CASE REPORT

The Use of Electromyographic Biofeedback in Treating a Client With Tension Headaches

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Key Words: biofeedback • electromyography

This case report presents a patient with tension headache problems referred to occupational therapy for electromyographic (EMG) biofeedback training to reduce or eliminate headache episodes. As reported by the patient, the frequency and intensity of the headaches was interfering with her ability to adequately attend to activities of daily living, including child care, homemaking, and vocational activities. By simultaneously recording a composite of psychophysiological behavioral responses, biofeedback lends itself to treating the patient from a holistic perspective (Abildness, 1988). Treatment methods involving biofeedback in occupational therapy practice are matched to the patient’s life-style needs and goals based on a thorough behavioral analysis of the problem.

By far the most common type of headache, the tension headache is usually described as a steady, dull pain located in the occiput or posterior region, often extending around to the forehead region. This type of headache is believed to develop as a result of sustained contractions of the skeletal muscles around the face, scalp, neck, and shoulders (Basmajian, 1983). EMG biofeedback is the process of monitoring changes in muscle tension and relaying these changes to the patient in the form of varying tones, lights, or pointers on a dial. With this external information, the patient can dramatically increase his or her awareness of the varying levels of muscle tension. The patient becomes increasingly able to note these changes and control them before excessively elevated levels occur, which result in tension-related muscle pain or soreness (Curtis, Detert, Schindler, & Zirkel, 1985).

Budzynski, Stöva, Adler, and Julianey (1973) provided a good beginning model for the use of EMG biofeedback in treating patients with tension headaches. In a study of 80 medically defined tension-headache subjects, Peper, Ancoli, and Quinn (1979) found that “EMG levels after biofeedback training appear to be reliably lower during both headache and nonheadache periods” (p. 437). In a study on tension headache, Blanchard et al. (1982) combined EMG biofeedback with systematic relaxation exercises, which incorporated a home training program. However, some patients treated for tension headaches using EMG biofeedback have not shown a relationship between changes in EMG activity across therapy sessions and headache activity, implying that something other than muscle tension (e.g., neurochemical imbalance) may be involved (Schwartz, 1987). A recent study conducted by occupational therapists supported the effectiveness of biofeedback for treating headache disorders in adults and children (Engel & Rapoff, 1990). Participants in this study attended sessions of biofeedback-assisted relaxation training, and each received a cassette tape of all of the relaxation exercises for home practice.
Patient Information

The patient was a 34-year-old woman with a 1-year history of tension headaches occurring 3 to 4 times per week. She was married and the mother of a 14-year-old girl and worked part-time in the mornings as a medical secretary in a psychiatrist's office. Her headaches began sporadically approximately 1 year before her referral for biofeedback, slowly increasing to 3 to 4 times per week. The headaches usually occurred early in the morning before she would leave for work. The referring physician believed the headaches were not work-related. In evaluating her in the occupational therapy clinic, I believed that the headaches were due to an overall tenseness and anxiety not created by a specific event. This belief was based on interview information regarding activities of daily living and the patient's responses to a life-style questionnaire developed in the occupational therapy clinic. Initially, she was taking acetaminophen as needed to reduce the symptoms after onset of a headache. One month before her referral for biofeedback, she used an analgesic-sedative combination (acetaminophen and butalbital) as needed to relieve symptoms with limited success.

She was referred for biofeedback evaluation and training services as an outpatient in the occupational therapy department at St. Mary's Medical Center in Racine, Wisconsin, to decrease her headache episodes. She had not received prior treatment or therapies other than visits to her family physician, where she had received medication prescriptions. St. Mary's Medical Center is a general hospital with a large physical medicine and rehabilitation department that includes physical, occupational, and speech therapy services. Occupational therapy services include a biofeedback program for muscle reeducation and muscle tension-related disorders. This program was developed by the occupational therapy supervisor approximately 1 year prior to the referral of this patient.

Clinical Program

The biofeedback program for treating headache disorders was developed in occupational therapy for two reasons. First, the department was already using biofeedback equipment with patients for muscle reeducation purposes. Second, it was believed that occupational therapy was appropriate for tension headache patients, because their occupational performance is often affected in the areas of self-care, work, and leisure and play. EMG biofeedback is used as a means of indicating muscle-tension problems to patients, who are then treated through relaxation and resistive exercises.

The program usually consists of nine outpatient visits. The first visit is an orientation session lasting 1/2 hr., during which time the patient is given information about (a) the purpose of the program, (b) the neurological rationale for the program, (c) the biofeedback equipment, and (d) the treatment plan. On the basis of the patient's understanding and interest, a second session for evaluation purposes is scheduled. During the 1-hr evaluation session, pertinent background information (i.e., type of headache, initial onset, frequency and time of occurrence, secondary symptoms, family and significant others, and daily activities) as well as EMG biofeedback readings are collected from the patient to determine levels of muscular tension that may be a causative factor in the headaches. If the results of the evaluation session suggest increased muscle tension related to increased stress and anxiety, the patient is then scheduled for two 45-minute treatment sessions per week for three weeks. At the end of the treatment program, a 1-month follow-up visit is scheduled.

