unaffected is that, feedback inhibition of GnRH by large doses of estrogen. The GnRH plays an important role in pubertal growth spurt. A similar finding was noted in a previous study wherein *Rhesus* monkeys were treated with exogenous estrogen combination. Premature thelarche and menarche were observed without any change in the linear bone growth [2].

The highest known incidence of premature thelarche was observed in Puerto Rico where significant serum levels of 2 ethylhexyl phthalates and plasticizers were identified as endocrine disrupting chemicals of estrogenic nature [3]. There are reports where use of hormone containing hair products like shampoos and oils had contributed to earlier onset of puberty in the African American population [4]. Tiwary [5] analyzed that hair products contained up to 4mg of estradiol per 100gms and he also noted that the pubertal changes regressed on discontinuing the use of these products.

A detailed history, examination and investigations to elicit the etiological factors are of the utmost importance. Drug ingestion should be suspected in all unexplained cases of pubertal precocity.

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REFERENCES

1. Speroff L, Feritz MA (eds). Text Book of Clinical Gynaecologic Endocrinology and Infertility. 7th Ed. New Delhi: Jaypee Brothers; 2005.
2. Golub MS, Hohrefe CE, Germann SL, Lasky BL, Nalarajor K, Tarantaly AF. Effect of exogenous estrogenic agents on pubertal growth and reproductive system maturation in female rhesus monkeys. Toxicol Sci. 2003;74:103-13.
3. Colon I, Caro D, Bourdony CJ, Rosario O. Identification of phthalate esters in the serum of young Puerto Rican girls with premature breast development. Environ Health Perspect. 2000;108:895-900.
4. Kaplowitz PB, Oberfield SE. Re-examination of the age limit for defining when puberty is precocious in girls in the United States; Implications for evaluations and treatment. Pediatrics. 1999;104; 936-41.
5. Tiwary CM - Premature sexual development in children following the use of estrogen or placenta containing hair products. Clin Pediatr. 1998;37:733-9.

MRI Abnormalities of the Anterior Temporal Lobe: A New Indicator of Congenital Cytomegalovirus Infection

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Abnormalities of the anterior part of the temporal lobe (abnormal and swollen white matter, cysts, and focal enlargement of the anterior part of the inferior horn- either alone or more often in combination) suggest congenital cytomegalovirus (CMV) infection. This is not widely known.These can be seen in neonatal period and they continue to persist in later life.

Key words: *Cytomegalovirus, Neonate, Temporal lobe*.

Cytomegalovirus (CMV) is the leading cause of congenital infections and in the West, it affects about 1% of all live births [1]. Intrauterine CMV infection presents in the neonatal period as jaundice, hepatosplenomegaly, petechiae, microcephaly, and chorioretinitis. At the same time, it is also known that about 90% of infants affected by intrauterine CMV

infection are asymptomatic at birth [1,2]. Serological tests for diagnosing congenital CMV infection are not very sensitive [3].

With the wider availability of MRI, it has become the neuroimaging modality of choice for evaluating neurological conditions in newborn and infants. It is important to note that unless particular sequences are used, calcifications are commonly missed on MRI. Periventricular calcifications on computed tomography (CT) scan of brain always used to be clue for congenital infections. Abnormalities of the anterior part of the temporal lobe (abnormal and swollen white matter, cysts, and focal enlargement of the anterior part of the inferior horn-either alone or more often in combination) can suggest CMV infection [4]. The present case highlights this fact.

CASE REPORT

A full-term baby was born out of an uneventful pregnancy to a non-consanguineously married couple. On day 4 of life, mother noticed jaundice but baby continued to remain well. The stools were yellowish in colour and urine high coloured. On day 10 of life, baby was referred with history of melena and hemetemesis. On examination, vitals were stable but baby had continuous cyclical movements of all 4 limbs with intermittent shrill cry. Per abdomen examination revealed a firm enlarged liver (span 10 cm) and mild splenomegaly. There was no evidence of any rash or petechiae or purpura. Other systemic examination was within normal limits.

This baby was born to a fourth gravida mother with no living issues. She had two still- births after the first pregnancy for which she was investigated. IgG anti-CMV antibodies were raised when tested in the mother four weeks prior to conception. No further interventions had been done in the mother.

