ORIGINAL ARTICLE

Is CT Scan Poor Predictor of Complicated Tuberculous Meningitis?

KHURRAM SALEEM[1], MOHAMMAD NASRULLAH[2], FUAD SHAFIQ[3]

ABSTRACT

Background: Tuberculosis is one of the common infectious diseases in the developing world which results in high morbidity and mortality. Tuberculous meningitis in adults is frequently secondary to or associated with reactivation of tuberculosis in extrameningeal foci leading to infarction, hydrocephalus and tuberculomas. CT scan brain is used for diagnosis of these complications.
Aim: To assess predictive value of CT scan brain in cases of complicated TBM.
Methods: Cross sectional study was conducted in medical wards of Mayo Hospital, Lahore. Patients were selected based on convenient sampling. Fifty patients were included in this study. All patients were evaluated through clinical examination, blood tests, CSF examination, Chest X-Ray and CT scan. The data was analyzed using SPSS version 16. Quantitative data was presented with the help of Mean±S.D and qualitative data was presented with the help of frequency tables. Chi-square test was applied to see the association between different variables.
Results: The mean age for male patients were 34±17 years and for female patients it was 29.81±17.72 years (p-value=0.398). Cranial nerve involvement does not show any association with respect to gender (p-value=0.520). CSF protein level and Cell count were statistically same in both groups (p-value=0.107 & 0.936) respectively. Vaccination status was not associated with the complications (p-value=0.370). CT scan was not predictive of the complicated cases having a high negative predictive value (64.3%).
Conclusion: CT scan brain poorly predicts complicated TBM.
Keywords: TBM, Complications, CT. Scan

INTRODUCTION

Tuberculosis is one of the common infectious diseases in the developing world which results in high morbidity and mortality. According to world Health Organization (WHO) report 1995, it is 6th major cause of death worldwide. It killed 3 million people in 1993. This represents 5% death worldwide. Estimated cases in 1995 were 8.8 million, and 52000 deaths per weeks. Ninety five percent of sufferers live in third world countries, 2 billion people carry the germs and 10 % of them will end up with the active form of disease(WHO 1995) The incidence of tuberculosis is high in Pakistan like other developing countries [(1)]. The awareness and economic condition of public in general is not conducive for early detection, diagnosis and treatment of tuberculosis in general. We studied patients presenting with tuberculous meningitis for a period of three months from the onset of illness, especially looking at the pattern and frequency of neurological complications with respect to CT scan study of brain.

[1]*Assistant Professor University of Lahore*

[2]*Assistant Professor Central Park Medical College Lahore*

[3]*Professor of Medicine Central Park Medical College Lahore*
Correspondence to Dr. Khurram Saleem, Assistant Professor, Email: khurramsaleem@hotmail.com

MATERIAL & METHODS

This prospective study was carried out on fifty consecutive patients, in the department of Medicine mayo Hospital, Lahore, for the duration of 3 months from March 2009 to May 2009. Patients were collected from in-door and out-patients department, casualty departments of Mayo Hospital. All cases above 12 years of age irrespective of sex were included in this study. On admission full blood count, erythrocyte sedimentation rate, blood sugar, blood urea and serum electrolytes were assessed in all the patients. Lumber puncture was performed as soon as possible, the cerebrospinal fluid was examined for; protein, sugar and cells, gram staining and Ziehl Nelsen staining, AFB culture and microbial examination X-ray chest was done. CT-Scan of the brain was done in those patients who had either focal neurological deficit or coma.

Statistical analysis:

The data was analyzed using SPSS version 16. Quantitative data was presented with the help of Mean±S.D and qualitative data was presented with the help of frequency tables. Chi-square test was applied to see the association between different variables.

RESULTS

Fifty consecutive patients were included in the study. Both sexes were equally affected (Table-1). Twenty-four (48 %) were males and twenty-six (52 %) were females. The mean age of male patients was 34.00 (± 17.00) years while that of female patients was 29.81± 17.72 years. The age difference between two groups was not statistically significant (Table 1).The mean ages of male and female patients who developed complications were compared. But no statistically significant difference between two groups was found (Table 1).

