CUMULATIVE TRAUMA INJURIES IN ROWING

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The objective of this study was to describe several common musculoskeletal injuries associated with rowing and attempt to identify contributing factors. In a structured interview case series, 8 (5 males and 3 females) rowers ranging from novice to Olympic competitors were asked specific questions regarding previous sport-related injures and training methods. Results indicated a high prevalence of specific musculoskeletal injuries in rowing. Typical injuries included: lumbar and thoracic back pain, stress fracture of the ninth rib, chondromalacia of the patella and extensor tenosynovitis of the forearm. Heavy weight lifting, especially squats, was found to be an aggravating factor. As well, a warm-up and cool down were not common components of on-water training and considered a contributing factor.

KEY WORDS: technique, dry-land training, survey

INTRODUCTION: Common musculoskeletal injuries among rowers include, lumbar and thoracic back pain (LTBP), stress fracture of the ninth rib (SFNR), chondromalacia of the patella (CPa) and extensor tenosynovitis of the forearm (ETF).

LTBP: Lumbar sprain and thoracic back pain is the most common complaint among rowers (Wajswelner, 1987). The incidence LTBP has increased over the past 20 years, and is a serious concern among coaches and athletes (Wajswelner, 1987). The current stroke technique used by many rowers (Green, 1980; Stallard, 1980) and the popular physiological conditioning practice of high pressure (speed) and low cadence/high pressure training (Green, 1980) have been identified has the two main attributing factors. The current stroke taught by coaches involves trunk flexion and as much lumbar rotation as possible during the catch phase. This maneuver has the effect of producing large shear forces on the joints of the lower spine (L4/L5 and L5/S1). Over time the cumulative trauma at these joints resulting from performing this technique can cause an instability. Physical therapy management may helpful in reducing pain and to strengthen supporting muscles. Specific strength exercises have been advocated to strengthen the supporting muscles of the lumbar spine and the hamstring musculature to induce injury (Green, 1980; Stallard, 1980).

SFNR: High pressure and low cadence/high pressure training methods have been identified stress fractures of the ribs, particularly the ninth (Holden & Jackson, 1985). A carefully planned training regime is recommended with no sudden introduction of speed or high pressure training and weight training.

CPa: "Rower's knee" is a term referring to chondromalacia of the patella. In order for the quadriceps to produce large forces during the drive phase of the stroke, the hip joints are adducted in an attempt to stabilize the extensor mechanism. This causes the patella to move medially during tracking (NOTE: Anatomical and physiological studies have shown that vastus medialis oblique originates from the adductor group (longus and magnus) and the medial intramuscular septum, and with knee extension and hip adduction there is a facilitatory preferential activation of vastus medialis oblique (Hanten & Schulthies, 1990)). In so doing, the patella will tend to rub on the medial condyle of the femur causing inflammation and pain. A biomechanical analysis of technique of the athlete and incorporate adjustments is the most appropriate approach.

ETF: Faulty stroke technique has been shown to be related to tenosynovitis of the radial extensors of the forearm (Williams, 1977). Over gripping the oar may irritate the extensor and flexor muscle groups of the forearm (Williams, 1977). A loose grip during the entire stroke cycle is recommended.

METHODS: In a structured interview (Table 1) case series, 8 (5 males and 3 females) rowers ranging from novice to Olympic competitors were asked specific questions regarding previous sport-related injures and training methods.

Table 1 Injuries Structured Interview for Rowers

Dear Rower:
Your cooperation would be greatly appreciated by the Sport Science Laboratory, Dalhousie University, as we attempt to identify common training- and technique-related injuries among high performance rowers. In the future, this information may be beneficial to you or your team mates. ALL INFORMATION IS STRICTLY CONFIDENTIAL.

1.) Personal Data:
Sex: male O female O age:_____

2.) Performance Category:
Lightweight O Heavyweight O Scull O Sweep O
Check the highest level obtained:
World/Olympic team member O
International competitor O
National team member O
other (specify) _____

3.) Injury Data:
Have you at some point in your rowing career had one or more of the following injuries DIAGNOSED BY A PHYSICIAN - a back injury or pain (rower's back), stress fracture of a rib, a knee injury (rower's knee) and forearm tenosynovitis (forearm splints):
rower's back O yes, O no (If yes go to question #4)
rib stress fracture O yes, O no (If yes go to question #5)
rower's knee O yes, O no (If yes go to question #6)
forearm splints O yes, O no (If yes go to question #7)

4.) Rower's Back:
4A.) When did you first notice the problem?: _____
4B.) How long did the initial problem persist?: _____
4C.) Has this become an on-going problem?: _____
4D.) What was considered the cause of the problem? _____
4E.) Did it interfere with your racing or training O yes, O no
if yes give details, if possible: _____
4F.) Please give any further details of your back problem, if possible: __

5.) Rib Stress Fracture:
5A.) When did you first notice the problem?: _____
5B.) How long did the initial problem persist?: _____
5C.) Has this become an on-going problem?: _____
5D.) What was considered the cause of the problem? _____
5E.) Did it interfere with your racing or training O yes, O no
if yes give details, if possible: _____
5F.) Please give any further details of your stress fracture, if possible: __

6.) Rower's Knee:
6A.) When did you first notice the problem?: _____
6B.) How long did the initial problem persist?: _____
6C.) Has this become an on-going problem?: _____
6D.) What was considered the cause of the problem? _____
6E.) Did it interfere with your racing or training O yes, O no
if yes give details, if possible: _____
6F.) Please give any further details of your knee problem, if possible: __

7.) Forearm Splints:

7A.) When did you first notice the problem?: _____
7B.) How long did the initial problem persist?: _____
7C.) Has this become an on-going problem?: _____
7D.) What was considered the cause of the problem? _____
7E.) Did it interfere with your racing or training O yes, O no
if yes give details, if possible: _____
7F.) Please give any further details of your tenosynovitis, if possible: ___
You have finished the structured interview. Thank you for your cooperation.

