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# Atypical motor behavior in a poststroke subject with agenesis of the corpus callosum: A case report

## *Comportement moteur atypique dans un patient post-AVC avec agénésie du corps calleux : une étude de cas*

*Keywords:* Bimanual movements; Corpus callosum; Hemiparesis; Interhemispheric communication; Interlimb coordination; Stroke rehabilitation

*Mots clés :* Mouvements bimanuels ; Corps calleux ; Hémiparésie ; Communication interhémisphérique ; Coordination inter-membres ; Réadaptation après AVC

## 1. English version

### 1.1. Introduction

The corpus callosum connects both the cerebral hemispheres and plays a vital role during their independent processing. It integrates information between both the hemispheres and is responsible for interhemispheric communication [4,41,42]. Additionally, it coordinates the multiple areas of brain for successful motor performance [7,24] The function of corpus callosum is significant during intensive bimanual coordination [26,28,32,34,37]. One hemisphere inhibits the other through corpus callosum during unimanual motor performance. The same callosum facilitates disinhibition between the hemispheres during bimanual activity [41].

Developmental absence or agenesis of the corpus callosum (ACC) is a neurodevelopmental congenital disorder commonly reported in females [2,14]. The absence may occur in isolation or with other conditions [39]. The development of corpus callosum fibers gets completed by the age of 6–8 years of life [9]. Hence, its role is also supported for handedness and laterality functions [34].

ACC exhibits delayed motor development, difficulty with balance, awkwardness during bimanual movement, large head size, low muscle tone, poor depth perception, reduced pain perception, sleeping difficulties, and either left or mixed handedness [26]. It is also evident that ACC may be associated with mental retardation, diverse neurological and psychiatric symptoms with or without hyperactive disorders [46]. Clients with ACC exhibited impairment in intelligence, cognitive-sensory-motor processing, attention, decision-making and executive functions [23,18,19,27,35,6].

The relation between stroke and ACC is unclear. Although impairment related to ACC is widely mentioned in the literature, the deficit in a poststroke patient with ACC is sparsely available [21,22]. The aim of the present case report was to focus atypical motor behavior in a poststroke subject having congenital ACC. The other objective was to examine the effect of interlimb coordination based occupational therapy in poststroke subject with ACC.

### 1.2. Case description

A 28-year-old female, postgraduate student had an episode of stroke. She could not stand and walk and presented with severe weakness on the right side of body. Stroke was diagnosed by a neurologist, as an acute event of cerebrovascular origin causing focal or global neurological dysfunction lasting for more than 24 hours, and confirmed by computed tomography [11]. Computed tomography (CT) scan showed hypodensity in the left ganglionic capsular region and subcortical parietal region suggestive of ischemia along with absence of the corpus callosum (Fig. 1). The subject had undergone inpatient care and standard medical management.

Prestroke, she had been facing the acute and severe episodes of migraine headache (especially during academic examinations and any other stressful situations) for few years. Her prestroke MRI revealed agenesis of corpus callosum (Fig. 2a–c). She had been prescribed non-steroidal anti-inflammatory drugs for the headache. Her childhood history revealed obesity, large head size and delayed milestones. She started walking at the age of 2 years with an atypical gait pattern in form of mild scissoring and extra body weight on her toes of the feet. Her mother also informed about insignificant behavioral issues as forgetfulness, aggressiveness and irritability. The subject informed that her handwriting (dominant, right hand) quality and speed was poorer than the other classmates during the student life prior to the stroke. She had difficulty in bimanual tasks. Such tasks were either time consuming or being avoided due to poor quality of performance. However, the quality of bimanual asymmetrical tasks was better than the symmetrical tasks.

Poststroke, she had not taken any specific rehabilitation management and discontinued her studies. After many months she reported to the occupational therapy unit at study site. Her motor impairment was stabilized during the last few months.

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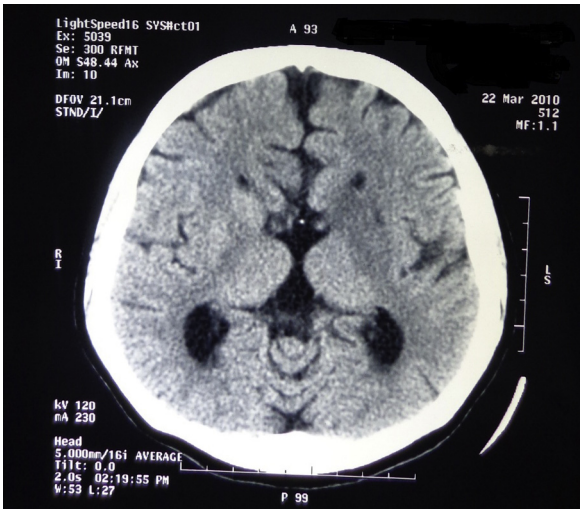


Fig. 1. CT scan showing hypodensity in the left ganglionic capsular region and subcortical parietal region along with absence of the corpus callosum.

