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# Upper extremity conversion disorder in children

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**Background:** Conversion disorder in children presents a challenge to orthopedic surgeons. The condition is frequently associated with unnecessary diagnostic tests, treatments, and cost. The purpose of this study was to report a series of children with upper extremity conversion disorder to raise awareness for this uncommon condition and to assist with its diagnosis and management.

**Methods:** A retrospective review was conducted of 4 pediatric patients with upper extremity conversion disorder at a tertiary pediatric hospital from 2015 to 2017. Medical records were reviewed for patient demographics, including psychiatric history, clinical findings, diagnostic studies, treatment, and cost of care.

**Results:** Patients presented with upper extremity muscle stiffness, unremitting dysmorphic muscle spasms, weakness, pain, very limited shoulder range of motion, and complaints of recurrent shoulder dislocations. All patients had been evaluated by multiple specialists and had an extensive prior diagnostic workup that was inconclusive. Two patients had a history of prior psychiatric illness and suicidal ideation, and all patients expressed despair and depression. All patients had normal physical examination findings under anesthesia. Two patients with muscle stiffness were treated with botulism injections and improved their shoulder range of motion. The average total charge for care since presentation was $42,729.

**Conclusions:** Conversion disorder should be considered in patients with an extensive prior diagnostic workup, deficits inconsistent with anatomic patterns or imaging findings, and a history of prior psychiatric illness. Examination under anesthesia is a successful diagnostic approach in children with suspected conversion disorder.

**Level of evidence:** Level IV; Case Series; Treatment Study



**Keywords:** Conversion disorder; pediatric; children; examination under anesthesia; psychiatric illness; hysterical paralysis; functional neurologic disorder; adolescent

Children with conversion disorder present a unique diagnostic and therapeutic challenge for orthopedic surgeons. Conversion disorder is a psychological illness in which patients have an alteration in physical function or appearance without an identifiable organic cause.[6] Although rare, conversion disorder is occasionally seen by orthopedic surgeons because the core symptoms are predominantly disruptions in motor function or joint mobility.[9] The correct diagnosis of this disorder may be perplexing for orthopedic surgeons because perhaps they are not formally trained in recognizing this rare condition. Clinical manifestations also vary significantly between patients.

The differential diagnosis for conversion disorder includes medical and neurologic disorders, malingering, and

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other psychiatric disorders. Organic pathologic processes must be excluded before a diagnosis of conversion disorder is made. A neurologic evaluation is often warranted. Clinicians may be hesitant to diagnose conversion disorder in fear of missing an organic etiology of a patient's symptoms.[17] Similar to conversion disorder, patients with factitious disorder, complex regional pain syndrome, and malingering patients all may have physical symptoms inconsistent with organic pathology.[5] The variety of conditions that present similarly to conversion disorder and the variable nature of symptoms of conversion disorder further obscures the diagnosis.

Early recognition of conversion disorder is essential to successful treatment. Orthopedic surgeons must be able to recognize conversion disorder to avoid the unnecessary diagnostic workups, surgery, and cost frequently associated with this condition.[9] Conversion disorder is often comorbid with other psychiatric illnesses, including depression and anxiety.[20] Patients with conversion disorder are at an increased risk for attempting suicide, with reported attempt rates ranging from 19.6% to 34.2%.[7,20] Misdiagnosis of this disorder may cause additional psychological stress and worsening symptoms in response to incorrect interventions.[10]

Studies have shown that early diagnosis, shorter duration of symptoms, and satisfaction with care predict positive outcomes for motor conversion disorder symptoms.[8] Treatment for conversion disorder begins with family education about the diagnosis. However, further treatment for these patients should be multidisciplinary and often requires psychiatric evaluation. Many patients benefit from various therapy modalities. A high index of suspicion for conversion disorder should prompt early referral for psychiatric evaluation because of the substantial incidence of comorbid psychiatric illness.

Conversion disorder tends to occur more often in children than adults.[9] However, reports of conversion disorder are rare in pediatric orthopedic literature and are primarily associated with low back pain.[12-14] The purpose of this study was to report a series of upper extremity conversion disorder cases in children and adolescents to raise awareness for this rare condition and to identify clinical features that assist in its diagnosis and management.

