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MEDICAL ISSUES AFFECTING TENNIS PERFORMANCE

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The focus of most epidemiological studies in tennis has been on injuries^{1,2}, but it is increasingly being recognised that illnesses form a significant burden of disease as well. Sell et al³ recently reported on the incidence of illness over a 16-year period during the US Open Tennis Championships (1994 to 2009). They found that the number of illness cases requiring assistance by medical staff was 58.2±12.0 per year and 36.7 per 1000 match exposures, compared to 76.2±19.6 injuries per year and 48.1 per 1000 match exposures⁴. The most commonly reported types of illness for both men and women were conditions of the upper respiratory tract (ear, nose, throat) and the skin.

In a recent study, 73 junior tennis players in the Netherlands were monitored over a 32-week period using a weekly online questionnaire on injuries and illnesses. The average weekly prevalence of injuries was 7.6% (95% CI: 6.9-8.3%) and illnesses 5.8%

(95% CI: 4.6-6.9%). The incidence of acute injuries was 1.2/1000 hours of tennis play (95% CI: 0.7-1.7). On average, 12.1% of players reported some form of overuse problem at any given time (95% CI: 10.9-13.3%) and 3.4% reported substantial overuse problems (95% CI: 2.3-4.4). The most commonly reported illnesses were upper respiratory tract infections (61%), followed by gastrointestinal infections (9.4%).

This review describes the most common medical conditions that affect performance in tennis players and how to treat them⁵.

UPPER RESPIRATORY TRACT INFECTIONS

The most common illness affecting tennis players are viral upper respiratory tract infections³. Most colds primarily affect the nose and throat, although the same viruses can cause bronchitis and laryngitis. More serious bacterial infections of the throat, ears and lungs can follow a viral cold.

Colds are spread by direct contact with infected secretions (shaking hands, kissing) or indirect inhalation of the virus in the air. Contrary to common belief, exposure to cold temperatures, damp environments or draughts do not seem to enhance vulnerability. However, a long, strenuous practice day, an exhausting tennis match or persistent over-training or stress can increase the susceptibility to and severity of upper respiratory and other viral infections. Strenuous exercise has a depressant effect on the immune system that can persist for a week or more.

Symptoms of a viral upper respiratory tract infection can range from a runny nose, sneezing and congestion to sore throat, hoarseness and a non-productive cough. Players often feel weak and occasionally have sore muscles, despite little or low-grade fever. Infections can greatly affect tennis performance. Exercise during the



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early acute phase of some infections may worsen or prolong the illness. Therefore, if signs and symptoms indicate that viral infection is impending, the player should greatly reduce volume and intensity of heavy training for 1 to 2 days and take more rest. He should abstain from heavy practice or matches with a temperature of over 38°C (100.4°F). This is because a serious virus infection may also produce inflammation of the heart muscle, which is a potentially serious disease with an increased risk of acute arrhythmias leading to sudden death during exercise⁶. A cold usually lasts 3 to 4 days but can persist up to 10 to 14 days.

Treatment consists of non-prescription cold remedies, decongestants, cough syrups, cough drops and gargling with warm salty water for symptom relief as well as getting some rest. Antibiotics are only needed if a bacterial infection develops on top of the viral infection, but are not useful in the early stages of a viral infection.

TRAVELLER'S DIARRHOEA

'Traveller's diarrhoea' is the most common disease affecting travellers. Players travelling to tournaments in developing countries in Latin America, Africa, and Asia are at highest risk⁷. The primary source of infection is ingestion of faecally contaminated food or water.

The onset of traveller's diarrhoea usually occurs during the first week of a stay, but may occur any time, even after returning home. Illness usually begins suddenly and typically includes four to five loose or watery bowel movements each day. The player may also experience abdominal cramps, nausea, vomiting, bloating, fever, urgency and malaise. Most cases are benign and resolve in 1 to 2 days and 90% resolve within a week, but optimal tennis performance may not be regained for a week or so.