Her chief complaints were in ability to hold a pen with the affected side and impairment in performing bimanual daily tasks such as folding cloths, kneading dough, plating hair and using keyboard. The subject scrambled few words when she was made to hold the pen by the affected hand. She was preparing for a professional entrance examination to become a school teacher. She was practicing with her less-affected hand (non-dominant, left side); however, with compromised speed and quality. The difficulty in performing bimanual and writing activities was the rationale for her reporting.

Clinically, it was observed that whenever the subject moved her affected arm in any direction, her left side (less-affected) also moved reflexively in an unusual pattern. Every time she made an effort by the affected hand similar hand movements appeared on her less-affected side. For instance, while pouring water from bottle to glass by the affected upper extremity, the less-affected upper extremity passed behind the body (shoulder adduction, extension and internal rotation; elbow flexion; wrist dorsiflexion and clawing of fingers with thumb in palm). Similarly, while picking up small objects such as beads by the paretic hand the less-affected arm passed behind the body; however, there was associated wrist flexion, and hyperextension and fanning of the fingers. During taking out pegs by the affected arm the less-affected hand moved very abruptly behind the body with associated clawing (less-affected fingers) and grasping, and spreading of the fingers (less-affected) and releasing (Video). The amount and severity of movement and contraction on the less-affected side was dependent on the efforts made on the affected side. Further, when the subject was instructed not to move the less-affected side, her movement quality deteriorated on the affected side. On resisting the movement on less-affected side passively by the therapist or against the subject's body, there was strong contraction of the entire limb and observable wriggling movement of the fingers on the same side. She also exhibited half open and twisted jaw towards the affected side during her motor efforts. All the atypical motor presentations on the left side (less-affected)

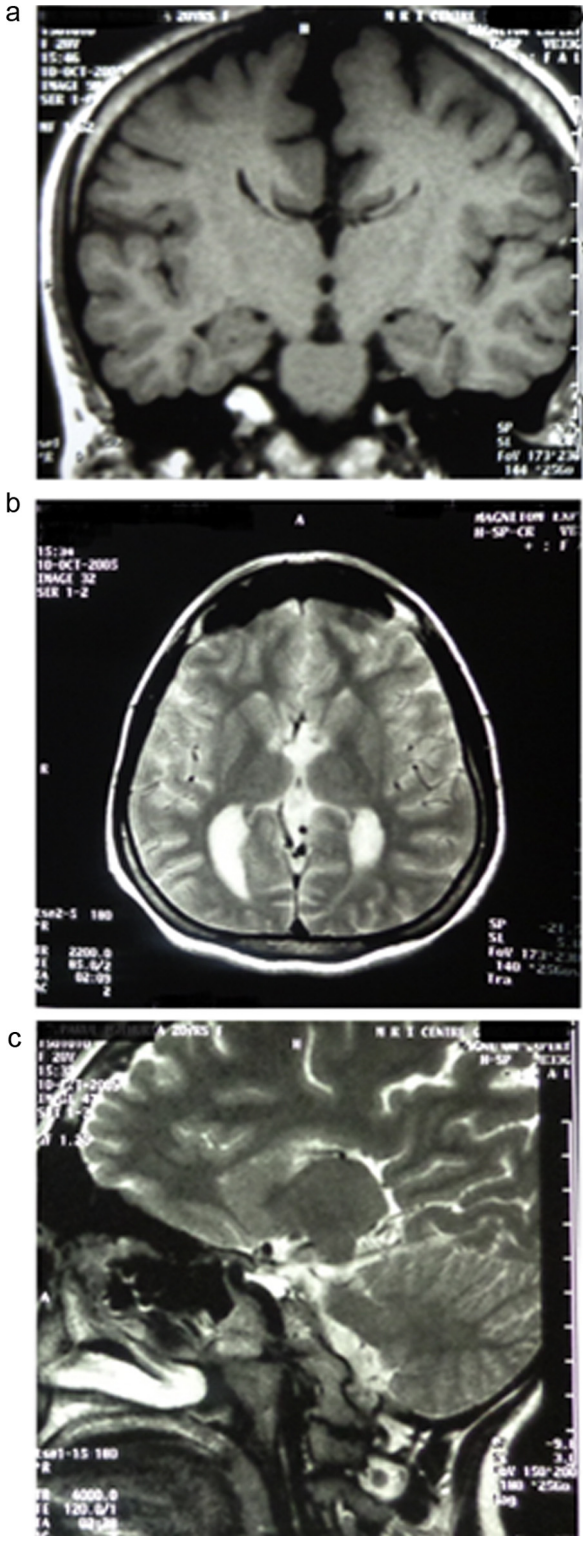


Fig. 2. a–c: prestroke MRI revealing agenesis of the corpus callosum: a: T1 coronal; b: T2 axial; and c: T2 saggital.

were not present prior to the stroke. The presentations were obvious as the voluntary motor control improved on the affected side. Further, associated movements were also exhibited on the affected side (right) when the resistive movements were provided on the less-affected side (left). For