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Case Report

Stroke in gliomas: a case report and literature review

Ryan J. Green[1]*, William Caufield[1], Rhys Thomas Parker[1], Tsz Him Chan[1], Corey Kirkham[1], Sarath Vennam[2]

[1]Department of Surgery, Cairns Base Hospital, Queensland, Australia
[2]Department of Radiology, Royal Cornwall Hospital, UK

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***Correspondence:**
Dr. Ryan J. Green,
E-mail: Ryan.green@health.qld.gov.au

ABSTRACT

A 60-year-old patient presented to the emergency department with sudden onset neurological symptoms suggestive of a cerebrovascular event. Initial diagnostic imaging revealed a complex clinical picture with an unclear diagnosis, with differentials including aneurysm, neoplasm, ischaemia accompanied by cerebral oedema. CT angiography revealed a small aneurysm, while subsequent MRI demonstrated findings consistent with diffuse multifocal glioma and areas of restricted diffusion, suggesting post-compressive ischaemia. This case highlights both the diagnostic challenges of using CT imaging for early suspected stroke and the importance of multimodal imaging when the clinical diagnosis is uncertain.

Keywords: Glioma, Stroke, CT, MRI, Angiography

INTRODUCTION

Acute neurological deficits often present with diagnostic challenges. This case report describes the presentation of a 60-year-old patient suffering from sudden onset neurological symptoms suggestive of a stroke. Initial imaging was atypical and equivocal and MR imaging revealed a more complex clinical picture suggestive of glioma with the sequelae of ischaemic stroke. Gliomas are the most commonly seen brain tumours which can not only lead to neurological deficits themselves, but significantly increase the risk of stroke.[1] This case illustrates the diagnostic challenges of differentiating diagnoses in acute neurological presentations.

CASE REPORT

A 60-year-old otherwise well patient presented to the emergency department with sudden onset or dysphagia and right sided weakness. The initial presentation was concerning for stroke.

Summary of imaging

CT brain with and without contrast: Initial CT scans, with and without contrast were diagnostically unclear. The scan showed generalised oedema of the left cerebral hemisphere with midline shift and preservation of grey-white matter differentiation which was reported as concerning for vasogenic oedema. These initial images were unable to differentiate between the possible diagnoses of subarachnoid haemorrhage with vasospasm, atypical appearances of ischaemia or a non-enhancing neoplasia (Figure 1).

CT angiography

The patient proceeded to have a CT angiogram intracranial in order to exclude an aneurysm or vascular occlusion. This imaging demonstrated a 3mm aneurysm arising from the distal left ICA in the expected region of the left PCOM raising the possibility of an aneurysmal subarachnoid haemorrhage (Figure 2).

MRI scan with contrast

The patient underwent a contrast enhanced MRI scan, demonstrating swelling and high T2 signal in the left frontal, temporal, insular and occipital lobes with extension across the corpus callosum into the medial right frontal lobe with chronic infarct in the right cerebellar hemisphere resulting in left lateral ventricle mass effect with left to right shift of midline structures. There are focal areas of restricted diffusion within the left frontal and left insular lobes. Appearances were thought to represent diffuse multifocal glioma and areas of restricted diffusion might represent regions of post compressive ischaemia in the ACA and MCA territories (Figure 3).

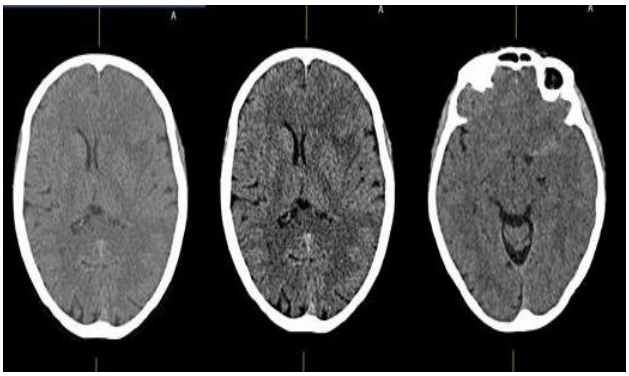

Figure 1: CT head non-contrast and contrast.

