Austin Journal of Clinical Case Reports

Open Access

Austin Publishing Group

Case Report

Congenital Mirror Movements in 2-Year-Old Male: A Case Report

Sharma K*
Department of Pediatrics, Columbia University School of Nursing, USA

***Corresponding author:** Sharma K, Columbia University School of Nursing, Department of Pediatrics, USA

Received: November 16, 2020; **Accepted:** December 08, 2020; **Published:** December 15, 2020

Abstract

Congenital Mirror Movement disorder (CMM) is a rare neuromuscular condition presenting as mirrored movement of the upper extremity with voluntary action of the opposite limb. It is relatively benign but has been associated with pain and an inability to engage in some activities. Mirrored movements are often isolated to the hand and fingers, though they can be seen in the toes. The condition is associated with mutations of the DCC, RAD51, and DNAL4 gene families, and is familial with an autosomal dominant pattern of inheritance. In this article a 2-year-old male with a familial history of moderate CMM is presented. This case study will review the pathophysiology, common clinical manifestations, and treatment options for CMM.

Keywords: Congenital Mirror Movements; Mirror Movement Disorder; Pediatric

Abbreviations

Congenital Mirror Movement Disorder (CMM); Mirror Movements (MM); Neonatal ICU (NICU)

Background

Congenital Mirror Movement Disorder (CMM) is a rare neuromuscular condition characterized by involuntary bilateral movements of the fingers and wrists. Unlike mild Mirror Movements (MM) of childhood, which gradually disappears over the first ten years of life, CMM presents at birth and persists into adulthood [1]. It is a relatively benign condition, and its prevalence is unknown [2]. CMM is a familial disease, characterized by an autosomal dominant inheritance pattern but some instances of sporadic CMM have been reported [3]. The condition is usually isolated without associated comorbidity [4,5] though it can be a symptom of underlying neurological pathology [6,4,7]. Symptoms of CMM range in severity, presenting anywhere from mild pain or cramping with prolonged activity to a complete inability to engage in sports or play musical instruments due to pain and discoordination [3]. Educating primary care providers with regards to early recognition and management of CMM, an often overlooked condition, will improve the quality of life for children with this disorder.

A 2.5-year-old Caucasian male is presented in this article with a history of persistent involuntary bilateral movement of the upper limbs, notably in the hands and fingers. Parents report he was delayed in his speech development, however that resolved at two years of age. There are no other reports of emotional or gross- or fine-motor delay. This examines the clinical manifestations, diagnostic reasoning, pathophysiology, and standards of treatment for children with CMM.

Case Presentation

History of Present Illness

A two-year-old Caucasian male presents with his mother for a well visit. The mother is concerned for involuntary bilateral hand movements. The mother states when "he opens one hand the other opens, too", and that his "fingers move symmetrically".

Developmental History

According to his mother the patient began crawling in a "scooting" pattern, using both arms symmetrically to pull himself forward; this resolved at around one year, when he began to stand and walk with assistance. The patient demonstrated an early clumsiness due to his involuntary movements, frequently struggling to hold onto an object with one hand while releasing the other. However, he displayed strong fine motor skills, easily mastering the pincer grasp and reaching all developmental milestones. His preschool teachers have expressed concern over gross motor development, noting that he does not jump or run as readily as his classmates, and that he sometimes loses his balance.

His mother reports that as he has aged his symptoms have decreased in severity. His mother reports similar movements as a child, decreasing in severity as she aged. She currently demonstrates fractioned mirroring which she states does not interrupt her daily life.

Past Medical History

The patient is an ex-39 week male. His history is significant for birth by cesarean section due to breech presentation, which did not require admission to the NICU. He was discharged two days post delivery. His mother confirms taking prenatal vitamins and denies any other complications with the pregnancy. It was her first pregnancy. He received all his vaccinations.

The patient has one hospital admission in 11/2017 for pneumonia. He was discharged three days later with no further complications. He has taken one international trip to Barcelona in September of 2017. All immunizations are up to date.

Family History

The mother had bilateral involuntary movements present in infancy which decreased in severity over time. She has never been

Citation: Sharma K. Congenital Mirror Movements in 2-Year-Old Male: A Case Report. Austin J Clin Case Rep. 2020; 7(6): 1186.

formally diagnosed with CMM. She was forced to give up playing musical instruments due to her condition but denies any chronic pain or other handicap.

Neither grandparent has a history of mirrored movements or other neurological abnormalities.

The father has no significant medical history.

The family history is otherwise unremarkable.

