Dysplastic gangliocytoma of the cerebellum

(Lhermitte-Duclos disease)

PJ de Korte

MBChB, MMed, Rad.D(Pret)

Radiologist, Pretoria

Abstract

A case of Lhermitte-Duclos disease (LDD) was recognised in an adult woman with minimal symptomatology. Although histological proof is not available, a confident radiological diagnosis is possible due to the characteristic radiological features of this rare condition.

The MR imaging features of this condition are discussed, with a short review of the literature.

Case report

The patient is a 32-year-old woman, who was referred for MR imaging because of a long history of intermittent headaches. She was otherwise healthy, with no medical history of note. On specific questioning she mentioned that she recently found it difficult to walk in a group, since she kept bumping into people. Her physical examination was unremarkable.

MR Imaging findings

A mass located in the right cerebellar hemisphere was found on MR imaging with slight mass effect on the right lateral recess of the fourth ventricle (Figure 1). No oedema or hydrocephalus was present. Some of the folia in the right hemisphere were enlarged (Figure 2). The lesion appeared hyperintense on T2, and iso-intense on

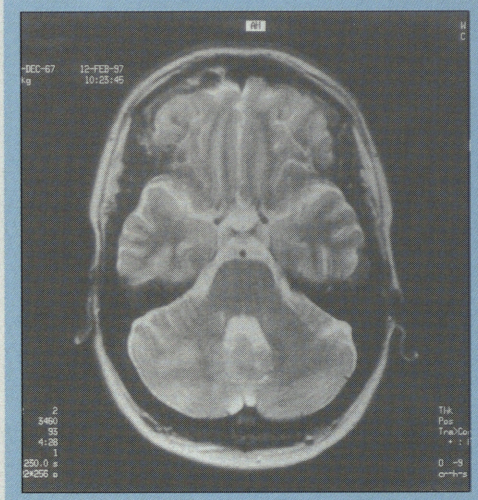

Figure 1: T2-weighted image, with the hyperintense lesion in the right cerebellar hemisphere (arrow). Note the blunting of the right lateral recess of the fourth ventricle.

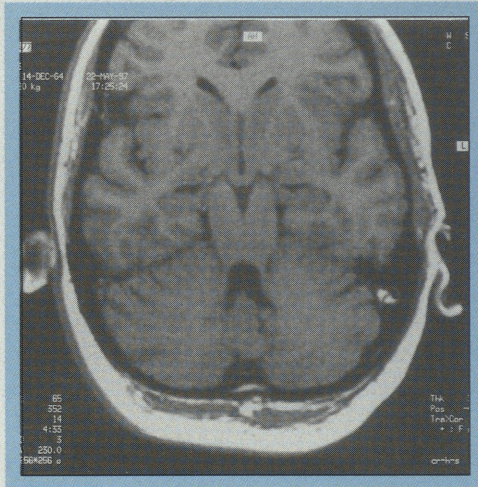

Figure 2: T1-weighted image. The lesion is iso-intense and not visible. Note the enlargement of the folia in the right hemisphere, together with the asymmetry of the fourth ventricle.

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T1-weighted images. The right cerebellar hemisphere was enlarged with a thickened cortex (Figure 3),

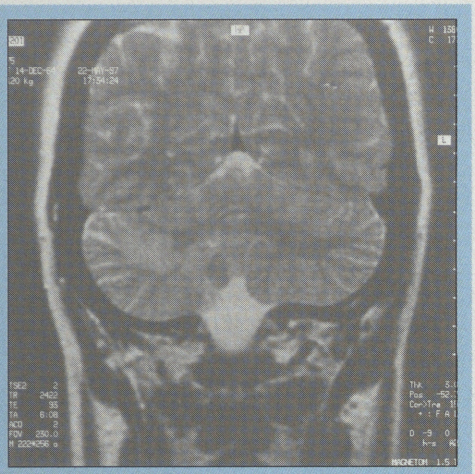

Figure 3: This T2-weighted, coronal image of the cerebellum shows the hyperintense lesion in the right cerebellar hemisphere. Note the accentuated and abnormal foliar pattern of the right cerebellar hemisphere.

together with a decrease in the amount of central white matter (Figure 4).

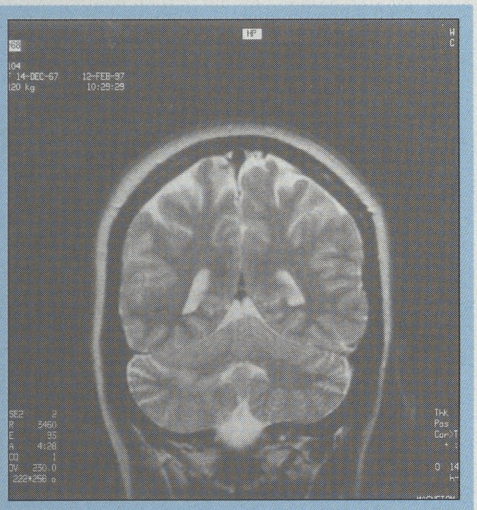

Figure 4: T2-weighted coronal image, showing the decreased central white matter of the right cerebellar hemisphere.

Post-gadolinium images showed absence of enhancement. Additional findings were a small venous angioma in the deep white matter of the left cerebral hemisphere, and hypertrophy of the right cerebral hemisphere. Angiography was normal.

Discussion

Less than 70 cases of this rare entity have been reported worldwide since Lhermitte and Duclos's first report in 1920.

