

Computed Tomography Scan Findings in Children from a Tropical Region

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Abstract

Citation: Inah GB, Kajogbola G, Ani N. Computed Tomography Scan Findings in Children from a Tropical Region. Open Access Maced J Med Sci. <https://doi.org/10.3889/oamjms.2018.154>

Keywords: Computed Tomography; Children; Brain; Tropical Region; Cerebral Atrophy

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Received: 21-Feb-2018; **Revised:** 03-Mar-2018; **Accepted:** 04-Mar-2018; **Online first:** 14-Apr-2018

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Funding: This research did not receive any financial support

Competing Interests: The authors have declared that no competing interests exist

BACKGROUND: Computed Tomography in the diagnosis of pathologies in children is becoming increasingly popular.

AIMS: To document indications and findings of referrals for CT scan in children in a private Radio - diagnostic Center in a developing environment.

METHOD: Children aged 6 months to 13 years referred to a private Radio - diagnostic Center, between June 2015 to June 2016 were studied. Patients were examined using GE CT Brivo 385 machine.

RESULT: Forty - seven children were referred for CT scan during the period. Of these 45 (95.47%) were referred from the Teaching Hospital located in the same city. A brain scan was most commonly performed (93.6%) while the frequency of abdominal CT was (6.4%). The main indications for the referrals were delayed milestones (61.7%) and seizures (17.0%). The major findings were cerebral atrophy 26 (55.32%), and cerebral infarction 3 (6.38%).

CONCLUSION: This study shows a predominance of brain CT scan request in children, delayed milestones and seizures being the most common indications, while cerebral atrophy and cerebral infarction were the common brain findings. In the absence of MRI, CT scan provides a suitable alternative for imaging of the brain and abdominal pathologies in a developing environment like ours.

Introduction

Neurological and abdominal disorders in children are usually sources of great apprehension in both parents and pediatric surgeons. The use of Computed Tomography (CT) scan in the diagnosis of these disorders has increased rapidly [1]. CT involves much higher radiation than plain radiographs and in developing countries is further limited by availability and cost [2].

Consequently, there is need to ensure that appropriate protocols are employed to avoid misuse [3] [4]. This study was aimed at documenting the sources, indications and findings of referrals for CT scans in children in a Radio - diagnostic Center in Calabar, Nigeria.

This study was aimed at documenting the number of referrals, sources, indications and findings of such referrals for CT scan in children in a private Radio - diagnostic Center.

Methods

This was a retrospective descriptive study involving children referred to Asi Ukpo Radio - diagnostic Centre, Calabar, for CT scan. The Centre is a private diagnostic facility situated in Calabar Municipality. The study was carried out between June 2015 and June 2016. Information concerning the age, gender, indication and type of CT scan conducted and findings were documented. The patients' request cards, stored images and radiology reports were reviewed by the authors. The indications for the scan were documented. The protocol for paediatric CT scan was used in all the patients recruited for this study in keeping with the ALARA (As Low As Reasonably Achievable) principle. Pre and post - contrast images were acquired using GE CT Brivo 385 machine and assessed by the Radiologist. Lead covers were used to shield parts of the body that was not under examination to reduce the radiation risk.

All data were entered into the Microsoft word excel spreadsheet and analysed by the use of simple proportions and percentages. Frequency tables were used to demonstrate the results.

Results

Forty-seven children were seen during the study period giving a rate of 3.92 children per month. Twenty-six (55.31%) of these were males while 21 (44.68%) were females. The ages ranged from 6 months to 13 years with a median of 2.0 years. The majority of children (36.2%) were aged one year and below. Forty - five (95.74%) of the children were referred from the Teaching Hospital located in the same city while 2 (4.26%) were from the private clinics.

A brain scan was the most commonly performed (93.6%) while the frequency of abdominal CT was 6.4%. The main indications for the CT examination were delayed milestones and seizures as shown in table 1. Brain CT scan was the most commonly performed investigation 44 (93.6%) while abdominal Ct was done in three (6.4%).