Physical Exam

The patient has a strong vocabulary and speaks in fragmented sentences. He shows no cognitive or behavioral delays. A full neurological exam was significant for bilaterally mirrored movements. Mirroring is seen primarily in the fingers and palms, though there is some symmetry in the movement of the upper limbs. The patient demonstrates mirroring with voluntary actions, such as grabbing a pencil or drawing. Passive movement of the hands does not cause a mirrored reaction.

The physical exam is otherwise unremarkable.

Discussion

Manifestations of CMM

The hallmark characteristic of CMM is voluntary movement of the distal extremities accompanied by a mirroring movement on the opposite side, which does not resolve by the 10th year of life [8]. These movements are usually isolated to the upper limbs, but mirroring in the feet and toes has been documented [9]. Bimanual tasks become difficult; one study showed an inability by participants with CMM to twirl the finger of one hand while tapping the finger of another, though the presentation and severity varies significantly by case [8]. Multiple phenotypes of CMM have been categorized, including "actual" (with visible mirroring accompanying each movement), "fractioned" (mirroring was reduced in severity, or seen with only certain actions), and "sub-clinical" (mirroring detectable by sensors, but not distinguishable to the naked eye) [5]. These phenotypes have been associated with distinct genotypes. Passive movement has not been seen to cause motor movements in any CMM phenotype; only voluntary action seems to have a response [10].

The criteria for diagnosis of CMM as opposed to mirror movement of childhood is a) onset in infancy, b) presentation predominantly in the upper libs, increasing in severity from proximal to distal and always involving the fingers and hands, and c) moderate disability in daily life, which prevents the patient from performing tasks requiring bimanual dexterity and coordination. Diagnosis can be further confirmed with genetic testing for mutations of the DCC, RAD51, and DNAL4 genes, though cases without the involvement of these genes have been reported [11].

Pathophysiology

The pathophysiology of CMM is not fully understood. Research has found a connection between CMM and abnormal ipsilateral corticospinal tracts causing motor signals sent from the brain to travel not just contra laterally from the stimulated hemisphere, but ipsilaterally as well [12,13]. For the most part, patients will have unremarkable neurological exams, and MRIs show none of the abnormalities commonly found in conditions associated with mirror movements, such as spinal lesion, corpus callosum abnormalities, or brainstem changes [8,9,14]. Some individuals with CMM have a notable decrease in lateralized readiness potential, resulting in a slightly longer planning time before initiating an action [2].

Genetics

There is a strong genetic component to CMM. The condition is familial, likely with an autosomal dominant inheritance pattern. Thus far, mutations in the DCC, RAD51, and DNAL4 have been linked to CMM, though in many cases the individual's genotype is unknown [5]. There is a relationship between mutation location and the severity of the conditions, with RAD51 often associated with the most severe cases of CMM. Currently there is no diagnostic testing required for the diagnosis of CMM. Diagnosis is based on patient presentation and family history, with genotyping optional but not required.

Management

Treatment of CMM is sparsely studied. Currently there is no known treatment for CMM [15]. There are routes of treatment that may be beneficial, but thus far research has not explored them thoroughly. Pain management techniques are important; parents can offer hot and cold packs for mild muscle pain, and NSAIDS should be prescribed for moderate pain related to prolonged manual activity [16].

There is great potential for studies looking at the benefits of therapy on CMM. Research has shown that movement therapy may be beneficial in assisting patients with congenital hemiparesis and ipsilateral corticospinal projections [17]. A handful of studies have looked at transcranial magnetic stimulation as a way to decrease the severity of mirror movements with variable success [18-20].

Conclusion

This patient warranted a referral to neurology for evaluation, to rule out any underlying causes of his mirroring. He was referred to Early Intervention as well; where it was determined he qualified for physical and occupational therapy. Thus far he does not require accommodations for preschool based on his CMM. It is crucial to follow-up with this patient at annual health supervision visit unless concerns arise.

Congenital mirror movement disorder is a condition that deserves our attention and research. Though relatively benign, there are serious effects to the quality of life associated with CMM. CMM can cause pain and cramping after prolonged activity, it can make it difficult for children to complete schoolwork or take tests. It prevents children and adults alike from engaging in activities and can be a source of frustration for patients and parents alike.

Children with CMM should be given accommodations for test taking and other activities that require bimanual coordination or could cause pain and cramping in the upper limbs. Providers may recommend they be allowed to opt out of tasks they find particularly challenging or which require bimanual coordination. There is a risk for stigma and bullying related to the involuntary motions associated with CMM, which the primary care nurse practitioner should address during annual visits. Parents and children should be reassured that CMM does not indicate a cognitive disability, though they should also know to inform the provider if any abnormal symptoms develop [21].