Investigations revealed a prolonged coagulation time and thrombocytopenia with hyponatremia. Cerebrospinal fluid examination was normal as were the renal function tests. There was conjugated hyperbilirubinemia (total-12 mg/dL; direct-8.1 mg/dL) with raised liver enzymes. TORCH serology was negative in the baby and fundus examination did not show any evidence of chorioretinitis. Magnetic resonance imaging (MRI) of brain showed signal changes in right parieto-occipital region that were hypointense on T1W image and hyperintense on T2W images. Incidentally, cystic lesions were noted in bilateral temporal lobes anteriorly (***Fig* 1a**). These cystic lesions prompted us to send blood for CMV DNA PCR studies which came positive thereby confirming the diagnosis of congenital CMV infection. Later a plain CT scan of head was done which revealed bilateral periventricular calcification suggesting CMV infection.

Hyponatremia was corrected slowly over 48-hours and convulsions were controlled with phenobarbitone. Injection ganciclovir was given for four weeks with careful monitoring of the blood counts and liver function tests. Baby received packed cell transfusion twice during gancyclovir therapy. There were no episodes of thrombocytopenia or granulocytopenia. Brain-stem evoked response audiometry done at six weeks of life revealed elevated threshold on left side and normal threshold on right side. Early intervention program was advised to parents.

The baby was on regular monthly follow-up and at one year of age, child has normal developmental milestones. There was no recurrence of seizures or any neuro-deficits. Repeat MRI at one year showed the persistence of the anterior temporal horn cysts. Rest of the brain parenchyma was normal (***Fig*. 1b**).

DISCUSSION

Congenital CMV infection is one of the leading causes of mental deficiency [1,2]. Serological diagnosis is not fool proof and is complicated by the maternal transfer of IgG antibodies and ineffective production of IgM antibodies by the neonate [3]. More sensitive and specific studies like CMV DNA PCR studies are not widely available in most places, especially in developing countries. If diagnosed at birth, early initiation of gancyclovir (< one-month of age) can prevent future development of deafness in the neonate) [5]. There is a need for some more sensitive and specific tests or markers which are widely available and can diagnose CMV infection. Neuroimaging is one such test [4].

There are many reports of abnormalities on CT scan of brain in congenital CMV infection. In

neonatally symptomatic patients, frequent findings include intracranial calcifications, ventriculomegaly, white matter abnormalities, neuronal migration abnormalities, and an extensive destructive encephalopathy [6-8]. In 20%-30% of patients, CT scan can be normal [6,7]. In asymptomatic patients, Williamson, *et al.* [9] observed white matter abnormalities in only 14% of the children.

Studies describing MR imaging findings in congenital CMV infection when compared to CT scan have been very less [4]. The MRI findings in symptomatic infections include dilated ventricles, enlarged subarachnoid spaces, gyral abnormalities like polymicrogyria, delayed myelination, and deep white matter lesions mainly in parietal area. Cysts in the anterior portion of the temporal lobe and dilated inferior horns in patients with CMV infection were reported by Barkovich and Lindan [10].

Abnormalities of the anterior part of the temporal lobe, including abnormal and swollen white matter, cysts, and focal enlargement of the anterior part of the inferior horn - either alone or more often in combination appear to be particularly suggestive of congenital CMV infection. In a study by van der Knaap MS, *et al*. [4], amongst all the neuroimaging findings, abnormalities of the anterior part of the temporal lobe emerged as the most optimal predicting variable for congenital CMV infection [4]. In their study, 94% of patients with anterior temporal lobe abnormalities showed positive results on culture or PCR studies for CMV infection.

The present case report highlights how specific neuroimaging findings like anterior temporal horn cysts in a neonate may suggest a possibility of CMV infection. It also demonstrates that these changes continue to persist later in life and can be seen even in neurologically normal patients.

