
CASE REPORT

A Large Pontine Capillary Telangiectasia Detected by Susceptibility-weighted Imaging But Inconspicuous on Diffusion-weighted Imaging

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ABSTRACT

A case of symptomatic pontine capillary telangiectasia detected by susceptibility-weighted imaging is reported. The lesion was inconspicuous on diffusion-weighted imaging. To our knowledge there is only limited literature emphasising the diagnostic utility of diffusion- and susceptibility-weighted imaging in such lesions, particularly with reference to the combined appearances of susceptibility- and diffusion-weighted imaging in the same lesion. A large enhancing pontine lesion involving the acoustic pathway was found on post-contrast T1-weighted magnetic resonance images in a 62-year-old woman with progressive right-sided hearing loss. Susceptibility-weighted imaging was useful for lesion characterisation as it demonstrated evidence of slow flow in the lesion. However, the lesion was inconspicuous on diffusion-weighted imaging, despite its large size. In such lesions, the diagnostic utility of gradient recalled echo sequences is well established. Limited literature about the signal characteristics of these lesions on diffusion-weighted imaging is divergent, with descriptions of both normal and hypointense appearances. Literature about signal characteristics on susceptibility-weighted imaging is more unified for the low signal appearance of such lesions. Further studies may be necessary to establish the diagnostic utility of diffusion- and susceptibility-weighted imaging to characterise these lesions, particularly with a view to differentiating ominous entities with similar appearances on conventional magnetic resonance imaging sequences.

Key Words: Cerebrovascular circulation; Intracranial arteriovenous malformations; Magnetic resonance imaging; Telangiectasis

中文摘要

磁敏感加權成像可以診斷、卻未能於彌散加權成像顯示的大型腦橋毛細血管擴張症病例

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本文報告一宗未能以彌散加權成像、卻可以磁敏感加權成像診斷的腦橋毛細血管擴張症病例。據我們了解，探討上述兩種技術診斷方式於毛細血管擴張症的診斷功能的文獻十分有限，尤其是關於兩者顯示相同病灶的文獻。一名62歲患有右耳進展性失聰的女病人，T1-加權磁共振成像發現造影強化且影響聽覺傳導通路的巨大腦橋病灶。由於能顯示病灶內減緩血流，磁敏感加權成像很有效；反之，雖然是巨大病灶，彌散加權成像顯示並不清楚。對於這些病灶，梯度回波序列的診斷已經明確。這類病灶在彌散加權成像上的訊號特徵在文獻上意見分歧，而關於磁敏感加權成像病灶為低訊號這點文獻的觀點則較為統一。有需要進一步研究建立以上兩種技術對此種病變的診斷功能，尤其當常規磁共振成像上表現類似時，如何將之與預後不兆的病灶區別出來。

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INTRODUCTION

Capillary telangiectasias are slow-flow vascular malformations of the central nervous system. They are most commonly located in the pons, though are found in other locations in the brain and spinal cord.¹

The majority of these lesions remain occult after conventional catheter angiography and computed tomography (CT). Magnetic resonance imaging (MRI) represents the standard of reference in diagnostic imaging of capillary telangiectasias.²

Susceptibility-weighted imaging (SWI) is a high spatial resolution 3D gradient-echo MRI technique, which is very sensitive for the detection of intravascular venous (deoxygenated) blood as well as extravascular blood products.³ Thus, it is very sensitive for the detection of capillary telangiectasias, which contain deoxyhaemoglobin in slowly flowing / stagnant blood.

Differentiation of capillary telangiectasia from other enhancing lesions, such as tumour, subacute infarction and active demyelination, is important because the treatment strategy for each is different.⁴

CASE REPORT

A 62-year-old Chinese woman presented to the outpatient clinic with a history of progressive right-sided hearing loss in July 2009. The referring physician evaluated the patient and clinical localisation was a possible brainstem or peripheral lesion. MRI brain was requested to exclude a possible retro-cochlear lesion.

A brain MRI was conducted on a 1.5-T (Magnetom

Avanto; Siemens, Erlangen, Germany) superconducting system with a standard circularly polarised head coil, and with the protocol optimised for evaluation of retro-cochlear acoustic pathway.

MRI showed no visible abnormality on T1-weighted spin echo (Figure 1a), a hyperintense lesion on T2-weighted fast spin echo images (Figure 1b), and diffuse enhancement (Figure 1c) following administration of intravenous gadoterate meglumine (0.1 mmol/kg). Few small enhancing vessels were also seen within the lesion. The lesion measured approximately 1.4 x 1.6 cm and was not associated with any mass effect, surrounding oedema or detectable gliosis.

