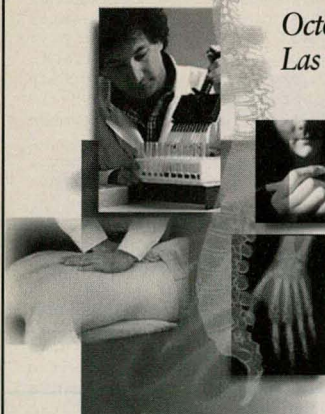


EXERCISE-INDUCED MUSCLE INJURY: DYNAMICS AND THERAPEUTIC APPROACHES, J.N. Howell, Ph.D., A.G. Chila, D.O., G.C. Chleboun, Ph.D. and R.R. Conatser, M.S., Ohio University College of Osteopathic Medicine, Somatic Dysfunction Research Institute, Athens, OH 45701

Exercise-induced muscle injury can be produced experimentally in humans under uniformly controlled conditions and offers a unique opportunity to study the effects of therapeutic interventions on healing. In four separate studies involving 151 subjects, **no effects** of NSAIDs, therapeutic exercise, ice application, or osteopathic manipulative treatment on soreness, swelling, stiffness, or muscle strength could be detected in the two week recovery period following injury to elbow flexors through a regimen of eccentric exercise. (For experimental details see Howell et al., J. Physiol. 464:183, 1993.) The studies with the NSAIDs, flurbiprofen (0.3 g/day) and ibuprofen (1.6 and 3.2 g/day), were double blind. The two therapeutic exercises were 1) isometric (35% of max. voluntary contraction) and 2) movements through the full range of motion. 3-4 treatments over 2 weeks were provided by two experienced D.O. specialists in manipulation, who were instructed only to treat the subjects as if they were patients presenting with arm soreness. Power analysis indicated that we would have been able to detect intervention-induced changes of 20% or greater in any of the measured variables. Our results, together with other reports in the literature, suggest that the recovery from this type of acute injury is a highly stereotyped process not readily altered by therapeutic intervention. Like the other interventions, NSAIDs, despite their widespread use for postexercise muscle soreness, offered neither accelerated healing nor analgesia. (Funded by AOA Grants 90-08-259, 91-08-259, 93-08-369.)

40th Annual Research Conference

October 7-11, 1996
Las Vegas, Nevada



Magnetic Resonance Imaging and Osteopathic Medicine

Under the sponsorship of
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CME quiz discussions

The following discussions relate to the CME quiz appearing in the July 1996 issue of JAOA.

1. (c) Microcalcifications with a mammographically detected dominant mass that was nonpalpable are more likely to be malignant. Lesions that meet this criterion are best followed up with needle-localized breast biopsy to determine their pathologic status.
2. (b) Although microcalcification with a dominant mass is more likely malignant than microcalcification without a dominant mass, this combination is not pathognomonic for malignancy. Eighty percent of lesions with microcalcifications followed up by needle-localized biopsy were histologically benign.
3. (e) Surgical removal is the treatment of choice because there is no effective chemotherapeutic agent for the treatment of eustrongyliidiasis.
4. (a) Eustrongyliidiasis should be included in the differential diagnosis of acute appendicitis.
5. (c) Fifteen percent of patients with chest pain resulting from an acute myocardial infarction will have a reproducible component to their pain. Facilitation of the upper thoracic spinal segments generate motion restrictions and reproducible pain in the corresponding vertebrae and ribs. (Tierney WM, Fitzgerald J, McHenry R: Physicians' estimates of the probability of myocardial infarction in emergency room patients with chest pain. *Med Decis Making* 1986;6:11-19.)
6. (b) False. If the physical examination is medically necessary, offering children a choice of which part they would like only opens the door to conflict and mistrust.
7. (a) True. Words that demystify and provide a sense of security will frequently result in enhanced cooperation.
8. (e) Metaplastic breast carcinoma is often further classified into subgroups of pseudosarcomatous metaplastic lesions, low-grade adenosquamous carcinomas, and spindle cell carcinomas.