References

1. Depienne C, Bouteiller D, Meneret A, Billot S, Groppa S, Klebe S, et al. RAD51 haplo insufficiency causes congenital mirror movements in humans. The American Journal of Human Genetics. 2012; 90: 301-307.
2. Franz EA, Fu Y. Pre-movement planning processes in people with congenital mirror movements. Clinical Neurophysiology. 2017; 128: 1985-1993.
3. Depienne C, Cincotta M, Billot S, Bouteiller D, Groppa S, Brochard V, et al. A novel DCC mutation and genetic heterogeneity in congenital mirror movements. Neurology. 2011; 76: 260-264.
4. Sag E, Gocmen R, Yildiz FG, Ozturk Z, Temucin C, Teksam O, Utine E. Congenital mirror movements in Gorlin syndrome: a case report with DTI and functional MRI features. Pediatrics. 2016; 137: e20151771.
5. Franz EA, Chiaroni-Clarke R, Woodrow S, Glendining KA, Jasoni CL, Robertson SP, et al. Congenital mirror movements: phenotypes associated with DCC and RAD51 mutations. Journal of the neurological sciences. 2015; 351: 140-145.
6. Webb BD, Frempong T, Naidich TP, Gaspar H, Jabs EW, Rucker JC. Mirror movements identified in patients with Moebius syndrome. Tremor and Other Hyperkinetic Movements. 2014; 4.
7. Manara R, Di Nardo F, Salvalaggio A, Sinisi AA, Bonanni G, Palumbo V, et al. Spectral signatures of mirror movements in the sensori-motor connectivity in kallmann syndrome. Human brain mapping. 2018; 39: 42-53.
8. Franz EA. Bimanual action representation: A window to human evolution. Taking action: Cognitive neuroscience perspectives on intentional acts. 2003; 259-288.
9. Srour M, Philibert M, Dion MH, Duquette A, Richer F, Rouleau GA, et al. Familial congenital mirror movements: report of a large 4-generation family. Neurology. 2009; 73: 729-731.
10. Heim J, Vemuri A, Salih MA, Kruer MC. Movement Disorders in Childhood. In Clinical Child Neurology. 2020; 149-173.
11. Gallea C, Popa T, Billot S, Meneret A, Depienne C & Roze E. Congenital mirror movements: a clue to understanding bimanual motor control. Journal of neurology. 2011; 258: 1911-1919.
12. Solmaz B, Ozyurt MG, Ata DB, Akcimen F, Shabsog M, Turker KS, et al. Assessment of the corticospinal fiber integrity in mirror movement disorder. Journal of Clinical Neuroscience. 2018; 54: 69-76.
13. Gallea C, Popa T, Hubsch C, Valabregue R, Brochard V, Kundu P, et al. RAD51 deficiency disrupts the corticospinal lateralization of motor control. Brain. 2013; 136: 3333-3346.
14. Cincotta M, Ragazzoni A, De Scisciolo G, Pinto F, Maurri S, Barontini F. Abnormal projection of corticospinal tracts in a patient with congenital mirror movements. Neurophysiologie Clinique/Clinical Neurophysiology. 1994; 24: 427-434.
15. Gupta N, Jain P, Singh K. Congenital Mirror Movements in a 7-Year-Old Boy. Pediatric neurology. 2015; 53: 543-544.
16. Rajapakse D, Liossi C, Howard RF. Presentation and management of chronic pain. Archives of disease in childhood. 2014; 99: 474-480.
17. Kuhnke N, Juenger H, Walther M, Berweck S, Mall V, Staudt M. Do patients with congenital hemiparesis and ipsilateral corticospinal projections respond differently to constraint-induced movement therapy?. Developmental Medicine & Child Neurology. 2008; 50: 898-903.
18. Jang SH, Kwon HG. Decrement of mirror movements by repetitive transcranial magnetic stimulation in a patient with porencephaly. Neurosciences. 2016; 21: 170-172.
19. Srour M, Philibert M, Dion MH, Duquette A, Richer F, Rouleau GA, et al. Familial congenital mirror movements: report of a large 4-generation family. Neurology. 2009; 73: 729-731.
20. Kim HS, Jang SH, Lee ZI, Lee MY, Cho YW, Kweon M, Son SM. Therapeutic benefit of repetitive transcranial magnetic stimulation for severe mirror movements: A case report. Neural regeneration research. 2013; 8: 569-574.
21. Meneret A, Welniarz Q, Trouillard O, Roze E. Congenital mirror movements: from piano player to opera singer. Neurology. 2015; 84: 860-860.