

# 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 [1], and that a more solid guideline for LP indication in acute confusional state elderly patients is required.

**Keywords:** [2]

## 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 is no clear guideline for LP indication in elderly patients. While delirium 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, because of the 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. No need for new paragraph here.

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 [3] [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 metabolic (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 ~~Confusion~~Confessional-Assessment Method (CAM). It includes several 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. We excluded (1) cases of typical presentation in which patient present with classical triad of fever, headache, and neck stiffness who have intact consciousness and proved later by lumbar puncture to have CNS infection, and (2) cases of ACS with clear systemic disease (like renal failure) that explains their presentation. Selection of the sample included elderly patients that presented with ACS without clear causes. This occurs with elderly patients that present with clinical and laboratory findings that could point to more than a few simple causes for their ACS presentation.

In addition to the well-known causes of difficulty in diagnosis in the elderly, our sample include 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 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.

### **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%), idiopathic (12%), meningitis (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 infection (meningitis and encephalitis) represents only 8% of cases of ACS in the elderly. Unknown causes of ACS represent 14% of our sample. Table 2 gives the causes of ACS in elderly patients.

**Table 2:** Causes of ACS in elderly patients

Causes	Number of Patients	Percentage
<b>CNS infection</b>	4	8 %
<b>Systemic infection</b>	25	50 %
Pneumonia	5	
UTI	5	
Typhoid fever	3	
Bedsore	3	
<b>GIT (what does this stand for?)</b>	2	
Septicemia	2	
Influenza	2	
Cellulites	2	
Brucellosis	1	
<b>Electrolyte disturbance</b>	10	20 %
Dehydration	7	
Hyopnatremia	2	
Hypocalcemia	1	
<b>Other</b>	4	8 %
Drug; anicholenergic	2	
Heart failure	1	
Liver failure	1	
<b>Unknown causes</b>	7	14 %

Pre-LP systemic disease does not eliminate the need for LP. In our sample, four

patients proved to have CNS infection. Two patients had apparent systemic diseases at the time of presentation. The lacked specific apparent causes in their initial presentation.

**Table 3:** LP results in ACS cases in elderly patient presenting with systemic disease

Diseases	Positive LP for CNS infection (systemic disease)	Negative LP
Systemic infection	One case of chest infection (pneumonia) that was apparent at the time of presentation	24 negative LPs
Electrolyte disturbance	One case of dehydration that was apparent at the time of presentation	9 negative LPs
Other (drugs, heart failure, liver failure)	No positive LP results	4 negative LPs

In our sample, we faced two types of patients according to the inclusion criteria:

1. Patients that presented with apparent disease at initial evaluation but the picture was atypical for systemic disease. This group represents 40% of the sample. It involves mostly patients with electrolytes disturbance (10 patients); less than a third (8) had systemic infection and 2 had heart and liver failure.
2. Those with ACS but without specific apparent disease and atypical for CNS infection. No fever and no neck stiffness. This group represents 60% of the sample. Systemic infection represents the major part, as it takes more time for diagnosis. The primary investigation of complete blood picture and ESR cannot differentiate between the types of systemic infection or CNS infection. While we wait for cultures or serology, LP is mandatory. The other two cases of drug poisoning are difficult to diagnose even if there is a history of drug ingestion. This is because there is no toxicology centre in our city and we must send the samples to Baghdad.

Regarding the presentation of our patients, ACS was the main clinical presentation. 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; 2 proved to have a CNS infection. The other 15 patients (30% of our sample) presented with ACS without fever; 2 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:** 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
ACS with fever	30%	2
ACS without fever	70%	2

The most difficult cases come from the presence of neck flexion resistance. This is hardly evaluated in the 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 in the older age group of our sample. Half of our cases have neck stiffness but only two patients had a CNS infection.

CNS infections (meningitis and encephalitis) are mostly bacterial in the elderly, and both cases in our sample were due to *S. pneumoniae*. 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:** Causes of CNS infection in elderly patients

Causative organism	Number of patients	Percentage of positive LP	Diagnostic difficulty
Bacterial <i>S. pneumoniae</i>	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, who point to being 81 years while female predominance is comparable to his results who points to 78 men and 93 women [5] [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.

Most of the cases of ACS were systemic diseases, while 8% were due to CNS infection. In other studies, the percentage of CNS infection cases have some conflicting results. Majed [6] points to 11%, while Warshaw [10] points to only around 1%, concluding that LP is unnecessary in cases of ACS in elderly unless there are clear classical signs of CNS infection. 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. This is comparable to D'Amore, who points to 46% of his cases of meningitis as having systemic diseases [13]. 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 Delorme [15], and this means that there is more mortality, so there is more urgency to do LP.

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. This is because many common causes of ACS can be easily missed if there is no available investigation like blood gas measures, serology, immunological markers, hormonal tests, and toxicology.

### **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 clear guidelines and with such inconsistent results, the decision to perform LP looks more philosophical and subjective than being based on a solid clinical base.

### **Recommendations**

1. More studies are needed to reach a solid guideline for LP in the elderly.
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.