Intracranial Bleed Post Stereotactic Biopsy: Lessons Learned
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Citation

Abstract
Stereotactic brain tumor biopsy has a high rate of diagnostic yield in lesions in which resection is not indicated because of the eloquence of the brain area involved or due to uncertainty of the differential diagnosis. It remains a flexible diagnostic method with generally low morbidity. We report a case of intracranial bleed after Stereotactic Biopsy of intracranial lesion.

INTRODUCTION
Stereotactic surgery refers to an image-guided neurosurgical procedure in which a three-dimensional guidance stereotactic system is used to facilitate a diagnostic or therapeutic goal in the brain. A surgical complication is defined as an adverse event that occurs either during surgery or within a 30-day postoperative interval (Kondziolka 1998). Takahashi (2004) used stereotactic biopsy based on these 3 factors: 1) Patient is too old or ill to go for craniotomy 2) Lesion which is deep, diffuse, multiple or in eloquent area 3) Cytoreduction is not needed for management of the lesion. The potential risks associated with stereotactic biopsies are sometimes underestimated (Yamada 2004, Grossman 2005, Nishihada 2008). Significant complications mainly haemorrhage may occur at and around the biopsy site. The reported incidence of complications associated with stereotactic biopsies varies between 0–9.3 percent in different clinical series (Abhaya et.al. 1998). The bleed can be simply divided into symptomatic and asymptomatic (Kulkarni 1998). In his study, patients who are asymptomatic have a CT scan finding of hematoma size ranging from 4mm to 40mm. Review of literature noticed that most of intracranial bleed post biopsy was managed conservative. However, there are cases which has been managed surgically (Warnick 2003, Takahashi 2004, Nishihara 2008). Warnick (2003) had proposed that a patient who had undergone stereotactic biopsy without any intraoperative bleeding or new neurological deficit within 2 hours of observation in recovery room of operation theatre, may be managed in the general ward. This study has been supported by Owen et al in 2009 where they found out that absence of intraoperative blood in biopsy needle have negative predictive values of 98.8%.

CASE REPORT
58 years old malay woman, a known case of hypertension on regular follow up, presented with history of sudden onset headache for 3 days duration, followed by 1 day duration of left sided weakness and numbness. The headache was described as throbbing in nature and generalised. It was not relieved with analgesia. It was associated with vomiting. She also noticed her left side of body becoming weak but she does not require any assistance when ambulate. There was numbness on the left side of her body involving the face. There was no history loss of consciousness or seizure. There was no history of recent trauma to the head. Her systemic review was unremarkable. She had a strong family history of lymphoma where 2 of her sisters died because of the disease.

On examination, she was alert and conscious, her Glasgow Coma Scale recorded as 15/15 (E4V5M6), both pupils size 3mm and reactive. Her higher mental function was intact. Cranial nerve examination showed left UMN CN VII weakness. Her gross motor examination showed upper motor neuron weakness on left side with grade 4/5. She had loss of sensation on the left side.

CT brain showed right basal ganglia space occupying lesion with perilesion edema. It enhanced homogenously with contrast. She was started on IV dexamethasone 4mg qid and her symptoms improved on the next day. MRI brain done 3 days later and showed the lesion reduces in size.

She was then subjected for frame based stereotatic biopsy on
the following elective list. The biopsy was taken at 2
different sites. Post procedure she was extubated and
observed at recovery bay in operating theatre. During
observation, her blood pressure ranging from 170/90 to 200/
100 where she required labetolol infusion. Her
consciousness remains intact. After 1 hour at recovery bay
her blood pressure was control and she was transferred to
Neurosurgery General Ward. She remains well until at 0130
am when the staff nurses noted she had loss of consciousness
with only right side of the limbs moving. During this time
her GCS was E1 V2M5 pupil 2+/2+. She was electively
intubated, followed by mechanical ventilation and sedation.
Intravenous mannitol was given and urgent CT brain was
arranged. The CT brain reported as intracranial bleed at
Right Basal Ganglia region with mass effect.

She was subjected for urgent right craniotomy and clot
evacuation with left external ventricular drainage for
intracranial pressure monitoring. We decided to do
craniotomy and clot evacuation because the clot size was
more than 30cm³, and she deteriorated due to the hematoma.
Post operatively she gradually improved. After 1 week she
regained consciousness with GCS E4VtM6. However her
left sided weakness graded as 1/5. She is currently still under
rehabilitation.

Histopathology examination reported as Non Hodgkin’s
lymphoma diffuse B cell type. She was referred to
Hematology team for initiation of chemotherapy and further
management.

**DISCUSSION**

Complications of stereotactic biopsy for brain tumor
generally occur within 12–24 hours of surgery after which
the patient should be stable (Kulkarni 1998). Mortality rates
of 0%–3.3% and morbidity rates of 0%–9.3% have
previously been reported in patients undergoing a stereotactic
brain biopsy (Kodzlioka 1998). It can be assumed that
bleeding or edema may develop more often in malignant
lesions with neovascularization and abnormal blood vessels,
such as malignant gliomas (Kreth 2001). In addition, one
may assume that cortical involvement, lesions located in the
dominant hemisphere, or pre-existing signs and symptoms of
elevated intracranial pressure (ICP) may also be associated
with an increased incidence of complications. However, R
Grossman et al (2005) found that none of the above variables
were statistically significant. Field et al (2001) found in their
analysis an increased bleeding tendency when the platelet
count fell below 150,000mm³. Yamada (2005) noticed that
intracranial bleed post biopsy, commonly occurs in patient
with tumor stain on angiography. Nishihara (2008) noticed
that biopsy at deep seated region such as basal ganglia,
thalamus and glioma carry a significant risk developing
hematoma. In addition to that, Elias et al (2009) in his study
noticed that biopsy that adjacent to sulcus or transventricular
has high incidence of hematoma formation.

