

## Erythromelalgia — A Case for Biofeedback

by ARLENE M. PUTT, R.N., Ed.D.\*

As nurses develop increasing knowledge about and expertise in using instrumentation, the logical extension from obtaining information from electronic equipment is to relate these findings to patient care and nursing intervention. Biofeedback affords the perfect link between nursing capability and patient care. The case of Beverly S., who suffers from erythromelalgia, illustrates a nursing intervention that uses electronic biofeedback for symptom alleviation.

### *THE PATIENT AND HER PROBLEM*

Erythromelalgia is a rare disorder in which there is paroxysmal bilateral vasodilation of the extremities, which causes painful burning distress that lasts minutes to hours. The condition occurs with equal frequency in men and women, and the etiology is unknown. Initially, the burning area is circumscribed, but later it may become more extensive. An attack is provoked by exposure to a stimulus that elicits vasodilation; therefore, exercise or a warm climate is frequently a contributing factor.

Beverly S. has had this condition for years. At first, she was only troubled by a hot burning sensation in her toes and the soles of her feet during the summertime. In the last several years, however, she has had

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\*Professor and Director, Medical-Surgical Nursing, School of Nursing, University of Arizona, Tucson.

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trouble the year round with increasing incapacitation. She has not been able to tolerate closed shoes and must wear exercise sandals all year. Tucson's summer heat is intolerable, and during that season Beverly leaves the city for a cooler climate. She has learned that cold is "good," therefore, "the colder the better."

An electrical engineer friend is in the process of inventing a pair of cooling coil innersoles for her. She hopes that the innersoles will permit her to resume wearing closed shoes and riding boots.

When Beverly's feet become warm, they flush and she has intolerable pain and itching relieved only by Histacon and/or methysergide (Santert). For further relief, she puts her feet into a tub of cold water.

Such was the verbal picture Beverly presented to members of the health care team. On examination, her feet demonstrated trophic changes due to ischemia. The fourth toe on both feet was sausage-shaped, and the other toes were swollen with the skin being red, shiny, thin, and hairless. She was otherwise asymptomatic, and no anomalous objective physical or laboratory findings were elicited.

Beverly's internist was distressed. He had tried everything he could and the situation continued to worsen. He was reluctant for her to continue on heavy medication. Therefore he discussed her problem with the author, who suggested that biofeedback might provide some relief.

Beverly was placed under the research protocol developed for testing the effectiveness of relaxation mechanisms and biofeedback on stress-related disorders currently under way at the University of Arizona College of Nursing. The patients who participate in the project are seen once weekly for nine weeks, then twice a week for two weeks, with a follow-up after one month. They are taught basic relaxation techniques and various relaxation exercises to practice between sessions. Periodic measurements are made during each therapy session.

Multiple instruments were used in Beverly's data collection. Physiologic measurements consisted of: (1) blood pressure and polygraph recordings of electromyograms and heart rate; and (2) digital readouts of skin temperature. To obtain information regarding psychologic parameters, two tests — the Fear Survey Schedule and the IPAT Anxiety Scale — were used.\* Relaxation training entailed on-site individual instruction at the beginning of the therapy, which was reinforced by the use of Budzynski audio tapes as follow-up.<sup>8</sup> The technique employs fantasy to aid relaxation.

\*The Fear Survey Schedule is from Wolpe, J., and Lang, P.: A fear survey schedule for use in behavior therapy. *Behav. Res. Ther.*, 2:27-30, May, 1964.

The IPAT Anxiety Scale is from Cattell, R. B.: The conceptual and test distinction of neuroticism and anxiety. *J. Clin. Psy.*, 13:221-233, July, 1957.

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## THEORETICAL BASIS OF THERAPY

The question asked in this study was, "What effect does a combination of biofeedback and relaxation training have upon: (1) heart rate, (2) blood pressure, (3) the electromyogram, (4) skin temperature, and (5) subjective responses in patients with chronic stress-related disorders?" The theoretical basis for this approach to therapy is based upon the following assumptions:

A. The most fundamental assumption made was that the mind/body dichotomy is a fiction. In other words, the individual functions as an integrated whole. Consequently, one can approach problems in life by dealing with their manifestations in either the body or the mind, or both.

B. A second assumption is that in chronic stress, whether due to social, psychiatric, or physical factors, the individual sustains a high level of muscle tension and sympathetic tone which he cannot reduce without *actively learning how* to decrease tension. When muscle tension is lessened, symptoms subside, and the result is an improvement in general functioning. The improvement may or may not be accompanied by insight that correlates with the cause or change.

C. Finally, when a person is taught to decrease his arousal level in a specified muscle or muscle group, he expands conscious control over his body and he learns that all body systems can be brought under increased conscious control.

Stoyva and Budzynski base their work on the hypothesis that individuals who experience persistent stress show hyperarousal in one or more systems of the body; i.e., they have deranged homeostasis.<sup>8</sup> Frequently, stressed individuals who are overreactive all the time lose their ability to relax. Bombarded by the impacts of modern, urbanized, technical, and complex societies, the individual must mobilize his physical and mental resources at a high level and maintain them at that pitch. Such a response entails activation of muscle tension and sympathetic nervous responses. Recuperation in the parasympathetic mode becomes a lost art.

