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"On the Other Hand": A Case of Hereditary, Congenital Mirror Movement

Y C Chan, K H Ho

ABSTRACT

We describe 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, a phenomenon that has not been previously described. Both father and son have no associated neurological abnormalities. Bilateral cortical representation for hand muscles and the presence of active ipsilateral corticospinal projections have been postulated as the mechanisms responsible for this condition.

Keywords: hereditary, congenital mirror movements, ipsilateral corticospinal projections, incomplete pyramidal decussation, bilateral cortical representation

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CASE REPORT

A 20-year-old Chinese man undergoing military service in Singapore was referred for a neurological opinion after having persistent problems tackling part of the standard army obstacle course. He repeatedly fell from the "monkey bars", where one is required to cross between two points at a height by swinging from hand to hand gripping a series of horizontal bars. However, he was strong enough to support his body weight and battle load with one hand. His military instructors were extremely sceptical of his explanation that his arms mirrored each other's movements and that releasing the handgrip on one side resulted in a similar release movement in the other. The battalion medical officer was unfamiliar with this condition and referred him for a specialist opinion.

The patient's arms had exhibited mirror movements from childhood. His father is similarly affected. He is an only child, and no other family history of a similar condition was present. His birth history and childhood development were unremarkable. Before beginning military service, he had worked in an ice cream parlour, and recalled at that time having difficulty holding tubs of ice cream with one hand while scooping ice cream with the other. Nevertheless, he insisted that his condition had caused little handicap or embarrassment until he joined the army.

Examination was normal except for the presence of mirror movements in the upper limbs. The legs were spared. The mirrored movements were of smaller amplitude than voluntary movements, increased with increasing effort and were partially suppressible. The most clearly mirrored movements were in the fingers and with forearm pronation and supination. Passive movement of the arms did not produce mirroring.

Magnetic resonance imaging of the brain, X-rays of the cervical spine and sex hormone profile proved normal. Transcranial magnetic stimulation over both motor cortices did not show ipsilateral activation of the small hand muscles even with reinforcement, although a prominent ipsilateral silent period was demonstrable.

We also examined the patient's father, a 47-year-old businessman. Asymmetry of the mirror response was noted, with the mirror response of the opposite hand to active movement of the left being of a lesser extent than the reverse situation. A mild mirroring response in the left toes occurred when he was asked to pick up a 1 cm diameter bead with the right toes. He was positive that his mirror movements had started to diminish gradually after his mid-thirties and estimated that the problem was only about a third of its original severity.

DISCUSSION

Mirror movements are involuntary movements that occur in homologous contralateral muscles on voluntary activation. These are normal in children but do not usually persist beyond 10 years of age. Persistent mirror movements have been associated with Klippel-Feil Syndrome, phenylketonuria, Friedreich's ataxia, schizophrenia, agenesis of the corpus callosum, Usher Syndrome and Kallmann Syndrome[1]. Familial and sporadic cases without associated abnormalities have also been reported. The characteristics of congenital

Division of Neurology National University Hospital, Singapore 5 Lower Kent Ridge Road Singapore 119074

Y C Chan, MBBS, MRCP
Registrar

K H Ho, MRCP, FAMS
Visiting Consultant

Correspondence to:
Dr Y C Chan
Tel: (65) 6779 5555
Fax: (65) 6779 4112
Email: chanyc@nuh.com.sg

Table I. Characteristics of congenital mirror movements[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

cases are summarised in Table I. To our knowledge, the progressive amelioration of symptoms with time in our patient's father has not been previously reported.

The condition does not usually cause significant functional problems[1,2], and our patient had not experienced significant disability until the fateful "monkey bar" exercise. The increased effort of gripping and releasing the hands while bearing his body weight exacerbated the mirroring of hand movements. Previous reports have mentioned difficulties with typing, piano playing and climbing ropes, while a nurse kept dropping vials held in one hand while drawing up solutions into a syringe with the other[2].

Transcranial magnetic simulation of the motor cortices produces contralateral hand muscle responses in normal individuals but can evoke bilateral responses in patients with mirror movements[3]. The ipslateral and contralateral evoked potentials elicited have similar latencies. These findings suggest the existence of a bilateral cortical representation for hand muscles and the presence of active ipsilateral corticospinal projections. Incomplete pyramidal decussation has been suggested[3,4].

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