Ischemic Stroke During Sexual Intercourse

A Report of 4 Cases in Persons With Patent Foramen Ovale

Kyra Becker, MD; Elaine Skalabrin, MD; Danial Hallam, MD; Edward Gill, MD

Background: The association between patent foramen ovale (PFO) and stroke risk in young adults is controversial and poorly understood. Paradoxical embolization through a PFO represents a possible mechanism by which PFO might predispose to stroke.

Objective: To describe 4 patients with PFO who experienced the onset of ischemic stroke during sexual intercourse.

Design: Case series.

Setting: Tertiary referral stroke clinic.

Patients: Consecutive patients experiencing stroke during intercourse.

Results: All 4 patients were found to have PFO. Despite a thorough evaluation, no other etiology for stroke was identified.

Conclusion: We suggest that paradoxical embolization through a PFO due to elevated intrathoracic pressure during sexual activity could be a potential mechanism for stroke in these patients.

Arch Neurol. 2004;61:1114-1116

We describe 4 patients who had strokes during sexual intercourse; all had echocardiographic evidence of patent foramen ovale (PFO) and no obvious explanation for their strokes, making paradoxical embolism plausible. Pertinent details of the patients’ demographics, past medical histories, and hematologic evaluations are presented in the Table.

REPORT OF CASES

CASE 1

A 25-year-old woman developed a “humming” sensation in her left ear while engaging in sexual intercourse. Immediately post coitus, she developed dizziness, headache, vomiting, and right upper extremity weakness. Magnetic resonance imaging showed a diffusion abnormality in the distribution of the right superior cerebellar artery. T1 axial fat-saturated magnetic resonance imaging of the neck showed no evidence of vertebral dissection; gadolinium-enhanced magnetic resonance angiography of the neck and head showed no evidence of extracranial or intracranial vascular disease. Results of vertebral duplex and transcranial Doppler ultrasonography with emboli monitoring were unremarkable. Transesophageal echocardiography with injection of agitated saline revealed a right-to-left shunt only during the Valsalva maneuver.

CASE 2

A 24-year-old woman experienced language difficulties and an inability to control her left hand following orgasm. Magnetic resonance imaging revealed 2 distinct diffusion abnormalities in the right parietal cortex. Results of extracranial and intracranial magnetic resonance angiography, carotid duplex, and transcranial Doppler were unremarkable. Transesophageal echocardiography showed a large PFO with prompt right-to-left shunting at rest (evidenced by color Doppler). An atrial septal aneurysm was present.

CASE 3

A 38-year-old man developed the acute onset of vertigo and diplopia during intercourse. Magnetic resonance imaging showed a diffusion abnormality in the left cerebellum. Intra-arterial angiography showed no evidence of atherosclerotic vascular disease or dissection. A PFO was visualized by 2-dimensional transesophageal echocardiography at rest; its presence was confirmed by color Doppler and contrast injection.
A 23-year-old woman with a history of 3 spontaneous abortions developed the acute onset of right arm dysco-ordination and nonfluent aphasia immediately follow-ing sexual intercourse. Magnetic resonance imaging re-vealed a left parietal infarct; extracranial and intracranial magnetic resonance angiography results were unremark-able. Transesophageal echocardiography showed the pres-ence of a small right-to-left shunt following injection of agitated saline; the shunt was present at rest and accen-tuated with the Valsalva maneuver.

**COMMENT**

The prevalence of PFO may be higher in young patients with cryptogenic stroke than in the general population, although the strength of this association has recently been called into question. Regardless of the causative role of PFO in young patients with cryptogenic stroke, the risk of recurrence is less than 1% per year. If PFOs do predispose to stroke, it is assumed that they do so by allowing venous clots to pass into the arterial circulation at the level of the atria, and paradoxical embolization can clearly be documented in some patients with cryptogenic stroke. One would predict that paradoxical embolization should occur more often in persons prone to deep venous throm-bolism and in situations where the right atrial pressure ex-ceeds the left atrial pressure, such as with the Valsalva maneuver. While neither deep venous thrombosis nor stroke onset during the Valsalva maneuver are reliably docu-mented in patients with PFO and cryptogenic stroke, emerg-ing evidence suggests that thrombophilias are more preva-lent in these individuals.

During the Valsalva maneuver, there is an increase in intrathoracic, central venous, and right atrial pres-sure; if the right atrial pressure exceeds that of the left atrial pressure, right-to-left shunting will occur through a PFO. While heart rate and blood pressure increase sig-nificantly during coitus, the intrathoracic pressure and directionality of flow through interatrial defects during intercourse and orgasm are unknown. Nonetheless, the physiologic changes during coital activity are likely simi-lar to those seen during the Valsalva maneuver and thus could predispose individuals to paradoxical emboliza-tion. In 3 of the patients presented here, however, right-to-left shunt occurred at rest, suggesting that such an in-crease in intrathoracic pressure is not required to precipitate paradoxical embolization but may make such an event more likely.

In our series, 2 of the 3 women were taking oral con-traceptive pills, both had migraines, and 1 smoked. While
migraine headaches and oral contraceptive pill use are independently associated with increased risk of stroke, especially in smokers, the mechanism of increased risk is not fully understood. Oral contraceptive pills increase the risk of deep venous thrombosis, especially in persons with inherited thrombophilias. Of the patients presented, however, only 1 had laboratory evidence of a prothrombotic state (ie, mild elevation in factor VIII activity). Moreover, 2 of the patients had no history of migraine or oral contraceptive pill use. Only 1 of our patients met criteria for atrial septal aneurysm; atrial septal aneurysm, either alone or in addition to PFO, is associated with increased risk of stroke. The only finding common to all of the patients presented was PFO. Because these patients were seen in referral at a time remote from their stroke, evaluation for deep venous thrombosis was not undertaken. None of the patients were taking illicit drugs.

There are several reports describing benign postcoital headache and subarachnoid hemorrhage, but there is only a single description of ischemic stroke occurring following intercourse. In this case, a 33-year-old man developed severe headache during orgasm followed by the onset of left homonymous hemianopsia. Angiography revealed filling defects in the right posterior cerebral artery. The presence of a PFO was not commented on; the filling defects could therefore have represented partial recanalization of the vessel following paradoxical embolization.

In summary, we report the occurrence of ischemic stroke during sexual intercourse in 4 young persons with PFO. Despite thorough workup, no obvious etiology of stroke was identified in any of these patients. We propose paradoxical embolization through the PFO due to elevated intrathoracic pressure during sexual activity as a possible stroke mechanism.

Accepted for publication December 5, 2003.

Author contributions: Study concept and design (Dr Becker); acquisition of data (Drs Becker, Skalabrin, Hallam, and Gill); analysis and interpretation of data (Drs Becker, Skalabrin, Hallam, and Gill); drafting of the manuscript (Dr Becker); critical revision of the manuscript for important intellectual content (Drs Becker, Skalabrin, Hallam, and Gill); administrative, technical, and material support (Drs Becker, Skalabrin, Hallam, and Gill); study supervision (Dr Becker).

This study was supported by grant KO2 NS02160 from the National Institute of Neurological Disorders and Stroke, Bethesda, Md (Dr Becker).

Correspondence: Kyra J. Becker, MD, University of Washington Stroke Center, Box 359775, Harborview Medical Center, 325 9th Ave, Seattle, WA 98104-2499 (kjb@u.washington.edu).

REFERENCES