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CASE REPORT

A 15-year Exercise Program for Rheumatoid Vasculitis

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A rare case of rheumatoid vasculitis and responses to a 15-year supervised exercise program. This patient presented with significant impairment in mobility and physical work capacity. His exercise tolerance improved considerably and he benefited emotionally.

Key words: rheumatoid arthritis, rheumatoid vasculitis, supervised exercise, METS

As several authors (1–4) have shown, rheumatoid vasculitis (RV) occurs on a continuum from focal ischemic digital lesions to systemic necrotizing arteritis, with inflammatory vascular destruction and may flare independently of synovitis. *Clinical* vasculitis, as seen in this case, is uncommon. It occurs in less than 1% of those with rheumatoid arthritis (RA) and carries a poor prognosis. In the present study, we observed responses to a 15-year exercise program by a patient with a rare case of RV that has required astronomical amounts of medical care. The writers are not aware of a similar study of such length.

The patient

This 55 year-old white male sales manager was retired prematurely on disability and was referred by his rheumatologist for a supervised program of therapeutic exercise at the age of 40. He was determined to overcome multiple disabling conditions relative to his disorder, characterized by chronic visceral and peripheral pain that encourages disability. The patient has a 30-year history of rheumatoid arthritis and secondary vasculitis with inflammatory neuropathy and mononeuritis multiplex, preceded by a severe case of rheumatic fever at age three. Family history is remarkable for cardiovascular disease, systemic lupus erythematosus, Hodgkin's Disease, and rheumatic fever. There is a smoking history of 12 pack years, but the patient has not smoked for 30 years. Modest but transient blood pressure elevations have been observed in the past. His lipid status is normal.

The patient presented with significant muscle wasting, hypesthesia, and diminished proprioception in the extremities. No reflexes were elicited in the lower extremities. Subluxation deformities were noted in both hands, the left greater than on the right. There was flexion and extension limitation of the metacarpophalanges and proximal interphalanges with flexion limitation in both knees at 90 degrees.

There is decreased position, pinprick, and vibratory sense as well as severe loss of motor and sensory function in the hands and feet requiring braces. There is no feeling distally from the elbows and knees. This is considered Class II rheumatoid arthritis. The ability to perform activities of daily living (ADL) is impaired. His car has been specially adapted for entrance/exit and operation. He cannot use public transportation. Buttons have been replaced by velcro. The left hand has no prehension and cannot be used for daily tasks – items on the floor, shelf, or table can be picked up only with the right hand. Stairs can be managed with a railing.

The medical history includes a subtotal gastrectomy, bilateral vagotomy for peptic ulcer, and bilateral synovectomy for the knees. Repetitive renal calculi have been managed surgically. Cataract and retinal surgery were required for the right eye in 1991. Other clinical concerns include osteomyelitis in the left foot and surgical reconstruction of the left hand. Compromised arterial circulation proceeded to gangrenous involvement in 4 fingers and 4 toes, requiring surgical debridement. No dorsalis pedis pulse can be obtained on the left and chronic venous incompetence has required compression stockings in the past. Acute cholecystitis required a cholycystectomy in 1981. Hospitalization was required in 1971 for pulmonary emboli which were resolved by heroic anticoagulant therapy. Some clinical concerns may be related to the side-effects of prednisone, taken for 20 years in doses ranging from 5 to 75 mg daily. In the words of his rheumatologist, "This patient has never had a remission, in the classic sense, of rheumatoid arthritis, and

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no patient I'm aware of has taken prednisone for as long a period and lived."

Methods

Medical profile test

Prior to beginning his program the patient was given a Medical Profile Test that included a detailed history, physical examination, multi-stage exercise test (MSET), pulmonary function test (PFT) with conventional spirometry, lipid profile, and CBC screen, and body composition by skinfold measure. The MSET, PFT, bloodwork, and skinfolds were repeated annually (excluding 1982, 1984, 1994). His first test was taken at age 40 in 1980 and the final one at age 55 in 1995.

Multi-stage exercise test (MSET)

A continuous, stepped, MSET with workloads increased at 3-minute intervals was completed on an electronically calibrated bicycle ergometer with a modification of the protocol described in reference 5 as scheduled above. Twelve-lead EKG tracings along with heart rate, blood pressure, and ratings of perceived exertion were obtained for each workload. Metabolic data were obtained with a Sensormedics 2900 Energy Expenditure Unit.

Conditioning program

Reeducation in basic movement patterns was necessary before attempting formal exercise. Early triumphs were: lifting his forearms, writing, dialing a telephone, turning a doorknob, walking, riding a stationary bike. He modified or designed splints, clothing, exercise equipment, and self-help devices and learned to distinguish between neural, arthritic, and muscle pain.

