

Case Reports

The Mirror Sign: A Reflection of Cognitive Decline?

J. Loretta Mulcare, M.D., Stephen E. Nicolson, M.D., Viwek S. Bisen, M.D.,
Samuel O. Sostre, M.D.

Psychotic symptoms are common in older patients, with estimates of the prevalence of psychosis ranging from 4% to 10% in those over the age of 65 years.¹ Often, the psychosis observed in this population is recent in onset. For example, in a retrospective study of patients over age 65 years admitted to a geriatric psychiatry inpatient service, late-life onset psychosis was observed in approximately 10% of 1730 patients. Of these, 64% suffered from delusions, most commonly of the persecution/paranoia and self-reference subtype, 29% reported hallucinations, most commonly visual, and the remaining 7% had mixed delusions and hallucinations. The psychotic symptoms were most commonly seen in the context of dementia (40%), while other common causes were major depression (33%), medical conditions (7%), and delirium (7%).²

Psychiatrists are often called upon to evaluate symptoms of psychosis in this population. Unfortunately the treatment of psychosis in the elderly can be difficult. It is widely acknowledged that the use of antipsychotic medication in patients with Alzheimer's and other dementias is associated with many serious adverse effects, including sedation, delirium, falls, and even death.³ In a study of patients with Alzheimer's disease (AD) who were being treated with atypical antipsychotics for symptoms of psychosis, aggression, or agitation, Schneider et al. concluded that adverse effects outweigh benefits.⁴ Due to these concerns, it is important to uncover causes of hallucinations and paranoia that may respond to behavioral interventions rather than antipsychotic medication.

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Ms. N, a 78-year-old woman, was admitted twice to our hospital within the last year and seen by the psychiatry consultation service to evaluate psychosis. Her family described Ms. N as normally a quiet and polite woman. She

graduated from high school and completed 1 year of college. She kept an "immaculate" house prior to the onset of her illness. Her medical history included coronary artery disease, diabetes mellitus, hypertension, breast cancer, and fatty liver disease status post-cholecystectomy. Additionally, about 10 years ago, she was struck by an automobile that rendered her unconscious for 3–4 days and required hospitalization for over a month. She had no past contact with psychiatry. There was no family history of psychiatric problems or dementia.

Approximately 18 months before her first hospitalization, Ms. N's primary care doctor began prescribing sertraline for vague symptoms of anxiety. Six months later, Ms. N complained of hallucinations of spiders. Those hallucinations resolved with the discontinuation of the sertraline. The family reported that about 4 months prior to her hospitalization, Ms. N started complaining about a woman in her mirrors who was stealing her clothes and jewelry. Ms. N could clearly recount recent events, including seeing a female stranger several times daily in her house, where she lived alone, beginning about 4 months prior to hospitalization. She would see the stranger through a mirror in her bedroom. She did not speak or interact with the stranger. She did not characterize these visions as hallucinations; rather, she insisted that the woman was a physical presence in her house who was consciously aggravating her. Ms. N reported no previous hallucinations, depressive symptoms, or substance use.

Received March 2, 2011; revised June 23, 2011; accepted June 28, 2011. From Albert Einstein College of Medicine, Bronx, NY (JLM); Albert Einstein College of Medicine, Montefiore Medical Center, Department of Psychiatry and Behavioral Sciences, Bronx, NY (SEN, VSB); University of Medicine and Dentistry, New Jersey-Robert Wood Johnson Medical School, Piscataway, NJ (SOS); Send correspondence and reprint requests to Stephen E. Nicolson, Dept. of Psychiatry, Montefiore Medical Center, 111 E 210 St., Bronx, NY 10467, USA; e-mail: snicolso@montefiore.org

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The neurology service considered a broad differential for Ms. N's altered mental status and hallucinations, but her work-up, including physical exam, vision screening and laboratory testing, did not reveal serious pathology. An EEG was read as having "generalized background slowing with no lateralization or epileptiform activity." A computed tomography (CT) scan found no cerebral pathology. Magnetic resonance imaging (MRI) without contrast showed non-lateralized mild white matter microvascular ischemic disease more profound in the posterior than anterior watershed areas. The neurology team felt that these results, especially the EEG and MRI findings, were consistent with dementia, most likely of the Alzheimer's type.

During our exam, Ms. N was calm and pleasant. Her thought processes were goal-directed. Other than the stranger in the mirror, her thought content was non-bizarre. Ms. N was unable to recall any of three words after 5 minutes and was able to follow only the first two of a three-step command. Otherwise she did well on cognitive testing, achieving a Mini-Mental State Examination (MMSE)⁵ score of 26/30. Her clock-drawing test demonstrated impairment in planning and spatial skills. When brought to face the bathroom mirror in her hospital room, she confirmed the presence of the stranger. She avoided directly gazing at her reflection and refused to touch the mirror, but could not explain her refusal. She was able to correctly identify reflected images of the examiners and other objects. Given her poor short-term memory, the psychiatry consultation team agreed with the provisional diagnosis of dementia, likely due to Alzheimer's disease and/or cerebrovascular disease. We conceptualized her belief that a woman was stalking her as a cognitive misperception rather than a hallucination. Since she did not show any signs of behavioral problems in the absence of mirrors, antipsychotic treatment was not recommended. She was discharged home with instructions for her family to cover or remove the mirrors in her apartment.