Prevention is therefore important and includes the avoidance of tap water, iced beverages, food from street vendors and

fresh leafy greens and fruit that cannot be peeled before eating. Hot tea or coffee, boiled water, soup, bread, butter, bottled carbonated beverages, fruit that requires peeling and food that is well-cooked and immediately consumed are safe.

The most important treatment for diarrhoea is to replace the fluids, including salts and sugars, which the body loses through watery bowel movements. Fluid and electrolyte balance can be maintained by purified water, potable fruit juices, broth, caffeine-free soft drinks and oral re-hydration salts. When feeling better, gradually introduce small amounts of bland, easily-digested food (bananas, salted crackers, carrots, rice). Dairy products aggravate diarrhoea in some people and should be avoided.

Anti-motility drugs, such as loperamide, may be used if rapid relief of symptoms is desired e.g. when a player has a match coming up, but only in the absence of fever or bloody stools. Anti-microbial therapy may be used if it is important to shorten the course of the disease or to decrease the severity. A physician should be consulted if the player has a high fever, is severely dehydrated or has bloody stools.

GLANDULAR FEVER

Glandular fever (infectious mononucleosis) has a bad name among tennis players after several of the top players, including Roger Federer, Andy Roddick, Robin Soderling, Mario Ancic and John Isner revealed they had suffered from this illness and that it had drained their energy for months.

Glandular fever is a result of an infection with the Epstein-Barr virus and the incidence is highest among 15 to 30-year-olds. It is therefore not surprising that we see it a lot among young male and female tennis players on the tour who fall into this age group. Infectious saliva is the cause of the spreading (which is why it is known as 'kissing disease').

Symptoms include fatigue, fever, sore throat, headache and nausea. Clinical

PRACTICAL TIPS FOR DIABETES SUFFERERS

examination may reveal a throat infection, swollen lymph nodes and enlargement of the spleen. The illness lasts between 5 to 15 days, but it may take several months before the fatigue and weakness entirely disappear. This is why many players fear this illness, but there is no solution other than to take the time to recover.

A player suffering from glandular fever should take a break from tennis until all acute symptoms have disappeared. In some cases the liver of the patient can be affected (hepatitis). If this is the case, a low-fat diet should be followed. Resumption of training may be allowed as soon as blood tests show improved liver function.

Training should be resumed gradually, first increasing duration and then intensity, with adequate periods of rest. It may help to regularly monitor heart rate to determine intensity of play.

CHRONIC MEDICAL CONDITIONS

For optimal tennis performance it is important that players control chronic medical conditions, such as diabetes and asthma.

Diabetes mellitus

Diabetes mellitus is a group of metabolic diseases characterised by high glucose levels of the blood, due to deficiency or diminished effectiveness of insulin. In diabetes mellitus type 1, most common in those aged below 30, the body fails to produce the hormone insulin. In diabetes mellitus type 2, occurring mainly in the middle-aged and elderly, there is a depressed sensitivity to insulin at the cellular level. This high blood sugar may cause symptoms such as frequent urination, thirst, weight loss and tiredness. Serious long-term complications of diabetes include heart disease, kidney failure and damage to the eyes. Famous tennis players with diabetes include Arthur Ashe and Billy Jean King (both type 2).

Tennis players with diabetes mellitus type 1 must receive insulin, which can only be administered by injections. They therefore need to apply for a Therapeutic Use Exemption (TUE), since insulin is on the prohibited substance list and the administration of injections is normally not

- *Monitor blood glucose level before, during and after play to establish the player's response pattern.*
- *Adjust carbohydrate intake and insulin dosages according to the duration and intensity of the player's practice (approximately 15 to 30 g of carbohydrates per 30 minutes of exercise).*
- *If the training will last more than 45 to 60 minutes, the insulin dose may be reduced.*
- *The player should abstain from play if their blood glucose level is above 16 mmol per litre because a further rise may be expected.*
- *Respect the doping regulations. Diabetics with a valid TUE are allowed to use a device off-court to check blood glucose and administer subcutaneous injections of insulin if necessary.*

allowed during match play⁸. Type 2 diabetes is treated with diet and medications with or without insulin. Exercise has a beneficial effect on diabetes mellitus type 2, because it increases insulin sensitivity. In diabetes mellitus type 1, exercise does not improve the control of the glucose levels and careful monitoring of blood glucose levels is required, but regular exercise is associated with long-term positive changes. An adjustment of insulin dosage is important in reducing the risk of low glucose levels during or after exercise.

