



Clinical Observations

The Correlation of Dystonia Severity and Serum Transaminases in a Child With a Brain Injury



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ABSTRACT

BACKGROUND: Severe anoxic brain injury can lead to prolonged episodes of status dystonicus. Sustained dystonia can result in skeletal muscle breakdown and elevation of serum transaminases, which can initially be confused with polypharmacy-related hepatotoxicity or an underlying metabolic condition. **PATIENT:** We present a 19-month-old boy who sustained a severe anoxic brain injury in the setting of a viral upper respiratory tract infection. Within 2 weeks after injury, he developed prolonged periods of severe dystonia. **RESULTS:** Serum creatine kinase peaked at 4504 U/L, alanine transaminase at 183 U/L, and aspartate transaminase at 198 U/L. **CONCLUSIONS:** This child demonstrated a clear correlation between severity of dystonia after brain injury and changes in serum alanine transaminase, aspartate transaminase, and creatine kinase. In the literature, aspartate transaminase and alanine transaminase elevations have been reported in seizures, myopathies, and extreme exercise. This is the first report of serum transaminase elevation secondary to dystonia. Early identification of skeletal muscle causes of increased alanine transaminase and aspartate transaminase may prevent unnecessary investigations and can reduce concern about medication-related hepatotoxicity.

Keywords: brain injuries, dystonia, rhabdomyolysis, pediatrics

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Introduction

Status dystonicus was first described as “increasingly frequent and severe episodes of generalized dystonia, which necessitates urgent hospital admission” by Jankovic in 1982.¹ It is a rare condition that may occur secondary to severe anoxic brain injury.^{2,3}

Numerous medical problems can result, including respiratory failure, hyperpyrexia, dehydration, and rhabdomyolysis with renal failure.⁴ In association with status

dystonicus, derangements of liver enzymes have been reported, leading to further investigations with no underlying cause determined.⁵ We present a 19-month-old boy who developed status dystonicus from severe anoxic brain injury, resulting in skeletal muscle breakdown and subsequent elevation of serum transaminases.

Patient Description

A previously healthy 19-month-old boy developed respiratory distress secondary to croup. He had a witnessed respiratory arrest in the hospital, and cardiopulmonary resuscitation was carried out for about 13 minutes. His initial brain magnetic resonance imaging was consistent with a severe anoxic brain injury with areas of restricted diffusion in both frontoparietal lobes, the thalami, caudate heads, putamina, and the globus pallidus. Within 2 weeks of injury, he developed significant dystonia with ongoing posturing. During dystonic episodes, he exhibited postures for seconds to minutes at a time with brief breaks in between, displaying decerebrate posturing on the right and decorticate posturing on the left. The episodes increased in severity and peaked 34 days after respiratory arrest with more than 12 cumulative hours of dystonia per day (Figure). Various oral medications were tried: gabapentin, clonazepam, oral baclofen, chloral, and trihexyphenidyl. The rest of his

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The authors have no conflicts of interest to declare.

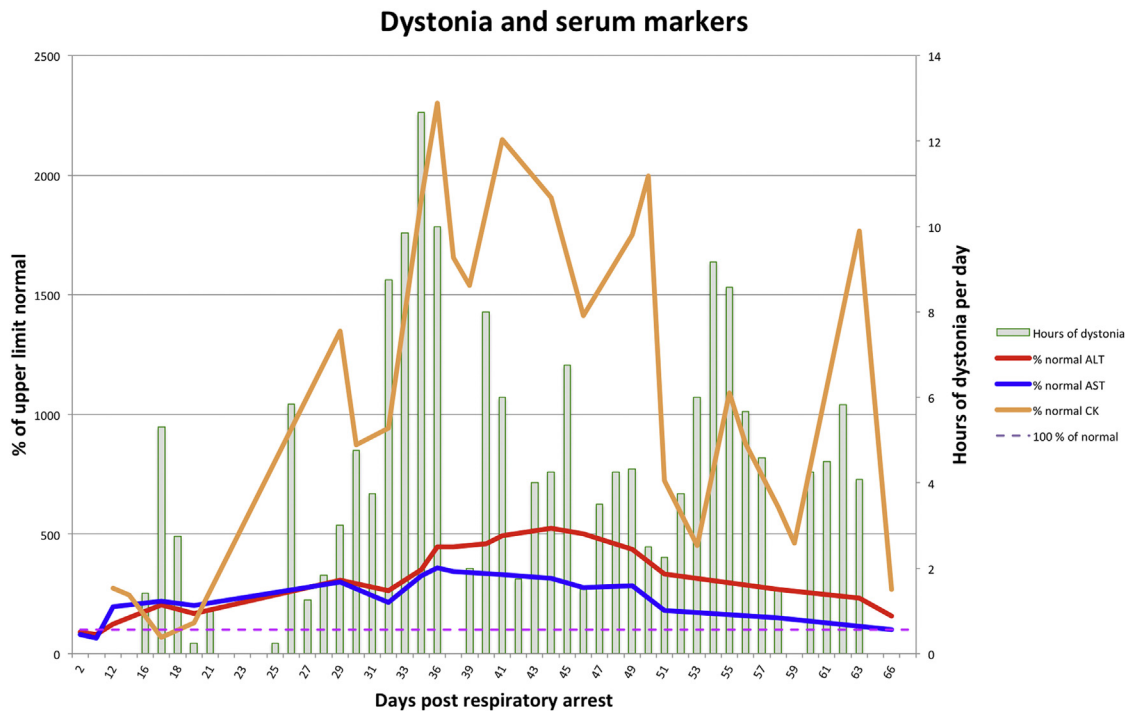
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**FIGURE.**