## Case reports

### Patient 1

A 16-year-old girl presented with progressive right shoulder stiffness, weakness, and pain. The symptoms began 11 months prior, after she sustained several right rib fractures while surfing. She was treated with right upper extremity shoulder immobilization. Prior workup by 3 orthopedic surgeons and a pain management specialist was inconclusive. This workup included a radiograph, magnetic resonance imaging (MRI) arthrogram, and electromyography (EMG) of her right shoulder that were within normal limits. An intra-articular injection provided partial temporary pain relief, and acupuncture provided no relief.

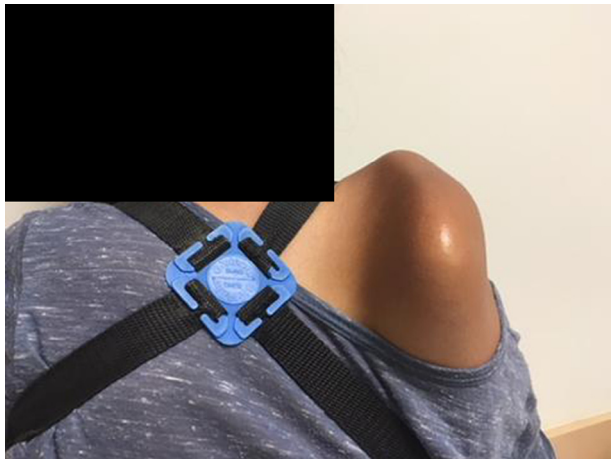

**Figure 1** Patient 1 (16-year-old girl). Significantly elevated and protracted right scapula on initial presentation. *Reproduced with permission from the Children's Orthopaedic Center, Los Angeles.*

The patient developed post-traumatic stress disorder (PTSD) due to a near drowning episode while surfing at the time of injury. She received 6 weeks of therapy and was prescribed sertraline. The patient was a high-performing student and the captain of her water polo team.

On examination, the patient held her arm adducted and internally rotated. Her scapula was elevated and protracted (Fig. 1). She lacked significant passive and active shoulder movement, with a total arc of motion of 10° of forward elevation, 5° of abduction, 0° degrees of external rotation, and 0° of internal rotation secondary to stiffness and pain. She had paresthesia in a nondermatomal distribution. Sensation was intact to light touch throughout. There was tenderness to palpation along the glenohumeral joint line.

The initial differential diagnosis included frozen shoulder, complex regional pain syndrome, and glenohumeral vs. scapular thoracic shoulder abnormality. The results of an MRI arthrogram and standard MRI of her right shoulder were within normal limits. An examination under anesthesia revealed full range of motion of her right upper extremity. Injection of botulism toxin into several muscles in her shoulder significantly improved her shoulder range of motion at 10-day follow-up.

Five days after an examination under anesthesia, the patient presented with suicidal ideation, intermittent catatonia, and hallucinations. Neurology and psychiatry evaluated the patient. Results of an MRI of the brain and electroencephalogram were within normal limits.

The patient improved with quetiapine. She maintained her range of motion, participated in physical therapy, and returned to water polo 6 months from the injury, 3 months after examination under anesthesia and botulism toxin injections. She works with a psychiatrist and counselor regularly and has nearly completely returned to preinjury function per child and parents.

