The Role of Lumbar Puncture in Children Less Than Five Years Who Presented with Fever and Fit a Hospital Based Study

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ABSTRACT:

BACKGROUND:

Lumbar puncture is a procedure that is commonly performed to diagnose meningitis, encephalitis, and subarachnoid hemorrhage and it is helpful in evaluating demyelinating, degenerative and collagen vascular diseases and the presence of tumour cells within the subarachnoid space. It is the test of choice to diagnose pseudo tumor cerebri.

OBJECTIVE:

To highlight the important role of lumbar puncture in excluding serious central nervous system infections in patients presented with fever and fit.

PATIENTS AND METHODS:

A prospective study was carried out on 67 patients who were less than five years of age, presented with fever and fit from the 1st of April 2011till thirty first of October 2011, who were admitted to the Children Welfare Teaching Hospital/ medical city / Baghdad for evaluation and management. All the patients underwent lumbar puncture.

RESULTS :

There were 67 patients with male predominant (52%) , the common age of presentation was between one month to one year ; 42 (62%) , 38 (56%) of patients presented with high grade fever and fit , 42 (62%) patients presented with simple fit , 25 (38%) presented with complex fit , 40 (59%) presented with generalized fit , 27 (41%) presented with focal fit , 28 (42%) patients presented as first attack and 39 (58%) presented as a recurrent attack ,in 11 (17%) the result of gram stain was positive while 56 (83%) the results were negative , 9 (14%) the results of cerebral spinal fluid culture showed growth of bacteria while 58 (86%) showed no growth.

CONCLUSION:

The lumbar puncture is necessary in patients presented with fever and fit especially in infancy and those presented with high grade fever and recurrent and complex fit to exclude central nervous system infection.

KEYWORDS: Lumbar puncture, fever fit.

INTRODUCTION:

Examination of the cerebrospinal fluid (CSF) is essential in confirming the diagnosis of meningitis, encephalitis, and subarachnoid hemorrhage, and is often helpful in evaluating demyelinating, degenerative, and collagen vascular diseases and the presence of tumor cells within the subarachnoid space. It is the test of choice to diagnosis pseudotumor cerebri.[1] Knowledge of the normal physiology and pathophysiology of CSF production and flow is useful to interpret such test results.[2]CSF is produced by the choroid plexus in the lateral, third and fourth ventricles.[3] CSF is reabsorbed in the arachnoid villi, located along the superior sagittal and intracranial venous sinuses and around the spinal nerve roots. Each arachnoid villus functions as a one-way valve permitting unidirectional flow of CSF into the blood. [4]

The CSF cell count determination should be performed promptly since the count may be falsely low if measured more than 60 minutes after the LP is performed. This spuriously low cell count may be due to settling of the cells in the CSF over time and/or adherence of RBCs or PMNs to plastic tubes.[16]

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An elevated CSF WBC concentration does not diagnose an infection, since increases in the CSF WBC concentration can occur in a variety of both infectious and noninfectious inflammatory states. The following truisms about the interpretation of CSF cell counts may be useful: The CSF cell count must always be correlated with clinical findings. PMNs, for example, predominate in the CSF of as many as two-thirds of patients with meningitis due to enteroviruses; a shift to lymphocytic predominance occurs within 12 to 24 hours. On the other hand, lymphocytes rarely predominate in the early phases of bacterial meningitis. The presence of eosinophils in the CSF has limited diagnostic utility. [5][6]

Among patients with bacterial meningitis, the classic findings are: - A CSF WBC count above 1000/microL, usually with a neutrophilic predominance, a CSF protein concentration above 250 mg/dL, and CSF glucose concentration below 45 mg/dL (2.5 mmol/L) .

However, the spectrum of CSF values in bacterial meningitis is so wide that there is substantial overlap with the findings in viral infection.[7]

AIMS OF THE STUDY:

This study aimed to highlight the important role of lumber puncture to exclude serious CNS infections in patients less than 5years who presented with fever and fit

PATIENTS AND METHODS:

A prospective study carried out on 67 patients who were less than five years of age who presented with fever and fit from the 1st of April 2011 till thirty first of October 2011, who were admitted to the Children Welfare Teaching Hospital / medical city /Baghdad for evaluation and management.

Information obtained from the patients includes age, sex, chief complaint (fever and fit), duration, character of fever, type of fit, recurrence.

All the patients underwent lumbar puncture; the CSF was examined for protein, sugar, cells (total and differential count), gram stain, and CSF culture.

