Subdural Effusion in Bacterial Meningitis Experience in Children Welfare Teaching Hospital

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ABSTRACT:

BACKGROUND:

Subdural effusions occur in (10 - 33 %) of children with acute bacterial meningitis. Usually occur bilateral over frontoparietal region, although localized collections can develop over occipital region. Effusions are most common when meningitis results from H.influenzae .(45% of all effusions).

OBJECTIVE:

To find out the incidence , age distribution and type of bacteria involved in occurrence of subdural effusion in bacterial meningitis, to know the risk factors that might associated with subdural effusion .

PATIENTS AND METHODS:

from march 2010 – feb.2011 a Prospective study was done on 50 patients diagnosed and treated as meningitis, information's obtained from patients include (patient name, date of birth, sex, residency, duration of illness before admission, clinical presentation, and if antibiotics used prior to admission. Diagnostic inclusion criteria clinical and laboratory based. daily follow up of them .Brain CT was done to all of patients with meningitis after 7 days of treatment to roll out subdural effusion because some of the patients were asymptomatic.

RESULTS:

The study shows that incidence of subdural effusion in bacterial meningitis was (22.0%).It is most commonly occur in children below the age of (1) year, there was no significant difference between male and female . Regarding CSF analysis, there were no specific findings that indicate presence of subdural effusion. The majority of the patients show no growth of bacteria on CSF culture, blood culture and gram stain, the others show equal growth of (streptococcus pneumonia, H.influenzae and N.meningitidis). Regarding outcome the majority of the patients discharged well, only one patient had focal deficit and one patient died.

CONCLUSION:

There were no significant risk factors associated with development of subdural effusion. The majority of patients was discharged without any intervention and required follow up only. It's important for physician to maintain a high index of suspicion for diagnosis of subdural effusion .It is important to follow-up patients with meningitis by imaging study, because majority of patients with subdural effusion are asymptomatic.

KEY WORDS : subdural effusion, bacterial meningitis .

INTRODUCTION:

meningitis is a life-threatening illness resulting from infection of the meninges. As a result of advances in understanding the pathogenesis of meningitis its seems that there is a great improvement in the prognosis especially after new advances in the methods of investigations, treatment and prevention[1,2]

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Early diagnosis of meningitis is crucial because the symptoms of meningitis can closely mimic the flu or other viral illnesses; many clinicians miss the diagnosis and prescribe inappropriate treatments. In many cases, a missed diagnosis can have fatal consequences. [3]

All health care workers should be aware that early recognition of the symptoms can be a matter of life and death, and they should become familiar with all possible signs and symptoms. [1,3]

Subdural effusions occur in 10 to 33 percent of children with acute bacterial meningitis. [4,5]

Usually occur bilateral over frontoparietal region, although localized collections can develop over occipital region. Effusions are most common when meningitis results from H.influenzae (45% of all effusions); less often, streptococcus pneumonia (30% of all effusions) and Neisseria Meningitidis (9% of all effusions) are the responsible pathogens.[5,6]

Clinical manifestations of subdural effusions are often subtle or absent. In very young children, bulging fontanels may be a sign of this complication, while in older children; subdural effusions can rarely produce increased intracranial pressure and a shift of intracranial structures. In most children, subdural effusions produce few symptoms and require no treatment.[5]

Tests include: CT scan of the head ,MRI scan of the head ,Ultrasound of the head

Surgery to drain the effusion is n rarely necessary, full recovery from a subdural effusion is expected. If neurological problems continue, they are generally due to the meningitis, not the effusion. Long-term use of antibiotics is usually not necessary. [7]

Since the 1980s, many countries have included immunization against Haemophilus influenzae type B in their routine childhood vaccination schemes. This has practically eliminated this pathogen as a cause of meningitis in young children in those countries. In the countries where the disease burden is highest, however, the vaccine is still too expensive.[8,9]

AIM OF STUDY:

To find out the frequency of (SDE) in bacterial meningitis in our patients , demographic characteristic and the type of bacteria involved.

To high light factors that might be associated with increased incidence of (SDE), the relationship between CSF findings and CT scanned and the outcome of (SDE).

PATIENTS AND METHODS:

From March 1st.2010- February 1st. 2011, a prospective study was done on 50 patients, who diagnosed and treated as a case of meningitis, in 4th unit in children welfare teaching hospital, age group between 1 month -12 year.

Information's obtained from patients include (patient name, date of birth, sex, residency, duration of illness before admission, clinical presentation, and any antibiotic or other medication used prior to admission.

