THE RELATIONSHIP OF ISOLATED SLEEP PARALYSIS AND PANIC DISORDER TO HYPERTENSION

Carl C. Bell, MD, Carolyn J. Hildreth, MD, Esther J. Jenkins, PhD, and Cynthia Carter, BS
Chicago, Illinois

An hypothesis is proposed that there exists a subgroup of African-American hypertensive patients whose hypertension could have been prevented by the early detection and treatment of easily recognizable symptoms that signal the initiation of the pathophysiologic processes that lead to essential hypertension.

A pilot study of 31 patients with elevated blood pressure revealed that 41.9 percent had isolated sleep paralysis, 35.5 percent had panic attacks, and 9.7 percent had panic disorder. These proposed hyperadrenergic phenomena may be related to the development of hypertension in certain individuals.

Previous studies have revealed that isolated sleep paralysis is common in African Americans,[1,2] and that this altered state of consciousness[3] may indicate greater vulnerability to stress and may serve as a predisposition to developing panic disorder. After an episode of isolated sleep paralysis, an individual experiences symptoms that are produced by adrenergic stimulation (eg, tachycardia, tremulousness, sweating, panic). The isolated sleep paralysis appears to be caused by a dysrhythmia of the sleep/awake cycle, controlled in part by adrenergic mechanisms. This evidence suggests that adrenergic dysfunction is involved in isolated sleep paralysis.

Similarly, adrenergic dysfunction appears to be involved in the symptoms of panic disorder.[4] This hypothesis is derived from the observations that individuals who experience panic disorder have symptoms produced by adrenergic stimulation,[5-7] that pharmocologic agents (such as α-adrenergic agonists, tricyclic antidepressants, and benzodiazepines, which decrease adrenergic activity in the locus ceruleus) decrease symptoms of panic,[8-10] and that patients with panic anxiety have increased plasma levels of 3-methoxy-4-hydroxyphenylethylene, implying increased adrenergic activity.[11]

Although the lateral tegmentum nuclei appear to be the central nervous system's adrenergic center that is specifically related to blood pressure regulation, there is evidence that the locus ceruleus complex plays a role in cardiovascular regulatory mechanisms, including activating arterial-pressure elevating systems.[12] Further evidence indicates that during panic attacks the blood pressure is elevated,[5-7] and that adrenergic mechanisms may play a role in the production of both anxiety and high blood pressure. The relationship between anxiety and high blood pressure is also indicated because antihypertensive therapy (such as clonidine) appears to reduce blood pressure through a central nervous system mechanism and also has been shown to reduce panic anxiety.[5,8,10,11] Other evidence supporting the relationship between adren-

From the Community Mental Health Council, Inc., and the University of Illinois School of Medicine; the Near North Health Services Corporation; the Northwestern University Medical School; the Community Mental Health Council, Inc.; and the University of Illinois School of Medicine, Chicago, Illinois. Requests for reprints should be addressed to Dr. Carl C. Bell, Community Mental Health Council, Inc., 8704 South Constance Ave., Chicago, IL 60617.

ergic overactivity, anxiety, and high blood pressure is seen in the example of delerium tremens—a withdrawal syndrome produced by overactivity of the locus ceruleus and characterized by increased blood pressure and symptoms of anxiety, which can also be treated with clonidine.[13] Thus, evidence continues to mount indicating that hypertension is indeed a psychophysiologic disorder, and that issues of stress, anxiety, anger, and high blood pressure are related intimately.[14]

In understanding that African Americans have a disproportionate prevalence of hypertension and a disproportionate prevalence of stress,[15] and that there exists a relationship between these two phenomena, the authors decided to look for the presence of "stress syndromes," specifically isolated sleep paralysis, panic attacks, and panic disorder in a small sample of Afro-American hypertensive patients.

A review of the literature indicated that this may have been a good line of reasoning based on a number of existing studies that make a connection between stress, isolated sleep paralysis and panic disorder,[1,2] stress and panic disorder,[16–18] and panic disorder and cardiovascular problems.[19–23] This latter group of studies is particularly instructive. For example, one study involved a six-year follow-up of 112 subjects with anxiety neurosis (panic disorder) and of 110 controls; it was demonstrated that 17 percent of the patients with anxiety neurosis developed hypertension compared with 7 percent of the controls (this difference was significant at the $P < .05$ level).[22] In the same study, 19 of the 22 patients with anxiety neurosis, who later developed hypertension, developed their hypertension within two years of initiation of their anxiety symptoms.[20] Another retrospective study found that in 55 cases of panic disorder 15 percent of the patients were hypertensive compared with 9 percent in the adult primary care population that served as controls (significant at the $P < .05$ level).[21]

Thus, it appears that there may be a subset of hypertensive patients whose hypertension is heralded by the onset of panic disorder. In the previous work of Bell et al,[1,2] subjects with isolated sleep paralysis were at risk for developing panic disorder, and it seems that blacks have a greater prevalence of isolated sleep paralysis than whites. In addition, blacks may also have a greater prevalence of anxiety disorders than whites[24]; certainly blacks are more often exposed to the types of stressors that would produce anxiety disorders.

