Effectiveness of lumbar puncture in elderly patients presenting with acute confusional state

Objective: To evaluate the effectiveness of lumbar puncture (LP) as a diagnostic procedure in acute confusional states in elderly patients.

Patients and Methods: This is an observational prospective study as a short research article that enrolled 50 elderly patients with acute confusional state to assess lumbar puncture results in Al-Fallujah Teaching Hospital in Al-Anbar, Iraq, between January 2011 and January 2013. All of the patients have been subjected to lumbar puncture (LP), as well as laboratory investigations.

Results: This study reveals slight female predominance (54%) in cases of acute confusional state. The mean age was 68 years. Acute confusional state in 92% of our cases was due to systemic disease, and central nervous system infection (meningitis and encephalitis) represented only 8% of cases. Most LPs were negative (normal). Fifty per cent of CNS infections were in pre-LP cases presenting systemic diseases. Central nervous system infections were mostly bacterial meningitis.

Conclusions: This study reveals that positive LP results were low in elderly patients presenting with acute confusional state. This gives an idea about the LP effectiveness that should be suspected. But since the causes of such presentation are life threatening diseases, so the valuable role of LP cannot be underestimated even in such low positive results.

Keywords: Lumbar puncture, acute confusional state, Geriatric, Delirium.

Abbreviations

LP: lumbar puncture
CNS: central nervous system
ACS: acute confusional state
TB: tuberculosis

Introduction

ACS in the elderly is a diagnostic dilemma that physicians and neurologists in emergency units face daily. One of the most challenging questions is whether to proceed with LP. Yet there are many difficulties for LP indication in elderly patients. While ACS occurs in 33% to 41% of elderly patients [1], the overall incidence of meningitis is about 2 to 10 cases per 100,000 people per year [2]. Approximately 20% of the cases were projected to involve individuals >60 years [3]. However, in the sense of atypical presentation of CNS infection in the elderly, and because of its high mortality rate, meningitis should effectively be excluded. Some authors believe that older people more often present with the triad of fever, neck stiffness, and altered mental status than younger adults [4], while others believe in the triad of fever, nuchal rigidity, and altered mental status, though this triad is only seen in 40% of elderly patients with meningitis [5]. The geriatric patient may also have false-positive findings of meningitis. Signs and symptoms of meningeal irritation, such as nuchal rigidity or a positive Kernig's sign or Brudzinski's sign, may be found in healthy elderly people.

This false-positive finding is attributed to the presence of limited neck mobility and cervical spine disease. Thus, classic signs and symptoms of meningeal irritation are unreliable in the elderly and make the diagnosis of meningitis more difficult [2]. LP efficiency decreased dramatically according to patients' age [6]. LP is never mentioned as a primary investigation and was always left to the condition without firm guide. While being the most valuable diagnostic tool for CNS infection, LP has a limited role in ACS due to its very low yield as some authors' believes [7].

Some have suggested that cerebrospinal fluid should be analysed only in atypical cases of stroke, or when pyrexia develops without an apparent source of infection in an elderly patient with stroke [8]. Others believe that it should be done for every patient with ACS [9], while yet others do not believe in doing LP unless for typical cases of meningitis [10]. The causes of ACS in the elderly are mainly due to systemic infection (34%), stroke (11%), and electrolyte disturbance (10%) [11]. CNS infection represents 1% to 5% of cases of ACS. These numbers give an idea of the difficult decision regarding LP. The aim of this study was to evaluate the effectiveness and safety of LP as a diagnostic procedure in ACS in elderly patients in Al-Fallujah Teaching Hospital in the Al-Anbar Governorate, Iraq.

Patients and Methods

This is a prospective observational study as a short research article on 50 elderly patients. The patients were aged 60 to 85 years old. The mean age was 68, with a small female predominance. Patients present with ACS at time of hospital admission at Al-Fallujah hospital in Al-Anbar, Iraq, between January 2011 and January 2013. All patients were examined by a neurologist via LP. General medical and neurological examination was done for the patients. We applied the Confessional Assessment Method (CAM). It includes the following criteria:

1. Acute changes in mental state with fluctuating courses
2. Inattention
3. Disorganized thinking with respect to orientation, content of thinking, or illogical ideas
4. Altered level of consciousness and psychomotor activity (alert or drowsy)

Diagnosis involves 1+2+either 3 or 4.

The patients were fully assessed with clinical and laboratory investigations: blood count, ESR, glucose, urea, creatinine, electrolytes, liver function test, ECG, cardiac echo-study, X-ray, ultrasound, and neuroimaging (CT, MRI) according to the patient's condition.