Presenting features of all patients were recorded. Fever was the most common presenting feature, which was present in 94 % of patients. Visual disturbances (diplopia and blurring of vision) were the least common presenting feature, found in 52% of patients (Table 1).

In our study, amongst the 24 male patients with the disease, seventeen (71%) developed complications and seven (29%) did not develop any complication. Amongst the 26 females, 16(62%) developed complications while 10(38%) had no complications. The difference between the two groups was not significant statistically (Table 1).

In this study it was noted that the most common complication was cranial nerves involvement observed in twenty-three patients (46%). Abducens nerve was most frequently affected in sixteen patients (32%). Olfactory, accessory and hypoglossal cranial nerves were not involved in any patient. Blindness was noted in one patient, who was already on anti-tuberculous drugs for the last six weeks. The clinical examination of patient showed dilated pupil, absent direct light reflex and pale optic disc on fundoscopy, while the consensual light reflux was intact on the same side. Findings were consistent with optic neuropathy. Other cranial nerves were intact. CT scan of patient revealed no abnormality. Considering ethambutol toxicity drug was stopped and recovery started within two weeks, but patient did not report for follow-up. In our study we observed hemiplegias in thirteen patients (26%) and paraplegia in six patients (12%). Seizures were observed in four patients (8%). The complications rate and domain was not dependent on sex of patient (Table 2). CSF Protein, Sugar and Cell counts were statistically same in both groups (Table 2).

All cases under went X-ray chest examination it was found that 48% of patients revealed no abnormality while 6% of patients had millary tuberculosis, 27% had pulmonary infiltrates, 9% had pulmonary cavities, 6% had lobar consolidation, and 4% had hilar lymph node enlargement. (Table-2)

Out of thirty-three complicated cases, twenty-three (70%) patient under went C.T scan examination of brain. Out of these, five (22%) had normal C.T scan while eighteen (78%) had abnormal C.T Scan.

Ten (43 %) had Hydrocephalous
Five (22%) had cerebral Infarction
Three (13%) had tuberculomas (Table 3)

Out of seventeen patients without clinical complications, fourteen had CT-Scan examination of brain. In this group nine had normal C.T scan while five patients had enhancement of basal meningies only (Table 3).

The majority of CT-Scan (78%) were abnormal with complicated tuberculous meningitis while CT-Scan were normal (64%) in majority of uncomplicated tuberculous meningitis. The positive predictive value of CT brain in patients with tuberculous meningitis was 81.8% and negative predictive value was 64.3% (Table 3).

Table 1

	Male (n=24)	**Female (n=26)**	**P value**
Age in years	29.81 ± 17.72	29.81±17.72	0.398
Complicated cases (n=33)	31.88± 16.05	26.38±12.10	0.277
	Cranial nerve involvement		
Gender	**Present**	**Absent**	
Male	11	6	0.520
Female	12	4	
	Presenting features of patient		
	Yes	**No**	
Fever	47	03	
Neck stiffness	46	04	
Vomiting	42	08	
Headache	41	09	
Altered sensorium	33	17	
Behavioral changes	29	21	
Visual disturbance	26	24	
	Complicated cases (n=33)	**Uncomplicated cases (n=17)**	
CSF protein levels	2.16 ± 0.38	1.98 ± 0.34	0.107
CSF sugar levels	1.66 ± 0.19	1.72 ± 0.21	0.312
CSF cells counts	2.17 ± 0.39	2.16 ± 0.47	0.936

Table 2

Nerve involvement			
Cranial	23		
Abducens	16		
Olfactory	-		
Accessory	-		
Hypoglosial	-		
Blindness	1		
Chest x-ray examination (n=50)			
No abnormality	24(48%)		
Millary tuberculosis	3(6%)		
Pulmonary infiltrate	14(28%)		
Pulmonary cavities	4(8%)		
Labor consolidation	3(6%)		
Hilar nymph node enlargement	2(4%)		
C.T. Scan			
	Done	**Not done**	**P value**
Complicated n=33)	23	10	0.338
Uncomplicated n=17)	14	3	

