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RESEARCH ARTICLE

COMPUTED TOMOGRAPHY OF BRAIN IN POLYCYTHEMIA WITH VERTEBROBASILAR DOLICOECTASIA

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ABSTRACT

Many polycythemic and dolicoectasia patients are asymptomatic until late in disease or present with non-specific symptoms. Non Enhanced Computerized Tomography (NECT) of brain done can give the signs required for diagnosis and aids in preventing further complications of each entities. We report this case for its rarity and unique characteristic appearance of both the entities on NECT brain. Knowledge of these conditions can help the radiologist in guiding the clinicians towards early diagnosis, as it is associated with high morbidity.

INTRODUCTION

Polycythemia is a condition, which is characterized by an increase in the proportion of blood volume that is occupied by circulating red blood cells. Early diagnosis is crucial as it often complicated by both arterial and venous thrombosis. Vertebrobasilardolichoectasia (VBD) is a condition characterized by ectasia, elongation and tortuosity of the basilar artery. It may manifest clinically by compression of the cranial nerves, ischemic symptoms or intracranial bleeding. Rarely, the dilated and ecstatic basilar trunk may manifest as obstructive hydrocephalus. Many polycythemic and dolicoectasia patients are asymptomatic until late in disease or present with non specific symptoms. Non Enhanced Computerized Tomography (NECT) of brain done can give the clues required for diagnosis. We report this case for its rarity and unique characteristic appearance of both the entities on NECT brain.

Case report

A fifty two year old, male with history of headache for the last six months not responding to medication underwent NECT brain to rule out the possibility of any organic pathology. There was no history of trauma. NECT brain revealed diffusely hyperdense vasculature of the brain including large and small branches of Circle of Willis, dural venous sinuses including transverse sinus and deep cerebral veins (Figure 1) and cortical veins draining in to superior sagittal sinus (Figure 2), with HU values ranging from 50–55. The left verterbral artery appeared hyperdense and dilated and tortuous curving in the premesencephalic cistern from left to right and again from right to left (Figure 3). The basilar artery was also tortuous, with a diameter of 6.7 mm and extending into the suprasellar cistern. There was no evidence of any focal or diffuse parenchymal abnormality in the supratentorial or infratentorial compartment. Based on these findings, the possibility of polycythemia with vertebrobasilar artery dolicoectasiawas suggested.

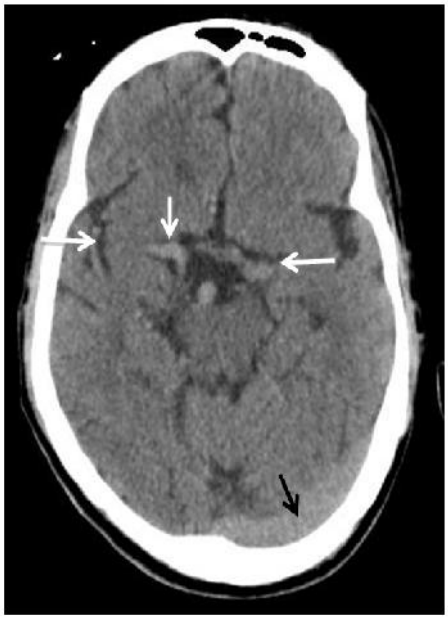

Figure 1 Axial NECT image showing diffusely hyperdense vasculature of the brain including large and small branches of Circle of Willis and dural venous sinuses including transverse sinus (black arrow).

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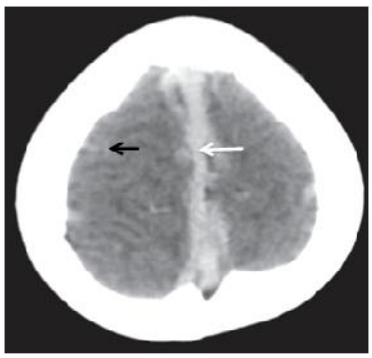

Figure 2 A more cephalad axial NECT image showing hyperdense cortical veins (black arrow) draining in to superior sagittal sinus (white arrow)

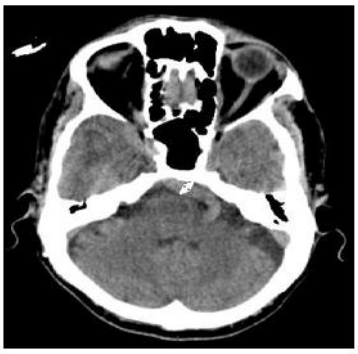

Figure 3 Axial NECT image showinghyperdense, dilated and tortuous left verterbral artery curving in the premesencephalic cistern from left to right (white double arrow). The diameter was around 7.4mm.