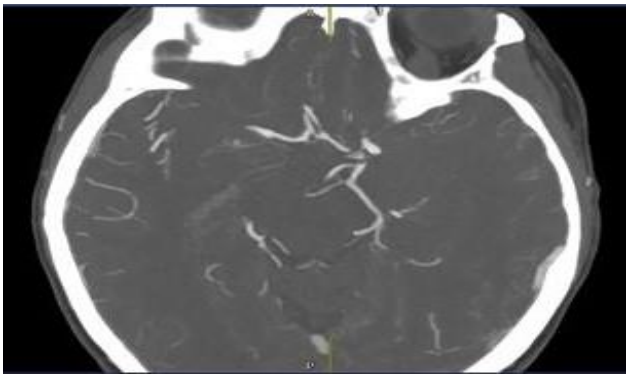

Figure 2: CT angiogram intracranial demonstrating small MCA aneurysm.

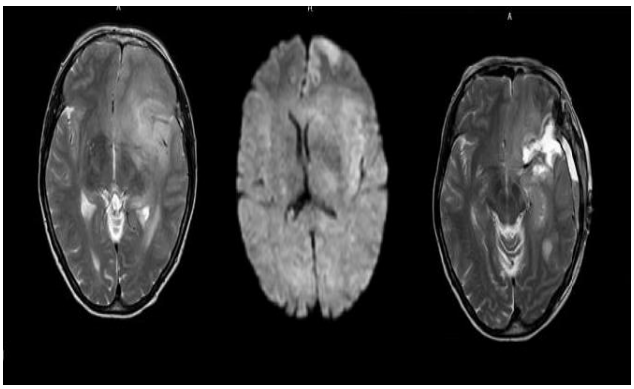

Figure 3: MR intracranial with contrast.

DISCUSSION

This case presents an atypical and challenging diagnostic scenario and highlights the importance of comprehensive imaging and astute clinical correlation. This case also underscores the importance of considering alternative differential diagnoses in patients presenting with acute neurological deficits. Clinically, the patient presented with symptoms concerning for an acute ischaemic stroke with subsequent CT imaging raising the possibility of an aneurysmal subarachnoid haemorrhage. Imaging is the mainstay of diagnosis and differentiation of these presentations.[2] Non-enhancing neoplasia on CT was a less likely differential given the acuity of the presentation. The vasogenic oedema affecting the left hemisphere is unusual for an ischaemic stroke or subarachnoid haemorrhage. The preservation of grey-white matter differentiation complicates the diagnosis as this is atypical of an acute ischaemic event.

Stroke

Stroke, or cerebrovascular accidents (CVA), are caused by acute disturbance of blood flow to the brain. These can range from transient ischaemic attacks, or TIAs, to permanent neurological deficits and brain damage. Stroke is a leading cause of death and disability.[3] In 2020 the stroke rate in Australia was 154 per 100,000 population.[4]

Strokes can be divided into ischaemic or haemorrhagic, with 80-90% of strokes being ischaemic due to embolism or thrombosis causing occlusion of the blood supply to the brain.[5] Haemorrhagic strokes are often due to a bleed into the brain parenchyma, however intracerebral haemorrhage, also includes subarachnoid haemorrhage.

Symptoms of stroke can vary depending on the parenchymal territory affected by the stroke but may include aphasia, hemiparesis, and visual disturbance.

Risk factors include age and medical history including hypertension, diabetes smoking, obesity and cardiac dysrhythmias such as atrial fibrillation.[6]

Early diagnosis is vital to improve outcomes, particularly in the case of ischaemic stroke, with the common adage “Time is brain” emphasizing the rapid loss in neurological function with time. Prompt diagnosis and early intervention, whether via thrombolysis or via endovascular clot retrieval, has robust evidence of improved long term neurological outcomes.[7,8]

Diagnosis is typically made by imaging including CT and MR imaging modalities. Non-contrast CT is often the initial scan of choice in the emergent setting due to speed, availability and the ability to rule out intracerebral haemorrhage before performing more advanced imaging. However, the sensitivity of non-contrast CT brain scans for ischaemic stroke in the initial 6 hours can be limited. Within 3 hours the sensitivity is reported as 12-52%.[9]

At 3-6 hours the sensitivity is reported as 58-70%.[10] After 6 hours the sensitivity is 80-90% or higher.[10]

Specificity of non-contrast CT is generally higher than the sensitivity in the early stages of ischaemic stroke with 88-98% reported in the literature.[9] This makes the early CT non-contrast scan useful for ruling out alternative diagnoses such as a intracerebral haemorrhage or neoplasm.