Based on all of these pieces of evidence, the authors decided to investigate the relationship between isolated sleep paralysis (also known as "the witch is riding you"), panic disorder, and hypertension. The hypothesis was that there exists a subset of African Americans whose hypertension began from excessive adrenergic reactivity (identifiable by the presence of isolated sleep paralysis) and who were subjected to excessive stress (resulting in the development of panic disorder) that initiated pathophysiologic cardiovascular processes that developed into essential hypertension. Further, the treatment of these readily identifiable precursors of hypertension in this subset of hypertensive patients will be discussed as a means of prevention.

METHODS

Black adult patients with known or apparent episodic hypertension were interviewed using the questionnaire developed by Bell et al.[1,2] This questionnaire defines isolated sleep paralysis for the patient, and requests patients who have experienced isolated sleep paralysis to describe a typical episode so as to check the validity of their report. Information was obtained about events, if any, that were perceived to precipitate an episode or prevent episodes. In addition, information was gathered on the duration and frequency of sleep-paralysis attacks, family history of sleep paralysis, and whether family members also had a history of hypertension. Patients were then asked for a history of symptoms related to their panic attacks. The *Diagnostic and Statistical Manual of Mental Disorders,*[25] ed 3 (DSM-III) criteria were used.

Patients with isolated sleep paralysis and panic attacks or panic disorder and patients with panic attacks or panic disorder alone were felt to have readily identifiable symptoms of anxiety. These patients were informed of the authors' hypothesis that such symptoms of anxiety may be indicative of adrenergic dysfunction that could be a cause of their hypertension. Patients were also informed that the treatment of their anxiety (in addition to reducing their discomfort) might have an influence on the course of their hypertension.

After a discussion of the possible major side effects of treatment,[26] the patients were started on desipramine, 50 mg at bedtime, with doses increased by 50 mg at 30-day intervals until a ceiling dose of 150 mg was attained. Baseline electrocardiograms (if not present on the chart) were performed and were re-

peated after each increment of tricyclic antidepressant dose. Patients were interviewed with regard to their symptoms of anxiety, and blood pressure was monitored by one of the authors, an internist, approximately every two weeks.

RESULTS

Thirty-one patients were interviewed. Twenty-nine patients had hypertension and two patients had apparent episodically elevated blood pressure. Seventy-seven percent of the patients were female, and 23 percent were male. The mean age of the patient population was 52 years old. The mean personal or family income was $6,357 per year, and the mean educational attainment was 9.7 years. Of the patients, 41.9 percent reported at least one episode of isolated sleep paralysis, and 30.8 percent reported having sleep paralysis disorder, ie, at least one episode of sleep paralysis a month. A vast majority of the patients were unable to report whether isolated sleep paralysis ran in their family; however, 64.5 percent reported a family history of hypertension. Of the patients reporting, 30.5 percent met the DSM-III criteria for panic attacks; two additional patients bordered on meeting the criteria. Three patients met the DSM-III criteria for panic disorder (ie, at least four attacks within a four-week period), and two other patients fell slightly short of having panic attacks frequently enough to be considered panic disorder. Thus, 9.7 percent of the study subjects had definite criteria for panic disorder, and considering the two borderline cases, this percentage may be as high as 16.1 percent. Of the 13 patients with isolated sleep paralysis, three had panic disorder, one bordered on having panic disorder, two had panic attacks, and two bordered on having panic attacks; five of the 13 denied ever having panic attacks. Of the 18 patients who denied having isolated sleep paralysis, 13 also denied having any episodes of panic attacks, four reported having panic attacks, and one almost met the criteria for having panic disorder (Table 1).

Eight patients (25.8 percent) were started on desipramine. One patient dropped out early and was lost to follow-up; another dropped out after four days of being on the medication secondary to intolerable side effects. Of the six others, only four were consistent with scheduled appointments for follow-up.