Ms. N's nephew removed most of the mirrors except those in her bathroom and on her bedroom closet door. Soon after returning home, Ms. N had told family members that there was a woman living in her closet. Ms. N's neighbors reported increased forgetfulness and wandering. The patient's sister found Ms. N's apartment to be unkempt and filthy with food left in front of the mirrors, presumably for the "other woman." Ms. N once saw her reflection in a window and threatened to jump out so she could kill the other woman. An outpatient neurologist/psychiatrist prescribed several medica-

tions, including risperidone, ziprasidone, thiothixene, and donepezil, without improvement.

Medication nonadherence was suspected when, 10 months after her initial presentation, Ms. N was admitted to the hospital with chest pain, elevated blood pressure, a urinary tract infection, and agitation. After being treated with antibiotics and antihypertensives for 6 days and when her initial agitation and delirium had resolved, a psychiatry consultation was again called for psychosis, Ms. N still endorsed being stalked by a woman both in her own house and at the hospital. She refused to go into the hospital bathroom because of the presence of the woman in the mirror. However, she was able to recognize her image both in small handheld mirror and on her identification card. She scored 6/30 on the MMSE. Her exam revealed bilateral palmomental and grasp reflexes, which were not present during her previous admission.

Ms. N was again behaviorally stable in the absence of mirrors. Given her rapidly progressive cognitive decline, which the family indicated had been her baseline for several months, further investigation was undertaken. Laboratory testing was again unremarkable. An MRI showed no acute disease such as a stroke or mass, but did reveal "mild interval increase in the extent of cerebral volume loss and white matter disease." A repeat EEG was more disorganized than her previous study, with asymmetric frontal intermittent delta activity. While there was concern for a rapidly developing progressive process, such as Creutzfeldt-Jakob disease, Ms. N did not have associated features such as muscle twitching, stiffness, gait abnormalities, speech impairment, or seizures. The neurology team felt the imaging and EEG results were most consistent with worsening Alzheimer's disease. Because of her inability to demonstrate understanding of her medical problems and treatment, she was discharged to a nursing home. Six weeks after discharge, the family reported that mirrors in her room had to be removed as patient became distressed upon seeing the reflection of the "other woman." Otherwise, the patient had not been a behavioral problem at the nursing home.

Discussion

Mirror Recognition

Humans are among only a few species, including bottlenose dolphins, Asian elephants, magpies, chim-

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panzees, bonobos, orangutans, gorillas, and orcas that are capable of recognizing their own reflection in a mirror.⁶ Prior to 1 year of age, most humans believe their mirrored reflection to be another friendly human. Between the ages of 1 and 2, infants typically realize that the reflection is not a friendly playmate, and initially behave in a withdrawn manner towards their reflection. By the age of 2, most children interact with their reflection appropriately.⁷

Mirror Sign

The mirror sign has been defined as both the symptom of autistic withdrawal expressed by a patient's looking into a mirror for an extended period of time⁸ and as the inability to recognize one's own mirrored reflection.⁹ In the later definition, it is considered to be a component of a delusional misidentification syndrome (DMS) related to the more frequently reported DMSs of Capgras Syndrome and Fregoli Syndrome (see Table 1). There is considerable overlap between the misidentification syndromes, and also considerable variability in author's classification of patients' symptoms into the various syndromes.¹⁰ For example, the phantom boarder symptom, though often reported as unique from mirrored-self misidentification, may in fact be an alternate manifestation of the same underlying pathology.¹¹ Additionally, at least one case of mirrored-self misidentification has been classified as Capgras for the reflected image.¹²

The mirror sign, defined here as the loss of the ability to recognize one's reflection in a mirror, has been reported in a variety of contexts. The earliest example found in our literature review was a 1928 report describing a 68-year-old man with senile dementia who, when presented with a mirror, became irritated and said (translation from German), "You see, there's the guy again!" and walked behind the mirror with offerings of money and tobacco in an apparent effort to cheer up the image.¹³ A 1948 case described a 50-year-old woman with impaired memory who mistook her mirror image for her deceased older sister.¹⁴ Twenty years later, the case of a 61-year-old woman who complained that a "terribly ugly" double of herself who was only visible through a mirror was reported.¹² In 1982, the first American report of the mirror sign was a case series of seven individuals with probable AD who exhibited the syndrome of mirrored-self misidentification.⁹

TABLE 1. Delusional Misidentification and Related Syndromes

Syndrome	Description
Capgras syndrome	A stranger presents in the physical form of an intimate contact
Fregoli syndrome	An intimate contact presents in the physical form of a stranger
Mirrored-self misidentification	The image seen in a mirror is a stranger, not the patient's reflection
Reduplicative paramnesia of the self (syndrome of subjective doubles)	There exists a physical duplicate of the patient (someone is trying to impersonate the patient physically)
Reverse Capgras	The patient believes that his/her mind has been replaced but his/her body remains the same
Reverse Fregoli	The patient believes close contacts do not recognize him/her
Phantom boarder syndrome	An unwelcome stranger lives in the patient's home
Prosopagnosia	The patient has an inability to recognize faces
Syndrome of internetamorphosis	Persons known to the patient have exchanged identities with each other