MR has a significantly improved sensitivity in diagnosing ischaemic stroke, especially within 6 hours of symptom onset. Specifically, diffusion weighted imaging (DWI) has proved particularly advantageous in comparison to non-contrast CT in detecting acute ischaemic stroke.

Overall sensitivity of MR 83-100%, DWI sensitivity within 6 hours, DWI sensitivity beyond 6 hours.[11,12] MRI also demonstrates high specificity in diagnosing ischemic stroke. Overall specificity of MR for use in ischaemic stroke is 86-98%.[11] DWI-MR specificity is in the range of 95-100%.[12]

Treatment of ischaemic stroke can be managed with systemic thrombolysis, or interventional endovascular clot retrieval when achieved in a timely manner.[13] Haemorrhagic stroke may require surgical decompression and are beyond the scope of this case report. Preventative measures can modify baseline risk and reduce risk of further stroke. Primary lifestyle modifications include smoking cessation, obesity reduction, strict blood pressure control, and therapeutic anticoagulation or antiplatelet therapy for atrial fibrillation or in other select patients.

Glioma

Glioma is a primary brain tumour originating from glial cells. Glioma is the most common type of brain tumour, accounting for approximately 80% of tumours.[14] Subtypes of glioma are classified by the world health organisation (WHO) by their cell of origin, the features of the tumour, and increasingly so the molecular parameters.[15]

Symptoms of glioma may include gradual onset headache, vomiting, seizures, and in advanced disease neurological and cognitive deficits.

Diagnosis of glioma is generally led by diagnostic imaging when suspected. CT imaging for the diagnosis of glioma is poorly sensitive, but MRI has a sensitivity and specificity of 100% and 91% respectively.[16] Those presenting with symptoms associated with CNS neoplasia often will have had CT imaging in the first instance, due to easy access and the ability to rule out other differential diagnoses with overlapping clinical features. MR imaging with contrast is the gold standard imaging modality in patients with a high suspicion for CNS neoplasm such as glioma; this is paired with tissue biopsy, a similar approach in the work up of most suspected cancers to confirm histology, and molecular analysis to enable grading.[17]

Tumours are graded on a scale of I to IV, indicating their aggressiveness and informing their treatment pathways, which commonly involves surgery, radiation, chemotherapy and some emerging immunotherapies.[18] Long term survival of glioma varies across grades but generally has a poor prognosis.

Stroke secondary to glioma

Gliomas may feature neurological deficits similar to those seen in stroke although clinically may be differentiated as the onset of stroke is generally more acute. Differentiating tumour progression in those with known glioma from stroke is challenging. This case highlights the diagnostic complexity of two conditions with overlapping symptoms, in which the underlying glioma has resulted in an ischaemic stroke through compression of local vessels. As many as 22% of those with some gliomas such as glioblastoma may develop stroke.[1]

Gliomas may cause stroke by various mechanisms including:

Hypercoagulability: Gliomas and other tumours can increase coagulability leading to an increased risk of thromboembolism and thus ischaemic stroke. The underlying aetiology is complex and may involve expression, activity and release of coagulation factors and inflammatory cytokines.[19]

Direct compression: as gliomas grow they may compress or invade blood vessels supplying brain tissue leading to ischaemia.[20]

Treatment effects: treatment of gliomas may increase risk of stroke, including chemotherapy, radiation or surgery.[20]

CONCLUSION

This case report highlights the complexities seen in gliomas and stroke. This presents a diagnostic challenge that highlights the importance of prompt neuroimaging and astute clinical correlation. Important takeaways from this case are the adage “time is brain” in stroke management and that atypical presentations require urgent and appropriate diagnostic neuroimaging. This highlights the importance of research into the link between tumours and the development of stroke and may lead to improved imaging and diagnostic techniques to improve outcomes.

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