Table 1: Indications for Referral for CT scan (n = 47)

	Frequency	Percent	Valid percent	Cumulative percent
Delayed milestones	29	61.7	61.7	61.7
Seizures	8	17.0	17.0	78.7
Hemiparesis	1	2.1	2.1	80.9
Hydrocephalus	2	4.3	4.3	85.1
Headache	2	4.3	4.3	89.4
Congenital	2	4.3	4.3	93.6
Head trauma	2	4.3	4.3	97.9
Intra-abdominal malignancy	1	2.1	2.1	100.0
Total	47	100.0	100.0	

The major brain CT findings were cerebral atrophy 26 (55.32%), normal scan 8 (17.0%) and cerebral infarction 3 (6.38%) see Figure 1 to 3.

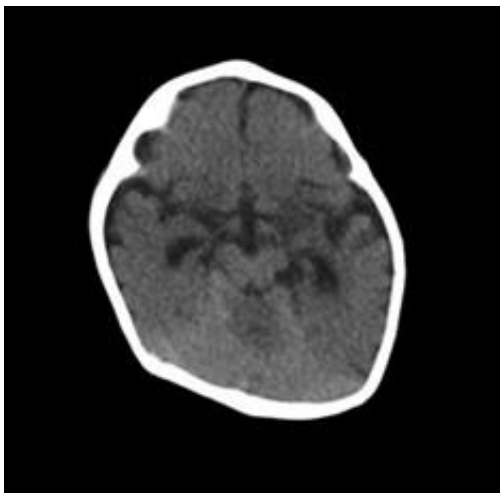


Figure 1: Cerebral atrophy with craniosynostosis

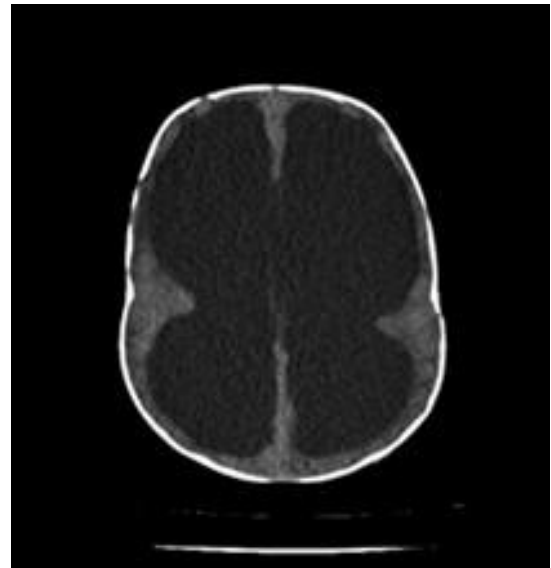


Figure 2: Communicating hydrocephalus with cortical thinning

Abdominal CT findings included renal trauma and nephroblastoma (Figure 4) in equal proportions (2.1%). Table 2 shows the CT findings in the study population.

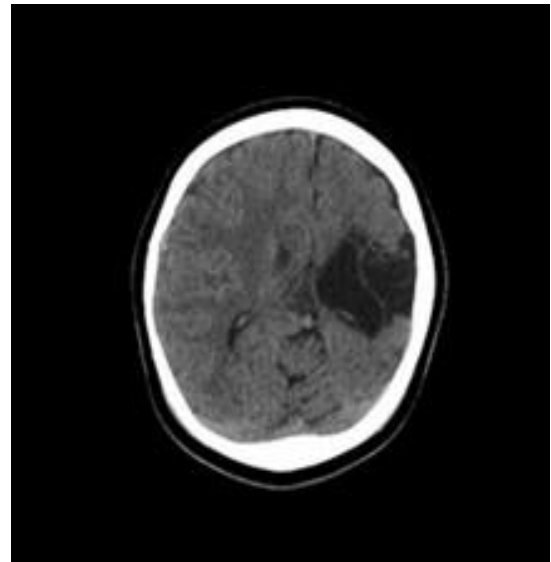


Figure 3: Chronic left temporal lobe infarction

Discussion

After sonography which is the preferred imaging method for screening the central nervous system (CNS) during infancy, CT scan is the next preferred method for all other ages [4]. However, the risk of this method should be considered alongside its advantages and radiation dose reduction should be employed where necessary [3] [4]. However, the small proportion of children with normal scan indicates good selection by referring clinicians.