The normal value of CSF of those less than one month (protein 20-170 mg/dl, sugar> 60% of blood sugar, cells < 20 cells mainly lymphocyte) and those from one month to five years (protein 20 – 40 mg /dl, sugar> 60% of blood sugar, cell < 5 cells mainly lymphocyte). [8,9]

If colony forming unit (cfu)\ml up to 103 , 25% of gram stain result will be positive, if it is between 103-105 cfu\ml, 60% of gram stain will be positive and if it is more than 105 cfu\ml, 97% of gram stain result will be positive.[10]

RESULTS:

Sixty seven patients were included in this study and distributed according to the age and sex which shows male predominant that account (52%) while female (48%). The common age of presentation for those less than one year accounts (62%) as shown in table -1.

It was found that 38 (56%) patients presented with high grade fever and 29 (44%) patients presented with low grade fever,those of age from one month to one year commonly presented with high grade fever which accounts (47%). Also it was shown that 40(59%) patients presented with generalized fit and 27(41%) patients presented with focal fit, those of age from one month to one year represent the highest percentage that accounting (43%), those presented with generalized fit. 42 (62%) patients presented with simple fit and 25 (38%) patients presented with complex fit, those of age from one month to one year commonly presented with simple fit (34%).

Also it shown that 28(42%) patients presented with first attack fit and 39(58%) patients presented with recurrent attacks fit ,those age from one month to one year commonly presented with recurrent attacks fit that accounting (38%).In 11(17%) the results of gram stain were positive while the remaining 56(83%) the results of gram stain were negative and 9(14%) the results of CSF culture shows growth of bacteria while 58(86%) the results of CSF culture shows no growth as shown in table -2.

The results of CSF analysis, showed that the results of normal protein were 24(36%), high protein results were 43(64%), the results of normal sugar were 40(60%) while low sugar results 27(40%), and presence of the cell (the neutrophils and lymphocytes) 40(60%) while the normal (less than5 cell, and in neonate less than 20 cell) 27 (40%) as shown in table-3.

Table 1: The age & sex distribution.

Age	Male	Female	Total
≤ 1 month	4 (6%)	5 (8%)	9 (14%)
>1month – ≤ 1 year	22 (34%)	20 (28%)	42 (62%)
>1year-5 years	8 (12%)	8 (12%)	16(24%)
Total	34 (52%)	33 (48%)	67 (100%)

Table 2: Clinical findings according to age distribution.

Clinical presentations		Age			
		≤ 1 month	>1month – ≤ 1 year	>1year-5 years	Total
Character of fever	High grade	2 (3%)	32 (47%)	4 (6%)	38 (56%)
	Low grade	7 (11%)	10 (15%)	12 (18%)	29 (44%)
Type of fit	Generalized	0	29 (43%)	11 (16%)	40 (59%)
	Focal	9 (14%)	13 (19%)	5 (8%)	27 (41%)
Character of fit	Simple fit	8 (12%)	23 (34%)	11 (16%)	42 (62%)
	Complex fit	1 (2%)	19 (28%)	5 (8%)	25 (38%)
Recurrence of fit	First attack	1 (2%)	16 (24%)	11 (16%)	28 (42%)
	Recurrent attacks	8(12%)	26(38%)	5(8%)	39(58%)
Result of Gram stain	Positive	1 (2%)	8 (12%)	2(3%)	11 (17%)
	Negative	8 (12%)	34 (50%)	14 (21%)	56 (83%)
Result of CSF culture	Growth	0 (0%)	8 (12%)	1 (2%)	9 (14%)
	No growth	9(14%)	34(50%)	15(22%)	58(86%)

Table 3: Results of CSF analysis.

Age	Protein		Sugar		Cells		
	Normal	abnormal	Normal	abnormal	Neutrophil>3cell	Lymphocyte >5 cells	5 cell and less
≤ 1 month	9(14%)	0(0%)	3(5%)	6(9%)	3(5%)	nil	6(9%)
>1month – ≤ 1 year	10(15%)	32(48%)	23(34%)	19(28%)	12(18%)	20(29%)	10(15%)
>1year-5 year	5(7%)	11(16%)	14(21%)	2(3%)	3(5%)	2(3%)	11(16%)
Total	24(36%)	43(64%)	40(60%)	27(40%)	40(60%)		27(40%)

DISCUSSION:

This prospective study that carried out on sixty seven patients who were less than five years of age presented with fever and fit and all of them underwent lumbar puncture shows that the incidence of fever and fit was higher among children who aged between one month and one year (62%) (mean age 6 month). This finding was nearly similar to that observed in studies conducted in Nepal by Joshi R. *et al* (2008) [10] (which shows mean age 6 months) and in Nigeria by Akeped GO, *et al* (1992) [11], (which shows mean age 6 months also.) and disagree with study in Baghdad done by Dr. Wissam A. convulsions with fever (2005) [12] mean age of presentation 36 months). This is explained by fact that in this study we took only the sample that lumbar puncture done for them.