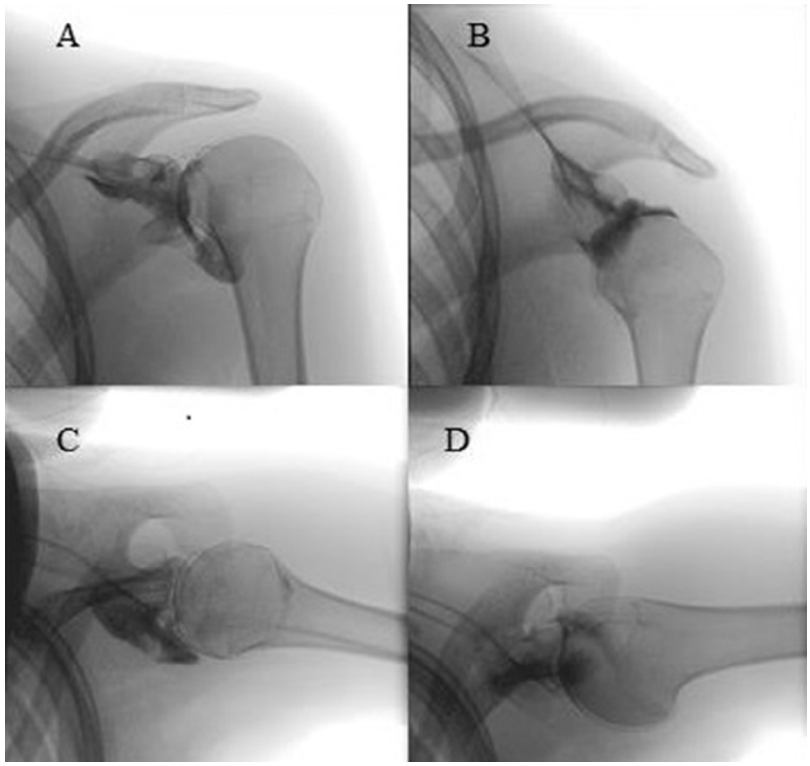


**Figure 2** Patient 2 (14-year-old girl). Left shoulder arthrogram during examination under anesthesia. No obvious anterior or posterior instability was noted. (**A**) Neutral position. (**B**) Sulcus position pulling the humerus inferiorly. (**C**) Axial view: anterior load and shift. (**D**) Axial view: posterior jerk test. *Reproduced with permission from the Children's Orthopaedic Center, Los Angeles.*

## Patient 2

A 14-year-old girl presented with recurrent left shoulder dislocation, weakness, and pain. The patient initially dislocated her left shoulder 2 years prior during a jiu-jitsu competition, causing axillary neuropraxia. She was treated with closed reduction and sling immobilization. Her sensation resolved, but pain and recurrent dislocation persisted. Prior workup by several orthopedic surgeons was inconclusive. An MRI of her left shoulder exhibited shoulder subluxation.

The patient was competing in jiu-jitsu on a national level and reported depression since her injury because it limited her performance. She attempted suicide 1 year before presentation. The patient saw a psychotherapist for anxiety due to her parents being separated, financial problems, and social trouble.

On examination, the patient had anterior subluxation of her left shoulder due to gravity. She held her left arm adducted internally rotated. Her humeral head subluxed anteriorly with external rotation. The patient had no motor function of her deltoid despite intact sensation throughout. Passive range of motion was intact. The patient underwent physical therapy and used a shoulder stabilization brace, taping, and a muscle stimulator. Diagnostic testing included an MRI arthrogram, 3 EMGs, and 2 MRIs of her left shoulder, the results of which were within normal limits. A pain management specialist thought the patient's pain might be secondary to anxiety and prescribed sertraline.

An examination under anesthesia and left shoulder arthrogram revealed normal range of motion and no instability (Fig. 2). The patient received psychotherapy and physical therapy. At the 3- month follow-up, the patient's instability had improved, but weakness remained. The patient had full symmetric passive range of motion and limited active range of motion (Table I).

## Patient 3

A 10-year-old girl with no history of trauma presented with 2 months of acute onset left shoulder stiffness, weakness, pain, and numbness. Evaluation by a primary care provider, general surgeon, 2 neurosurgeons, and 2 orthopedic surgeons was inconclusive. Prior imaging included a radiograph of her scapula, MRI of her chest, and MRI of her brachial plexus that were within normal limits. A computed tomography of her cervical spine showed a congenital C5-C6 fusion, but this was not believed to be the etiology of her symptoms.

On examination, the patient held her left arm adducted and internally rotated. She had minimal active and limited passive shoulder movement, with 30° of forward elevation and 0° of external rotation secondary to stiffness and pain. Sensation was intact to light touch. She had anterior shoulder tenderness

**Table I** Patient data

| Patient | Sex | Chief complaint | History of mental illness | Prior inconclusive diagnostic workup | Sensorimotor deficits fit anatomic pattern | Exam under anesthesia | Effective treatment | Total cost of care at this institution |
|---|---|---|---|---|---|---|---|---|
| 1 | Female | Muscle stiffness, weakness, and pain | Post-traumatic stress disorder | Yes | No | WNL | Botulism injections | $36,524 |
| 2 | Female | Recurrent dislocations, pain | Reported depression, suicide attempt | Yes | No | WNL | Physical therapy, psychotherapy | $47,988 |
| 3 | Female | Muscle stiffness, weakness, and pain | None | Yes | No | WNL | Amitriptyline | $32,603 |
| 4 | Male | Muscle stiffness, weakness, and pain | None | Yes | No | WNL | Botulism injections, interscalene block | $53,799 |

*WNL*, within normal limits.