Table 2: Findings for children referred for CT scan (n = 47)

	Frequency	Percent	Valid percent	Cumulative percent
Normal	8	17.0	17.0	17.0
Cerebral atrophy	26	55.3	55.3	72.3
Cerebral infarction	1	2.1	2.1	74.5
Meningial enhancement	1	2.1	2.1	76.6
Arnold chiari	1	2.1	2.1	78.7
Communicating hydrocephalus	1	2.1	2.1	80.9
Choroid plexus papilloma	2	4.3	4.3	85.1
Cerebral atrophy and infarction	2	4.3	4.3	89.4
Sturge-weber syn	1	2.1	2.1	91.5
Abscess(s)	1	2.1	2.1	93.6
Encephalocele	1	2.1	2.1	95.7
Renal trauma	1	2.1	2.1	97.9
Nephroblastoma	1	2.1	2.1	100.0
Total	47	100.0	100.0	

The study revealed that the most frequent age of those referred for Paediatric CT scan was one year.

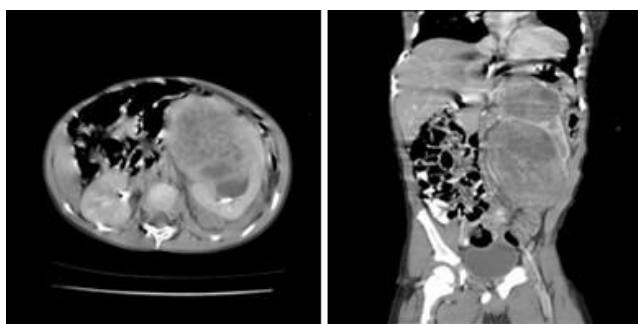


Figure 4: Left nephroblastoma

The most frequent referrals were for a brain scan. This agrees with a study done by Anas et al., [5] in Kano and may be related to the use of cheaper options like plain radiography, contrast studies and ultrasonography in examination involving other parts of the body. A study was done by Nzeh et al., [6] revealed that most prevalent suspected abnormalities of the paediatric brain could be evaluated by ultrasound in much younger children before the fusion of the fontanelles. The use of ultrasonography in the evaluation of pathologies in younger children is very important as children are known to be more radiosensitive than adults as seen in studies by Brenner et al., [3] and Donnelly et al., [4].

Delayed milestones 29 (61.7%), seizures 8 (17.0%), hydrocephalus 2 (4.3%) and trauma 2 (4.3%) were the predominant indications for CT examination in this study. This is similar to the study done by Anas et al., [5] where the most common indications were convulsions (21.43%) followed by trauma (15.71%) and progressive head enlargement (11.43%). The high incidence of birth asphyxia, meningitis and neonatal jaundice as reported by Eyong et al., [7] in our environment may be responsible for this pattern. About 17% of the CT scans in this study showed normal findings. This is less than that reported by Anas et al., [5] (30%), Islam et al., [8] (45%) and Fenton et al., [9] (54%). This work reflects cerebral atrophy as the major CT finding probably due to the high incidence of birth asphyxia from obstructed and prolonged labour followed by choroid plexus papilloma

and cerebral infarction. Anas et al., [5] however reported obstructive hydrocephalus as the most common finding which may be due to the high prevalence of meningitis in the northern part of the country [5].

In conclusion, the high yield of diversity of CT scan findings in the children in our study justifies the appropriate use of CT scan in the diagnosis and management of suspected brain pathologies in areas where magnetic resonance imaging scan is unavailable or where ultrasonography cannot be done following the fusion of the fontanelles in younger children. Although cost should be considered, the patient should be given the chance for an appropriate work up to avoid delay in diagnosis. The cost problem can be solved by universal insurance scheme that is inclusive of both the public and private work force. Paediatric CT scan is an important diagnostics tool with lots of potentials and flexibility [6]. It should, however, be used with great caution as stipulated by the "as low as reasonably achievable" (ALARA) principle to reduce radiation dose to the patient [4]. It is obvious from this study that the environment is underserved and therefore Public Private Partnership (PPP) is recommended to expand CT facilities in this environment.

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