Table 3: C T Scan

Complicated Cases (n=33)			**Uncomplicated cases (n=17)**		
CT-Done (n=23)		**CT-Not Done (n=10)**	**CT-Done (n=14)**		**CT-Not Done (n=3)**
Normal	Abnormal	10	Normal	Abnormal	3
5	18	**-**	**9**	**5**	**-**
CT Abnormal (n=18)		Only basal Meningeal enhancement was observed among the abnormal			
Hydrocephalous		10			
Cerebra Infarction		5			
Tuberculomas		3			
Relation Between Ct Scan Results And Complications					
True Positive = 19			False Positive= 4		
False Negative= 5			True Negative= 9		
Positive Predictive Value =81.8%					
Negative Predictive Value=64.3%					

Table 4: Comparison of CT-scan findings with other studies

	Our study 2009	**Hosoglu's et al 1998**	**Larry-E et al 1993**
Total patients	50	101	54
CT done	37	64	43
Abnormal CT-Scan	62%	93.7%	63%
Hydrocephalous	27%	45.3%	52%
Cerebral infarcts	13.5%	6.3%	12%
Tuberculomas	8%	12.5%	16%

DISCUSSION

Tuberculous meningitis acts as one of the markers of frequency of infection. It is a common disorder in children, but our study includes subjects with age above 12 years who were admitted in general medical units at Mayo Hospital, Lahore.

It was found that majority of patients were in their productive years of life and in their youth. Huebner and Castro (1995) had noted that the tuberculosis was more common in 25 - 44 years[1]. Our results agreed with his observation. The mean age of males in our study was 34±17 years and that of female patients was 29.81±17.72 years (table I). Similar age incidence was observed by Guliaeve SE et al in 1988 (30 -35 years)[2]. Our findings were similar to his results. In our study both sexes were almost equally affected, but study by Tajamal Begum (1988)[3]. in Peshawar revealed that male patients were more in number as compared to female patients [(3)]. Almost same figures had been quoted from another study by Davis I E et al 1992[4]. The reasons for the difference in sex incidence may be due to difference in selection criteria. We included patients who were above 12 years of age while Tajamul Begum selected only pediatric cases and Davis I E et al 1992 included all cases irrespective of age.

In our study the most common presenting feature was fever, found in 94% patients and least common presenting feature was visual disturbance (diplopia and blurring of vision) in 52%. The frequency of presenting features was almost similar in our study and that of Yechoo V. K. et al 1996[5].

During the course of disease patients may develop a wide spectrum of complications. Common complications include cranial nerve palsies, cerebral Infarctions leading to hemiplegias. Paraplegia might be due to involvement of spinal cord secondary to spinal arachnoiditis, tuberculomas, abscesses, vasculitic infarction of spinal cord, spinal meningitis and transverse myelitis[6]. Seizures may also be a consequence of this process. Hsieh et al 1992 in their study found that focal weakness in a patient with tuberculous meningitis may be due to cerebral infarction, arteritis or compressive stenosis of intracranial vessels due to fibrosis and tuberculomas[7]. Garg R.K. et al 1998 found that paraplegia is frequently due to spinal tuberculous meningitis in a pattern of myeloradiculopathy[8]. Spinal tuberculous meningitis should be suspected when there are root signs in addition to signs of spinal cord involvement. The different complications which the patient developed were observed in this study. Most common complication was involvement of cranial nerves, the prevalence of which was 46%. Similar results were found by Mahakul K C et al (1988) i.e., 44.6%[9].