There is still considerable confusion as to the exact pathogenesis of this rare disorder, which in the past has been classified as granular cell hypertrophy of the cerebellum, hamartoma, ganglioneuroma or diffuse hypertrophy of the cerebellar cortex.[1,2,3,4]

Clinically LDD manifests itself as a slow growing mass in the cerebellum, with a propensity to involve the left hemisphere. Although the age at diagnosis ranges from birth to the 8th decade, most cases are diagnosed in the third and fourth decades, without a sex preference. The duration of symptoms ranges from months to years. The clinical presentation includes a triad of headache, ataxia and visual disturbances. Cerebellar signs are usually minimal or absent.[2]

A small percentage of patients present with symptoms and signs of increased intracranial pressure. Several patients are known to have died abruptly, possibly due to acute decompensation of chronic hydrocephalus. Two patients with LDD developed malignant astrocytoma of the cerebellum years after the initial diagnoses.[5]

LDD is frequently associated with other abnormalities including megaloencephaly, cortical dysplasias, cutaneous and visceral angiomata, leontiasis ossea and polydactyly.[2]

Twelve cases have been reported in association with Cowden disease, an autosomal dominant hamartomatous condition of skin and mucous membranes, with a high incidence of breast cancer.[3,5] One patient with LDD also had neurofibromatosis.[2] Two familial cases have been reported by Ambler *et al*, who suggested an autosomal dominant pattern of inheritance.[2]

The radiology of LDD

Skull x-ray films may reveal an enlarged head, chronically increased intracranial pressure and deformity of the occipital bone.

Brain CT scans usually show a poorly delineated, hypodense, non-enhancing mass in the cerebellum, often with calcifications. Distortion of the fourth ventricle with hydrocephalus may develop in large lesions. On MR imaging scanning, the examination of choice, the lesion is well circumscribed, hyperintense on T2-weighted images, and hypo- to isointense on T1-weighted images. On both T1 and T2-weighted images, parallel linear striations are visible on the surface of the lesion as well as within the lesion matrix, resulting in a lamellated appearance. These represent thickened, dysplastic cerebellar folia and are considered pathognomic of LDD.[6] There is a decrease in the central white matter of the cerebellum. Large lesions occupy the entire posterior fossa, compressing the fourth ventricle and causing caudal displacement of the tonsils. They may even extend up through the tentorial hiatus to compress the brain stem, sometimes with an associated syrinx of the cervical cord. Prominent draining veins in or adjacent to the lesions may be visible. Angiography reveals a nonvascular cerebellar mass. The lesion does not enhance after intravenous contrast, although two lesions with slight enhancement have recently been reported.[7]

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The pathogenesis of LDD

The pathogenesis of LDD is still largely uncertain. Lhermitte and Duclos who referred to the lesion as a diffuse ganglioneuroma of the cerebellar cortex, regarded it as a combination of a congenital malformation and a ganglion cell neoplasm. Ambler *et al*, in their comprehensive review of 34 reported cases, classified this lesion with tuberous sclerosis, neurofibromatosis and Sturge-Weber syndrome, as a developmental disorder of cell growth. The long lasting evolution, the report of a familial case, the occurence of the disease in a newborn, and the association of other malformations (as well as the absence of mitoses) led them to classify this lesion as a phacomatosis.

Roski *et al* felt that the histological findings in their case supported the concept of a congenital abnormality in granular cell migration,[1] while granular cell hypertrophy is another popular theory. A possible hamartomatous origin is suggested by histochemical studies. Hamartomas are neoplasms made up of an abnormal configuration of normally present tissues. They have no malignant potential and are slow growing. Further support for a hamartomatous nature of LDD lies in its association with Cowden disease.[6,8]

Pathology

Grossly the cerebellar abnormality is characterized by pale, thickened folia, reaching up to 4 mm, and nearly total disappearance of the white matter in the axis of the folia. There is no sharp demarcation from normal cerebellar tissue. The central white matter of the cerebellum is severely diminished.[2]

Microscopically there is a gradual transition from normal to abnormal folia. The normal tri-layered pattern of the cerebellar cortex is changed to a bilayered pattern.[9] There is an abnormally thickened molecular layer that contains abnormal, heavily myelinated axons and few oligodendroglial cells. The abnormal axons are radially orientated toward the molecular layer where they become parallel to the subpial region. The granular layer (inner layer) is also thickened and it contains abnormal large neurons with abundant cytoplasm. Light and electron microscopy suggest that these neurons are hypertrophied granular cells. The overall cell density of this layer is diminished as compared to the normal granular cell layer and this is probably responsible for the increased signal on T2 images. There is total absence of the middle layer of Purkinje cells in the affected areas and this could in part explain the decrease in central white matter. No mitotic figures or surrounding oedema are reported. Interstitial calcifications are often observed.

Treatment

Since the disease's clinical significance is due to its mass effect, surgical debulking is the treatment of choice.

MR imaging is important in planning the surgery because of its superior resolution of the lesion. Because the post-surgical follow-up periods of most patients with LDD reported in the literature have been so short, the natural history is still unknown.[4]

Five patients with recurrence after gross removal have been reported in the literature.[10] Based upon this, some authors feel LDD should be considered a low-grade neoplasm that may recur after sub-total removal.

Conclusion

A new case of LDD is reported. The unique radiological findings in LDD, namely the thickened cerebellar cortex with enlarged, dysplastic folia, and the thinning of the central white matter is well demonstrated in this case.

Since other cerebellar masses such as medulloblastoma, astrocytoma, ependymoma, hemangioblastoma and metastases destroy the folial pattern and enhance with contrast, MR imaging should be diagnostic.

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