Original Paper

Correlation of Computed Tomographic Scan Findings in Children having Neurodisability– A Study of 100 Cases

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Abstract

Introduction: Neurodisability is an umbrella term for conditions associated with impairment involving the nervous system. The parents of these children remain worried about the cause of the disability and seek the diagnosis. Nowadays radiological diagnosis by CT scan is possible in most of the cases which may help in the management of such children.

Objective: To correlate between clinical and CT scan findings in neurodisabled children.

Materials and Methods: One hundred children with neurodisability were selected randomly who were scanned by 6, 16 and 128 slice CT scanners. This retrospective study was conducted in CMH Dhaka and Central Hospital Limited, Dhaka in between 2010 to 2014.

Results: Abnormal CT scan was found in 57 cases out of 100 patients having neurodisability. A large number of patients having neurodisability are suffering from psychomotor delay, motor delay, seizure disorder and speech difficulty. Hypoxic ischaemic injury in perinatal period is one of the major causes of the disability.

Conclusion: CT scan is very effective to find out the cause of neurodisability in less time (around 25 to 30 seconds) and is widely available in Bangladesh.

Key-words: CT Scan, Neurodisability, Neurodisabled Children, Nervous System.

Introduction

CT scan is an important tool to find out the cause of neurodisability[1]. By using this tool we can find out the cause in most of the cases and correlate with the clinical findings of neurodisability[2]. Neurodisability is an umbrella term for conditions associated with impairment involving the nervous system and includes disorders such as cerebral palsy, autism and epilepsy. It is not uncommon for such conditions to co-occur. Children with a neurodisability have a range of impairments but many have complex and continuing need. As a result they are frequent users of the health service at all levels, community, primary care inpatient and outpatient settings[3].

The parents of these children remain worried about the cause of the disability and seek the diagnosis. Nowadays radiological diagnosis is possible in most of the cases which can guide us for further management. Important evidence of timing of the lesion may be inferred which will help further research in this field[4].

A large number of children with neurodisability suffer from cerebral palsy. There have been radical changes in the understanding of the aetiology of cerebral palsy (CP) over the past decade. In 1863, little reported that spastic CP was caused by abnormal circumstances at birth[5]. From that time it was widely accepted that most cases of CP were due to birth asphyxia. A normal brain imaging study does not mean that the child does not have cerebral palsy, because the diagnosis is always based only on physical examination findings[6].

Despite advances both in the care of mothers and babies and the development of new methods of investigation, the cause of CP is unclassifiable or unknown in 41–58% of full-term children. In premature infants, the contribution of perinatal and neonatal factors is likely to be higher than in full-term infants but the causes of prematurity are still generally elusive[7].

Magnetic resonance imaging (MRI) is more informative in diagnosing diseases of the brain[8,9]. But MRI is not available everywhere as well as it is time consuming and costly. Most of the children in the series would have needed anaesthesia for doing MRI which is another difficulty[10].

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Though there are hazards of radiation, CT is easily available and it requires only few seconds to accomplish a CT scan of brain. Considering these, CT scan was preferred over MRI in this study.

The aim of this study was to categorize the CT findings in childhood neurodisability, relate them to their respective aetiologies, as well as the types of cerebral palsy and other neurodisability. Furthermore, the role of CT in the management of these patients was evaluated.

Materials and Methods

This study was a retrospective analysis of the computed tomographic (CT) scan findings in 100 children having neurodisability, carried out in Combined Military Hospital (CMH) Dhaka Cantonment and Central Hospital Limited Dhaka in between 2010 to 2014. Detailed history and clinical fearues were taken to find out the aetiologies. One hundred children with neurodisability were selected randomly who were scanned by 6, 16 and 128 slice CT scanners. CT scans were done in many cases months or years after the initial insult or onset of symptoms. CT findings were correlated with the clinical observations.

Results

In 100 children of the studied population, there were 64 boys and 36 girls. Male: Female ratio is 1.8:1. Table I shows the age distribution of the cases included in this study.