Severity of dystonia and serum marker levels. The number of hours of dystonia was determined by a retrospective chart review of nursing notes. ALT, AST, and CK levels are normalized by calculating percentage increase from upper limit of normal. CK, creatine kinase; ALT, alanine transaminase; AST, aspartate transaminase. (Color version of this figure is available in the online edition.)

medications included clonidine and propranolol for the treatment of dysautonomia. The dystonic episodes were severe, and as a result, he developed contractures of multiple joints and suspected compartment syndrome of the left forearm. An intrathecal baclofen pump was inserted 50 days after respiratory arrest with significant improvement in dystonia intensity and duration.

An interesting aspect of this child's presentation was an observed increase in serum transaminases during the hospital stay. Aspartate transaminase (AST) peaked at 198 U/L 36 days after respiratory arrest, and alanine transaminase (ALT) peaked at 183 U/L 44 days after respiratory arrest. The levels of serum transaminases seemed to correlate with dystonia severity (Figure). As his dystonia improved, AST and ALT levels slowly normalized. In spite of the elevation of serum transaminases, other markers of liver damage, gamma-glutamyl transferase (GGT), alkaline phosphatase (ALP), international normalized ratio (INR) and/or partial thromboplastin time (PTT), bilirubin, and albumin, remained unchanged. However, serum markers of skeletal muscle injury, creatine kinase (CK) and lactate dehydrogenase (LDH), were elevated, and their levels also correlated with dystonia severity (Figure). CK peaked at 4504 U/L 41 days after respiratory arrest, and LDH peaked at 758 U/L 51 days after respiratory arrest.

He was discharged from hospital 5 months after injury into a community-based rehabilitation program. At the time of discharge, he was able to fix and follow and progressed to being able to bring his hands to the midline. Overall, his dystonia improved significantly, and although he had little dystonia at rest, he continued to have dystonia when crying and initiating volitional movements.

Discussion

We present a child who developed status dystonicus after severe anoxic brain injury. An interesting aspect of his clinical presentation was the elevation of serum transaminases which correlated with dystonia severity. Initially it was suspected that the elevation of

transaminases was due to hepatotoxicity from polypharmacy. Hepatotoxicity is a known side effect of clonidine, clonazepam, and propranolol. In addition to polypharmacy, an underlying metabolic disorder was investigated as etiology of elevated serum transaminases. A metabolic screen was ordered, but no underlying disorder was evident.

The rise in AST and ALT correlated with severity of his dystonia. AST and ALT are enzymes present in various tissue types. AST can be evident in liver, skeletal muscle, brain, heart, and erythrocytes.⁶ ALT is more specific, and elevations of ALT usually indicate liver damage. However, skeletal muscle can also be a source of ALT, and serum transaminases may be released into the blood stream from skeletal muscle damage.⁷ Clues that suggest a skeletal muscle source of AST and/or ALT elevation include an increase in CK and LDH with no increase in GGT, bilirubin, and/or PTT.⁷ Additionally, an initial AST-to-ALT ratio of 3:5 that equalizes within 4 days of transaminase peaking has been reported.⁷ Our patient's presentation was consistent with a skeletal muscle source of transaminase elevation. In the literature, increases in AST and ALT from skeletal muscle injury have been reported in seizures, myopathies, and extreme exercises.^{7,8} This is the first case report of transaminase elevation secondary to dystonia. Early identification of skeletal muscle causes of increased serum transaminases is important; it may prevent unnecessary investigation into other causes of hepatic dysfunction and can reduce concern about medication-related hepatotoxicity.

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It is quite necessary to distinguish two different phenomena in the act of speech, namely, the power of creating words as signs of our ideas and that of articulating these same words. There is, so to speak, an internal speech and an external speech; the latter is only an expression of the former.

Jean Baptiste Bouillaud (1827)