The lesion exhibited hypointensity on minimum intensity projection (mIP) SWI (Figure 2a) and since the lesion demonstrated diffuse enhancement, it indicates presence of deoxyhaemoglobin in what was presumed to be slowly flowing blood. Furthermore, the lesion was not demonstrable on diffusion-weighted imaging (DWI) [B=1000], despite its large size (Figure 2b), making the possibility of an acute or early sub-acute infarct highly unlikely. Absence of surrounding oedema and a non-acute symptomatic onset along with susceptibility-related signal loss is usually seen in chronic plaques (due to iron deposition), which makes the possibility of acute demyelination unlikely.

In view of above findings, capillary telangiectasia was considered to be the probable diagnosis.

DISCUSSION

Brain parenchymal vascular malformations are classi-

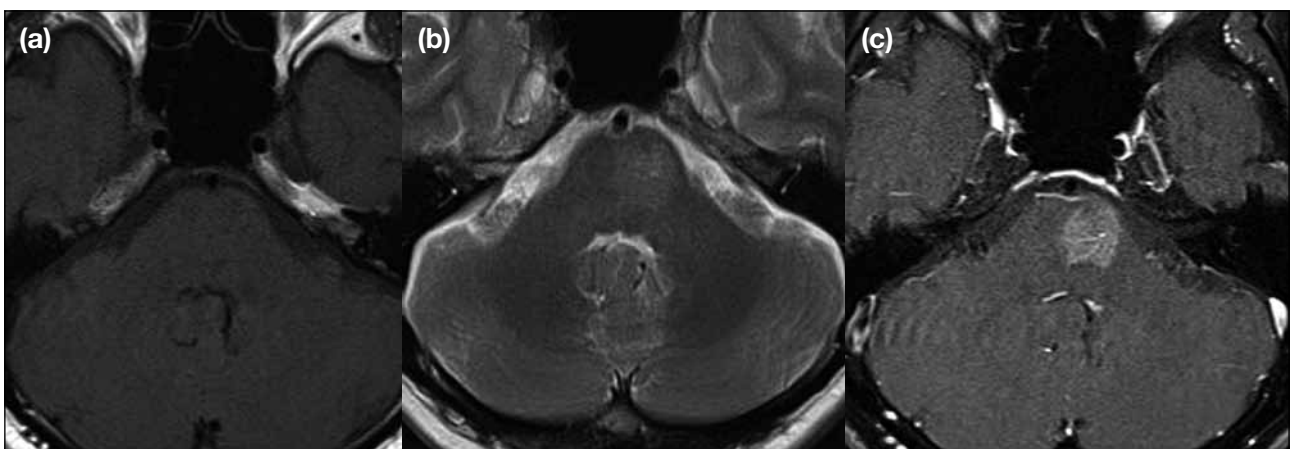


Figure 1. (a) T1-weighted spin echo shows no abnormality. (b) The lesion is slightly hyperintense on T2-weighted fast spin echo. Note absence of surrounding oedema. (c) Post-contrast T1-weighted spin echo image shows an enhanced area in the pons without contour deformity. Note the small enhancing vessels within the lesion.