LP results are considered abnormal when the CSF analysis shows leukocytes count > 5 cells per mm^3, protein > 50 mg/dL, glucose < 60% of blood level, CSF pressure > 180 mmH_2O. Cultures of CSF and polymerase chain reaction were done to prove the diagnosis of CNS infections.

Selection of the sample included elderly patients that presented with ACS without clear causes and LP was done for them to diagnose or exclude CNS diseases. We excluded; (1) cases of typical presentation of CNS infections in which patient presented with classical triad of fever, headache, and neck stiffness who have intact consciousness (not confused) and proved later by lumbar puncture to have CNS infection, and (2) cases of ACS with clear systemic disease (like renal failure, liver failure) that explains their presentation with ACS.

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Results

The range for the age of the patients was between 60 and 85 years old. The mean age was 68 years old, with a little female predominance, as 54% of our patients were female.
Table 1 gives the distribution of patients by age and sex.

Table 1: Age and sex distribution of cases

Age(years)	Male	Female	Total	Percentage
60–69	11	14	25	50
70–80	6	9	15	30
>80	6	4	10	20
Total	23	27	50	
Percentage	46	54	100	100

Regarding ACS as the presenting picture of our sample, the most common causes of ACS are systemic infection (50% of cases), electrolyte disturbance (20%), unknown causes (14%), CNS infection (8%), and other causes (8%), which involve drugs, heart failure, and liver disease. Regarding systemic infection, chest infections represent 20% of cases, as do UTIs. Regarding electrolyte disturbance, dehydration is the most common. CNS infections (meningitis and encephalitis) represent only 8% of cases of ACS in the elderly.
Table 2 gives the causes of ACS in elderly patients.

Table 2: Causes of ACS in elderly patients

Causes	Number of Patients	Percentage
CNS infection	4	8 %
Systemic infection	25	50 %
Pneumonia	5	
UTI	5	
Typhoid fever	3	
Bedsore	3	
Gastroenteritis	2	
Septicemia	2	
Influenza	2	
Cellulites	2	
Brucellosis	1	
Electrolyte disturbance	10	20 %
Dehydration	7	
Hyopnatremia	2	
Hypocalcemia	1	
Other	4	8 %
Drug; anicholenergic	2	
Heart failure	1	
Liver failure	1	
Unknown causes	7	14 %

Total cases	50	100 %

The presence of pre-LP systemic disease does not eliminate the need for LP.

CNS infections (meningitis and encephalitis) were present in both cases of ACS with apparent disease at initial evaluation and in patients without apparent disease at initial evaluation.

Patients who presented with apparent disease at initial evaluation but their pictures were atypical for systemic disease i.e. the presence of neck stiffness, represents 40% of the sample (20 patients). It involves mostly patients with electrolytes disturbance (10 patients); systemic infection (8 patients) and 2 patients had heart and liver failure. Only two patients of this group had a CNS infection.

Those with ACS but without specific apparent diseases and atypical for CNS infections i.e. patient with fever or leukocytosis without neck stiffness, represent 60% of the sample. Only two patients of this group had a CNS infection

Systemic infection represents the major part for this group, as it takes more time for diagnosis.

Table 3 Pre-LP presentation

Presentation	Percentage	Number of patients with positive LP for CNS infection
Patients with apparent systemic disease & with neck stiffness	40%	2
Those without apparent specific disease & no neck stiffness	60%	2

CNS infections (meningitis and encephalitis) were present in cases of ACS with fever and in cases of ACS without fever.

We had 35 patients (70% of our sample) who presented with ACS with fever; only two patients of them proved to have a CNS infection. The other 15 patients (30% of our sample) presented with ACS without fever; only two of them proved to have a CNS infection. This means that 50% of our patients with CNS infection had fever and the other 50% had CNS infection without fever. Table 4

Table 4: CNS infection (meningitis and encephalitis) in patients with and without fever

Presentation of our patients related to fever	Percentage	Number of patients with positive LP for CNS infection
ACS with fever	30%	2
ACS without fever	70%	2

CNS infections (meningitis and encephalitis) are mostly bacterial in the elderly, and both cases in our sample were due to *S. pneumonia*. We had one case of viral encephalitis and one case of TB meningitis. These results were proved by CSF culture and DNA testing with PCR, as with clinical responses to treatment. Table 5

Table 5: Causes of CNS infection (positive LP) in elderly patients with ACS

Causative organism	Number of patients	Percentage of positive LP	Diagnostic difficulty
Bacterial *S. pneumoniae*	2	50%	One patient with initial chest infection Another patient with ACS without fever with normal initial routine investigation
Viral Herpes	1	25%	Dehydrated patient with mild renal impairment after delayed presentation
Tuberculosis	1	25%	ACS without fever with normal initial routine investigation
Total positive LP cases	4	100%	

Discussion

The mean age was 68 years in this study and it was less than that of James George study, who point to being 81 years [12]. Half of our sample was between 60 and 69 years old, and the other older age group represented the smaller sample due to their decreasing number by death by aging. The difference in mean age between our sample and that of George was mostly due to hard living conditions in our country. While slight female predominance in our study (54%) is comparable to that of James George results who points to 78 men and 93 women in his study.