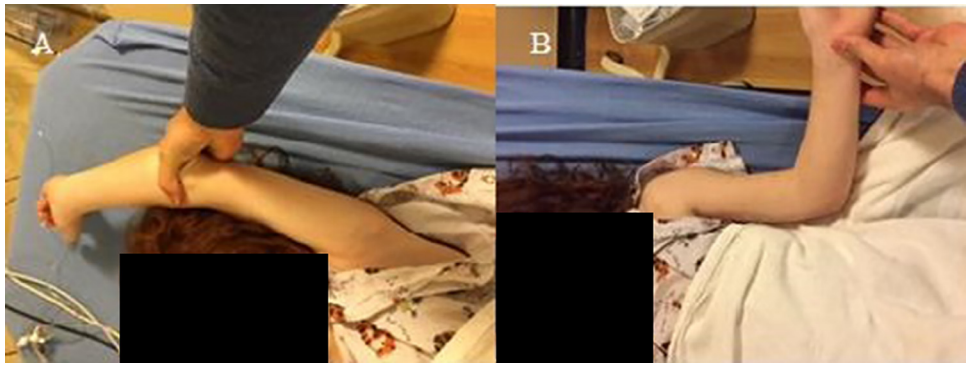


**Figure 3** Patient 3 (10-year-old girl). Examination under anesthesia. (**A**) Left shoulder forward elevation was 180°, and (**B**) left shoulder external rotation was 70°. *Reproduced with permission from the Children's Orthopaedic Center, Los Angeles.*

to palpation. Her examination changed when distracted. The patient had a left shoulder radiograph, MRI, MRI arthrogram, bone scan, EMG, flexion and extension radiographs of her cervical spine, arterial upper extremity ultrasound, and rheumatology laboratory testing (alkaline phosphatase, human leukocyte antigen B27, antinuclear antibody, and rheumatoid factor). The results of all of her testing and imaging were within normal limits. The initial differential included a viral infection, space occupying lesion, mechanical etiology, complex regional pain syndrome, reflex sympathetic dystrophy, and conversion disorder.

One week after presentation, the patient was admitted for severe pain preventing sleep. An examination under anesthesia revealed full range of motion of her left shoulder (Fig. 3). A pain specialist, psychiatrist, and neurologist evaluated the patient. The neurologist believed the symptoms lacked a neurologic etiology and prescribed the patient amitriptyline that effectively reduced night-time awakenings due to pain. At the 1-year follow-up, the patient's pain had resolved, and range of motion had considerably improved.

## Patient 4

A 15-year-old boy with no history of trauma presented with acute-onset progressive right shoulder stiffness, weakness, and pain for 3 months. He also reported decreased sensation in his fingers. Prior workup by an orthopedic surgeon and 2 neurologists was inconclusive. This workup included MRIs of the brain, cervical spine, brachial plexus, and shoulder, and a lumbar puncture, results of which were within normal limits. He had 2 EMG and nerve conduction studies that suggested a long thoracic nerve injury, after which he underwent a trial of steroids, with no improvement. However, his physical examination suggested more extensive involvement than the long thoracic nerve.

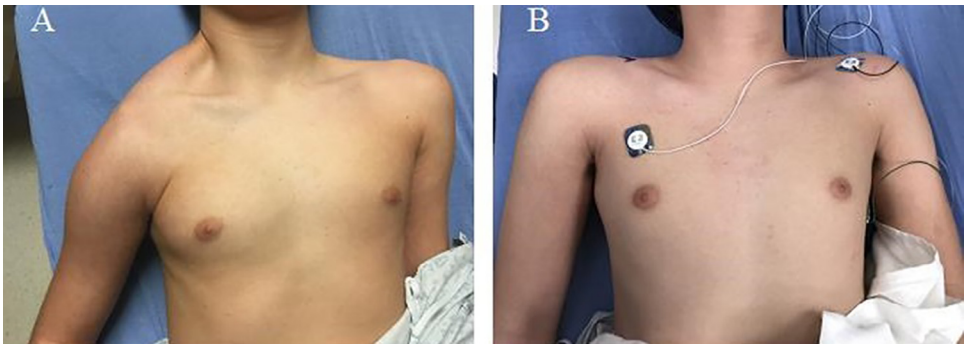


**Figure 4** Patient 4 (15-year-old boy). Examination under anesthesia. (**A**) Before the examination under anesthesia: right shoulder asymmetry with contralateral shoulder due to trapezius and pectoralis muscle spasms. (**B**) Symmetric appearance of shoulders under general anesthesia. *Reproduced with permission from the Children's Orthopaedic Center, Los Angeles.*