DISCUSSION

On CT studies only one factor i.e. electron density, defines image contrast and there is a linear relationship between CT attenuation and hematocrit, hemoglobin concentration and protein content [1]. Flowing blood at a hematocrit of 45% measures approximately 40 HU. Hematocrit ranges from 42-52%in normal adults and 37-47% in normal neonates. Therefore, large vessels and the dural venous sinuses appear isodense or minimally hyperdense in the normal adult as the normal adult gray matter measures approximately 39 HU [2]. In patients with a hematocrit percentage exceeding60%, both Circle of Willis and dural sinuses arehyperdense on NECT scans of brain. A linear relationship exists between the hemoglobin level and the contrast of the dural sinuses compared with the gray matter, suggesting that increased density of cerebral vessels on NECT is a sign of a high hemoglobin level [3]. Polycythemia is defined as an increase in thecirculating red cell mass. It is often detected as an incidental finding by increased hemoglobin or hematocrit. Concern that the hemoglobin may be abnormally high is usually triggered at 17g/dL for males and 15 g/dL for females. Hematocrit > 60% in male and 55% in femaleare almost invariably associated with increase in red cell mass [4]. Cerebral venous thrombosis is a known complication of polycythemia and hypercoagulable states and hence may coexist. MR venography, CT venography[2] or catheter venography may be required to differentiate between cerebral venous thrombosis in a patient of polycythemia with hyper dense venous sinuses. Hematocrit levels help in the diagnosis of a patient on a NECT scan. Hematocrit in our case was 76.3% and Hb level was 25.8 gm%.

VBD is an anatomic variant that involves enlargement and dilatation, often associated with a tortuous and elongated vessel.[4] It is known by various names like dolichoectasia, megadolichoectasia fusiform aneurysm of the vertebral and basilar arteries and tortuous vertebrobasilar system.[5] The prevalence of VBD is 4.4%, and it is more commonly observed in women. The major location for VBD is the basilar artery alone (40%), followed by bilateral vertebral arteries, basilar artery (22%) and both vertebral arteries (16%).[4]The diagnostic criteria for VBD is a basilar artery or vertebral artery diameter >4.5 mm or deviation of any portion of them higher than 10 mm from the shortest expected course, or basilar length >29.5 mm or intracranial vertebral artery length >23.5 mm.[4] The vertebrobasilar system may be considered elongated if the basilar artery lies lateral to the margin of the clivus or dorsum sellae, or if it bifurcates above the plane of the suprasellar cistern.[5]

The etiology of VBD is not clear. It is usually asymptomatic and less than 10% of the patients have neurologic symptoms.[9]

It may present with varied clinical syndromes like cerebellar dysfunction, ischemic stroke, transient or permanent motor deficits, central sleep apnea, trigeminal neuralgia, hydrocephalus as well as brain stem compression syndrome.[4,7,10] Symptoms may range from mild to severe. Clinical expression of this condition may be due to compression of the cranial nerves or brainstem, ischemia in the vertebrobasilar arterial territory and intracranial bleeding.

The hydrocephalus is an uncommon complication of VBD.

Management of VBD depends on symptomatic manifestations. For asymptomatic patients with VBD, functional testing such as brainstem auditory-evoked potentials (BAEPs), blink reflex (BR) and motor-evoked potentials may be useful for long-term monitoring and may help in the decision-making process prior to the surgical approach for relief of subjective symptoms.[8]

Knowledge of these conditions can help the radiologist in guiding the clinicians towards early diagnosis, as it is associated with high morbidity.

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