

# Central nervous system infections versus lead toxicity in the differential diagnosis of encephalopathy

Currently, lead toxicity is a major health problem in Iran, with lead encephalopathy being the most serious presentation of lead poisoning. It is not common in adults and may occur at high blood concentrations of lead.<sup>[1]</sup> The signs and symptoms of lead encephalopathy include headache, delirium, hallucinations, lethargy, agitation, tremor, memory loss, and single or recurrent seizures.<sup>[1-3]</sup> A tonic-clonic seizure is the most typical seizure type in these patients.<sup>[3]</sup> Delirium induced by lead may increase over a period of several days.<sup>[1]</sup> Coma is an uncommon presentation of lead encephalopathy, and progressive cerebral edema and increased intracranial pressure may result in death.<sup>[1]</sup>

The differential diagnosis of encephalopathy includes several central nervous system (CNS) infections, such as subacute meningitis, intracranial abscess, and encephalitis, along with lead encephalopathy. At least one report suggests that lead encephalopathy can present with a pattern similar to meningitis and encephalitis.<sup>[4]</sup> The failure to recognize any one of these serious etiologies can lead to significant morbidity and mortality.

Since the presentation of lead encephalopathy may mimic the presentations of serious CNS infections, distinguishing between them can be challenging. Both CNS infections and lead encephalopathy may present with a history of delirium, headache, and

seizure, and both may be associated with increased intracranial pressure. We therefore point out some differences between these two scenarios to help with the decision-making process. Although fever is usually noted in CNS infections, it is infrequent in lead encephalopathy. In contrast, lead encephalopathy may be accompanied with loss of memory and disturbances in attention, processing, visual-spatial capabilities, and cognitive and behavioral problems that are not typically seen with CNS infections.<sup>[4]</sup>

Cerebrospinal fluid (CSF) analysis may allow the diagnosis of lead encephalopathy or rule out other differential diagnoses. In patients with either lead encephalopathy or CNS infection, the hallmark characteristics of lumbar puncture include an increase in the opening pressure and increased CSF protein concentration.<sup>[5,6]</sup> However, the CSF white blood cell count in lead encephalopathy is slightly increased or even normal, while it is typically greatly increased in CNS infections (pleocytosis).<sup>[5,7]</sup>

The complete blood count may also help differentiate between the diagnoses. Anemia, especially hypochromic microcytic anemia, is a common finding in patients with lead encephalopathy.<sup>[8]</sup> Although some viral causes of encephalitis may induce bone marrow depression,<sup>[9]</sup> the frequency of anemia is higher, more specific to the red blood cell line, and more chronic in patients with lead encephalopathy.

Finally, the co-occurrence of gastrointestinal symptoms may help in the differentiation of lead encephalopathy from CNS infections.<sup>[4]</sup> Some specific indicators of lead poisoning that are not typically seen with CNS infections include abdominal pain (lead colic), constipation, and weight loss.<sup>[10]</sup> In cases where a blood lead concentration is not readily available, positive abdominal imaging results may help physicians diagnose lead encephalopathy and start treatment

**Table 1: Typical presentation features distinguishing lead encephalopathy from central nervous system infection**

Differential variables	Lead encephalopathy	CNS infections
Presence of coma	±	±
Occurrence of fever	-	+
CSF pleocytosis	-	+
Increase of opening pressure in lumbar puncture	+	+
Elevated CSF protein concentration in lumbar puncture	+	+
Co-occurrence of behavioral problems, loss of memory, disturbance in attention, visual-spatial capabilities, and cognitive symptoms	+	-
Anemia (especially hypochromic microcytic anemia)	+	-
Co-occurrence of gastrointestinal symptoms	+	-
Previous history of opium addiction, occupational or environmental exposure to lead	+	-

CSF=Cerebrospinal fluid; CNS=Central nervous system

expeditiously.<sup>[11]</sup> The distinguishing features between lead encephalopathy and CNS infections are summarized in Table 1.

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