On examination, the patient's right shoulder had visual asymmetry with his contralateral shoulder due to spasms in his trapezius and pectoralis muscles. Atrophy of the pectoralis muscles, rhomboids, infraspinatus, supraspinatus, and deltoid was observed. His active and passive range of motion of his right shoulder was limited, with 60° of forward elevation and 60° of abduction secondary to stiffness and pain. Sensation was decreased to light touch on the right proximal upper extremity. He had tenderness to palpation of his right shoulder. The initial differential included acute flaccid myelitis, Parsonage-Turner, and viral brachial plexus neuritis. The patient was prescribed muscle relaxants, nonsteroidal anti-inflammatory drugs, physical therapy, and gabapentin, which provided no symptom relief.

The result of a shoulder radiograph was within normal limits. An MRI of the brachial plexus showed inflammation. A neurologist gave the patient a trial of intravenous immunoglobulin after repeat EMG findings suggested a diagnosis of Parsonage-Turner. However, the changes on EMG were less severe than his weakness on examination suggested. An examination under anesthesia revealed full range of motion (Fig. 4). An interscalene block and botulism toxin injections into the patient's pectoralis muscle and trapezius muscle was performed. At the 6-month follow-up, the patient's spasms were dramatically improved. He had full passive range of motion and mild weakness with active range of motion.

## Discussion

Conversion disorders can present clinical conundrums to orthopedic surgeons as well as consume a multitude of resources in efforts for elucidation of the correct diagnosis. Reports of conversion disorder of the upper extremity in children are rare in the orthopedic literature. Ikeda et al[13] reported a case of conversion disorder in a 17-year-old with flexion disturbance of his dominant middle finger. Cases of conversion disorder in children related to low back pain have also been described.[12,14] Limited cases of upper extremity conversion disorder have been reported in adults.[13,18,19,22,23] In addition, cases of conversion disorder in the lower extremity and after spine surgery have been described.[2,17,24] Despite the condition's rare occurrence, understanding its typical clinical features can allow for more rapid diagnosis, preservation of resources, and improved outcomes for patients.

A nonanatomic distribution of deficits on physical examination is suggestive of conversion disorder. All patients in this series had deficits that did not fit an anatomic pattern or could not be explained by abnormalities in diagnostic studies. Similarly, Lentonoff et al[17] reported a series of 3 patients diagnosed with conversion disorder with loss of motor control and sensation in their lower extremities despite normal deep tendon reflexes. Higuchi et al[12] described a patient with conversion disorder in which there was loss of motor and sensory function in both legs despite normal motor reflexes and no dystonic posturing. When inconsistencies in physical examination findings suggest a nonorganic etiology, physicians should assess patients for other clinical features typically observed in patients with conversion disorder.

Studies have identified similarities in the presentation of conversion disorder in children and adolescents. Patients with conversion disorder typically present after a prior extensive workup.[3] All patients in this series had been evaluated by specialists in multiple disciplines and had undergone numerous inconclusive diagnostic tests before presentation. Although clinical manifestations of conversion disorder vary markedly between individuals, studies have observed that 63% of children with conversion disorder present with disturbances in motor function.[1,15] However, pediatric patients with conversion disorder are typically multisymptomatic, with 64% reporting more than 1 symptom.[15] Pain and lethargy usually accompany loss of motor function.[9] All of the patients in this series complained of pain accompanying their motor symptoms. Other manifestations include nonepileptic seizures, anesthesia/paresthesia, diminished consciousness, visual loss, limb paralysis, loss of speech, and hearing loss.[1]

Studies have also found 71% to 75% of children with conversion disorder are girls.[1,15] Three of the 4 patients in this

series were girls. It is also common that children with conversion disorder are high achievers in academics and sports.[9] In our series, patient 1 was a high-performing student, and patient 2 competed in martial arts on a national level. Recognition of some of these typical features may assist a physician's diagnosis of conversion disorder.

