MIRROR MOVEMENT: A CASE REPORT

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Abstract:
Mirror movement is an interesting but often overlooked neurological soft sign; these movements are described as simultaneous contralateral, involuntary, identical movements that accompany voluntary movements. This neurologic problem is very rarely seen in children; in familial cases there is a positive history of these movements in parents, diminishing with time. Here, we have presented the case of an 11-year old girl with mirror movements in her upper limbs which interfered with her hand writing. Her neurological examination revealed normal results. In this report, we have tried to explain some of the pathophysiologic mechanisms related to these abnormal movements.

Keywords: Mirror Movements, Children, Soft neurologic sign

Introduction

Mirror movements are neurologic soft signs (1). These movements have been described as simultaneous contralateral, involuntary, identical movements that accompany voluntary movements. While it was Erlenmeyer who first applied the term mirror movements in 1879, the first description of these movements as "involuntary, synkinetic mirror reversals of an intended movement of opposite side", was given by Cohen et al, in 1991(1,2). Three types have been identified, the hereditary, the form associated with other neurological diseases, and the third, the sporadic form. There are two main hypotheses concerning the cause of mirror movements; according to the first, mirror movements result from an abnormal development of the ipsilateral corticospinal tract and the second states that mirror movements result from a lack of transcallosal inhibition. There are some reports that in sporadic and hereditary forms, the severity of the problem diminishes with increasing age(1,2,4,5).

Case report

An 11-year old right handed girl, with a history of normal development, presented with the complaint that when she attempted to move one hand, her contralateral hand, too, moved in the same direction. These abnormal movements affected her upper extremities, her hands and fingers in particular, while her lower limbs were spared; the involuntary movements interfered with her hand writing. With time, the severity of these movements did eventually decrease. Neurodevelopmentally, the girl was normal and her parents had no history of these movements. Her past medical history revealed nothing unusual and no remarkable signs were found in her examination; a detailed neurologic examination also revealed completely normal findings. Following admission in our hospital for further evaluation, her laboratory data, brain MRI(Magnetic Resonance Imaging), and EEG (Electroencephalography)

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yielded normal results.

Discussion

Mirror movements are involuntary movements that occur in homologous contralateral muscles on voluntary activation but rarely during involuntary movements. These are normal in children but do not usually persist beyond 10 years of age(1,2). Three types of these movements have been reported, the Sporadic the Familial and the Persistent mirror movements associated with other neurologic disorders. Disorders known to be associated with persistent mirror movements are the Klippel-Feil Syndrome, phenylketonuria, Friedreich's ataxia, schizophrenia, agenesis of the corpus callosum, and the Usher and Kallmann syndromes. The characteristics of congenital mirror movements are (given in table in table 1) as follows(1,2):

• Predominant or exclusive involvement of the hands, especially the fingers
• Present on active movement, rarely, on passive movement
• Mirror movement of lesser amplitude than that of voluntary movement
• Occasional asymmetry of response; mirroring more evident on one side than the other
• Increase in the mirror movements with effort
• Partial suppressibility
• Noticed early and non-progressive after childhood
• May be hereditary (often autosomal dominant) or sporadic

"Mirror movements" first applied in 1879, as a term by Erlenmeyer, were defined in 1991, by Cohen et al as "involuntary, synkinetic mirror reversals of an intended movement of opposite side" (1.2).

Although the precise pathogenesis of these movements is unknown, some hypotheses available are: 1) Immature myelination of corpus callosum, 2) abnormal development of the ipsilateral corticospinal tract and 3) lack of transcallosal inhibiton(3,5). Disappearance of these movements with age supports the first hypothesis. Other investigations support the second and third pathogeneses suggested.

Sahin A, et al reported a case of polymicrogyria with increased mirror movements after epileptic seizure;(6) they suggested that epileptic seizures increase mirror movements by inducing cortical reorganization. In young children, functional ipsilateral, corticospinal projections have been demonstrated with transcranial magnetic stimulation(7). A successive maturation of transcallosal inhibitory projections, through which each hemisphere suppresses the uncrossed descending pathways of the other hemisphere, can explain the age-dependent reduction of mirror activity in children without disabilities. Recent data, however, suggest that bilateral cortical activation is the main cause of mirror activity in healthy non-disabled children. Bilateral activation probably results from a lack of interhemispheric inhibition, which normally suppresses the motor cortex, ipsilateral to the active hand. With increasing age, cortical activity becomes more lateralized as interhemispheric inhibition becomes more powerful; yet, even in adults, during unimanual tasks, some bilateral activation of cortical motor areas have been detected using brain imaging techniques(7).

Mayston M J et al, following a neurophysiological study concluded that the simultaneous EMG (Electromyography) activity, recorded in the left and right hand during a unimanual task is produced by simultaneous activity transmitted by the fast-conducting contralateral projection of the corticospinal tract from both the left and right motor cortices(8).

RamavhandranNair R et al, in 2006, reported a case of mirror movements in a child with intractable epilepsy, following cortical resection of polymicrogyria; his neurophysiologic studies supported the existence of a transcallosal inhibitory pathway connecting homologous motor cortical neurons(10).

There are some reports of hereditary, congenital mirror movement; Chan Y C and Ho K H, reported a 20-year-old male Singaporean army recruit with hereditary, congenital mirror movements who presented with difficulties in military training because releasing the grip of one hand resulted in a similar release by the other hand. His father has mirror movements with a significant decrease in symptoms with time(2).

In 2002, Bhattacharya A and Lahiri A, reported twenty three patients with classic mirror movements, studied over a period of six years; five patients had cerebral palsy,

4 - symptomatic epilepsy, 3 - cranio-vertebral anomaly, 4 - Parkinson's disease, 4 - cerebrovascular disease, and 3 of them had obsessive-compulsive disorder(1).

In our case, the patient's parents had no history of disabling mirror movements, leading us to consider her case to be a sporadic form of mirror movement; her abnormal movements were produced by voluntary actions and her writing skills were being hindered.

Some investigators have reported a marked reduction of mirror movements after training, suggesting that unwanted mirror activity in the ipsilateral pathway can be suppressed by learning(11).

After 2 years of follow up, the abnormal movements our patient was suffering from have decreased and she is quite comfortable with hand writing.

Conclusion

To conclude, mirror movements are neurologic soft signs, rarely seen in clinical practice. In sporadic and familial cases these movements will decrease with age but if these movements disturb the daily skills of the individual, special training might help the patient, as demonstrated in our case.

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