Diagnostic inclusion criteria clinically and laboratory based regarding symptoms and signs of meningitis (e.g. fever, severe headache, seizure, irritability, photophobia, vomiting, drowsiness, neck stiffness, bulging fontanel, kerning and Brudziniski signs) with CSF finding including(pressure,color,total and differential WBC count, protein and sugar).Increase in CSF leukocyte of more than 10 cells/mm3 and mostly PMN with increase CSF protein and decrease sugar might indicate bacterial meningitis but some time lymphocyte predominant either in early stage of bacterial meningitis or due to partial treated meningitis. In addition to the result of the CSF gram stain which was obtained after 48 hours ,CSF culture and blood culture results obtained after 5-7 days.

Careful follow up for the patients during hospitalization include daily measurement of temperature, assessment of conscious level and development of seizures. Every 2-3 days weighing the patients and measurement of OFC.

If after 7 days of treatment and patients were still febrile, changing antibiotic were done either according to result of c/s or if not available according age and clinical presentation. Brain CT was done to all of patients with meningitis after 7 days of treatment to roll out subdural effusion because some of the patients were asymptomatic.

Statistical Analysis:

Statistical Package for Social Sciences version 17 (SPSSv17) was used for data input and analysis. Variables were discrete and presented as numbers and percentages. Chi-square test was used to test the significance of observed distribution. Chi-square test for independence used to test the significance of association between variables. All P values were asymptotic and two tailed. Findings with P value < 0.05 were considered significant.

(N.B) P value represent sampling error (effect of chance), so observed findings with high probability of error (chance) ($P \geq 0.05$ i.e. chance effect $\geq$ 5%) are not considered significant (cannot rely on them).

(N.B) if $P = 0.07$ then the effect of chance (sampling error) is 7% which is not acceptable and thus the result is not significant. Here if the probability of chance is 7% then the probability of being true is 93%, and this is why when to interpret the relationship you can't say there is no relation BUT you must say there is no significant relation.(10)

RESULTS:

The study included 50 children diagnosed as meningitis admitted to child welfare teaching hospital, during the course of treatment and follow up we found that frequency of subdural effusion in meningitis was(22.0%) (fig 1).

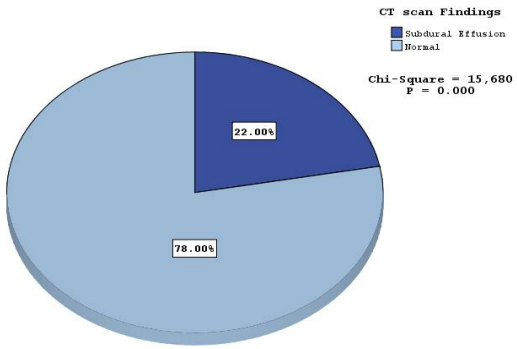

Figure 1: Distribution of study sample according to CT scan finding of subdural effusion.

Table (1)shows the Demographic Characteristics of the study group, there was a significant association between age group and subdural effusion ,the subdural effusion was significantly of higher occurrence in infants than older ages (P < 0.05)and there was no significant association between being male or female and subdural effusion (P>0.05).

Table 1: Demographic Characteristics:

	Subdural Effusion				
Variables	Present	Absent	Total	X2	P
	N = 11 (100%)	N = 39 (100%)	N = 50 (100%)		
Age					
< 1 y	10 (90.9)	15 (38.5)	25 (50.0)	9.531	0.009
1- < ١y	1 (9.1)	17 (43.6)	18 (36.0)		
6-12 y	0 (0.0)	7 (17.9)	7 (14.0)		
Sex					
Male	8 (72.7)	22 (56.4)	30 (60.0)	0.952	0.329
Female	3 (27.3)	17 (43.6)	20 (40.0)		

The most common signs in patients with subdural effusion were bulging of fontanel which present in the majority of the patients, followed by neck rigidity which was present in (9.1%) of the patients between age 1-6years, although those clinical finding it had no significant association with subdural effusion (P>0.05).

Table 2. shows symptoms of subdural effusion, although presence of these symptoms might indicate subdural effusion it has no significant association with subdural effusion (P>0.05).