The sudden appearance of symptoms after physical or emotional trauma should also increase a physician's suspicion for conversion disorder. Studies have postulated that physical and emotional trauma both have a role in the pathogenesis of conversion symptoms.[1,21] A study reported antecedent stressors in 81% of children with conversion disorder.[1] Patient 1 had a near drowning episode at the time of injury that led to PTSD. Patient 2 reported depression due to her initial injury limiting her performance in martial arts. Although the precise mechanism of motor symptoms in conversion disorder is unknown, recent evidence suggests that conversion symptoms involve selective activations in brain regions involved in emotional regulation.[4] Orthopedic surgeons do not typically have knowledge about a patient's psychological state, but investigating this may be beneficial for them if there is suspicion for conversion disorder.

Conversion disorder is a diagnosis of exclusion. Neurologic evaluation is often warranted. Although organic etiologies must be ruled out through appropriate diagnostic testing, unnecessary testing and cost is frequently associated with this disorder.[9] In this series, the average total charge for care was $42,729. Physical symptoms lacking an organic basis can also be manifestations of several other conditions. Complex regional pain syndrome is characterized by pain out of proportion with history and physical examination findings. A significant number of pediatric patients with complex regional pain syndrome have comorbid conversion disorder; however, complex regional pain syndrome is distinguished by the presence of autonomic dysfunction.[11]

Malingering patients and patients with factitious disorder also present with symptoms that lack an organic basis; however, their symptoms are feigned. Malingering patients feign symptoms for external benefit, whereas patients with factitious disorder seek a patient role.[5] Inconsistency between reported and perceived function, lack of treatment adherence, and the potential for obvious external benefit should raise a physician's suspicion for these conditions.

Once organic etiologies are ruled out, an examination under anesthesia may help diagnose conversion disorder. All patients had normal physical examinations under anesthesia. Similarly, 2 studies reported patients with contractures secondary to conversion disorder whose contractures released under general anesthesia.[13,19] After a diagnosis of conversion disorder is made, treatment begins with family education about the diagnosis. Sometimes identifying the stressors that precipitated the conversion symptoms helps resolve the symptoms.[17]

It has been reported that 90% of children with conversion disorder have an improvement in neurologic symptoms at 1 year.[1] However, if not treated appropriately, residual organic sequela can occur, including contractures from a flexed immobile extremity.[17] Consequently, patients 1 and 4 received trapezius, pectoralis, and latissimus botulism injections to improve their muscle stiffness. At follow-up, both patients had a dramatic improvement in range of motion.

Although some children's symptoms resolve quickly without intervention, others have prolonged illness and require psychiatric evaluation.[9] One study found that at 1 year after diagnosis, 28% of pediatric patients with conversion disorder had been diagnosed with a new psychiatric illness.[1] Furthermore, conversion disorder is often comorbid with psychiatric illness. Another study of children with conversion disorder found a history of mental illness in 42% of patients, with 14% of patients taking psychotropic medications for anxiety or depression.[15] In this series, patient 1 developed PTSD after her initial injury and was admitted for psychiatric illness after her examination under anesthesia. Patient 2 had a history of a suicide attempt and reported depression since her injury.

Owing to the significant proportion of pediatric patients with conversion disorder suffering from a comorbid psychiatric illness, we recommend a low threshold for psychiatric evaluation. Treatment for these patients should be multidisciplinary and can include psychotherapy, pharmacotherapy, family therapy, physical therapy, and occupational therapy.[9] Medication can sometimes be an effective treatment for conversion disorder, especially in patients with comorbid anxiety or depressive disorders. Antidepressants are most commonly used.[16]

## Conclusions

Conversion disorder is rare, but orthopedic surgeons must be aware of the condition to limit the unnecessary diagnostic testing, treatments, and cost it is frequently associated with. Conversion disorder should be suspected in patients who present with a nonanatomic pattern of sensorimotor deficits and an extensive prior inconclusive diagnostic evaluation. Owing to the history of trauma, complexity of symptoms, and risk of suicidal ideation, expenses for diagnostic workup and multiple medical and therapeutic visits are likely unavoidable. In patients whom conversion disorder is suspected, an examination under anesthesia may help diagnose the disorder. Although these patients require an extensive workup for organic pathology, expedited recognition of conversion disorder and early psychiatric evaluation still have the potential to limit unnecessary testing and may improve patient outcomes. The role of adjunctive botulism toxin injections into these normal muscles subjected to abnormal use requires further study. Correct diagnosis and treatment can improve time to recovery for these children and adolescents.

## Disclaimer

The authors, their immediate families, and any research foundation with which they are affiliated have not received any financial payments or other benefits from any commercial entity related to the subject of this article.

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