Journal of Namibian Studies, 33 S3(2023): 2969–2974 ISSN: 2197-5523 (online)

Computed Tomography of the Brain Prior to Lumber Puncture in Children with Suspected Meningitis in Duhok – Iraq

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Abstract

Objective: the aim of this study was to determine the role of brain CT scan in children presented with symptoms and sings of suspected meningitis.

Method: A prospective study conducted at Heeve Pediatric Teaching Hospital, during the period from 1-1-2019 to 1-12-2021.Children from the age of 18 months to 14 years with suspected meningitis who attending this hospital, lumber puncture was done for all of them and CT scan of the brain for 110 cases prior lumber puncture.

Results: A total of 120 patients were attending Heeve Pediatric Teaching Hospital with suspected meningitis and their age was between 18 months-14 yeas. Lumber puncture was done for all of them and CT scan of the brain prior to lumber puncture was done for 110 cases. CT scan was reported normal in 96 patients, however cerebral edema was found 6 cases, cerebral infarction in 2 cases ,4 cases with ventricular dilatation and 2cases with intracranial bleeding No complications were reported after lumber puncture.

Conclusion: Computed Tomography of the brain may have a beneficial role in children with acute meningitis. Reported abnormalities in head CT scan were low. Further studies are required to use the CT scan as routine investigation for acute meningitis in children

Keywords: Bacterial Meningitis; Children; Lumbar Puncture; Computed Tomography.

Introduction

Bacterial meningitis is a life-threatening disease that results from infection of the meninges. Delay in establishing diagnosis and starting

treatment poses high risks on patients [1]. Suspected bacterial meningitis is the principal indication for lumbar puncture (LP) [2].

All cases of bacterial meningitis are associated with varying degree of increased intracranial pressure; however, herniation of the brain is a rare complication. Due to the potential risks of the lumber puncture procedure, a computed tomography of the brain is widely used to decide which patient in whom lumber puncture should be avoided [3].

The use of CT scan has grown dramatically in recent years and discus about its risks has also been increased., although the brain CT scan cannot rule out increased intracranial pressure [4].

In patients with certain clinical features (a severe immunocompromised state, signs that are suspicious for space-occupying lesions, new-onset seizures, or moderate-to-severe impairment of consciousness), the Infectious Diseases Society of America and the European Society of Clinical Microbiology and Infectious Diseases recommend cranial CT before LP, and to start antibiotic treatment and dexamethasone before sending the patient for imaging [5].

Methods:

This study was carried out from 1-1-2019-1-12-2020, and comprised records of all patients with suspected meningitis admitted to Heeve Pediatric Teaching hospital in Duhok city. The following information was recorded, age, sex, the presence of fever, vomiting, headache, seizure, decrease level of consciousness and focal nerve abnormalities. Samples of CSF were collected for all patients by doctors and immediately transported to microbiological laboratories. Computed tomography of the brain was done for 110 patients prior to the lumber puncture.

Results:

In this study 120 cases were included ,78(65%) patients were male and 42(35%) were female.38 patients were from the age between 18 months and 6 years, 53 patients between 6-10 years' while 19 patients were between the age of 10-14 years. The results of the CSF showed that 18 (15%) patients were bacterial meningitis ,96(80%) were aseptic meningitis, while 6(5%) were mycoplasma pneumonia. Brain CT scan was done for 110 patients, the CT was abnormal in 14 (14.6%) of cases and of these cases 8 (57.2%) were males and 6(42.8%) were females. The majority of patients had fever 92 (76.6%), brain CT scan was abnormal in 2 patients (2.8%). A decreased level of consciousness was seen in 24 (20%) of cases, brain CT scan was abnormal in 6 patients (25%), seizure in 48 (40%) cases, three of them the CT scan of the brain was abnormal, headache and vomiting in 72 (60%) of cases, but only 2(1.85%) patients had abnormal brain CT scan, while focal nerve

abnormality in 3(2.5%) of cases and one (33.3%) of them had abnormal CT scan.

