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A case of comorbidities highlighting cerebral stroke, vision impairment, and dementia

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Abstract

This case report is of a two-time stroke survivor with significant health comorbidities. This report highlights A.R.'s pre-existing, non-neurological vision impairments, stroke-related vision impairments, in addition to cognitive impairment and possible dementia. Information including her past medical history, current functional status, and battery of assessments that were used in the acute care hospital are detailed. Conclusions include the need for comprehensive, valid, and adapted assessments especially when comorbidities are present. We suggest that cognitive assessments that do not rely on vision may have improved the test accuracy in this case.

Keywords

Visual impairment, dementia, stroke, comorbidities, aging, neuro-ophthalmology

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Introduction

Advances in medicine have resulted in people living longer and consequently being more likely to experience age-related diseases. Stroke is a leading cause of disability for older Americans.[1] Older stroke survivors commonly experience diseases that predispose them to sustaining additional strokes.[1] In fact, after a first stroke, survivors have a 43% risk of a second stroke occurring within five years.[1] A second stroke could result in additional symptoms, either adding to existing impairments or creating new complications.[1]

Comorbidity is most frequently defined as the presence of two or more health conditions and usually is considered in relation to the specific index condition.[2] Comorbidity is associated with worse health outcomes and the need for additional use of health services.[2] However, opinions vary on the duration, severity, and classification of similar conditions.[3] For stroke survivors, whether the comorbid condition is concomitant or is a direct result of the stroke, the additional medical conditions complicate hospital stays, disease management, and anxiety around the possibility of returning home to manage their health.[3]

Health care increasingly needs to address the management of individuals with comorbidity. Therefore, researchers and clinicians have a responsibility to use of precise terminology in order to have consistency between disciplines and seek literature to properly manage individuals with comorbidity.[2] Relatedly, the sequence in which comorbidities occur may impact prognosis or treatment and therefore are relevant to consider when reporting in clinical notes or research reports.[2] Other recommendations include classifying comorbidity with great detail and using unique types of assessment methods[4] or comprehensive test batteries.[2]

The objective of this article is to highlight the case of a woman who survived multiple strokes and has comorbidities. The report discusses the potential relationship between dementia, the pre-existing vision impairments, and vision impairments caused by the stroke. In addition, we discuss the importance of using comprehensive, valid, and adapted assessments especially when comorbidity is present.

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Case history/examination

Past medical history and functional status

A.R. (alias used to protect her privacy) is a Caucasian woman without a high school degree, and a past medical history of left occipital stroke at age 19, due to complications during pregnancy. She had no stroke risk factors, and her family only had a history of uveitis. This stroke did not leave A.R. with any cognitive difficulty. However, for many years post stroke, she had right hemiplegia and aphasia. Overtime, A.R. was able to independently participate in all activities of daily living tasks but required supervision for safety for cooking and cleaning tasks. A.R. did not drive out of personal preference, lived with her sister, and never returned to work. Around age 50, A.R. started to develop comorbid health conditions that required management. She had atrial fibrillation, hypertension, diabetes mellitus, hyperlipidemia, coronary artery disease, and seizure disorder. She was also diagnosed with glaucoma and cataracts in both eyes. Her medical records showed that she was managing her health conditions fairly. Besides taking medications and eating well, she continued to smoke, did not see her healthcare professionals regularly, and did not exercise.