(continued on page 496)

CME quiz discussions continued

9. (b) False. The incidence of metaplastic breast carcinoma is approximately 0.02% of all breast carcinomas.

10. (b) False. Levonorgestrel (Norplant) rods do not provide enough contrast difference from the surrounding soft tissues to be rendered visible on plain x-ray films. Computed tomography improves contrast resolution of these implanted rods.

11. (e) Hypothyroidism can affect skeletal muscle, peripheral nerves, mental functioning, and reflex changes.

12. (a) True. Phosphorus 31—nuclear magnetic resonance spectroscopy can identify the spectral peaks for each of the three phosphorus atoms of the adenosine triphosphate (ATP) molecule.

13. (c) Metronidazole does not cover non-O group 1 *Vibrio cholerae* infection.

14. (d) Cirrhosis and cancer are known predisposing factors for the development of sepsis secondary to non-O group 1 *Vibrio cholerae* infection. ♦

These discussions relate to the CME quiz appearing in the Supplement to the July 1996 issue of JAOA.

(b) Maintenance of normoglycemia as much as possible is directly associated with prevention or deterrence of chronic complications of diabetes, such as retinopathy, nephropathy, and neuropathies. It is also associated with delayed progression of these complications.

2. (e) Microalbuminuria can be potentially prevented by intensive control of blood glucose levels and blood pressure from the onset of diabetes. Even at the onset of microalbuminuria or altered glomerular filtration rate, use of an angiotensin-converting enzyme (ACE) inhibitor can slow the progression of chronic renal insufficiency as can restriction of dietary protein.

3. (a) False. Self-monitoring of blood glucose will result in values 15% lower than serum values.

4. (b) Increased insulin production. Sulfonylureas increase the production of insulin over the short term.

5. (b) False. Modern insulin preparations do not require refrigeration. These preparations may be kept at room temperature for up to 8 weeks.

6. (b) Nutritional guidelines currently recommended by the American Diabetes Association suggest a total fat content of less than 30% (<10% from saturated fat), a daily protein allowance of nearly 0.8 g/kg of body weight (approximately 10% of daily energy intake), 25 g of fiber per 1000 kcal consumed, and a carbohydrate content supplemented with sucrose-based foods to aid satisfaction and motivate compliance (though caution must be used in obese individuals because of the potential high fat content associated with sucrose-containing products).

7. (c) Aerobic exercise appears to promote a number of important physiologic effects. Lipids are positively affected, with a decrease in very-low-density lipoprotein and a rise in high-density

lipoprotein levels. Low-density lipoprotein concentrations are reduced, though to a lesser degree. Additional benefits include a net blood pressure reduction of 5 mm Hg to 10 mm Hg, diminished platelet aggregation with augmentation of fibrinolysis, a decrease in hematocrit, and reduction of plasma viscosity. A biphasic influence on insulin sensitivity seems to occur through enhanced translocation and activation of GLUT-4 transporters acutely (first 24 hours) with elevation of GLUT-4 intracellular concentrations developing after extended activity (during several days).

8. (a) False. Financial constraints and limited insurance coverage are *not* the single greatest barrier to controlling diabetes mellitus and preventing its long-term complications. Rather, it is lack of patient compliance—poor adherence to prescribed treatment and exercise plans. Although we have vast knowledge of the disease and available treatment tools, diabetes mellitus remains the fourth leading cause of death by disease as a result of poor patient compliance.

9. (b) Selective serotonin-reuptake inhibitors are only mildly hypoglycemic and do improve general alertness. They may be the best choice when the diabetic patient's depressive state makes medical therapy necessary. Monoamine oxidase inhibitors would not be appropriate as they may result in severe hypoglycemic episodes, weight gain, and specific dietary restrictions. Also to be avoided are the tricyclic antidepressants, which have a hyperglycemic effect, impair memory, and increase one's craving for carbohydrates. ♦