All of the patients reported improvement in overall well-being and felt that their ability to cope with stress was improved. They all noted also a decreased frequency and severity of their panic attacks over the course of treatment. Of the two patients with episodically elevated blood pressure, one dropped out early but showed persistent normalization of blood pressure while on desipramine. This same patient presented with a blood pressure recording of 178/90 mmHg while having a panic attack. When the patient was begun on desipramine, her blood pressure was recorded at 136/80 mmHg. After being on desipramine, 50 mg for two weeks, the next blood pressure reading was 114/76 mmHg. Two weeks later, while still on desipramine, 50 mg at bedtime, the patient was seen during another anxiety reaction, albeit a less severe one than during her first visit, and her blood pressure was recorded at 148/100 mmHg. During this visit the patient was begun on desipramine, 100 mg at bedtime, and her last visit (two weeks later) revealed that her blood pressure was 142/72 mmHg.

The patient with episodically elevated blood pressure showed consistent normalization of her blood pressure while on tricyclic antidepressant medication treatment. She had previous blood pressure recordings of 140/90 mmHg to 144/90 mmHg, but with treatment for her symptoms of anxiety (isolated sleep paralysis and panic disorder), she had stable normalization of her blood pressure, with a mean reading of 125/81 mmHg. Neither of these two patients were on antihypertensive medications. No pattern of improved hypertension control could be shown for the four other patients, although their symptoms of anxiety were greatly reduced, and their blood pressure did not vary from the level of control already obtained from their usual antihypertensive regimens.

DISCUSSION

The finding that 41.9 percent of 31 patients with hypertension had isolated sleep paralysis can be compared with the findings that 41.0 percent of 108 randomly sampled, healthy, anxious, and postpsychotic subjects[1] had sleep paralysis and that in another study, 51.6 percent of 64 family members had isolated sleep paralysis.[2] Both the current study and the previous two studies report a significantly higher prevalence of isolated sleep paralysis than a recent study performed in Nigeria in which 164 medical students were reported to have a prevalence of 26.1 percent.[27]

The reasons for this discrepancy are several. First, the demographics of the four groups differed signifi-

TABLE 1. TABULATION OF PATIENTS WITH HYPERTENSION, ISOLATED SLEEP PARALYSIS, PANIC ATTACKS, AND PANIC DISORDER

	Condition			
Patient No.	Hypertension	Sleep Paralysis	Panic Attacks	Panic Disorder
1	+	−	−	−
2	+	−	−	−
3	+	−	−	−
4	+	−	−	−
5	+	−	−	−
6	+	−	−	−
7	+	−	−	−
8	+	−	−	−
9	+	−	−	−
10	+	−	−	−
11	+	−	−	−
12	+	−	−	−
13	+	−	−	−
14	episodic	+	+	+
15	+	+	+	−
16	+	+	border	−
17	+	+	+	+
18	+	−	+	−
19	+	−	+	−
20	episodic	−	+	border
21	+	+	border	−
22	+	+	−	−
23	+	+	−	−
24	+	−	+	−
25	+	−	+	−
26	+	+	+	−
27	+	+	−	−
28	+	+	−	−
29	+	+	−	−
30	+	+	+	+
31	+	+	+	border
Total number of patients 31	100% (n = 31)	41.9% (n = 13)	35.5% (n = 11)	9.7% (n = 3)

cantly; the ages and socioeconomic status of the Nigerian and African-American subjects studied were not similar. Second, the previous studies on African-American subjects indicated that isolated sleep paralysis may be related to stress,[1,2] and that perhaps living in an all-black context, such as in Nigeria, is less stress provoking than living in a racist society. Third, while the prevalence of isolated sleep paralysis in the control subjects did not significantly differ from that in the anxious and postpsychotic subjects in the random survey, that population was still weighted heavily with psychiatric subjects; this may account for the greater prevalence of isolated sleep paralysis when compared with the Nigerian sample. Similarly, because isolated sleep paralysis does seem to run in families, the family members studied may have been more predisposed to developing isolated sleep paralysis than the Nigerian population. Finally, the Nigerian population may be less prone to adrenergic dysfunction than the African-American populations; the evidence for this may be gleaned by the considerable difference in the reports of a family history of hypertension. The hypertensive patients reported 64.6 percent of their family members also had hyperten-