Most of the cases of ACS were systemic diseases, while 8% were due to CNS infection. In other studies, the percentages of CNS infection cases have some conflicting results. Majed [6] points to 11% cases of CNS infection among the total cases of ACS, while Warshaw [10] points to only around 1% CNS cases among the total cases of ACS concluding that LP is unnecessary in cases of ACS in elderly unless there are clear classical signs of CNS infection.

The most difficult cases come from the presence of neck flexion resistance. This is hardly evaluated in elderly especially in those with generalized spasticity. Most commonly this occurs in dehydrated patients and in those with previous history of multiple stroke or Parkinsonism or even merely cervical spondylosis. It is especially common among the older age group of our sample.

In addition to the well-known causes of difficulty in diagnosis in the elderly, our sample included cases of delayed presentation to the hospital, as one of the important causes of vague presentation. Because patients stayed at home, especially in rural areas, waiting for spontaneous improvement, with poor oral intake and without intravenous fluid, and began to deteriorate with dehydration and disturbed consciousness before being brought to the hospital, where we received them with complicating presentations, such as disturbed consciousness, generalized spasticity, and fever. At this point, physicians and neurologists face the problem of waiting for general supportive measures or proceeding with immediate LP. This causes diagnostic difficulty and makes the decision difficult for both medical staff and patients' relatives, with respect to complications versus benefits.

The presence of an apparent disease did not eliminate the need for LP. In our sample, we diagnosed 50% of our CNS infection cases in patients who already presented with apparent specific diseases at initial evaluation. This is very risky result because it may mandate LP for every patient with ACS. This is comparable to D'Amore, who points to 46% of his cases of

The presence of fever does not make a great different in the diagnosis of CNS infection, as appears in our study. This is comparable to Shah, who states that meningitis was present in both with or without fever [14]. He gave higher rates to those without fever, as he pointed out that meningitis occurred in 12%, compared to 7% in those with fever. CNS infection in the elderly is commonly caused by bacterial infection. This is comparable to Delerme [15], and this means that there is more mortality, so there is more urgency to do LP. This was differing from Majed [6] who points to (lymphocytic) meningitis (8.5%), while bacterial meningitis cases were only (2.4%).

If we take into account the percentage of unknown causes of ACS, which reaches 14% for patients who are subjected to unnecessary LP with normal results, we conclude that deficit investigations play a major role in LP decisions in Iraq especially in primary hospitals. This is because many common causes of ACS can be easily missed as important

investigations not always available in our primary hospital like serology, immunological markers, hormonal tests, and toxicology. Among the cases of unknown causes, five patients (10 % of our sample) improved with supportive measures during hospital admission. While the other two patients (4% of our sample) of unknown causes, were referred to a central hospital.

Larger sample is needed to cover more causes for ACS in elderly patients. Our entire positive LP results point only to CNS infection, while if the sample was larger we should suspect some results to point for other causes (like subarachnoid haemorrhage) or to be of nonspecific findings (like mild protein elevation) that demined more work up in such presentation.

Although our sample is not large, but it still can give an idea about the low positive results that the physicians should suspect when performing LP.

Since the causes of such presentation are life threatening diseases, so the valuable role of LP cannot be underestimated even in such low positive results, and especially because the negative results is important in excluding serious diseases and this is significant as the positive results.

Conclusion

This study reveals that positive LP results were low. While some authors see that LP must be done for all patients so as to not miss even a single case, others see that it is unnecessary to subject all patients to LP just to detect a few cases, and argue that doctors should save LP for clear cases. In the absence of consistent results, the decision to perform LP looks more philosophical and subjective than being based on a solid clinical base. But since the causes of such presentation are life threatening diseases, so the valuable role of LP cannot be underestimated even in such low positive results.

Recommendations

1. More studies with larger sample are needed to reach a solid base for LP indications in the elderly that make the selection of the patients more accurate to avoid unnecessary LP.
2. Geriatrics need attention and people need education about their elderly patients to ensure that elderly patients in need of medical attention are brought to the hospital as early as possible.
3. In developing countries like Iraq, the full availability of investigation is mandatory to reduce unnecessary LP.

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