Case Report

Transient mirror writing in migraine: An uncommon clinical observation

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ABSTRACT

Migraine aura, a transient neurological dysfunction, is characterized by reversible (<60 min) visual, sensory, language, and/or motor symptoms. This case report presents a 19-year-old female patient with frequent migraines who exhibited mirror writing during migraine episodes. Neurological assessments ruled out structural abnormalities, and the mirror writing was consistently observed in conjunction with migraine attacks. This case highlights a potential neurological connection between migraine and atypical manifestations such as mirror writing. The findings suggest that such symptoms may be overlooked in migraine patients, emphasizing the need for increased awareness and further investigation into the diverse presentations of migraines. This report contributes to understanding the complex relationship between migraine and neurological phenomena.

Key words: Migraine with aura, Mirror writing, Spatial orientation, Spiegelschrift, Transient neurological dysfunction

Migraine, ranked as the sixth most disabling neurological disorder, is characterized by moderate-to-severe headaches often accompanied by nausea, vomiting, photophobia, and phonophobia [1]. In 2019, India exhibited the highest prevalence of migraine cases, with an estimated 17,931,771 incidents documented [2]. About one-third of migraine patients experience reversible, transient neurological symptoms originating from the cortex or brainstem [3]. Migraine with aura, which is marked by such transient neurological symptoms, carries a higher risk of ischemic stroke compared to migraine without aura [4,5]. While visual disturbances are commonly observed during auras, writing disturbances such as mirror writing (MW) are rarely documented. The literature includes only a few cases, such as one involving an ambidextrous female with migraine [6].

This report presents a case of reversible MW in a migraine patient, highlighting the need for further research into this uncommon manifestation.

CASE PRESENTATION

A 19-year-old female 12th-grade student presented to the neurology outpatient department with a 3-day history of headaches, followed by difficulty writing over the past 24 h. The headaches were moderate-to-severe, primarily affecting the left side, throbbing in nature, and accompanied by nausea and non-vertiginous dizziness. The headaches partially responded to over-the-counter pain relievers. While her verbal communication skills were unaffected, she exhibited writing difficulties characterized by MW of both letters and numbers (Fig. 1). According to the International Headache Society Headache Classification-3 beta, the patient was diagnosed with migraine.

The patient had experienced left-sided headaches suggestive of migraines without aura since the age of 13, with varying frequency and intensity. Over the past 3 months, she reported an increase in the frequency of these episodes, occurring around 3–4 times/month, which improved with over-the-counter pain medications. Approximately 2 years ago, she had a similar episode of MW associated with a migraine headache, which lasted a few hours and resolved without specific treatment. There was a positive family history of migraine without aura in her mother.

On examination, her vital signs, general physical assessment, and optic fundus evaluation were unremarkable. She was alert and oriented, with normal fluency, naming, repetition, reading, drawing, and copying skills. However, her writing, both spontaneous and dictated, was abnormal, displaying mirror images of letters and numbers without any grammatical errors (Fig. 2a). The remainder of the neurological and systemic examinations was normal. All routine tests were within normal limits. Magnetic resonance imaging -brain and electroencephalogram conducted during the symptomatic period were also normal. She started on propranolol 40 mg/day and naproxen sodium 250 mg twice a day,

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which led to further improvement in headaches, after which her writing abnormality completely resolved (Fig. 2b and c).

At her follow-up visit 1 year later, it was noted that the frequency of migraine attacks had reduced to once a month (managed by analgesics), and there were no further episodes of MW (Fig. 2d and e).

DISCUSSION

MW is usually a transient phenomenon, lasting from a few days to weeks, but it can persist for years [7]. The term "mirror writing" (Spiegelschrift) was first introduced by Buchwald in 1878 [8]. MW can vary widely, affecting spontaneous, copied, or dictated text, and sometimes numbers. It can involve a single reversed letter or multiple pages and may include forms such as right-to-left writing, upside-down or inverted writing, and occasionally mirror reading [9]. Pathological left-handed MW in children is common in dyslexia or other learning disabilities, whereas in adults it commonly occurs after a focal lesion of the left hemisphere [10]. However, none of these conditions were present in the case.

MW is commonly considered a motor phenomenon rather than a cognitive phenomenon. The most acceptable theory is the motor center hypothesis; according to which motor programs in the brain are represented bilaterally in the mirror form. In MW, there is a failure to inhibit the natural left-handed tendency to write leftward and in mirror form [11]. Other explanations include the visual hypothesis, the spatial-orientation hypothesis, and the involvement of thalamocortical pathways in neurodegenerative disorders [12]. In this case report, MW coincided with persistent migraine headaches, suggesting a possible correlation between the two conditions. The patient's writing revealed that the MW text included all reversible digits in reverse order, whereas the spatial orientation of letters was proper while copying and writing (Fig. 2a). A similar observation was noted in the case of studies by Nakano *et al*. and Kirik and Sahin [6,13]. However in a case report by Kurita *et al*. MW was observed after suffering thalamic hemorrhage (lesion-related), unlike the presented case report [14].