Current medical history, functional status, and new stroke sequelae

In the fall of 2019, A.R., who was now 71 years old, went to the hospital with a diagnosis of a second stroke, which was identified to be a right posterior cerebral artery infarct and occipital infarct. Her main complaint and reason for calling 911 was new visual field loss—she had bilateral homonymous hemianopia. A.R. denied diplopia, eye pain, or floaters. The stroke team caring for A.R. at the hospital included multiple medical professionals. Since this case report highlights A.R.'s vision and cognitive function while inpatient at the hospital, the assessments reported in Table 1 are only those found in the neurology, occupational, and physical therapy notes.[5–8] Overall findings from Table 1 report severe vision impairment, anxiety, impaired physical function, and moderate cognitive dysfunction. Based on the clinical notes, A.R. required total assistance and verbal step-by-step explanations to participate in activities due to her vision loss. A.R. exhibited anxiety and specifically a fear of falling. She frequently articulated, "No, No, No . . . don't move me, I can't see where I am going." A.R. was also emotionally labile and had heightened irritability. Her neurologist found evidence of periventricular white matter damage on her brain image (noted in Table 1) and therefore concluded this to be a risk factor for dementia, in addition to the behaviors she was exhibiting, low levels of physical activity and her education status.

A.R. had a stay of 8 days in the acute hospital. Despite the recommendation from hospital staff, A.R. refused to go to rehabilitation upon discharge. Instead, home health, which included both therapy and nursing services, were set up and she returned home with 24-h supervision. Her sister continued to be her main caregiver and she was discharged with the following medications: clopidogrel, apixaban, metoprolol, insulin glargine, prednisone, atorvastatin, furosemide, montelukast, phenytoin, cyclobenzaprine, and latanoprost.

Discussion

This case reports on comorbidities and the additive effect these impairments had on a woman's pre-existing conditions. As the results show, the main contributor to her activity loss was her vision impairment and cognitive deficits. Since this case report is observational, we acknowledge that no inferences can be made as to the relationship between the comorbidities. In addition, we and others have recognized that the pathological link between vascular risk factors, cognitive impairment, and stroke is complex and still partially unclear. However, similar to this case, there are two separate studies, both investigating stroke survivors and found a significant association between vision impairments and dementia[9,10] as well as another study found a relationship between cognitive impairment, stroke, and vision impairment.[11]

Notably, A.R. had pre-existing vision impairment (glaucoma and cataracts) due to age. She also had a stroke 52 years prior to the second stroke. Both vision and stroke are conditions that have been reported to be risk factors for development of dementia.[12,13]

The subject's medical team attempted to formally test A.R., as seen in Table 1, but had difficulty with standardized tests because of her visual impairment. The occupational therapist did not seem to be aware that the Montreal Cognitive Assessment (MOCA) has been modified for visually impaired individuals.[14] This assessment should have been used with A.R. as well as a self-reported vision impairment assessment such as the Veterans Affairs Low Vision Visual Functioning Questionnaire.[15] The Veterans Affairs Low Vision Functional Questionnaire can be read to the participant verbally, therefore not relying on vision for it to be completed.

There are some limitations to this case report. First, this case lacked testing by the ophthalmologist. Consultation by an ophthalmologist would have contributed more specific information. In addition, formal testing such as the kinetic visual field test or frequency doubling perimetry would have provided details that could have improved treatment planning. Another limitation was the lack of access to any ophthalmic consults that occurred between the time of A.R.'s first stroke and the second stroke. The available notes on her history were vague. For example, the medical notes mentioned the addition of glaucoma was after age 50; however, it would have been more accurate to know the exact date of acquisition. The team had to rely on A.R.'s sister for the sequence in which the vision comorbidities occurred.

Conclusion

In conclusion, this case provides insight into an older woman who, after two strokes, developed new comorbidities of vision

Table 1. Assessments and findings.