In our study among the cranial nerve palsies, abducent nerve was found to be more frequently effected (Table 4). Domenico et-al 1988 also found in a study that abducent nerve is most common

cranial nerve involved in tuberculous meningitis[10]. The reason for most common involvement of abducent nerve may be the long intracranial course, which makes it more prone to be damaged by exudative material or increased intracranial pressure. Oculmotor nerve is next to abducent nerve. Singh et-al (1990). found in a study of tuberculous meningitis that ptosis due to third nerve palsy was presenting feature in most of the cases [(11)]. Misra et al (1995) found in their study of tuberculous meningitis that ophthalmoplegia due to involvement of oculomotor nerve was a common complication and there was no involvement of olfactory accessory and hypoglossal nerves, these results were similar to ours[12].

Among other complications we found that prevalence of hemiplegia due to cerebral infarct was 26%. This is nearly same as in the study by Hosoglu et-al 1998 (22.8 %)[13].

Paraplegia is an uncommon manifestation in patients with tuberculous spinal meningitis involving pia and arachnoid mater in a pattern of myeloradiculopathy. Tuberculous spinal meningitis should be suspected when there are root signs, in addition to cord signs (i.e., spastic paraparesis with brisk ankle jerk and absent knee jerk in appropriate clinical setting). In our study paraplegia was found in 12% of cases and almost all resulted from spinal arachnoiditis. Dastur et- al (1995) reviewed 74 cases of tuberculous paraplegia with out evidence of pott's disease and discovered that extra dural granuloma occurred in 64%, arachnoidal lesions with out dural involvement in 20%, sub-dural lesion in 8% and intramedullary lesions in 8% of patients [(14)]. Nussbaum et-al 1998 in a study found that intramedullary tuberculosis is more and usually associated with normal CSF parameter [(15)]. Seizure was found to be present in 8% of patients in our study of tuberculous meningitis while Misra et-al (1998) found in their study that prevalence of seizure was 47%[12]. This difference in the prevalence of seizure could be explained upon the difference in the criteria of case selection. We included only the cases of tuberculous meningitis while they included in their study the cases of pyogenic, viral, mollaret's, myeloma and fungal meningitis in addition to cases of tuberculous meningitis. In our study three patients had secondary generalized tonic-clonic seizures, while one patient had no clear evidence of focal onset. Similarly in a study by Patwari et-al (1996) the majority were having tonic-clonic seizures 48%[16].

Bilateral papillodema was present in 6% of cases in our study which is close to that seen in the study of Renaud Verdon et-al (1996) where bilateral papillodema was found in 4% of cases [(17)]. The contribution of extra meningeal tuberculous infection in establishing a reliable persumptive diagnosis must be emphasized. Tuberculous meningitis in adults is frequently secondary to or associated with reactivation of tuberculosis in extrameningeal foci. In our study x-ray chest was done in all cases. Pulmonary infiltration compatible with diagnosis of tuberculosis were seen in 52% of cases (table 4), this is relatively higher than the incidence studied by Davis I.E. et al (1992), where it was found to be 40%[4]. This difference of frequency is found to be due to increase prevalence of pulmonary tuberculosis in our country. The patients in which CT scan was performed was found to be normal in 38% and abnormal in 62% of the patients. These findings were similar to Larry E et al, where abnormal CT-scans were 63% [(18)]. Among abnormal CT-Scans of brain, 27% had hydrocephalous, 13.5% cerebral infarct, 8% tuberculomas and 13.5% were found to have basal enhancement. Hydrocephalous is the most common secondary problem in tuberculous meningitis and is associated with persistent disabilities and poor prognosis. The location of tuberculomas and infarction rather their mere pressure may determine the weakness. The importance of location of infarction as a determinant of weakness and outcome has been recently reported. Most commonly infarctions were found in basal gangion and internal capsule areas. The results of CT-scans in our study were compared with the studies of Hosoglu et al (1998) and Lerry-E. et al (1993) (Table 4). The results of these studies were not comparable with our study because of the reason that selection of patients was not uniform in other studies.

CONCLUSION

CT scan brain is a poor predictor for diagnosing complicated TBM owing to its high negative predictive value.

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