Table 1 below summarize reported case or study of
morbidity and mortality in stereotatic biopsy. Overall the
mortality and morbidity is low. Thus, it shows that
stereotatic biopsy is still safe provided it was done by an
experienced surgeon.
### Figure 1

Table 1: Summary of intracranial hematoma post stereotactic biopsy in various studies

<table>
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<tr>
<th>Author</th>
<th>No of patients biopsied</th>
<th>No of patients who had bleed post biopsy</th>
<th>Treatment</th>
<th>Mortality</th>
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<td>6 sz</td>
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Age asymptomatic; sc: symptomatic; IFH: interventricular hemorrhage
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Figure 2
Figure 1: CT and MRI finding prior biopsy; 1a: CT brain upon admission; 1b: MRI with Gadolinum showed tumor heterogeneously enhance with perilesion edema; 1c: MRI T2WI

Hemorrhage at the time of presentation in primary CNS lymphoma is rare. Vascular endothelial growth factor (VEGF) immunoreactivity by lymphoma cells may contribute to hemmorhage. James Rubeinstein et al (2002) reported a case of patient with lymphoma presented with haemorrhage. Expression of VEGF by primary central nervous system lymphoma cells may contribute significantly to several of the pathobiological features of this tumor. First, the majority of primary central nervous system lymphomas are associated with enhancement on MRI or CT scan. While these tumors typically obtain nourishment by angiotropism and not by angiogenesis, expression of VEGF could contribute to the vascular destabilization and permeability changes which characterize the disrupted blood-brain barrier in these tumors, thus accounting for this contrast enhancement. VEGF stimulates the formation of endothelial fenestrations and is a strong inducer of vascular permeability, with potency 50,000 times greater than histamine. Second, VEGF expression could contribute to the vasogenic edema which is characteristic of this type of brain tumor. Third, overexpression of VEGF isoforms 121 and 165 has been shown to induce vascular destabilization in an animal model of glioblastoma, resulting in intracerebral hemorrhage. Fourth, glucocorticoids have a critical role in the treatment of primary CNS lymphoma: at least 25% of patients exhibit a radiographic response to dexamethasone. The basis for this effect may be secondary to at least two mechanisms of action: while glucocorticoids likely exert a direct apoptotic effect on malignant lymphocytes, it is also plausible that dexamethasone may also reduce lymphoma-associated vascular permeability by blocking both the expression and/or actions of VEGF. Fifth, VEGF-mediated permeability changes may contribute positively to the relatively successful role of systemic chemotherapy in this disease.

Most biopsy site bleeding is capillary or venous, and it can usually be controlled simply by the implementation of conventional methods including cannula irrigation, head elevation, and induced hypotension to systolic 90mmHg. However, in cases of refractory bleeding, craniotomy and clot evacuation is an acceptable method of controlling hemostasis. Murat Kutlay et al (2010) have proposed a new technique of controlling hemostasis using ballon compression method. In this technique, through the biopsy cannula he introduces Foggarty Catheter size 5.5F. Using a C arm Fluroscope the position of catheter monitored. After 10 minutes of full inflation the catheter withdrawn and patient was sent for CT brain for assessment. However, his technique is used in patient who is under local anaesthesia, where clinical examinations perform intermittently. Apart from that it is used after conventional method of controlling hemostasis failed. It was done prior repeating CT brain or decision of craniotomy. It was not used as substitute to craniotomy.

Figure 3
Figure 2 : CT brain of patient when her condition deteriorate; 2a: pre craniotomy; 2b: post craniotomy and clot evacuation, hyperdense area was tumoral bleed; 2c: 1 week after craniotomy and clot evacuation
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The peculiarity about this case was the delay onset of symptomatic bleed. Intraoperatively during biopsy, no immediate complication occurred such as active bleeding through the cannula. Apart from that, the patient was ambulating well in the ward after the biopsy procedure. Retrospective review of our case noted that from clinical history she may have presented with features of bleed as evidence by acuteness of her symptoms. Initial CT brain plain noted hyperdensity of lesion over right basal ganglia. Although the density was not as bright as acute bleed, it is still relatively dense compared to grey matter. MRI T2 WI showed area of hyperdensity within a hypodensity lesion which may represent as different ages of bleed. Irregular enhancement on MRI T1 contrast may represent underlying neoplastic process. Hence, the biopsy may aggravate rebleeding in this patient. Post operatively, her blood pressure was not control prior for extubation. It may contribute to intra parenchymal bleed as well.

References
2. D. G. T. Thomas, Stereotactic Biopsies For Tumors: Indications, Limits, Diagnosis With Histopathology And Other Laboratory Techniques, Practical Handbook of Neurosurgery 2009, Part 4, 529-547
5. Kutlay, Murat MD; Şimşek, Hakan MD; Çolak, Ahmet MD; Demircan, Mehmet Nusret MD, Balloon Compression Technique in the Management of Persistent Intraoperative Intratumoral Hemorrhage Resulting From Stereotactic Biopsy: Technical Note, Neurosurgery: June 2010 - Volume 66 - Issue 6
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