Lumbar puncture in acute admissions to an adult medical ward

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Introduction

Lumbar puncture has been used in clinical medicine for 90 years. There are three main indications: (i) for diagnostic purposes *Table I*; (ii) for introducing contrast media; and (iii) for introducing chemotherapeutic agents, for example, in leukaemia. Acute adult admissions to our wards will usually have a lumbar puncture if there is a suspicion of meningitis or subarachnoid haemorrhage provided there is no contra-indication such as papilloedema. Clinical features which suggest these two diagnoses include fever, headache, vomiting, convulsions, neck stiffness and altered conciousness. Other diseases, however, can be associated with similar symptoms and signs, and the present study was performed to determine the spectrum of diagnoses among patients in whom lumbar puncture is considered necessary.

Table I

INDICATIONS FOR PERFORMING LUMBAR PUNCTURE FOR DIAGNOSIS

1. Suspected subarachnoid haemorrhage
2. Infections of central nervous system (viral, bacterial, tuberculous, fungal and protozoal meningitis; neurosyphilis; acute and subacute encephalitides).
3. Selected strokes, but not routinely.
4. Peripheral neuropathies – eg. Guillain – Barré Syndrome.
5. Suspected multiple sclerosis – very rare in Africa.

Methods

From January to June 1986, 1,908 patients were admitted to the adult medical wards, Kamuzu Central Hospital, Lilongwe. Lumbar puncture was considered necessary in 151 patients because of a clinical suspicion of meningitis or subarachnoid haemorrhage. A record was made of clinical features on admission, cerebrospinal fluid (CSF) findings, final diagnosis and whether the patient recovered or died. Patients with bacterial meningitis were treated with parenteral penicillin and chloramphenicol which in survivors was continued for 14 days. Patients with tuberculous meningitis were treated with streptomycin, rifampicin, isoniazid, pyrazinamide and corticosteroids. Patients with subarachnoid haemorrhage often received dexamethasone in an attempt to reduce cerebral oedema and antihypertensives to reduce high elevations of blood pressure. Patients with other diagnoses were treated along usual lines.

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Results

Unsuccessful Lumbar Puncture

Lumbar puncture was unsuccessful in 6 patients, a failure rate of 4%. Diagnoses were; drug overdose, psychosis, epilepsy, acute bacillary dysentery, tetanus and meningitis. The patient with tetanus died, the others recovered.

The patient with suspected meningitis was treated successfully with antibiotics for 14 days.

CSF Findings

Lumbar puncture was carried out successfully in 145 patients. There were 84 men and 61 women, mean age 30 (range 13-60) years.

a) Bacterial Meningitis

Bacterial meningitis was diagnosed in 43 patients. CSF was cloudy in appearance in 40 and clear in 3. In 36 patients microscopy revealed a mean white cell count of 1546/mm^3 (93% polymorphonuclear leucocytes); in the remainder white cells were too innumerable for counting, although in all cases polymorphonuclear leucocytes exceeded 90% of the total. CSF protein ranged from 78-1700 (mean 422) mg/dl. In 20 patients CSF glucose was zero. Organisms found by gram stain and/or culture were *S.pneumoniae*(10) *N. meningitidis*(4), and Enterobacter species (1). In 20 patients no organism was isolated; 9 had a history of antibiotic administration prior to hospital admission.

b) Tuberculous Meningitis

This diagnosis was made in three patients. CSF was cloudy in one and clear in two. Mean CSF white cell count was 390/mm^3 (75% lymphocytes). CSF protein ranged from 275-1200 (mean 340) mg/dl and CSF glucose was zero in 2.

c) Subarachnoid Haemorrhage

Subarachnoid haemorrhage was present in

eleven patients, the diagnosis based on uniformly blood stained CSF ± xanthochromic supernatant.

d) Other

In 88 patients CSF was clear (includes slightly hazy CSF in 7 from traumatic lumbar puncture), and microscopy revealed less than 5 WBC/mm³. In 5 patients CSF protein was greater than 40 mg/dl.

Clinical Features and Outcome

Clinical features and outcome in the 4 groups of patients are in *Table 2*. In patients with bacterial meningitis the level of consciousness on admission was inversely related to mortality; there were no deaths in those who were alert, 8 deaths (42%) in those obtunded, and 9 deaths (53%) in those who were admitted unconcious. Of patients with bacterial meningitis who recovered 5 had residual neurological deficits; VIII nerve deafness (3), VI nerve palsy (1), and right hemiparesis (1). In patients with subarachnoid haemorrhage 4 (67%) of those admitted unconcious died. The principal diagnoses of patients with normal CSF are in *Table 3*. 43 (84%) of 51 patients with enteric fever, malaria and pneumonia had a fever (temperature greater than 37°C) on admission in contrast to one patient (10%) with a diagnosis of cerebrovascular disease.