Table 2: Presenting features

	Subdural Effusion				
Variables	Present	Absent	Total	X2	P
	N = 11 (100%)	N = 39 (100%)	N = 50 (100%)		
Symptoms					
Fever	11 (100.0)	38 (97.4)	49 (98.0)	0.288	0.592
Irritability	9 (81.8)	19 (48.7)	28 (56.0)	3.815	0.051
Vomiting	6 (54.5)	27 (69.2)	33 (66.0)	0.825	0.364
Seizure	5 (45.5)	14 (35.9)	19 (38.0)	0.333	0.564
Headache	1 (9.1)	13 (33.3)	14 (28.0)	2.501	0.114
Altered Consciousness	1 (9.1)	9 (23.1)	10 (20.0)	1.049	0.306
Signs					
Bulging Fontanel	5 (45.5)	8 (20.5)	13 (26.0)	2.774	0.096
Neck Rigidity	3 (27.3)	17 (43.6)	20 (40.0)	0.952	0.329
Kerning Sign	0 (0.0)	2 (5.1)	2 (4.0)	---	0.605*
Purpura	0 (0.0)	0 (0.0)	0 (0.0)	---	---

* Fisher's exact probability test.

Regarding CSF examination in patients with subdural effusion, clear CSF present in 8(72.7%) and turbid CSF in 3(27.3%), appearance of the CSF has no clinical significant with subdural effusion (P>0.05, table 5).

Regarding CSF WBC,differential ,glucose level ,protien level ,serum sodium in patients with subdural effusion, they had no significant association with subdural effusion (P>0.05, table 3).

Table 3: Laboratory findings.

	Subdural Effusion				
Variables	Present	Absent	Total	X2	P
	N = 11 (100%)	N = 39 (100%)	N = 50 (100%)		
Appearance of CSF					
Turbid	3 (27.3)	7 (17.9)	10 (20.0)	0.466	0.495
Clear	8 (72.7)	32 (82.1)	40 (80.0)		
RBC in CSF	0 (0.0)	2 (5.1)	2 (4.0)	0.588	0.443
CSF WBC					
< 100	4 (36.4)	26 (66.7)	30 (60.0)	3.280	0.070*
100-499	6 (54.5)	10 (25.6)	16 (32.0)		
500-999	0 (0.0)	1 (2.6)	1 (2.0)		
1000-	1 (9.1)	2 (5.1)	3 (6.0)		
Differential WBC					
Predominantly Lymphocytes	8 (72.7)	27 (69.2)	35 (70.0)	0.050	0.823
Predominantly PMN	3 (27.3)	12 (30.8)	15 (30.0)		
CSF Glucose					
Decreased	8 (72.7)	20 (51.3)	28 (56.0)		
Normal	1 (9.1)	16 (41.0)	17 (34.0)	4.222	0.121
Increased	2 (18.2)	3 (7.7)	5 (10.0)		
CSF Protein					
Normal	8 (72.7)	24 (61.5)	32 (64.0)	0.466	0.495
Increased	3 (27.3)	15 (38.5)	18 (36.0)		
S.Na					
Decreased	3 (27.3)	7 (17.9)	10 (20.0)	1.669	0.434
Normal	5 (45.5)	26 (66.7)	31 (62.0)		
Not Done	3 (27.3)	6 (15.4)	9 (18.0)		

* After condensing WBC count into < 100 & ≥ 100.

Regarding CSF culture of patients with subdural effusion, the majority of the patients had no growth of bacteria, while 3(27.3%)patients in study sample had growth, although those finding, had no clinical significant with subdural effusion (P>0.05).

Regarding types of bacteria that had been isolated from patients with subdural effusion that had growth of bacteria there were equal growth of (streptococcus pneumonia, H.influenze, N.meningitidis), and there were no clear association between types of bacteria and increase incidence of subdural effusion (P>0.05). Table 4.

Table 4: CSF Bacteriological findings.

	Subdural Effusion				
Variables	Present	Absent	Total	X2	P
	N = 11 (100%)	N = 39 (100%)	N = 50 (100%)		
CSF Culture					
Growth	3 (27.3)	7 (17.9)	10 (20.0)	0.466	0.495
No Growth	8 (72.7)	32 (82.1)	40 (80.0)		
Type of Bacterial Growth					
No Growth	8 (63.6)	32 (84.6)	40 (80.0)		
Streptococcus pneumoni	1 (9.1)	2 (5.1)	3 (6.0)	4.640	0.031A
H. influenzae	1 (9.1)	0 (0.0)	1 (2.0)		
N. meningitidis	1 (9.1)	0 (0.0)	1 (2.0)		
CSF Gram Stain					
No Bacteria, pus seen	8 (72.7)	33 (84.6)	41 (82.0)		
Gram positive diplococci(Streptococcus pneumonia	1 (9.1)	3 (7.7)	4 (8.0)	0.820	0.365B
Gram negative coccobacillus(H.influenzae)	1 (9.1)	2 (5.1)	3 (6.0)		
Gram negative Diplococci (N.meningitis)	1 (9.1)	0 (0.0)	1 (2.0)		
Gram positive cocci (Streptococci)	0 (0.0)	1 (2.6)	1 (2.0)		

A after condensing rows into no growth, staph coagulase –ve and other growths.
B after condensing rows into no bacteria identified and bacteria identified.