Table-I: Distribution of patients according to age (n=100)

Age distributions	Number of patients	%
0-6 months	16	16
6 months to 2 years	31	31
2-5 years	22	22
5-10 years	25	25
Above 10 years	06	06
Total	**100**	**100**

CT scan was found normal in 43 cases. Again a normal brain imaging study does not mean that the child does not have neurodisability. In 33 cases, mild generalized atrophy of brain was found. This was evidenced by mild dilatation of the ventricles and widening of the external Cerebro Spinal Fluid (CSF) spaces. In 2 cases multiple small infarcts were seen in both the cerebral hemispheres and in 1 case infarcts were seen in right cerebral hemisphere along with generalized atrophy. Multiple small old infarcts were seen in 11 cases. Bilateral infarcts were seen in 4 cases, left sided infarcts were seen in 4 cases and right sided infarcts were seen in 3 cases. Cortical atrophy was found in 5 cases as evidenced by widening of external CSF spaces around both the cerebral hemispheres. Hydrocephalus was found in 3 cases. Agenesis of corpus callosum was seen in 2 cases. It is result of an insult occurring at approximately 8-12 weeks gestation leading to failure to form the corpus callosum. The white matter tracts which usually cross the midline instead are oriented vertically, separating the lateral ventricles widely known as colpocephaly[11].

Intracranial haemorrhaege: It was found in 1 case. Sturge Weber syndrome: found 1 case of Sturge-Weber syndrome. In this case the patient had port wine stain on left side of face and right sided hemiparesis. Her CT scan showed gyriform calcification in cortical and subcortical areas of left cerebral hemisphere with atrophy.

Arachnoid cyst: It was found in 1 patient. On imaging, they are characterized as well circumscribed cysts with an imperceptible wall, displacing adjacent structures and following the CSF pattern. In this case arachnoid cyst was found in left temporal region and the baby had seizure disorder.

Temporal lobe atrophy: It was found in 1 case.

Table-II: Findings of CT scan of brain

CT Findings	No of Patients	%
Normal CT scan of brain	43	43
Mild generalized atrophy of brain	33	33
Mild hemi atrophy of brain	2	2
Infarcts in cerebral hemisphere	11	11
Cortical atrophy of brain	5	5
Hydrocephalus	3	3
Agenesis of corpus callosum	2	2
Intracranial haemorrhaege	1	1
Sturge Weber syndrome	1	1
Arachnoid cyst	1	1
Temporal lobe atrophy	1	1
Periventricular leukomalacia	1	1

*Some of the patients had more than one findings

Psychomotor delay: It was found in 40 patients.

Table-III: The main associated symptoms

Associated Symptoms	No of Patients	%
Psychomotor delay	40	40
Seizure disorder	39	39
Speech difficulty	19	19
Motor delay	15	15
Hemiplegia	8	8
Altered behavior	3	3
Headache	3	3
Facial palsy	2	2
Large head	1	1
Congenital torticolis	1	1
Trauma	1	1