Name of assessment	Assessment purpose	Assessment scoring information	Findings	Department conducting assessment
Montreal Cognitive Assessment (MOCA)[5]	Cognition	18–25 = mild cognitive impairment (mean score is 22), 10–17 = moderate cognitive impairment (mild AD mean score is 16), less than 10 = severe cognitive impairment.	A.R. was unable to formally complete this assessment because of her new vision impairments. A.R. could not see the assessment document. Therefore, her therapist did not list the specific scores, but rather described her performance which included having impaired memory and delayed recall, poor attention, poor language and impaired orientation. She concluded that she has moderate cognitive impairment which warrants further testing upon her vision improving.	Occupational Therapy
National Institutes of Health Stroke Scale (NIHSS)[6]	Determine the severity of the stroke and predict clinical outcomes	Higher score indicates more severe stroke. Total score of 4 or less, more likely to have functional independence regardless of treatment. Score of > 22 is associated with increased risk of hemorrhagic conversion Some components of the NIHSS have low interrater reliability.	1A. Level of consciousness = 0 1B. Ask month and age = 2 1C. Blink eyes and squeeze hands = 1 2. Horizontal extraocular movements = 0 3. Visual fields = 3 4. Facial palsy = 1 5a. Left arm motor drift = 0 5b. Right arm motor drift = 4 6A. Left leg motor drift = 0 6B. Right left motor drift = 1 7. Limb ataxia = 0 8. Sensation = 0 9. Language/aphasia = 1 10. Dysarthria = 0 11. Extinction/inattention = 0 Total score of 13/24	Neurology
Magnetic resonance imaging (MRI)	Cognition	Scanning technique of the brain.	A.R.'s MRI showed a right posterior cerebral artery infarct and occipital infarct, an old infarct in the left occipital lobe and periventricular white matter damage.	Neurology
Hearing, Eyes, Ears, Nose, Throat exam (HEENT)	Portion of the physical examination that concerns the head, eyes, ears, nose and throat	No scoring, this assessment is used to document findings.	Visual acuity for the left eye is 20/200, and right eye only hand motions are reported. Visual field = bilateral homonymous hemianopsia Extraocular movements = left cranial nerve III damage, cranial nerve IV and VI were intact Sclera = white Conjunctiva = normal (quiet) Lid = mild ptosis on left side, which is most likely because of damage to the oculomotor nerve Pupils = Relative Afferent Pupillary Defect; noted in left, not noted in right. Most likely due to coexistence of another disease in the eye, which should be determined with an ophthalmoscopy.	Neurologist
Confrontation Testing[7]	Vision	Normal visual field reaches 180° in the horizontal plane (160° for monocular vision) and 135° in the vertical plane.	A.R. has binocular homonymous hemianopsia. No additional visual field tests were performed, because of the patient's cognitive status, lack of neuro-ophthalmology consult.	Occupational Therapy
Snellen Eye Chart[8]	Vision	Testing the smallest line a person can read to determine visual acuity.	20/200 in left eye. Testing in right eye could not be done A.R. could only see hand motions with her right eye.	Occupational Therapy
Strength and Movement testing, including functional coordination	Physical function	These notes provide a description of A.R.'s current level of functioning.	A.R.'s coordination was impaired. She had difficulty manipulating items in her left hand, for example, when using a utensil and grooming supplies. Her movement in her left arm and leg were normal Her left arm and leg had good overall strength, she could move against gravity. A.R.'s right side had residual spasticity in her hand, due to her old stroke. She could not walk, and required total assistance for transfers, meaning moving from one surface to another.	Physical Therapy

A.R. = case participant's initials.

and cognitive impairment in addition to her long-standing chronic conditions. This report highlights her presentation based on the assessments that were completed in the acute care hospital. This article suggests that stroke survivors with comorbidity may benefit from specific, comprehensive assessment batteries that are validated and adapted for to accommodate for multiple conditions, for example, cognitive batteries adapted for the visually impaired. Also, future research is needed to more comprehensively study stroke survivors with both vision and dementia since more adults are living longer and both conditions lead to poor quality of life and lack of independence.

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Author contributions

K.H., first author, completed the literature review, manuscript writing, manuscript preparation, and editing of multiple drafts. P.G., second author, completed manuscript preparation, assisting on writing and editing the case history section. T.R., third author, completed edits on the entire paper and participated in writing the clinical implication section and conclusions.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical approval

The study was approved by the Intuitional Review Board at the University of Texas Medical Branch. The IRB was a full board review and we were required to obtain patient consent. The number is: 19-0006. All precautions took place to maintain confidentiality and good ethics regarding data management.

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Informed consent

Written informed consent was obtained from the patient and her sister, for her anonymized information to be published in this article.

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