Table 5 show result of blood culture in patients with subdural effusion, show the majority of the patients had no growth, while 2(18%)patients had growth of bacteria from which 2(18.2%), but those had no association with increase incidence of subdural effusion (P>0.05).

Regarding the type of bacteria from the blood culture, shows the majority of the patients with subdural effusion had no growth, while those who had growth of streptococcus pneumonia and H.influenzae, although those finding, it was not associated with increase incidence of subdural effusion (P>0.05).

Table 5: Bacteriological findings of blood culture.

	Subdural Effusion				
Variables	Present	Absent	Total	X2	P
	N = 11 (100%)	N = 39 (100%)	N = 50 (100%)		
Blood Culture					
No Growth	9 (81.8)	32 (82.1)	41 (82.0)	0.000	0.986
Growth	2 (18.2)	7 (17.9)	9 (18.0)		
Types of Bacteria					
Streptococcus pneumonia	1 (9.1)	5 (12.8)	6 (12.0)	---	1.000*
H influenzae	1 (9.1)	2 (5.1)	3 (6.0)		

* After condensing rows into no bacteria identified and bacteria identified

During follow up of the patients , only 3(27.3%) of patients with subdural effusion , had increase in size of the head by measurement of head circumference, although statistically this was not significant (P>0.05, table 6).

Regarding the outcome the majority of the patients with subdural effusion were discharged well, while 1(9.1%) of the patients with subdural effusion discharge with focal deficit, and 1(9.1%) of the patients with subdural effusion died, and they were not statistically significant (P>0.05, table 9).

Table 6: Follow up and treatment outcome for the study group.

	Subdural Effusion				
Variables	Present	Absent	Total	X2	P
	N = 11 (100%)	N = 39 (100%)	N = 50 (100%)		
Head Circumference on Follow Up					
Stationary	8 (72.7)	35 (89.7)	43 (86.0)	2.063	0.151
Increased	3 (27.3)	4 (10.3)	7 (14.0)		
Outcome					
Discharged Well	9 (81.8)	37 (94.9)	46 (92.0)		
Focal Deficits	1 (9.1)	2 (5.1)	3 (6.0)	1.990	0.158
Died	1 (9.1)	0 (0.0)	1 (2.0)		

*After condensing outcome into either discharged well or not.

DISCUSSION:

Subdural effusion according to this study in welfare children teaching hospital by taking 50 patients with meningitis as sample and screen for subdural effusion by ultasonography and CTscan of the head,all of those patients were screened for subdural effusion and we did not depend on specific criteria for screening because the majority of the patients were asymptomatic, so we send all of the patients for CT scan,in this study,we found that the incidence of subdural effusion in meningitis was 22.0% ,this result was nearly close to result from study in Baghdad done by Dr.Emad Wissam [(6)] in which he found that 21.0% patients with meningitis had subdural effusion, While some studies show that incidence was 3.2% as mentioned by IRENIO GOMES in (1996).[(11)]

Dr Okba Alshaaf study in Baghdad (1998) found that only(6.0%) had subdural effusion[(12)] ,this result nearest close to result by Syrogiannopoulos et al (1986) who reported an incidence of 6.8% subdural effusion in (2,013) bacterial meningitis cases[(13)],these variation may be due to difference in sample size or in availability of facilities for diagnosis.

There is a significant association between age group and subdural effusion, this result was same as mentioned by MATTHIEU VINCHON in France(2006)[(14)] and by Syrogiannopoulos et al (1986) [(13)]

In other study there were no differences between the groups in age DC study done by Chieh-Tsai Wu in Taiwan(2010)[(15)]

There is no significant association between sex and subdural effusion in our study

This result was agree by MATTHIEU VINCHON in France (2006)[(14).]

Signs of bulging fontanel and neck rigidity were most prominent signs that might present with subdural effusion. Similar result in text book of pediatrics in which subdural effusion are asymptomatic in (85–90%) of patients,symptomatic subdural effusion may result in a bulging fontanel, diastasis of sutures, enlarging head circumference, emesis, seizures, fever,and abnormal results of cranial transillumination.[(2)]

In study done by Ahmad Razali Md Ralib in Malaysia(2004)[(16)]show Prolonged fever, focal and generalized seizures, focal neurological deficits, and altered levels of consciousness were the common modes of presentation, all patients had seizures at presentation.