The second concept germane to understanding the therapeutic value of biofeedback is that at least some learned responses occur in this arousal pattern. These responses, if learned, are subject to relearning or modification. A variable can be controlled if sufficient information about the variable is available to the controller. The modification of these learned responses can then be enhanced by feedback techniques. Stoyva and Budzynski elected to test whether or not modification would occur in response to low arousal mechanisms.

The works of Miller and DiCara are classics in the field of biofeedback.<sup>2, 6</sup> Miller did voluminous work in testing animal responses and,

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along with DiCara, demonstrated that the autonomic nervous system was a very effective learner. A graphic demonstration of selective learning is the rabbit who learns to dilate the blood vessels in one ear and to constrict the vessels in the opposite ear.

Green et al. and Schwartz were among the original workers in the field of biofeedback.<sup>3,7</sup> They studied and documented what swamies and other eastern meditators were able to do through a passive attitude, a quiet environment, a thought to focus upon, a comfortable position — factors identified by Benson as basic to a relaxation response.<sup>1</sup> Green and Schwartz are well aware of the capacity of the stream of consciousness to vary in cognitive and mnemonic content as attention shifts. Therefore, the focusing of attention only on thought becomes an important component of meditative relaxation.

All these works lead to the current concept of biofeedback: The body is a very efficient and selective learner when information regarding performance is made available to the learner, who uses the information to adjust the performance in the direction desired. This learning proceeds more rapidly if the learner is in a relaxed state of cultivated low arousal, an antistress mechanism.

#### THE PROGRESS OF THERAPY

The first time Beverly was to be treated, she arrived very distressed. Her feet were getting hot and starting to flush. The first treatment was therefore prefaced by a cold foot soak to avert a full-blown reaction.

Beverly is a very mature, stable, intelligent woman who scored exceptionally low on IPAT Anxiety and Fear Scales. She had a high level of knowledge of her disorder and understood the actions of her medications very well.

The goal set for Beverly was to teach her to warm her toes without having symptoms. By taping thermistors on one toe of each foot and connecting these to a digital readout thermometer, temperature could be measured and compared in either foot and at any point in time. It soon became apparent that Beverly had considerable ability to control the temperature in her toes up to 22° C (70°–71° F). She expressed a fear of allowing her toes to warm because she became uncomfortable at about 32° C. At the lower temperatures, her toes appeared ischemic. The trophic changes were probably due to the almost constant ischemia. The baseline heart rate and blood pressure recordings were low. The EMG also failed to show any great degree of tension. Basically, Beverly had learned to respond specifically to her feet and the discomfort she experienced when they became warm.

Beverly was instructed to assume a passive attitude and allow her toes to warm, to think about the pleasant sensation of her bare feet on a fur

rug with the sunlight upon them. She was also instructed to wear cotton socks to protect her toes from ambient temperature and trauma. Once a week in the laboratory, Beverly tried to shape the temperature of her feet. In the interval between laboratory sessions, she practiced with an alcohol-type thermometer at home. Through testing and retesting, she learned to increase her toe temperatures and not to generate symptoms. Her need for medication continued to decrease gradually. She remained symptom-free for three months. After four months, the skin on her toes looked better. The sausage appearance continued but was less pronounced. The skin appeared healthier and thicker. At that point, she could tolerate foot temperatures of 33°–34° C. She had discontinued all medicine but had resumed smoking. By practice in cooling her feet through mental processes, her activity was less restricted.

Her main problem had been the high Tucson summer temperatures; therefore, when the weather became hot, she left town for the summer. After four months at higher and cooler altitudes, Beverly returned to the city. She had gotten along reasonably well over the summer with only two bouts of distress. However, one of the latter caused her to resume medication to control her symptoms.

Upon returning to the city, Beverly reported for additional therapy. While she maintained that she had practiced relaxation during the summer, monitoring of her foot temperatures indicated that her abilities to warm her toes intentionally had regressed. Her toe temperatures were approximately 23° C at that point. She then returned to weekly therapy and was urged to practice her relaxation at least twice daily and to give up smoking. Over the next two months, her need for medication again diminished, and she was able to discontinue all her medications.

When she stopped smoking, she discovered that she was allergic to polyester sheets. After switching to cotton sheets, her symptoms disappeared at night. By carefully monitoring her toe temperatures, she found that she had daily biphasic temperature response patterns. This allowed her to time her relaxation practices to coincide with her diurnal temperature pattern. By the end of the third month, she was again symptom-free and so confident of her ability to control her symptoms that she bought herself a pair of walking boots, something she could not even have hoped to do one year previously.

Beverly has not been cured, but she has learned some control — enough control to keep her comfortable in winter and, it is hoped, enough control to help her tolerate better the hot southwestern summer weather.

#### SUMMARY

Beverly is one of the growing number of patients who are looking to biofeedback for relief. As the instruments become more available, more

compact, and more sturdy, and as clinical nursing research moves into the vanguard of care and application, increasing numbers of health care problems will no doubt prove to be amenable to this type of intervention. In this case, the biofeedback therapist was a nurse and the referring professional was Beverly's internist. Thus appears another role for nurses, that of biofeedback therapist acting upon referrals from a physician colleague.

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University of Arizona  
School of Nursing  
Tucson, AZ 85721

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