At the first indication of a low blood glucose level (sweating, nervousness, tremor), the player should ingest carbohydrate in solid or liquid form. A semiconscious or unconscious diabetic patient requires intravenous glucose administration. Players should be alerted to the possibility of delayed exercise-induced low blood glucose levels several hours after completion of exercise. A player should abstain from exercise when glucose levels are very high and there is insulin deficiency at the beginning of exercise. The glucose cannot be utilised, leading to increasingly higher levels and the burning of fat in the absence of glucose will lead to the production of acetone, recognisable by its foul smell.

Exercise-induced asthma

Exercise-induced asthma is asthma that is triggered by vigorous or prolonged exercise. It is quite common in young players, with a

10 to 15% incidence in adolescent athletes, including tennis players. Groups at high risk are those with asthma (70 to 80%) and allergic rhinitis (40%).

Symptoms include wheezing, tightness of the chest, shortness of breath, unusual fatigue and coughing. These symptoms usually begin within 5 to 20 minutes after the start of exercise or 5 to 10 minutes after brief exercise has stopped.

The strongest trigger for an attack is cold, dry air. Rapid breathing during exercise tends to cool and dry the airways and the muscle bands around the airways react by contracting.

Regular medication helps diminish lung hyperactivity, reducing the risk of asthma attacks and generally include corticosteroids and bronchodilators. Any nasal obstructions should be treated because congestion in the upper airways may decrease nasal filtration, heating and humidification.

Make sure to check the list of prohibited substances. Nasal and inhaled corticosteroids are allowed and so are salbutamol, formoterol and salmeterol in therapeutic dosages, but terbutaline, for example, requires a TUE.

Heat illness

Tennis is frequently played in very hot environmental conditions, such as during the US Open and the Australian Open, resulting in an increased risk of heat-related illnesses, including cramps, heat exhaustion and heat stroke.

Heat cramps are painful, involuntary muscle spasms of skeletal muscle and, although they may also occur during normal ambient temperatures, they are more often seen in the heat. In tennis players, the calf and thigh muscles are affected most often. The exact cause of muscle cramps is unknown, but suggested causes include dehydration and electrolyte imbalance and altered neuromuscular control⁹. Treatment of cramps consists of gentle stretching of the affected muscle and oral fluids containing sugar and salt.

Heat exhaustion is caused by the circulatory strain induced by dehydration, resulting in a lower circulatory fluid volume. Symptoms are physical exhaustion, a fast, weak pulse, clammy skin, low blood pressure, headache, dizziness and nausea. The player may even faint, due to a fall in blood pressure. Laying down improves the blood flow to the heart and brain and the person will quickly regain consciousness. Treatment consists of cooling the body, taking oral fluids and cessation of play.

If the player continues to play without taking any extra measures, the body may react by reducing blood flow to the skin, reducing heat loss from the surface, which may lead to a further rise in core body temperature and could potentially lead to heat stroke¹⁰.

Heat stroke is a life-threatening illness, characterised by a hot, dry skin, rapid pulse and a high body temperature, which may rise over 41°C (106°F). The player may display irrational behaviour due to disturbances of the central nervous system and the high body temperatures can lead to irreversible damage of the internal organs and even death. The body should be cooled as quickly as possible and the players should be re-hydrated with oral or intravenous fluids. Immediate transfer to a hospital should be arranged.