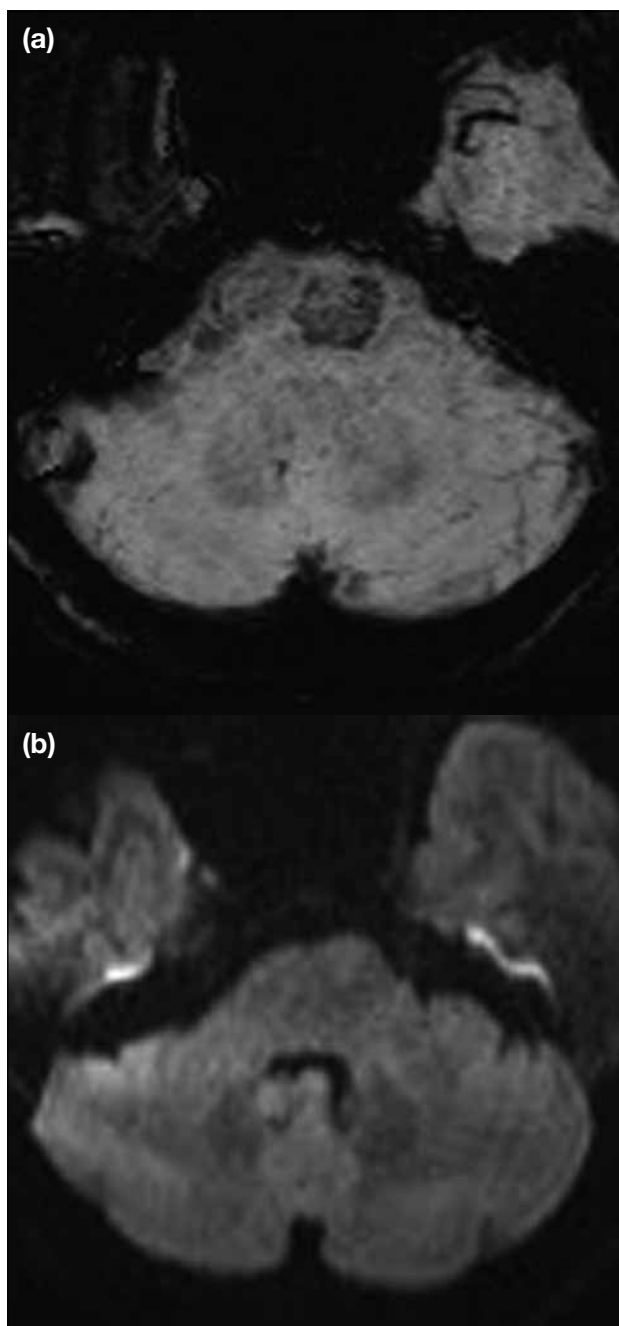


Figure 2. (a) Minimum intensity projection susceptibility-weighted imaging shows the lesion to be hypointense. (b) The lesion is not apparent on diffusion-weighted imaging.

fied into arteriovenous malformations, developmental venous anomalies (venous angiomas), cavernous angiomas, and capillary telangiectasias.

Capillary telangiectatic lesions are typically small and range from several millimetres to 2 cm in size.^{1,5} Occasionally they may be multiple or there can be co-existent cavernous angiomas or developmental venous

anomalies.⁶⁻⁸ Usually they are asymptomatic, incidental findings, but may give rise to mild symptoms (headache, vertigo, dizziness, tinnitus, hearing loss, mild facial weakness, and gait disturbances).^{1,5} There is usually no focal oedema or gliosis associated with capillary telangiectasias⁹ and the lesions do not exhibit haemosiderin deposits.¹⁰ Histologically, capillary telangiectasias represent a distinct type of vascular malformation, characterised by multiple thin-walled vascular channels, interposed between normal brain parenchyma.⁵

Because of slow flow, capillary telangiectasias are usually occult on catheter angiography and CT. They usually appear slightly hypo- or iso-intense on brain T1-weighted images, and slightly hyper- or iso-intense on T2-weighted images. They show enhancement on post-contrast T1-weighted images and characteristically demonstrate marked signal loss on gradient recalled echo (GRE) sequences.^{1,5} The border of enhancement is typically irregular or brushlike.⁵

Our patient's lesion was in the left hemipons and presented with right-sided hearing loss. Impulses from the dorsal and ventral cochlear nuclei travel via a variety of pathways (both crossed and uncrossed) to the superior olivary complex, the lateral lemniscus and inferior colliculus, while other impulses enter the reticular formation.¹¹ Although the majority of capillary telangiectasias are asymptomatic, it is possible that a lesion in the left hemipons (as in our patient) may predominantly affect crossed fibres and result in contralateral sensori-neural hearing loss.

In our patient, the lesion demonstrated enhancement, was hypointense on SWI and was inconspicuous on DWI; SWI being very sensitive for the detection of deoxygenated intravascular venous blood,³ and with the expectation of these lesions appearing hypointense. SWI thus helped in the characterisation of our enhancing lesion.

SWI is a high spatial resolution 3D gradient echo MRI technique which utilises tissue magnetic susceptibility differences, in order to generate contrast. The longer echo time used in SWI (40 ms vs 26 ms in GRE sequence) accentuates small changes in susceptibility across a voxel and appearing as signal intensity losses.

The magnitude and the phase information are combined to create a susceptibility-weighted magnitude image, which is referred to as SWI.

The raw phase images are filtered first to remove unwanted background field phase information that could create artifacts in the image. Since most of the unwanted background field phase information is of low spatial frequency dependence, a high pass filter is used.

Magnitude and phase data are then combined together as a final magnitude SWI dataset. The data can also be post-processed by using an mIP of over 4 or more images.

SWI has been reported to demonstrate improved sensitivity in detection of cavernous angiomas and venous angiomas.¹² Also owing to superior susceptibility change detection, SWI is more sensitive for the detection of early haemorrhagic complications.

Our finding concurs with the case report by Yoshida et al⁴ that capillary telangiectasis appears hypointense on SWI sequence. Also our lesion was inconspicuous on DWI, which was similar to the description of Osborn¹³ that the signal of capillary telangiectasis in DWI is usually normal.

In a recent study by Finkenzeller et al,² 148 consecutive patients with infratentorial lesions were evaluated retrospectively, out of which 18 that had pontine capillary telangiectasia were diagnosed on the basis of MR findings. Interestingly, all 18 lesions demonstrated a hypointense signal on DWI, which was contrary to our case where no abnormality was detected on DWI despite the large size of the lesion.

As these lesions are usually asymptomatic but demonstrate enhancement, they need to be differentiated from other contrast-enhancing lesions in this location that may require active treatment or confer a poor prognosis. Such lesions in the pons include neoplasm, active demyelination, infections, and sub-acute infarction.

In conclusion SWI is useful for the detection and char-

acterisation of capillary telangiectasia and both DWI and SWI may be necessary to enable differentiation from ominous lesions presenting with similar appearances on conventional MRI sequences.

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