The Role of the Coach in the Injury Prevention and Health Care of the Players

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There are great demands placed upon the players on the professional tennis tour. The season lasts 10-11 months, matches are played on different surfaces and can last up to five hours in temperatures over 37 degrees C (100 F) and with a humidity of over 90%.

Tennis is a demanding sport physically, mentally and emotionally. We do know a lot about the inherent demands in tennis, in terms of forces, velocities, ranges of motion, and amount of tennis play (Kibler and Safran, 2000). We also know a lot about the musculoskeletal base, in terms of maladaptations. However, we know only a little about the incidence of different injuries. What we do know is that tennis Injury rates are low, 2-20 injuries / 1000 athletic exposures or hours played, but few reliable figures are available.

Injures in tennis are often benign (Kuhne et al., 2004) such as blisters, sunburn, abrasions and cramps. Among more serious problems are strains (35%) e.g. hamstring strain, sprains (26%) e.g. ankle sprain, and ligament and tendon injuries 3%.

Upper extremity injuries include rotator cuff symptoms secondary to instability of the gleno-humeral joint. "Tennis elbow" which is the most common injury among non-professionals. Wrist pain is becoming an increasing problem especially in women's tennis, 29% had wrist pain in dominant and 25 % in non-dominant arm.

One common complaint is that of low back pain, which occurs in 47% of female and 31% of male players. 50% of elite players have suffered low back pain of at least one week duration including disc degeneration- herniation, facet impingement, and spondylolysis. In players that retired because of low back pain 46.7 % had abnormal radiographs of the lumbar spine (Swärd, 1990).

Muscle injuries mainly include thigh muscle strains and adductor muscle pulls. Generally, hamstring injury occurs during explosive acceleration when sprinting or charging towards the net and quadricep injury when sliding on a clay court.

Lower leg muscle-tendon injuries include muscle cramp and gastrocnemius strain. Achilles tendon rupture has an incidence of 5.5% in players over 40. Knee injuries involve 19% of total, with 70% being traumatic such as meniscus tears and 30% resulting from overuse. There are only occasional MCL and ACL injuries.

Ankle sprains are the most common injury in tennis. Stress fractures at the 5th metatarsal also occur as does plantar fasciitis and hallux rigidus. Another foot injury is

tennis toe, this is an injury to the great toe or second toe due to impaction of the toe onto to the toe box of the shoe.

INJURY PREVENTION IS VITAL FOR SUCCESS IN TENNIS

The tennis coach should be part of the prevention strategy, which can be successful if the coach and his medical support person are familiar with the injury incidence, injury severity and injury mechanism.

A previous or recurrent injury is the most common risk factor related to ankle ligament injury. 19% of all injuries in football are reinjuries (Ekstrand, 2005). This indicates the need for optimal care, i.e. the top level tennis medical service needs to be very well developed.

INTRINSIC FACTORS

This includes physical maladaptation in 60-86% of tennis players. Concerning the lower back players with decreased lumbar flexibility also have hip rotation inflexibility, which is associated with lower back injury (Val et al, 2003).

Decreased external rotation strength of the shoulder leads to altered internal/external rotation ratios. Gleno-humeral internal rotation deficit initiates a series of biomechanical alterations that lead to altered humeral positions in arm rotation and predispose to shoulder and elbow injury.

EXTRINSIC FACTORS – DEMANDS

The average point requires 8.7 changes of direction. Each change put a load of 1.5-2.7 times body weight on the planted knee (Kibler and Safran, 2000). An elite young player practices on average 2.3 h per day 6.1 days per week. The metabolic demands in tennis are 70% alactic anaerobic, 20% lactic anaerobic and 10% aerobic.

Is it possible to modify the demands?

Many actions are not considered modifiable. Top players require a lot of practice and play to be skilful. Attempts have been made to modify the amount of tournament play, such that the season this year is two weeks shorter. The effect that this change will have on injury incidence is not clear, as no data is available yet.

High body segment velocities, motions and loads.

An elite player must generate 4000W of energy or 5 hp in each serve with the entire body being involved. Trunk rotation is about 350 deg/s, shoulder rotation velocity 1700 deg/sec and elbow extension 1100 deg/sec, which results in a ball velocity of 95-105 miles/hour for women and 120-135 miles/hour for men.

Can the inherent biomechanical and physiological demands of hitting and running be modified?

Yes, as certain aspects of the mechanics of the production of tennis strokes are more efficient they can be used to place less strain on the body**.** Utilisation of kinetic chain sequencing from the ground reaction forces creates optimum proximal force generation, interactive movements in distal segments and produces efficient long axis rotation of the arm before ball impact (Kibler and Safran, 2000).

Specific alteration in mechanics such as incomplete flexion of the knees in cocking or incomplete cocking of the shoulder will create increased loads in the shoulder and elbow. Detailed coaching analysis and training should address these mechanical problems.

QUITE EXTENSIVE EQUIPMENT RESEARCH

Is being completed by the ITF and others and it concerns the following topics:

- **Racket Power:** analysing racket efficiency and its role in injury production by developing an automated test device**.** Effects of racket performance on the nature of tennis are established including: ball speed and shock transmission.
- **Strings and Spin:** analysing strings and tennis play with the aims to develop an automated test device and benchmark spin-generating capacity of rackets/strings. The aim is to establish effects of strings on the nature of tennis, including trajectories and biomechanics.
- **Research on the Ball:** with the question being, will a larger ball cause new and more injuries? Type 3 is a ball with larger diameter, which is now allowed by ITF. A recent study showed that play with the larger ball is not likely to increase the risk for overuse injury, but serving accuracy may increase compared to play with a regular ball. (Blackwell, Knudson, Sports Biomechanics, July, 2002)
- **Shoe/surface interaction:** with the question, are lateral stability, torsional flexibility, cushioning and traction control for court shoes important design elements to decrease the risk of injury? The aim is to establish shoe/surface interaction characteristics: impact absorption, friction generation and to establish the effects of shoe/surface interaction on injury.

SPORTS SPECIFIC PREPARTICIPATION EXAM

This will be increasingly important to develop a large base of data**.** It must be performed with specific guidelines especially concerning flexibility and strength**.** There is however, no data to relate improved flexibility and strength parameters to injury prevention in tennis players.

CONCLUSION: THE COACH SHOULD KNOW SOME ABOUT THE FOLLOWING

- The physical demands of tennis are starting to be documented and the adaptive response to these demands is started to be understood.

- The adaptive response is related most often to repetitive microtrauma with resultant loss of flexibility and strength.
- We have very limited information about injury incidence.
- Well planned serial musculoskeletal evaluations for maladaptation can be valuable.
- Preventive exercises to minimise injury risk need to be developed.
- Extrinsic factors like racket, ball, and surface are of limited importance but should be taken into account.
- We need much more research. Some has started.

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