When sufficient progress had been made, a supervised exercise program of cardiovascular, flexibility, and progressive resistance exercise (PRE) was begun at the Human Performance Laboratory (HPL), Holy Redeemer Medical Center, in Philadelphia. Cardiovascular training consisted of a 6-minute warmup, 45 minutes on a specially adapted stationary bike, a summation of three (3) 15-minute intervals achieved in gradual fashion, and a 6-minute cooldown. The exercise training portion other than warmup/cooldown could be reduced to as low as 10 minutes with pain flareups. Training heart rate range was set at 85% of an MSET peak heart rate minus 10 bpm (6). Changes in the exercise prescription were also made relative to pain thresholds and impairment in joint range of motion as well as improvements in conditioning when indicated. Similar approaches were taken with flexibility exercise (7) and PRE (using resistance machines and free weights) (8). Resistance and flexibility exercises were also performed at home with equipment designed by the patient. Exercise frequency at the HPL varied from 2 to 5 times weekly. There have been periods, as witnessed by the extensive medical history, when exercise was not possible. The exercise program was modified and gradually reestablished. This program pattern was followed for 15 years.

Results and discussion

ESR values have ranged from 2 to 34 mm/hr during the observation period, with persistent elevations in recent years. A chronic, persistent anemia and moderately elevated white cell count have been present for many years. Lipid values have remained WNL as have pulmonary function measures. Bodyweight has varied between 71.7 and 64.9 kg (height = 175.3 cm). Percent bodyfat ranged from an initial value of 16.4% to a low of 13.5% in 1993 to a high of 17.7% in 1995. No significant EKG changes or related symptoms have been observed during an MSET and initially excessive diastolic pressor responses during exercise testing have resolved.

Figure 1 shows the pattern of MSET workload responses in kilopond-meters/minute: 1 kpm = the energy required to lift a 1 kg mass 1 meter against normal gravitational forces. Performance doubled from 400 to 800 kpm/min in the period 1980 to 1983. Subsequent test responses failed to achieve this level, but all exceeded that of the initial test.

Figure 2 reveals a similar metabolic pattern. Physical work capacity (PWC) is displayed in METS or metabolic units where 1 Met = 3.5 ml/O_2/kg/min. PWC almost tripled in the first 3 years (2.8 to 7.6 METS). Reductions in 1988, 1992, and 1995 (7.0, 6.0, 6.3 METS, respectively) suggest regression and the observed reduction in metabolic status may well be related to the advance of RV and long-term medication side-effects, but PWC continues to exceed that observed prior to beginning the program. Significantly, 5 METS is the level established by the

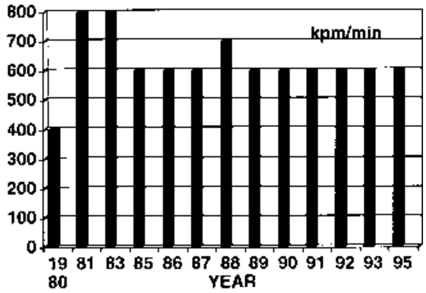

Fig. 1. Multi-stage exercise test responses.

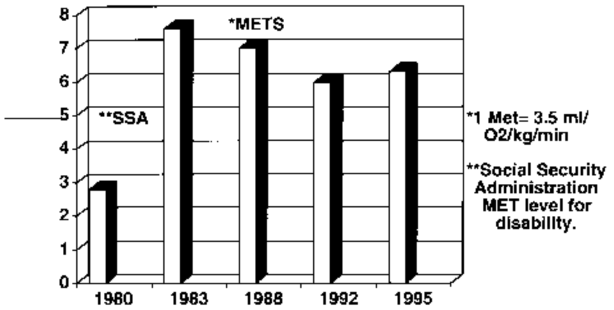

Fig. 2. Selected multi-stage exercise test metabolic responses.

Social Security Administration for disability classification and although the gains observed for this patient are modest, the exercise program, in the opinion of his rheumatologist, "… has improved his exercise tolerance considerably and has benefited him emotionally."

To conclude, despite the fact that low work capacity and muscular fitness are common in these patients, intervention with exercise has occupied a controversial role in RA therapy. Nordemar et al. (9) have reported that, "As in many other diseases, the general prescription of rest in RA is not adequate," and a better disease outcome is consistently observed in active patients. Similar reports (10–12) suggest that exercise frequency is not related to RA disease activity or radiological progression of joint destruction and it is well known that exercise counters the muscle-wasting effects of prednisone (13). Indeed, Rall et al. (14) report that exercise may enhance protein synthesis and reverse the reduced functional status relative to muscle weakness in RA. Other findings (15) clearly show that physical activity and related lifestyle interventions can significantly reduce premature all-cause mortality and disability, improve quality of life, and increase chances for longevity in the population at large. It would be presumed to benefit RA patients as well.

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