In this case report, the patient was right-hand dominant according to the Edinburgh handedness inventory [11]. Aside from the association with migraines, another unique aspect of our case is the occurrence of MW by the dominant right hand, an uncommon observation when compared to the Nakano *et al*. report [6].

The patient demonstrated language dysfunction in the form of spontaneous MW that was fluent and affected letters, numbers,

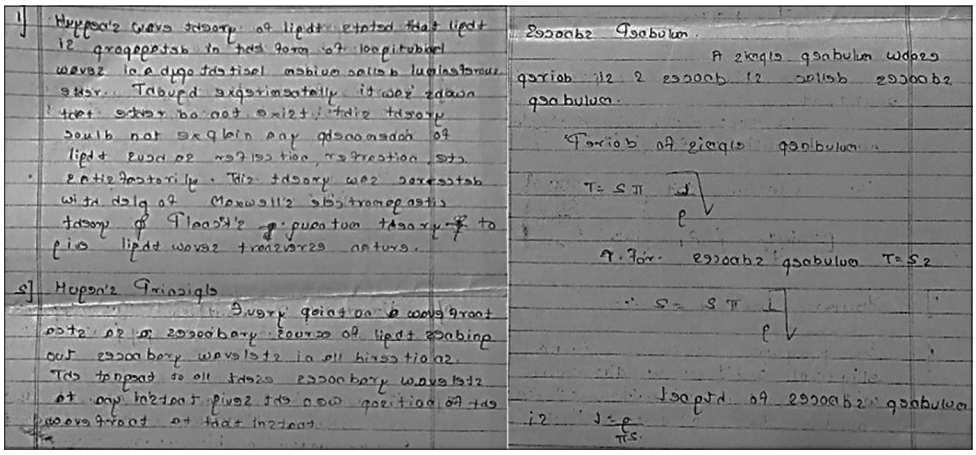

Figure 1: Change in spatial orientation of letters and numbers (during an episode of migraine)

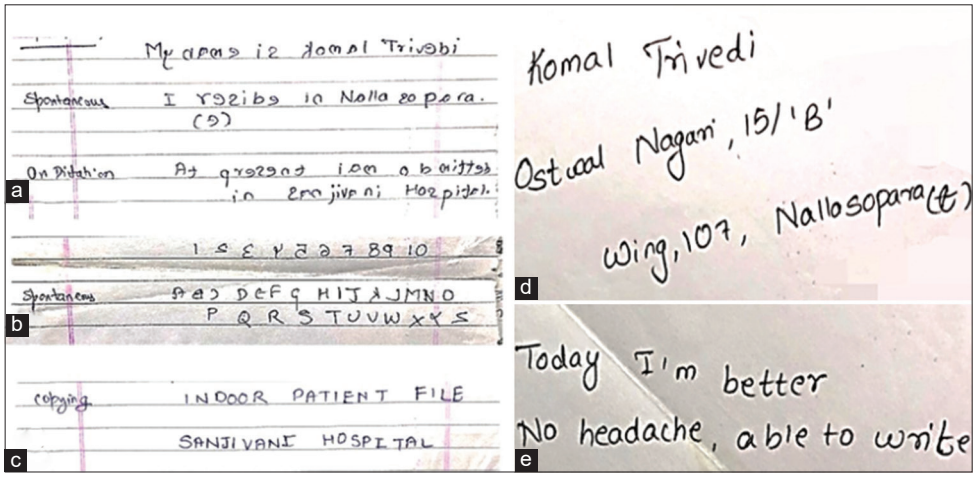

Figure 2: Change in spatial orientation of letters and numbers noted in (a and b) during the event; (c) change in writing after a few days; (d and e) indicates regular orientation of letters seen during dictation and spontaneous writing (post-recovery)

words, and sentences without grammatical errors (Fig. 2a). Her ability to copy and write from dictation, as well as her verbal language skills remained intact.

In most patients, language disturbances typically begin before the onset of the headache phase and tend to last <30 min [2]. In this case, the writing dysfunction began approximately 24 h after the onset of the migraine headache, and following standard treatment, there was an improvement in both the writing abnormality and the resolution of the headache (Fig. 2b). At the 12-month follow-up, her headache frequency decreased to 1/month, with no further MW, and was managed with analgesics.

CONCLUSION

This case emphasizes the language impairments such as MW that can be associated with migraines. Given the rarity of MW, thorough documentation is essential, as diagnosis typically relies on patient history and physical examination, as demonstrated in our case. Further research, including epidemiological studies and functional imaging analyses, is needed to deepen our understanding of MW.

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