In our study(27.3%)had increase in head circumference while in the In study done by Snedeker DJ, study in(1990) [(5)]effusion was more likely in those with increased head

circumference(63%),seizure during treatment (61%) or neurological abnormalities that remain at the end of treatment(27%),only in few instance recurrence of fever may herald development of subdural effusion. We can explain the lower incidence in increased head circumferences and neurological abnormalities in our patients to the strict follow up of the patients and all our patients daily measurement of head circumference done for them in addition to CT which was done 1 week following starting the treatment and these allowed early detection of these signs.

Nathoo et al (1999) (17)observed that fever (77%), neck stiffness (74%), headache (32%) and focal seizures (29%) were the common initial presenting features.

Bok and Peter (1993) observed that headache (71%), neck stiffness (60%), fever (58%) and altered level of consciousness (56%) were the common initial presenting features. Seizures were only seen in 34% of patients. (18), while in our study 100% had fever ,headache in 9,1%,neck stiffness in 27.3% ,this could be explained by the patient sample that included in each study with the difference in the pathogenic organisms involved , patient demographic and environmental features differences.

CSF analysis in this study, there was no specific finding that had been associated with subdural effusion, the same result were found in study done by Chieh-Tsai Wu in Taiwan (2010) in which there were no differences between CSF analysis in patients with subdural effusion [16]

In Snedeker DJ study in (1990) patients with effusion had higher level of CSF perotein and bacterial antigen and lower peripheral white blood cells count. [5]

Regarding the CSF culture in this study of subdural effusion, the majority of patients (63.0%) of study sample had no growth of bacteria in CSF culture, these finding may be due to prior initiation of antibiotic treatment, while in others there were growth of bacteria from which there were no significant difference in proportion of patients who had subdural effusion among the types of bacteria (H.influenze, streptococcus pneumonia,and N.meningitidis),the same result is present in Snedeker DJ, study in (1990)[5] and by IRENIO GOMES in (1996) in which subdural effusions occurred in cases with unidentified agents while hydrocephalus ocurred mainly in cases whose agents were (H.influenzae and Streptococcus Pneumonia)[11].

While in MATTHIEU VINCHON study in France (2006)[14], during the last decade, a shift in the causative bacteria has occurred from the initially prevalent H. influenzae to N. meningitidis, which accounts at present for the majority of cases, because of introduction of H.influenze vaccine.[14,19,20,21]

In study by Ahmad Razali Md Ralib in Malaysia(2004)(16)found that 79.2% positive detection of organisms either from blood culture, CSF culture, or serological tests, of whom 58% grew Haemophilus influenzae. Streptococcus species were only seen in 21% of patients.

Hussain et al (1998) observed 48% cases of haemophilus Influenza type b out of 71 cases of bacterial meningitis, [22]

Outcome for the majority of patients with subdural effusion were discharged well (81.8%) and did not require any intervention. There was one patient with focal deficit and one patient died. Similar result was in others studies, as in Snedeker DJ, study in (1990)(5) found that because of low incidence of empyema and tendency of effusion to resolve spontaneously, noninvasive approach in otherwise improving patient (even if febrile) seem appropriate, a conservative approach to management, except in the few cases (one, in this series) in which a subdural empyema was suspected.[5]

In MATTHIEU VINCHON study in France (2006), most of these fluid collections were clinically insignificant, and surgery was considered useless.[14]

In study by Ahmad Razali Md Ralib in Malaysia(2004) [11]observed that the level of consciousness at presentation had a highly Significant bearing on patient outcome ($p<0.01$).Two patients who showed ‘response to stimulation only’ died. Other patients who were alert and orientated were alive at outcome.in our study only one patient died he had subdural effusion but the cause of death was secondary to septisemia. Other parameters, i.e. age, blood culture, CSF culture, and causative organism,had no bearing on patient outcome .

In study by Chieh-Tsai Wu in Taiwan (2010) the outcome data showed no difference in the patients become a febrile, neurological outcome or complication rate. There was only 1 death in the series.[15]

CONCLUSIONAND ECOMMENDATIONS:

There younger age was a significant risk factors associated with development of subdural effusion. The majority of patients was discharged without any intervention and required follow up only. It's important for physician to maintain a high index of suspicion for diagnosis of subdural effusion .It is important to follow-up patients with meningitis by imaging study, because majority of patients with subdural effusion are asymptomatic.

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