



## *The Kinetic “Chain of Events”*

Howard A. Winston, MD, CCFP, FCFP, Dip. Sport Med. (CASM)

*George, 45, comes to your office complaining of shoulder pain. He is an avid tennis player who plays three times per week. He does not exercise on a regular basis outside of his tennis. He doesn't like to warm up before playing or cool down afterwards. His pain occurs with the follow-through of serving and overhands. He comes to you requesting guidance in regards to the treatment of his shoulder pain.*

After taking a further history and performing your regular, thorough physical examination of George, you notice that he is complaining mostly of a rotator cuff strain. He is not suffering significantly and you decide he just needs to work on a decent stretching and strengthening program for his rotator cuff. You explain to him that he has a rotator cuff muscle, but that all sports are not created equal. Tennis is a sport that is developed. That is, he has a rotator cuff muscle, but that all sports are not created equal. That is, he has a rotator cuff muscle, but that all sports are not created equal. That is, he has a rotator cuff muscle, but that all sports are not created equal. That is, he has a rotator cuff muscle, but that all sports are not created equal.

**Copyright©**  
**Not for Sale or Commercial Distribution**  
Unauthorised use prohibited. Authorised users can download, display, view and print a single copy for personal use

*...physical therapist. It is ... this rotator cuff muscle and ... kinetic chain. Simply put, the rotator ... muscles, parascapular muscles, extremity muscles, ... the forearm muscles, the chest muscles, the lower ... muscles and the abdominal muscles to serve effectively. This stroke in tennis stresses the rotator cuff the most. Any deficit of strength in any of these muscle groups, or reduced mobility of the shoulder joint, will be excessive stress on the rotator cuff and will cause microscopic breakdown of muscle to the point of pain. A program of stretching and strengthening is set out for him to address these deficits and he returns to your office two months later.*



On further examination, you review his progress and test his knowledge. You see that he has been very compliant in performing his program and he has already noticed a vast difference in his level of discomfort and in his overall performance in tennis. He asks you when he can stop doing the exercises. You respond emphatically that all exercises are homework for life. They must be done on a regular basis if he wants to benefit from them long-term.

***George returns to you some six weeks later, asking about eccentric loading of muscles.***

You tell him that strengthening muscles by having them lengthen while under resistance will help prepare them for the true forces of sport. Most injuries occur from excessive eccentric loading of a muscle. Most people will strengthen the muscle concentrically (having the muscle shorten while they expose it to resistance). A muscle, particularly the rotator cuff, must be trained the same way that it is going to be used. You show him exercises that involve both concentric and eccentric loading and send him on his way.

***George returns one last time to thank you for your interest in his problem. In particular, he is delighted that you didn't inject his shoulder with corticosteroid, but took a special interest in resolving his condition, both short- and long-term. His tennis game has never been better and he has had no further shoulder pain.***

You explain to him that motion is a by-product of a series of kinetic chain events. One should never look at one muscle as an isolated injury; the injury must be treated from the core outwards, towards the muscle in question, including all of the muscles that attach to the spine. As well, muscles must be strengthened the way they will be used to avoid future injury.

If this concept can be learned and understood, it can have a dramatic impact on both the treatment and prevention of many sports injuries. The biomechanics of sport involve the co-operation of many muscle groups and maintaining their long-term strength and flexibility is vital to their performance. Think of a single act of motion as being the sum of many “kinetic chain of events”—any breakdown in just one link of the chain and the chain will weaken and cause injury. This will result in greater stress on other links of the chain, both above or below. Keep the links strong and you will have no worries in dealing with the pathologic kinetic chain of events.

**Dr. Winston** is an Assistant Professor, Department of Family & Community Medicine, University of Toronto, and Medical Director, Centre for Health and Sports Medicine, North York, Ontario.