Tennis players can maintain their core body temperature at a safe level across a wide range of environmental conditions; core body temperature is determined mainly by the intensity of the exercise and the resulting metabolic rate¹¹. When the cooling mechanisms of the body (sweating and vasodilation in the skin) work normally, thermal equilibrium is reached and maintained during tennis match play¹¹. However, in adverse environmental conditions (e.g. high air temperature, high humidity, solar radiation and no wind), core body temperature is determined not only by the metabolic rate, but also by the environmental heat load.

It has been shown that when thermal discomfort increases, players slow down in the heat, which reduces their metabolic heat production¹².

In hot environmental conditions, players can take additional measures to cool their bodies during the changeover and may use ventilators, fans, parasols, ice vests, ice towels and cold water. The water and electrolytes lost through sweat must be replaced to avoid dehydration and the most effective way is by consuming sports drinks (beverages containing salt and electrolytes) before, during and after play. Finally, fit and acclimatised players will be less affected by the heat than players who are unfit and not acclimatised.

DIET

Since Novak Djokovic published his book 'Serve to win: the 14-day gluten-free plan for physical and mental excellence', many tennis players have followed his example and sworn off gluten, dairy and tomatoes and have turned to nuts, seeds, vegetables, fish, chicken and quinoa. However, only those with coeliac disease need to eliminate gluten from their diet and what works for Djokovic may not work for everyone.

Players should eat a healthy and balanced diet – what is good for health is generally also good for tennis. This diet should provide all the necessary macronutrients (carbohydrates, fats, proteins, fibre, water) and micronutrients (vitamins and minerals) that are needed for growth and development and that will provide enough energy during training and competition.

Players are advised to consume a healthy low fat diet with 5 to 7 g of carbohydrates per kg and no more than 25 to 30% fat, preferably polyunsaturated fats. Carbohydrates remain an important fuel when playing tennis and protein should be added to enhance recovery. Extra carbohydrates should be consumed prior to and during play on heavy training or competition days, preferably complex carbohydrates (starches). Protein is important for the strengthening and restoration of muscles after a workout and players are recommended to consume about 1.2 g/kg body weight daily. After a strenuous training session or match, players are recommended to consume 1.5 g carbohydrates per kg body weight and

PRACTICAL TIPS FOR ASTHMA SUFFERERS

- *A thorough warm-up is advised because a gradual, lengthy warm-up prior to more strenuous exercises has been shown to make the airway more resistant to irritants and to decrease the incidence of bronchospasms.*
- *A high fitness level will help to reduce the frequency and intensity of the attacks. A good way to build up stamina is by interval training, as this type of training has been shown to provoke fewer attacks.*
- *Tobacco smoke and other obvious forms of air-pollution should be avoided.*
- *Infections can cause asthma (colds, flu, sinusitis), so exercise should be restricted when the athlete is ill.*



Vitamin, mineral and antioxidant supplementation to a player on a well-balanced diet has not been shown to improve performance and is generally unnecessary



about 20 g protein within an hour after exercise to speed up recovery¹³.

Vitamin, mineral and antioxidant supplementation to a player on a well-balanced diet has not been shown to improve performance and is generally unnecessary. If vitamin and mineral intake is inadequate, it is at least as important to change nutritional habits toward nutrient rich foods as it is to take supplements. If a player does take dietary supplements (including vitamins, minerals, protein shakes, amino acids, herbal and 'natural' products) he needs to be sure they are guaranteed free from contamination with prohibited substances, to avoid an inadvertent doping offence. And it is NOT sufficient to just check the label, they may contain undeclared substances. Regulations for dietary supplements are less strict than for medications, so they need to be truly tested and guaranteed doping free.

CONCLUSION

In summary, there are no medical conditions that prevent an individual from playing tennis and there are widely published studies that outline the health benefits of tennis. As with any vigorous physical exercise, participants must be guided by their own general practitioner or specialist if they are on regular medication or suffering from a chronic medical disorder (e.g. cancer, cardiovascular disease).

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