During the orientation session, the patient appeared to understand the possible relationship between muscular tension in the neck and shoulders and tension headaches. She indicated understanding of the EMG biofeedback process after a demonstration using her right wrist extensor muscles and was interested in scheduling an evaluation session to determine tension levels in her neck and shoulders.

During the evaluation session, EMG recordings were obtained for the upper trapezius muscle regions bilaterally (see Figure 1 for placement of the electrodes). Recordings were obtained in four different body positions: (a) supported seated, (b) unsupported seated, (c) standing, and (d) supine. After 30 sec in each of the positions, EMG readings were averaged over a 10-sec interval. Table 1 indicates the readings obtained in these four body positions during the evaluation session as well as the readings obtained in the final treatment session. In a person not exhibiting increased muscle tension, EMG readings for the upper trapezius muscles in these body positions are expected to be below 2.0 microvolts (Basmajian, 1983). Based on the results of the evaluation, it was recommended that she complete the treatment portion of the program.

In the first week of treatment, deep-breathing exercises and progressive muscular relaxation exercises were taught to the patient and incorporated into a home program. The deep-breathing exercises are taught as a method to learn to relax muscle tension quickly, as needed. The progressive muscular relaxation exercises train muscle relaxation by having the patient increase tension and then letting go (Peper et al., 1979). EMG recordings were taken in a supported seated position at the beginning of each session. The patient then practiced taking deep, diaphragmatic breaths (i.e., in through the nose and out through the mouth) while observing the EMG recordings of her upper trapezius muscle groups. She was instructed to take three deep breaths, as practiced in the clinic, anytime during the day when she felt she was beginning to tense. During this first week, the patient was also in-
During the second week of treatment, resistive shoulder elevation exercises were added to the program. These exercises are thought to be important in teaching the patient to tense muscles appropriately during strengthening and daily activities while still being able to maintain relaxation during periods of inactivity. They are also an extension of the progressive muscular relaxation technique with added external resistance. The patient was instructed in a home program to elevate her shoulders against resistance offered by Thera-Band, which is a thin latex material placed over the shoulders to resist elevation. This was to be completed twice a day while she continued with the progressive muscular relaxation exercise at least once a day. EMG biofeedback was used during the second week of treatment to monitor upper trapezius electrical activity during an upper extremity task involving shoulder flexion (see Figure 2). Using EMG biofeedback, the patient was then challenged to decrease EMG levels related to upper trapezius activity while continuing with the upper extremity task. This portion of the

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Table 1
Electromyographic (EMG) Recordings of the Patient in Four Body Positions

<table>
<thead>
<tr>
<th>Body Position</th>
<th>Evaluation Session EMG Recording (in microvolts)</th>
<th>Final Treatment Session EMG Recording (in microvolts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supported, seated</td>
<td>27.3</td>
<td>1.7</td>
</tr>
<tr>
<td>Unsupported, seated</td>
<td>35.7</td>
<td>2.1</td>
</tr>
<tr>
<td>Standing</td>
<td>24.3</td>
<td>2.0</td>
</tr>
<tr>
<td>Supine</td>
<td>14.4</td>
<td>1.1</td>
</tr>
</tbody>
</table>

Figure 2. Patient engaged in an upper extremity task while upper trapezius electromyographic activity is monitored.

1Manufactured by the Hygienic Corporation, 1245 Home Avenue, Akron, OH 44310.
program is thought to be important in teaching the client to decrease abnormal levels of muscle contraction in the upper trapezius during upper extremity tasks. Learning to avoid overcontraction during activity is as important as learning to relax a muscle that is not being used. This program was maintained through the third week of treatment.

During the final treatment session, EMG recordings were taken and compared with those of the initial evaluation (see Table 1). A significant decrease to normal levels (less than 2.0 microvolts) was noted. The patient also indicated not only a decrease in the number of tension headaches (four episodes) over the past 3 weeks but also a lessening of the symptoms (i.e., the headaches were not as severe and of shorter duration). The patient was instructed to continue a home program of progressive muscular relaxation exercise and resisted shoulder elevation exercise at least once a day.

Two weeks following the final treatment session, when the patient was contacted to check on her status and to schedule a 1-month follow-up appointment, she indicated that for the first time she was able to avert a tension headache by using the deep-breathing exercises. She reported that since that time she has not had a headache recurrence but continues with her home exercise program as instructed. Due to her success, she was not interested in a follow-up appointment, and none was scheduled. When contacted 6 weeks later, the patient explained that she had not yet had a headache recurrence and had discontinued her home program except to complete the deep-breathing or progressive muscular relaxation exercises during times of major work-related or personal stress.

Summary

EMG biofeedback was used during a 4-week treatment program to decrease upper trapezius activity related to tension headaches. The headaches were believed to be caused by general tension and anxiety and affected the patient’s ability to adequately attend to activities of daily living, including child care, homemaking, and vocational activities. The program combined deep-breathing exercises, progressive muscular relaxation exercises, resisted shoulder elevation exercises, and EMG monitoring during upper extremity tasks involving shoulder flexion. An important adjunct to clinic sessions was a home exercise program to be completed 2 to 3 times per day. In this case, the EMG biofeedback program was successful in assisting the patient to eliminate tension headaches for at least an 8-week period. At the same time, the patient reported an increased ability to attend to activities of daily living, stating that she was able to “do more around the house” and had not missed a day at work in 2 months.

References