In these previous reports, the symptoms associated with the mirror sign vary. Some patients can calmly interact with their image,^{14,15} while others have generalized anxiety.¹⁶ More dramatically, others are calm and symptom-free in the absence of a reflective surface, only to become agitated or paranoid in the presence of their reflection.^{17,18} Some believe the image to be a person older than themselves,¹² others see the image as a younger person.^{14,17} Some patients, including Ms. N, complain about these visions,^{15,19} while most others do not.

There is an association between the mirror sign and cognitive dysfunction. Most case reports describe patients with existing diagnoses of dementia.^{14,16,20,21} However, some authors have noted the symptom of self misidentification to precede and perhaps herald dementia.¹¹ The mirror sign has also been reported in the setting of a hypotensive crisis¹⁷ and in patients with histories of traumatic brain injury or alcohol abuse.¹⁶ Most multi-patient studies of mirrored-self misidentification have focused on patients suffering from dementia, of either Alzheimer's or vascular subtypes. Within this population, estimates of the prevalence of mirrored-self misidentification ranged from 2.3% to 5.4%.²²⁻²⁵

When the symptom of phantom boarder is included with mirrored-self misidentification, prevalence estimates increase to 9%–21%.^{23,24} In addition to providing estimates of prevalence, several multi-patient studies show the incidence of mirrored-self misidentification to correlate with the severity of dementia.^{26,27} In one study, 20 of 20 patients with moderate dementia could self-recognize, compared with only four of 19 severely demented patients. The correlation between MMSE score and mirrored-self identification was 2.88 ($P < 0.001$).²⁶ Another study reported that six of six moderately demented patients with AD could self-recognize, while only three of six severely demented patients and none of six profoundly demented patients had this ability.²⁷

DMS Explanatory Theories

Misidentification syndromes have been described in the settings of intracranial hemorrhages, neoplasms, encephalopathy, paranoid schizophrenia, schizoaffective disorder, affective disorder, AD, Lewy body dementia, multi-infarct dementia, head trauma, epilepsy, cerebrovascular disease, pituitary tumor, multiple myeloma, multiple sclerosis, viral encephalitis, frontal lobe pathology, and AIDS.²⁸ Potential explanations include deficits in facial recognition, impaired spatial processing, decreased executive functioning,¹¹ an impaired sense of uniqueness,²⁹ a disconnection between visual input and emotional response, conflicting positive and negative feelings about oneself or others,³⁰ confabulation, and generalized depersonalization or derealization.^{15,31,32} Given the return to the infantile state of inability to interact appropriately with one's reflection, an alternative explanation could be to conceptualize the mirror sign as a behavioral version of a primitive reflex, signaling deterioration of the central nervous system.

The inability to recognize one's mirrored reflection may be a deficit or an illusion and, therefore not truly a delusional belief. However, patients (such as Ms. N) often develop a delusional system based on this misperception and thus present as paranoid. Without awareness of the source of these "hallucinations," many of these patients may be treated as psychotic. The mirror sign may also contribute to anxiety. For example, when Ms. N initially presented to her primary care physician, her anxiety may have been related to her misperception of her reflection.

Treatment

Just as there is no clear etiology for the mirror sign, no definitive treatment has been identified to date. Neuroleptics offer some but not complete improvement.⁹ As the perceived stranger in the mirror can cause much distress, targeting symptoms of depression and anxiety, in addition to covering reflective surfaces, can improve patient functioning.¹⁶ One woman's mirror sign and agitation vanished after she was exposed first to a small compact mirror, in which she was able to recognize her own reflection, then to progressively larger mirrors over the course of several days.¹⁸ Coltheart and colleagues suggested the use of Cognitive-Behavioral Therapy directed at correcting the two deficits they proposed propagate all monothematic delusions: the creation of the delusional belief and the failure to reject the created delusional belief.²⁸

Conclusion

Patients with the mirror sign exhibit a range of behavior. This diversity of symptoms contributes to the difficulty investigators have had classifying and organizing the various delusional misidentification syndromes. Because the mirror sign is not often elicited during routine inpatient or outpatient interviews, it may often be missed. This could be an important tool for the consultation psychiatrist. Elicitation of the mirror sign may indicate that the patient is at greater risk for rapid cognitive decline. Also, recognition of the mirror sign may allow the consultant to enact behavioral interventions, such as covering mirrors or exposure therapy with increasingly larger mirrors, which may help treat the anxiety, paranoia, and agitation in these patients, improving their quality of life without exposure to the risks of antipsychotic medication. Future directions for psychosomatic medicine research would include a prospective study in patients at risk for dementia in which investigators examine the subjects' affective response to their reflection when presented with a mirror while following their cognitive functioning and overall psychiatric symptomatology. This would allow us to better characterize the meaning of the mirror sign.

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