Fig-1: Mild cortical atrophy of brain

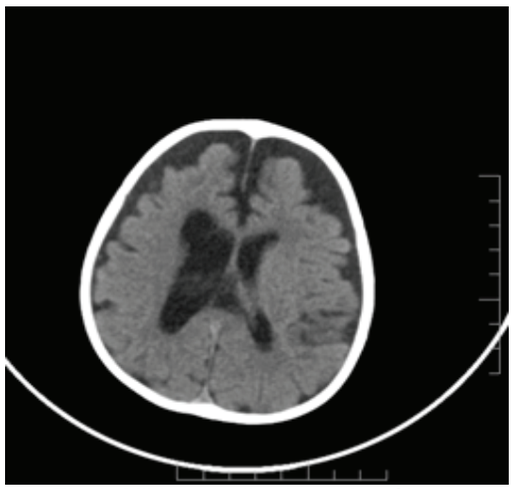

Fig-2: Mild generalized atrophy of brain

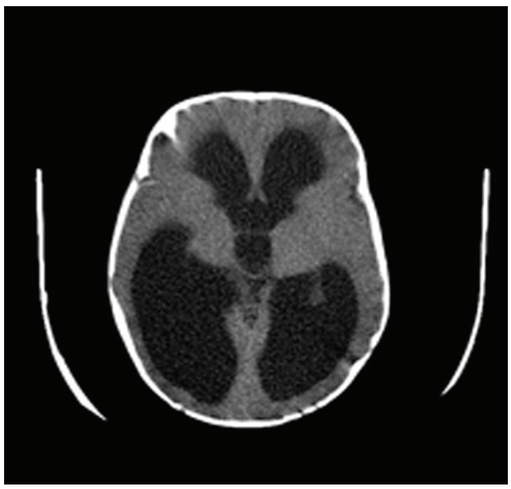

Fig-3: Hydrocephalus

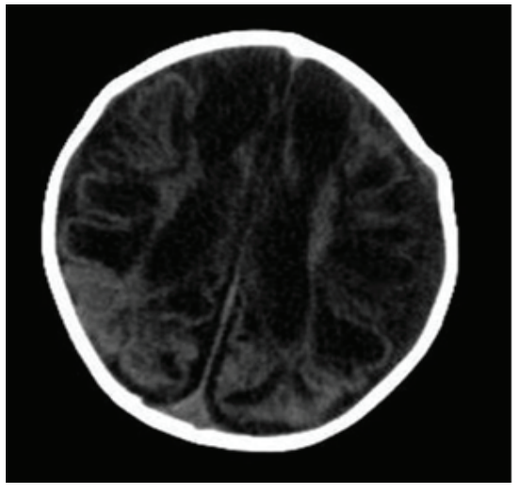

Fig-4: Periventricular leukomalacia

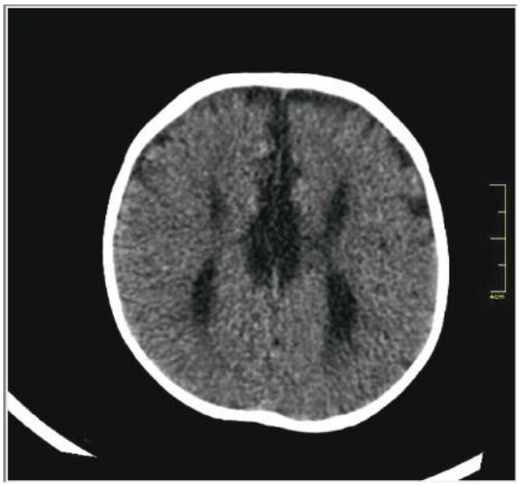

Fig-5: Agenesis of corpus callosum

Fig-6: Arachnoid cyst

Psychomotor delay: Psychomotor development delay was found in 40 patients. Out of them 12 patients had seizure disorder also. Abnormal CT was found in 28 patients. Mild generalized atrophy of brain was seen in 16 patients. One patient had mild hemi atrophy. Mild cortical atrophy was found in 3 patients. Bilateral old infarcts was seen in 2 patients who had also mild generalized atrophy of brain. Periventricular leukomalacia was seen in 1 patient, agenesis of corpus callosum was seen in 1 patient and 1 patient had atrophy of temporal lobe. Normal CT scan was seen in 12 patients.

Seizure disorder: Seizure disorder was seen in 39 patients. Some of these patients had other associated symptoms. Out of them 12 patients also had psychomotor delay. Only seizure disorder was seen in 23 patients. Abnormal CT was found in 18 patients. Mild generalized atrophy of brain was seen in 13 patients. Mild hemi atrophy of right cerebral hemisphere was seen in 1 patient. Old infarcts in both the cerebral hemisphere was seen in 2 patients. Arachnoid cyst was seen in 1 patient and hydrocephalus was seen in 1 patient. No abnormal findings in CT scan was seen in 21 patients.

Speech difficulty: Speech difficulty was seen in 19 patients. Out of them 8 patients had psychomotor delay. Seizure disorder was seen in 3 patients. Facial palsy was seen in 1 patient. Only speech difficulty was seen in 6 patients. CT scan was abnormal in 11 patients and normal in 8 patients. Mild generalized atrophy of brain was seen in 6 patients. Old infarcts was seen in 3 patients. Agenesis of corpus callosum was seen in 2 patients.