TABLE 2. COMPARISON OF PREVIOUS STUDIES ON ISOLATED SLEEP PARALYSIS

Studies	Sleep Paralysis % (Number and Total)	Family History of Hypertension % (Number and Total)	Sleep Paralysis Disorder* % (Number and Total)	Panic Disorder* % (Number and Total)	Hypertension* % (Number and Total)
State of consciousness study[1] (n = 108)	41.0 (44/108)	?	27.3 (12/44)	?	?
Telephone interview study[2] (n = 25)	100 (25/25)	84.0 (21/25)	48.0 (12/25)	16.0 (4/25)	32.0 (21/25)
Family study[2] (n = 64)	51.6 (33/64)	100 (64/64)	27.3 (9/33)	15.2 (5/33)	24.2 (8/33)
Nigerian study[27] (n = 164)	26.1 (43/164)	18.9 (31/164)	?	?	2.3 (1/43)
Hypertensive patient study (n = 31)	41.9 (13/31)	64.6 (20/31)	30.8 (4/13)	23.1 (3/13) 38.5 (5/13)**	100 (13/13)

* These percentages, numbers, and totals refer only to those subjects who had isolated sleep paralysis in the study.
** This percentage and number includes those two patients who bordered on meeting the criteria for panic disorder.

sion, and the family studied had a history of hypertension, but the Nigerian medical students only reported a family history of hypertension of 19.0 percent.[27] In an earlier study using telephone interviews, of the subjects who had isolated sleep paralysis, 84.0 percent reported having a family history of hypertension.[2]

The current study was also similar to the family and telephone interview study[2] in that this study also found a significant relationship between the presence of isolated sleep paralysis and the presence of panic attacks, χ^2 (1) = 4.91, $P < .05$. In addition, all of the hypertensive patients in the current study who had panic disorder also had isolated sleep paralysis. This was comparable to the family study in which all of the patients with panic disorder also had isolated sleep paralysis.[2] Only one hypertensive patient who denied having isolated sleep paralysis came close to having panic attacks frequently enough to qualify for a diagnosis of panic disorder, which was similar to the finding that none of the family members who denied having isolated sleep paralysis had panic disorder.[2] In comparing hypertensive patients with isolated sleep paralysis patients and other subjects with sleep paralysis,[2] it was found that the frequency of having isolated sleep paralysis disorder (ie, one or more episode of isolated sleep paralysis per month) was not significantly different (Table 2).

The two patients with episodic hypertension and panic attacks (one with panic disorder and the other borderline on meeting the criteria of panic disorder) may be future members of the proposed subset of African-American hypertensives who developed fixed essential hypertension secondary to the development of panic disorder. Of interest is that desipramine seemed to normalize their episodic hypertension. It may be that through early intervention, these patients with panic symptoms can be prevented from developing permanent essential hypertension. The four patients who had histories of longstanding essential hypertension did not have any better control of their hypertension with the addition of desipramine to their antihypertensive regimen. This supports the hypothesis that once the pathophysiology of essential hypertension is permanently set in place by the adrenergic mechanisms responsible for the panic symptoms, the damage has been done and can no longer be prevented but only controlled.

Whether the relationships between isolated sleep paralysis, panic attacks, panic disorder, and hypertension are causal, associational, or simply accidental are too complex to determine from this pilot study. It may be that the greater prevalence of isolated sleep paralysis and panic disorder found in the hypertensive-patient sample rather than in the general population is because of the somatic symptoms associated with these phenomena that would lead these patients to the primary care physician's office.[28,29] It may also be, however, that there is a subset of hypertensive patients whose hypertension has as its etiology a previously existing adrenergic dysfunction that produces isolated sleep paralysis, panic attacks, and panic dis-

order. Only larger, well-controlled, and better-designed studies will tell.

CONCLUSIONS

Isolated sleep paralysis, panic attacks, and panic disorders are prevalent in African-American hypertensive patients. Hypertensive patients with isolated sleep paralysis were more likely to have panic attacks than hypertensive patients without isolated sleep paralysis. These findings matched previous studies on isolated sleep paralysis in African Americans.

Perhaps a role exists for the evaluation and the treatment of patients with tricyclic antidepressants (such as desipramine) who have marked elevations of blood pressure in response to anxiety manifested by frequent episodes of isolated sleep paralysis and panic attacks. It may be that such treatment could prevent the future development of sustained high blood pressure. Would it be productive to screen hypertensive patients for stress indicators as explored in this study? Should a physician choose a centrally acting antihypertensive agent to treat such patients? The presence of stress factors might imply a central adrenergic dysfunction that may also be of etiologic significance in the patients' hypertension.

Acknowledgments

This research was supported by Merrell-Dow Pharmaceuticals Inc., and was presented at the 92nd Annual Convention of the National Medical Association, August 1, 1987, New Orleans, Louisiana.