Discussion

Lumbar punctures are usually carried out by clinical officers or medical assistants whenever they suspect meningitis or subarachnoid haemorrhage. Results indicate that these health workers are adept and competent at the procedure. Failed lumbar punctures were usually in uncooperative patients. Lumbar puncture in patients with tetanus is usually impossible because of rigidity of dorso-lumbar musculature.

57 (39%) of 145 patients in whom CSF was obtained had meningitis or subarachnoid haemorrhage. In bacterial meningitis visual inspection of CSF established the diagnosis in most cases, and this allowed treatment to be promptly commenced. In 3 patients, however, CSF was clear and the diagnosis was dependent on microscopy. It is very important to examine a drop of clear CSF as soon as possible under the micrsocope at ×40 power. More than 5 white cells/mm³, particularly if polymorphonuclear leucocytes, should suggest meningitis.

Although most patients with meningitis had fever and neck stiffness this was not a universal finding. Two case histories illustrate an important point. Both patients were men and both were admitted unconcious. In one patient there was a history from the guardian of excess alcohol consumption the day before admission, and the breath of the other patient smelt strongly of alcohol. There was no fever and no neck stiffness in either patient. Blood glucose levels were low

TABLE 2

CLINICAL FEATURES AND OUTCOME IN PATIENTS UNDERGOING SUCCESSFUL LUMBAR PUNCTURE

	BACTERIAL MENINGITIS	TUBERCULOUS MENINGITIS	SUBARACHNOID HAEMORRHAGE	OTHER
Number	43	3	11	88
Male: Female	21:22	2:1	8:3	53:35
Age (range) in years	24(13-60)	36(28-40)	38(20-60)	30(17-60)
Documented	39	3	7	86
History				
Headache (%)	30(77)	3	7(100)	46(53)
Vomiting (%)	5(13)	0	4(57)	5(6)
Convulsions (%)	2(5)	0	0	15(17)
Concious level				
Alert (%)	7(16)	1	1(9)	32(36)
Obtunded ± 19(44) Confused	19(44)	1	4(36)	42(48)
Unconcious (%)	17(40)	1	6(55)	14(16)
Neck stiffness (%)	36(84)	3	7(64)	38(43)
Fever > 37°C (%)	33(77)	1	2(18)	51(58)
Recovered (%)	26(60)	1	5(45)	61(69)
Died (%)	17(40)	2	6(55)	27(31)

TABLE 3

DIAGNOSES IN PATIENTS WITH NORMAL CSF.

	Number	Neck Stiffness(%)	Elevated CSF protein	Death(%)
Typhoid Fever ×	21	7(33)	2	7(33)
Malaria †	19	9(47)	2	0
Pneumonia	11	9(82)	0	3(27)
Cerebrovascular Disease	10	4(40)	1	9(90)
Miscellaneous #	27	9(33)	0	8(30)

× Diagnosis based on clinical features, normal or low WBC, response to chloramphenicol, or blood culture (one patient).

† Blood film positive in 10 patients for *P. falciparum*; in 9 patients diagnosis on clinical grounds.

Includes tetanus, drug overdose, acute alcoholism, cervical spine problems, acute hepatic failure etc.

at less than 40 mg/dl, but there was no improvement in concious level after 50 ml of 50% glucose given intravenously. Lumbar puncture in both patients yielded cloudy CSF; *S.pneumoniae* was isolated in one and in the other gram stain and culture were negative. A high index of suspicion is needed if meningitis is not to be missed.

In patients with clinical features suspicious of meningitis but in whom CSF was normal, typhoid fever, malaria, and pneumonia were important diagnoses to be considered, particularly if there was fever. Several patients with pneumonia had normal chest findings on the day of admission, but developed signs 24-36 hours later. Neck stiffness in these patients results from meningism, which may also give rise to a positive Kerning's sign. Raised CSF protein with increased white cells may be found in typhoid fever[1] and malaria[2].

It has been suggested that lumbar puncture in patients with a history of worsening headache, altered conciousness, focal neurology or papilloedema is potentially hazardous and should be preceeded by CT scan,[3],[4]. However, in bacterial meningitis a reduced level of conciousness is common and neurological signs can be found in 50% of patients[5]. Experienced health workers in Africa recommend that if there is a strong suspicion of meningitis or subarachnoid haemorrhage, both of which may be associated with mild papilloedema, lumbar puncture should still be done, if possible under cover of intravenous dexamethasone to prevent a tentorial pressure cone[6].

In our patients bacterial meningitis is common and it is eminently treatable provided chemotherapy is commenced early enough. In any patient suspected of having meningitis lumbar puncture is an essential investigation, and one which should be done as soon as possible.

Acknowledgement

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