Motor delay: Motor delay was found in 15 patients. CT scan showed abnormal findings in 8 patients and normal in 7 patients. Mild generalized atrophy was seen in 6 patients. Bilateral old infarct was seen in 1 patient and infarct in right cerebral hemisphere was seen in 1 patient.

Hemiplegia: Hemiplegia was found in 8 patients. All of the 8 patients had abnormal CT findings. Out of them 5 patient had right sided hemiplegia and 3 patient had left sided hemiplegia. Old infarcts were seen in 6 patients. One patient had Sturege Weber syndrome. One patient had intraparenchymal haemorrhaege. One of the patients had infarct in right cerebral hemisphere with blocked right Internal Carotid Artery (ICA), Middle Cerebral Artery (MCA) and Anterior Cerebral Artery (ACA), confirmed by CT angiography.

Headache: Patients presented with headache were 3 in number. Of them 2 had normal CT scan and 1 patient had mild generalized atrophy of brain.

Facial palsy: Facial palsy was seen in 2 patients. Mild generalized atrophy of brain was seen in 1 patient and 1 patient had normal CT scan of brain.

Large head: One patient had large head and CT scan showed hydrocephalus due to obstruction at the level of cerebral aqueduct.

Trauma: One patient was admitted with trauma but during CT scan he was found to have mild generalized atrophy of brain.

Discussion

In the series of 100 children, significant number of abnormal CT scan was found (57 out of 100 patients). Nowadays radiological diagnosis is possible in most of the cases though these radiological findings are not specific for any neurodisability. But definitely these findings guide us for appropriate management of these patients. Important evidence of timing of the lesion may be inferred which will help further research in this field.

In this study 40 patients had psychomotor delay. After 34 weeks of gestation cortical and subcortical areas are most vulnerable regions of the brain for hypoxic ischaemic injury. Acute profound hypoxic ischemic injury causes damage to the thalamus and basal ganglia. Prolonged partial hypoxic ischemic injury causes damage to the cortex and subcortical white matter. Mixed type of hypoxic ischemic injury causes shock brain[12].

It was assumed that brain injury occurred in 21 patients in perinatal period as evidenced by mild generalized atrophy, cortical atrophy and infarcts[13]. Periventricular leukomalacia was seen in 1 patient, which occurs at the gestational age of 28-34 weeks. Agenesis of corpus callosum was seen in 2 patients, which occurs at 8 to 12 weeks of gestation.

Out of 39 patients having seizure disorder, 23 patients had only seizure disorder and rest 16 had other associated symptoms. Abnormal CT was found in 18 cases. We think that brain injury occurred in 16 patients in perinatal period as evidenced by mild generalized atrophy, cortical atrophy and infarcts. Motor delay was seen

in 15 patients and abnormal CT was seen in 8 patients. These 8 patients had mild generalized atrophy, cortical atrophy and infarcts. We can assume that brain injury occurred in these patients in perinatal period. Hemiplegia was seen in 8 cases and specific causes were found by abnormal CT scan findings. Infarcts were seen in all 7 cases and 1 patient had Sturge Weber syndrome.

Speech difficulty was seen in 19 patients and abnormal CT scan was found in 11 cases. Out of them, 9 patients had mild generalized atrophy, cortical atrophy and infarcts, which occur due to ischemic injury to the brain in perinatal period. Two patients had agenesis of corpus callosum which is due to insult between 8 to 12 weeks of gestation.

Another similar study on cerebral palsy patients was conducted by Kolawole TM et al showed abnormal CT in 71% cases. In this study abnormal CT scan is 57%. The finding of low percentage in this study may be due to inclusion of disabilities other than cerebral palsy[14]. A study conducted by Yin R et al revealed that abnormal MRI was found in 39 cases out of 42 patients[7] having cerebral palsy.

Conclusion

A large number of patients having neurodisability are suffering from psychomotor delay, motor delay, seizure disorder and speech difficulty. Hypoxic ischaemic injury in perinatal period is one of the major causes of the disability. Though MRI is more informative in diagnosing diseases of brain, it is not available everywhere in Bangladesh. Moreover it is time consuming, requires anaesthesia which has added difficulty to manage the patients in the MRI scanner. CT scan is an important tool to find the cause and can be performed easily.

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