Literature Cited

1. Bell CC, Shakoor B, Thompson B, et al. Prevalence of isolated sleep paralysis in black subjects. J Natl Med Assoc 1984; 76:501–508.
2. Bell CC, Dixie-Bell DD, Thompson B. Further studies on the prevalence of isolated sleep paralysis in black subjects. J Natl Med Assoc 1986; 78:649–659.
3. Bell CC. States of consciousness. J Natl Med Assoc 1980; 72:331–334.
4. Charney DS, Redmond DE. Neurobiological mechanisms in human anxiety. Neuropharmacology 1983; 22:1531–1536.
5. Charney DS, Heninger GR, Redmond DE. Yohimbine-induced anxiety and increased noradrenergic function in humans: Effects of diazepam and clonidine. Life Sci 1983; 33:19–29.
6. Charney DS, Heninger GR, Breier A. Noradrenergic function in panic anxiety. Arch Gen Psychiatry 1984; 41:751–763.
7. Nesse RM, Cameron OG, Curtis GC, et al. Adrenergic function in patients with panic anxiety. Arch Gen Psychiatry 1984; 41:771–776.
8. Liebowitz MR, Fyer AJ, McGrath P, et al. Clonidine treatment of panic disorder. Psychopharmacology 1981; 17:122–123.
9. Grant SJ, Huang YH, Redmond DE. Benzodiazepines attenuate single-unit activity in the locus coeruleus. Life Sci 1980; 27:2231–2236.
10. Hoehn-Saric R, Merchant AF, Keyser ML, et al. Effects of clonidine on anxiety disorders. Arch Gen Psychiatry 1981; 38: 1278–1282.
11. Ko GN, Elsvorth JD, Roth RH, et al. Panic-induced elevation of plasma MHPG levels in phobic-anxious patients. Arch Gen Psychiatry 1983; 40:425–430.
12. Ward DE, Gunn CG. Locus coeruleus complex: Differential modulation of depressor mechanisms. Brain Res 1976; 107:407–411.
13. Bell CC. Simultaneous treatment of hypertension and opiate withdrawal using an alpha 2 adrenergic agonist. J Natl Med Assoc 1983; 75:89–93.
14. Chesney MA, Rosenman RH, eds. Anger and Hostility in Cardiovascular and Behavioral Disorders. New York: Hemisphere Publishing, 1985.
15. Bell CC. Black intrapsychic survival skills: Alteration of state of consciousness. J Natl Med Assoc 1982; 74:1017–1020.
16. Uhde TW, Boulenger J, Roy-Byrne PP, et al. Longitudinal course of panic disorder: Clinical and biological considerations. Prog Neuropsychopharmacol Biol Psychiatry 1985; 9:39–51.
17. Finlay-Jones R, Brown GW. Types of stressful life event and the onset of anxiety and depressive disorders. Psychol Med 1981; 11:803–815.
18. Faravelli C, Webb T, Ambonetti A, et al. Prevalence of traumatic early life events in 31 agoraphobic patients with panic attacks. Am J Psychiatry 1985; 142:1493–1494.
19. Coryell W, Noyes R, Clancy J. Excess mortality in panic disorder. Arch Gen Psychiatry 1982; 39:701–703.
20. Noyes R, Clancy J, Hoenk PR, et al. Anxiety neurosis and physical illness. Comp Psychiatry 1978; 19:407–413.
21. Katon W. Panic disorder and somatization. Am J Med 1984; 77:101–106.
22. Noyes R, Clancy J, Hoenk PR, et al. The prognosis of anxiety neurosis. Arch Gen Psychiatry 1980; 37:173–178.
23. Shear MK, Kligfield R, Harshfield G, et al. Cardiac rate and rhythm in panic patients. Am J Psychiatry 1987; 144:633–637.
24. Warheit GJ, Holzer CE, Arey SA. Race and mental health: An epidemiologic update. J Health Soc Behav 1975; 16:243–256.
25. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders, ed 3. Washington, DC: American Psychiatric Association Press, 1980.
26. Pollack MH, Rosenbaum JF. Management of antidepressant-induced side effects: A practical guide for the clinician. J Clin Psychiatry 1987; 48:3–8.
27. Ohaeri JU, Odejide AO, Ikuesan BA, et al. The pattern of isolated sleep paralysis among Nigerian medical students. J Natl Med Assoc, in press.
28. Von Korff M, Shapiro S, Birke JD, et al. Anxiety and depression in primary care clinic. Arch Gen Psychiatry 1987; 44: 152–156.
29. Katon W, Vitaliano PP, Russo J, et al. Panic disorder: Epidemiology in primary care. J Fam Pract 1986; 23:233–239.