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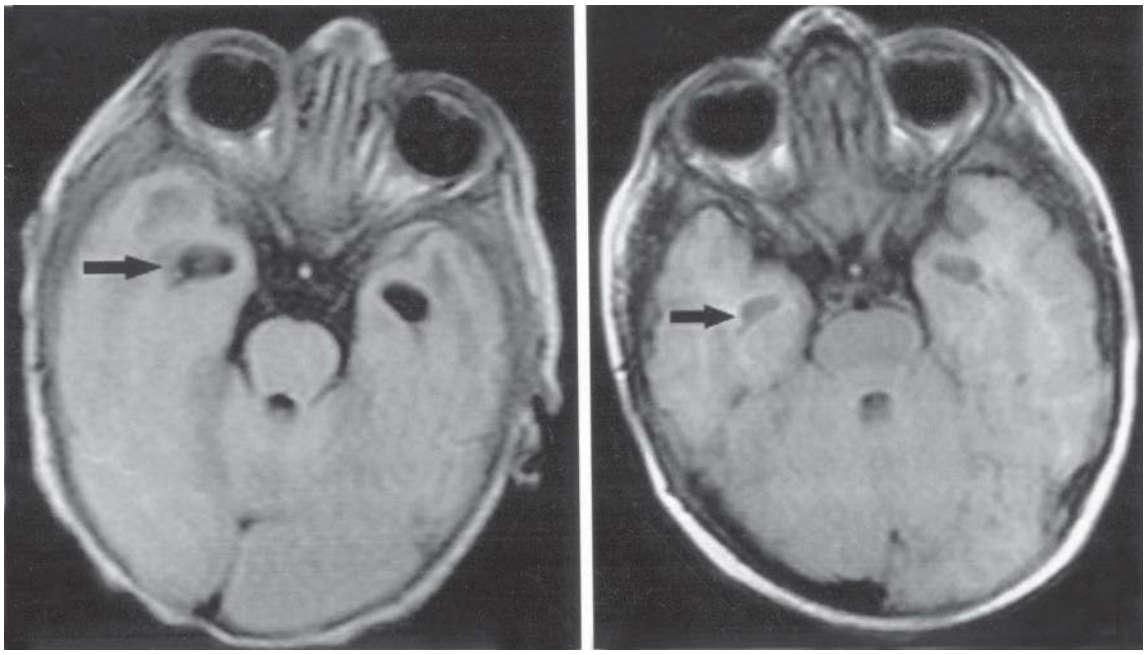
REFERENCES

1. Demmler GJ. Summary of a workshop on surveillance for



(*a*) (*b*)

FIG 1 *(a) MRI findings (FLAIR image axial section) on day 15 showing symmetrical cystic lesions in the anterior temporal white matter (arrow), (b) Follow up scan after 9 months (FLAIR image axial section) shows persistence of cystic lesions in the anterior temporal white matter (arrow).*

congenital cytomegalovirus disease. Rev Infect Dis. 1991;13:315-29.
2. Istas AS, Demmler GJ, Dobbins JG, Stewart JA. Surveillance for congenital cytomegalovirus disease: a report from the National Congenital Cytomegalovirus Disease Registry. Clin Infect Dis. 1995;20:665-70.
3. Brown H, Abernathy M. Cytomegalovirus infection. Seminars in Perinatology. 1998;22:260-6.
4. van der Knaap MS, Barkhof GVF, Hart AAM, Loeber JG, Weel JFL. MR Imaging Findings in congenital cytomegalovirus infection. Radiology. 2004;230: 519-36.
5. Whitley RJ, Cloud G, Gruber W, Storch GA, Demmler GJ, Jacobs RF, *et al*. Ganciclovir treatment of symptomatic congenital cytomegalovirus infection: results of a phase II study. National Institute of Allergy and Infectious Diseases Collaborative Antiviral Study Group. J Infectious Disease. 1997;175:1080-6.
6. Noyola DE, Demmler GJ, Nelson CT, Griesser C, Williamson WD, Atkins JT, *et al*. Early predictors of neurodevelopmental outcome in symptomatic congenital cytomegalovirus infection. J Pediatr. 2001;138:325-31.
7. Boppana SB, Fowler KB, Vaid Y, Hedlund G, Stagno S, Britt WJ, *et al*. Neuroradiographic findings in the newborn period and long-term outcome in children with symptomatic congenital cytomegalovirus infection. Pediatrics. 1997; 99:409-14.
8. Bale JF, Bray PF, Bell WE. Neuroradiographic abnormalities in congenital cytomegalovirus infection. Pediatr Neurol. 1985;1:42-7.
9. Williamson WD, Percy AK, Yow MD, Gerson P, Catlin FI, Koppelman ML. Asymptomatic congenital cytomegalo-virus infection. Audiologic, neuroradiologic, and neurodevelopmental abnormalities during the first year. Am J Dis Child. 1990;144:1365-8.
10. Barkovich AJ, Lindan CE. Congenital cytomegalovirus infection of the brain: imaging analysis and embryological considerations. AJNR Am J Neuroradiol. 1994;15: 703-15.