reported 51 cases of SDH associated with dural metastasis, with adenocarcinomas accounting for 33 out of the 51 cases. The most common primary tumour site was the stomach ($n = 13$), followed by the prostate gland ($n = 10$), breast ($n = 7$) and lung ($n = 4$).⁽⁵⁾ At autopsy, dural metastasis was most

frequently associated with primaries from the breast, followed by the lung, melanoma, gastrointestinal tract and prostate.⁽⁶⁾ The pathophysiology of the spread of extraneuronal malignancies to the dura can be related to the direct extension of calvarial metastases to the dura, or a combination of both arterial and venous dissemination.⁽⁷⁾

After the establishment of dural metastatic deposits, several mechanisms of SDH formation are proposed. In a review of 13 cases, head trauma and tumour necrosis with resultant haemorrhage were not found to be the causative factors. Coagulation abnormalities (thrombocytopenia) were present in only two of the 13 cases. However, histological evidence of tumoural invasion of dural vessels was evident in almost all cases, suggesting that haematoma formation was a result of dural vascular obstruction.⁽⁴⁾

The dura consists of a dense outer layer and a loose areolar inner layer. Veins in the inner layer drain into the veins of the outer layer, and eventually into the calvarial veins. Obstruction of the veins in the outer layer by tumour cells can cause dilation and rupture of veins in the inner layer, thus leading to the formation of SDH.⁽⁸⁾ In another postulation, infiltration of the dura by malignant cells can induce an angiodesmoplastic reaction, resulting in the formation of an abnormal subdural neomembrane

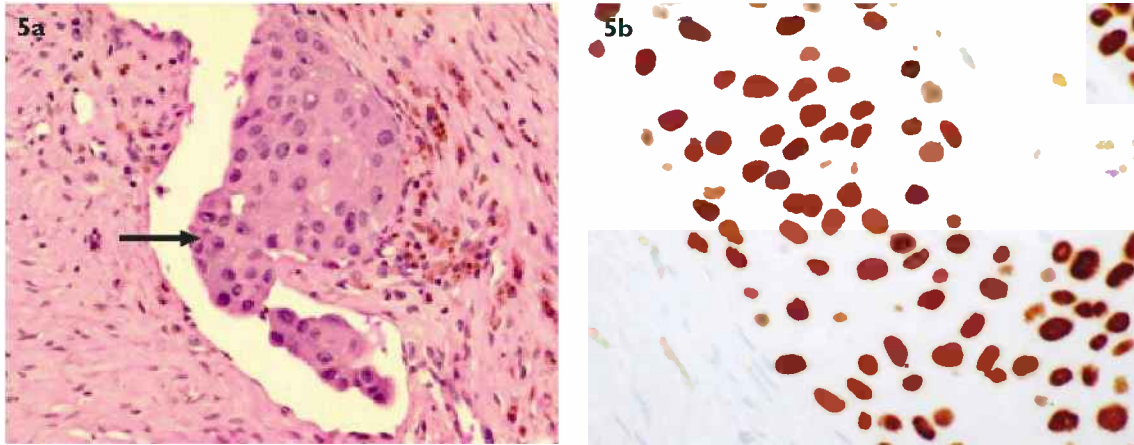


Fig.5 Photomicrographs show (a) clusters of tumour cells partially filling up a vascular space (arrow) (Haematoxylin & eosin, \times 100) and (b) strong nuclear staining for thyroid transcription factor-1 (Anti-TTF-1 immunoperoxidase, \times 600).

that is highly vascular, into which haemorrhage can occur more easily.⁽⁹⁾

Malignancies are associated with coagulation disorders, which may result from disseminated intravascular coagulation caused by the primary malignancy, or thrombocytopenia due to tumoural marrow infiltration. In some cases, anti-oestrogen therapy that is prescribed for certain malignancies can induce coagulopathy.⁽¹⁰⁾ The combination of metastases in dural vessels with a coagulation defect can lead to a large SDH.⁽⁴⁾

Due to the rarity of the condition and the absence of a definite diagnosis of a carcinoma at presentation, the diagnosis of dural metastasis as a cause of atraumatic SDH was not immediately apparent in our patient. To date, the primary malignancy in reported cases is usually known at presentation, and dural metastasis is evident either preoperatively from brain imaging or intraoperatively during examination of the dura, of which neither was the case in our patient. Radiologically and surgically, no abnormalities leading to this diagnosis were identified. Thus, no tissue was sent for histology initially, as this is not a standard practice for the identification of SDH. It was only after a subsequent biopsy of the grossly normal-looking dura that a histological diagnosis was made, and an accurate diagnosis was thus delayed. The prognosis is generally poor in such cases, as it indicates systemic cancer. While surgical evacuation can result in temporary neurological improvement, progressive deterioration due to malignancy or recurrent bleeding is common. An earlier diagnosis would entail wide excisions of the muscles, scalp, galeal and dural tissues, as well as subsequent reconstruction for wound closure. The advice of an oncologist could be sought to assist with prognostication and treatment. If the patient is in a poor neurological state, discussion with the family regarding withdrawal of treatment should be considered.

Dural metastasis is a rare cause of non-traumatic SDH and a rare first presentation of bronchogenic carcinoma. Based on our experience, we suggest that a high index of suspicion for malignancy should be maintained in approaching cases with non-traumatic SDH, especially if it is recurrent, even in the absence of obvious primary malignancy or radiological evidence of dural metastases. In such cases, careful scrutiny of the galea, the adjoining muscle tissues and subdural membranes, cytological examination of subdural fluid and histological analysis of the abovementioned tissues should always be carried out.⁽⁵⁾

REFERENCES

1. Komatsu Y, Uemura K, Yasuda S, et al. [Acute subdural hemorrhage of arterial origin: report of three cases]. *No Shinkei Geka* 1997; 25:841-5. Japanese.
2. Bergmann M, Puskas Z, Kuchelmeister K. Subdural hematoma due to dural metastasis: case report and review of the literature. *Clin Neurol Neurosurg* 1992; 94:235-40.
3. McKenzie CR, Rengachary SS, McGregor DH, Dixon AY, Suskind DL. Subdural hematoma associated with metastatic neoplasms. *Neurosurgery* 1990; 27:619-24.
4. Ambavagar PC, Sher J. Subdural hematoma secondary to metastatic neoplasm: report of two cases and review of the literature. *Cancer* 1978; 42:2015-8.
5. Kunii N, Morita A, Yoshikawa G, Kirino T. Subdural hematoma associated with dural metastasis-case report. *Neurol Med Chir (Tokyo)* 2005; 45:519-22.
6. Takakura K, Sano K, Hojo S, Hirano A. Metastatic tumours of the central nervous system. Tokyo: Igaku-Shoin 1982; 89-93.
7. Shamim MS, Bari ME, Enam SA. Dural metastases presenting as an extradural hematoma: a rare presentation. *J Pak Med Assoc* 2005; 55:509-10.
8. Russell DS, Cairns H. Subdural false membrane or hematoma (pachymeningitis interna hemorrhagica) in carcinomatosis and sarcomatosis of the dura mater. *Brain* 1934; 57:32-48.
9. Leech RW, Welch FT, Ojemann GA. Subdural hematoma secondary to metastatic dural carcinomatosis. *J Neurosurg* 1974; 41:610-3.
10. Yamashita T, Shimoji T, Komai T, et al. Growing mechanism of chronic subdural hematoma-light and electron microscopic study on outer membranes of chronic subdural hematoma. *Neurol Med Chir (Tokyo)* 1978; 18:743-52.