RESULTS: Case Studies: It has been suggested that with the recent increase and the widespread use of cross training methods, there will be a corresponding increase in the numbers of new (non-traditional) orthopaedic problems (Green, 1980; Stallard, 1980).
Accounts from several rowers reinforce this hypothesis:
Case 1 (LTBP): At age 19, this male oarsperson was a national metal winner in lightweight rowing. At the same time, he began to experience pain in the lower lumbar region. After an intense rowing workout, he noted that the pain was severe and sometimes radiated into his buttocks and posterior thighs. Sport physicians have suggested that his lower back muscular could not accommodate the increase tension created during the rowing action. He was advised to reframe from rowing. He contributed his condition to the instability of the musculoskeletal structures of his lower back. His rehabilitation program consists of morning and evening stretches prescribed by a physiotherapist. He now coaches and advocates the straight back swing technique.
Case 2 (LTBP): The second athlete has been one of the premier scullers in the Western Hemisphere for the past 4 years. A 1992 Olympian, at age 23, he has been considered by many rowing experts, as one of the up and coming stars in the sport. He has been plagued with pain in the thoracic region since he was 21 years of age. He stated that the pain is more pronounced during an off-season of training on an rowing ergometer. It is most noticeable 24 hours after an intense workout. He has been receiving formal physiotherapy for the condition. As well, analysis of his technique while training on the ergometer found several areas for improvement. He is mindful of the condition, and has modified his technique while using the rowing ergometer.
Case 3 (LTBP): A 23 year old heavyweight novice male rower began complaining of LTBP (lumbar region), after several months of on-water skill development, and an increase in the volume and intensity of the on-water conditioning program in preparation for the upcoming competitive season. As the intensity of the training sessions increased, the pain and stiffness increased. The pain was severe enough to interfere with other activities. After several weeks of strenuous workouts, the pain was so severe that the athlete retired before his first competition.
Case 4 (LTBP): The fourth oarsperson was a 22 year old heavyweight intermediate female with a predisposition for LTBP (thoracic region) resulting from an earlier accident. Severe LTBP began during early on-water precompetition training sessions. The lack of the warm-up and cool down while training in near freezing temperatures were identified as contributing factors. An off-water warm-up and cool down were incorporated into the program and the condition abated.
Case 5 (LTBP): A 20 year old heavyweight intermediate female oarsperson experienced LTBP (lumbar) on the side away from the oar that began during early on-water precompetition training sessions. A kinematic evaluation by her coach revealed technique faults. She was moved to the opposite side and technical modifications were incorporated and the LTBP disappeared.
Case 6 (SFNR): The sixth athlete was a 19 year old female international sculler. At the mid-point of the competitive macrocycle, she complained of pain in the region of the right midaxillary line while on-water training. Initially diagnosed as having a muscle pull, it was revealed after the pain and discomfort did not abate while sculling she had a stress fracture of the ninth rib. Her coach reduced the intensity of her training program and the condition improved.

Case 7 (CPa): This athlete is an international 19 year old male sweep rower. He was diagnosed with CPa during secondary school. After puberty the condition abated. However, originally a sculler, he began sweeping recently and the condition resurfaced in his right knee. He suggested that the pain was more pronounced during heavy weight lifting, especially squats. To alleviate the condition, he avoids heavy lifting. He will modify his technique, attempting to reduce the amount of lateral movement of the outside knee.

Case 8 (ETF): This athlete was a male novice competitor, and like most inexperienced oarsperson, he had poor balance and technique. While attempting to maintain the balance of the boat and learn the skills of rowing he tended to hold the oar with a very firm grip. Ignoring the pain, he trained consistently from three weeks before complaining of sore forearms. In exploring the situation with his coach, it was discovered that he was gripping the oars too tight. The oarsperson was instructed to loosen his grip on the oars and the condition improved. Finally, when these athletes were asked to prioritize the components important to performance in rowing, equipment was ranked first, natural growth and development of the mind and body, second, and most significantly, all of the interviewed athletes evaluated technique/physiological conditioning, third, and least important.

DISCUSSION AND CONCLUSION: Proper stroke mechanism and a well organized training program can help athletes avoid unnecessary injury. Stretching specific problem areas such as, the back and legs are useful preventive measures. Reducing the mechanical stress on vulnerable muscle groups by paying attention to proper rowing technique is essential. Stressful weight training is not recommended.

Rowing is a popular sport, for all ages and groups. It aids in the development and maintenance of many parameters of physical well-being. It can be performed in a social setting. As well, many participants have advocated the psychological benefits of rowing. Therefore, in a sport with such potential, priority must be given to void the sport of injury.

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