The male were more than females (52% males while 48% females). This results agree with Wissam A.study [12] which shows male to females ratio of (1,48:1), but Verity[13] said that there was no sex difference (1:1).

In this study the high grade fever represent (56%) while low grade fever (44%) , this disagree with Wissam A. study [12] (low grade fever more than high grade), This is explained in fact by in this study we took only the patients that lumbar puncture was done for them

Regarding the types of fit the simple fit represent (62%) and complex fit represent (38%) which is similar to Wissam A. study [12] which revels simple fit (70,1%) and complex fit (29,9%) and also agree

with Nelson [14] and Berg [15] and disagree with Verity [13] (simple fit (28%) and complex fit (62%). Regarding the recurrences of fit ,in present study the 1st attack fit represent (42%) while recurrent attack (58%) disagree with Wissam study [12] which show first attack (86%) and recurrent attack (14%) . To explain this results , the present study as we were mentioned above the sample that we took in this study include all the patients that lumbar puncture done for them to exclude any cause of fever and fit rather than febrile convulsion.

In this study gram stain was positive in only (16%) of all sample and this low results agree with Wissam A.[12] (12%) and Khawla A.Some epidemiological criteria and CSF profile in acute bacterial meningitis (2008) [16] (8%) in other study done by bandaru N. *et al*[17] (the gram stain reveal the probable etiological agent in 85.5% of cases), and this low results in this study may be due to high percentage of antibiotics used before admission .

In this study , the CSF culture was positive in (14%) and this is nearly similar to Ceyhan M. *et al*[18] which shows (17% positive , Wissam study [12] (8%) and Khawla study [16] (6%) also the study conducted in Nepal by Joshi R. *et al* (2008) [10] which shows (4.5%) positive culture and study conducted in Nigeria by Akeped GO .*et al* (1992) [11] that shows (4. 2%) positive culture , this low results attribute to high percent of antibiotics used before admission since the Children Welfare Teaching Hospital is tertiary center . All of the patients in this study who diagnosed as meningitis were between one month and one year and this similar to Ceyhan M. *et al* [18] found the majority of the cases of meningitis in their study was also from 1-12 months of age, and Bandaru N. *et al* [17] also found that 64.9% of the patients with meningitis in their study were below the age of one year.

The number of patients in this study who had positive culture were 9 (14%) 4(*Streptococcus pneumoniae*), 4 (*Staphylococcus aureus*),1(*H. influenzae*) while in study conducted in Nepal by Joshi R, *et al* (2008) the number of patients were(8) 3 (*S.aureus*),3(*H. Influenzae*) and 2(*S.pneumonia*e) .

In this study the CSF profile regarding protein , was high in (64%) and normal in (36%).This result near similar to Wissam study [12] which show high protein in (62%) and normal protein in (38%) . CSF protein may not be increased in early stages of many types of meningitis, in 10% of patients with bacterial meningitis, the CSF protein is normal [19] .

The majority of the patients (60%) has had normal CSF glucose and (40%) low CSF glucose this agree with Wissam[12] study (normal CSF glucose (60%) and low CSF glucose (40%)) while Tunkle AR. *et al*[20] reported that (60%) of their patients had decrease CSF glucose.

In this study, the CSF profile regarding cells, the abnormal cells (63%) (lymphocytes> 5 cell and neutrophils >3) [8][9] This disagree with Sallam AA. [21] Who report (36%) while in Khawla A. [16] study the results differ that showed (40.4%) .

CONCLUSION:

Lumbar puncture is a mandatory procedure to exclude serious CNS illness in patients presented with fit and fever in those less than five years (especially infantile period). Use of antibiotics before lumbar puncture is associated with false negative gram stain and CSF culture. Bacterial meningitis should be suspected in patients presented with high grade fever, recurrent and complex fit. Febrile convulsion should be suspected in patients presented with low grade fever and generalized, first attack simple fit.

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