Figure 1. Frequency of CT-scan finding

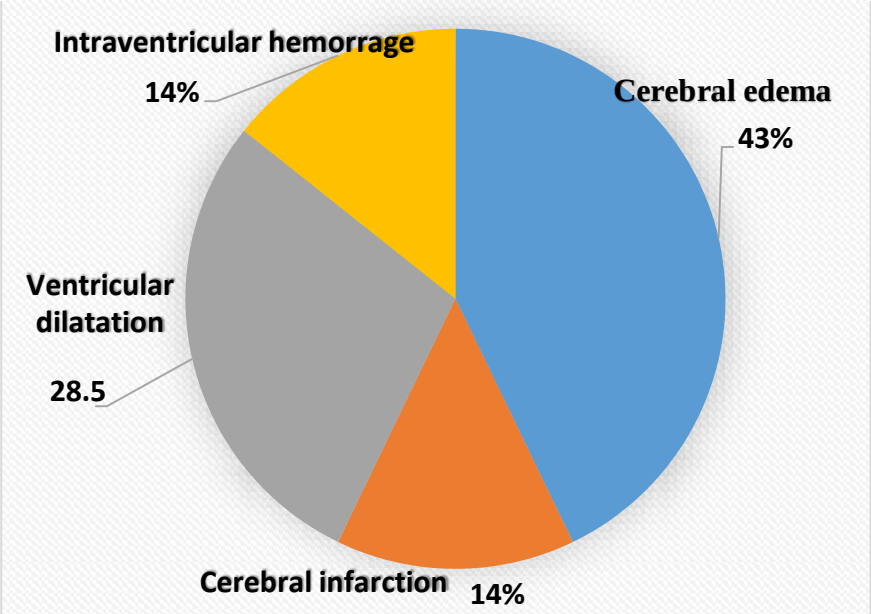

Table 1 Changes in CT scan variable

Changes in CT-scan variables		+ N=14	-N= 96	p-value
Sex	M	8 (57.2%)		
	F	6 (42.8)		
Loss of consciousness		+ 6 (42.8%)	8 (8.3.1%)	0.001
		- 8(57.2%)	88(91.66%)	
Seizure	+	+ 3(21.4%)	45(46.86%)	0.03
	-	-11 (78,6%)	51(53.14%)	
Vomiting &headache	+	+ 2(14.3%)	70 (72.9%)	0.002
	-	- 12 (85.7%)	26 (27.1%)	
Fever	+	+2(14.3%)	90(93.75%)	0.001

	-	-12 (85.7%)	6(6.25%)	
Focal nerve abnormality	+	1 (7.2%)	2(2.2%)	0.1
	-	13(92.8%)	94(97.8%)	

From the table above shown that there is highly significant between both losses of consciousness and fever and brain CT scan abnormality, there is also significant between seizure and brain CT scan abnormality. In the same time, it appears that there is significance between vomiting and headache and brain CT scan abnormality while there no significance between focal nerve abnormality and abnormality in brain CT scan.

Discussion

Lumbar puncture is necessary for the diagnosis of meningitis in order to identify the pathogen causing the infection, to confirm the presence of inflammatory cells in the cerebrospinal fluid, and to provide antibiotic therapy. However, due to the possible hazards connected to lumbar puncture, CT head scans are now frequently utilized to determine which patients should not undergo the procedure. It is becoming more common to get a CT head scan before doing a lumbar puncture, especially in situations where CT scans are widely accessible. Thus, it has become particularly challenging for frontline clinicians to determine if the patient needs a CT scan of the head before conducting a lumbar puncture [6].

The results of numerous other studies are concordant. For example, ten out of seventy-five patients with streptococcus pneumonia meningitis experienced brain herniation after a lumbar puncture and only two of those patients had abnormal CT head scan findings prior to a lumbar puncture [7].

All of the 120 individuals that were included in our study had lumber punctures, and 110 of those cases also had CT scans. This shows that every single patient in whom CT scan was taken into consideration had a lumber puncture. Only 14 scans turned up abnormalities. Hence, our results show that most CT head scans performed prior to lumbar puncture are normal. The CT head scans revealed the following abnormalities: two cases had fevers, six cases had low consciousness levels, three cases had seizures as seen in one of previous study [8], and the remaining three scans revealed two cases of vomiting and headaches and one case of a focal nerve abnormality. Despite the modest number of abnormal scans, we were unable to identify any associations between the scan's outcome and age group, kind of clinical presentation, or CSF study results [9].

An increase in brain shift could result from doing an LP in the context of an occult cerebral mass lesion, which could result in herniation and death. To check for evidence of brain shift contraindicating LP, a cranial CT scan is employed. However, retrospective studies revealed that cranial imaging in patients with bacterial meningitis has been linked to a delay in the start of antibiotic therapy and higher mortality [10].

For instance, with external lumbar CSF drains, some authors support the use of intracranial pressure-guided therapy for patients with bacterial meningitis. According to a retrospective Canadian study comparing adjuvant lumbar CSF drainage to conventional treatment, the mortality rate for individuals with bacterial meningitis treated with lumbar CSF draining was reduced [11].

When patients had CT scans before LPs, the LPs were delayed by two hours. According to earlier research on bacterial meningitis, patients whose CT scans were performed before LPs had a lower yield of CSF cultures (from 94% to 88%) [12].

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