Common Sport Injury in Tennis Players: A Literature Review

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Abstract. Tennis is a global sport that demands great physical strength when played at a professional level, which stresses muscles and joints through sudden sprints and repetitive racket movements. Each sport has high physical demands and risks of injury. Several studies have reported that professional athletes play while enduring pain and injury. This can have a negative impact on their health in the days after their tennis career ends. There is a dearth of data related to risk factors and tennis-related injuries. Therefore, this review was conducted to fill this knowledge gap. The literature review was conducted through a search of electronic databases and international papers published from 2019 to 2024 on topics related to sports injuries and tennis players. Most tennis injuries are caused by overuse and others are caused by traumatic injuries or acute events. Overuse injuries are most common in the shoulder, wrist, and elbow. The current review shows that injuries can occur and affect various anatomical areas. Clinicians can use the information contained in the current review to design appropriate preventive strategy programs and monitor tennis players' training loads and maximal fitness achievements, as this can reduce the risk of injury.

Keywords: Sport Injuries, Tennis Player, Risk Injury

1 Introduction

Tennis is a sport that is widely played by more than 200 countries that are members of the International Tennis Federation. Due to its popularity, various national and international tournaments are held throughout the year, many of which offer large prizes [1]. Tennis is a physically demanding sport when played at a professional level, with high stress on muscles and joints through sudden sprints and repetitive racket movements. Moderate-intensity exercise has been associated with many health benefits, including improved cardiopulmonary function, enhanced aerobic capacity, increased bone density, reduced body fat, elevated muscle strength, and a decrease in cognitive decline. The WHO recommendation for physical activity states that adults should do at least 150 minutes of moderate-intensity physical activity, 75 minutes of vigorous-intensity physical activity, or a combination of moderate- and vigorous-intensity physical activity per week [2] [3].

Tennis players train extensively on the court to improve their technical capacity while maintaining their technical characteristics. High-intensity training is essential for tennis

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players to achieve optimal performance during long tennis matches in tournaments, where optimal physical and physiological capabilities are required. Tennis players, who need to meet certain qualities, can suffer serious injuries, especially to the upper extremities during high-intensity training sessions [4].

The high number of repetitions of the hitting motion combined with explosive movements, puts players at high risk for injury, especially chronic or overuse injuries [5]. Participation at the elite level places high physical demands and increases the risk of injury. It has been reported that professional athletes play through pain and injury rather than taking the time to recover [2].

Need for preventive interventions that are believed to reduce the risk of injury. The focus of this article is to review common tennis injuries, noting the rates and locations of injury occurrence, and to highlight injury prevention strategies that can be implemented for elite players that may prevent common tennis injuries.

The electronic databases Nature Research, Proquest, Springer Link, Pudmed, ResearchGate and Science Direct as predictive reviews were searched. The inclusion criteria were (a)… (b) defined sport injuries dan tennis player, (c) investigated common tennis injuries and preventive strategy programs.

2 Method

The databases used to assist in performing this search were Nature Research, Proquest, Springer Link, Pudmed, ResearchGate and Science Direct. The searches were limited to articles in the English language. Search keywords included “sport injury”, “tennis player”, “risk injury” and “preventive injury”. Reference lists were searched for any additional research that would be eligible for inclusion.

Included articles met the following criteria: (1) an abstract was available, (2) full-text article was offered online, (3) published in peer-review journals, (4) published between 2017 until 2024, (5) journal articles and research were relevant to sports injuries, and (6) articles were all in the English language and Bahasa. Study designs included descriptive design, randomized clinical trials, controlled clinical trials, and literature reviews that contained an investigation of mechanisms of various stretching techniques. From the search, seven articles were chosen for inclusion (see table 1).

3 Results and Discussions

Recent sports injuries were defined as “new or recurrent musculoskeletal complaints occurring during competition or training and requiring medical attention” by the International Olympic Committee (IOC) Consensus Statement [6]. Sports injuries refer to a variety of injuries that occur during training, competition or after competition. The most affected are: bones, muscles, tendons and ligaments. The level of injury is one of the main factors influencing future recovery time and sport [7]. Epidemiological data

on the prevalence and/or incidence of sports injuries are limited, with high variability due to differences in athlete age and localization (e.g. muscle, tendon and ligament) [6].

Table 1. Research Matrix

Author & Year	Title	Objective	Result	Conclusions
Nicholas Shannon, Brian Cable, Timothy Wood, John D. Kelly (2020) [8]	Common and Less Well-known Upper-limb Injuries in Elite Tennis Players.	The common upper-limb injuries in elite players and includes less well known, but important, injuries which are of significant clinical importance are reviewed.	Common upper-limb injuries: impingement, rotator cuff, labral tears, tendinopathies. Less known but important injuries: posterior shoulder instability, distal humeral stress.	Common upper-limb injuries in elite tennis players include internal shoulder impingement, rotator cuff pathology, labral tears, elbow tendinopathies, extensor carpi ulnaris tendinopathies, and subluxation. Less well-known but important injuries include posterior shoulder instability, distal humeral bone stress, elbow medial collateral ligament, and nondominant wrist ulnar collateral ligament injuries.
Alessandro de Sire (2022) [6]	Sports-related musculoskeletal injuries: From diagnostics to rehabilitation.	Prevention rehabilitative approaches and training methods are still evolving, utilizing measurement and technologies investigating neuromuscular control, timing of muscle activation, postural and kinematic analysis of sport gesture to prevent the potential	The paper discusses the prevalence and incidence of sports-related musculoskeletal injuries. The paper highlights the importance of an adequate evaluation and rehabilitation plan for these injuries.	The paper emphasizes the importance of an adequate evaluation and rehabilitation plan for sport-related musculoskeletal injuries. The Journal of Back and Musculoskeletal Rehabilitation (JBMR) proposes new training programs and rehabilitation strategies for these injuries.

Author & Year	Title	Objective	Result	Conclusions
		musculoskeletal injuries.		
Ecaterina Vasenina, William B. Hammert, Ryoichiro Kataoka, Scott J. Dankel, Samuel L. Buckner (2022) [15]	Injuries and Strength Training Practices in Collegiate Tennis	Coaches value injury prevention exercise, sports-specific training and flexibility and mobility training the most, with muscle growth and maximal power ranked lowest.	Strength and conditioning practices explained 9.9% of the variance of injury rates in the upper body. Participation in upper-body muscle growth training was a significant predictor of upper-body injury.	Strength and conditioning practices influence injury rates Upper-body muscle growth training predicts upper-body injuries
Joseph A. Gil, Sanjeev Kakar (2019) [9]	Hand and Wrist Injuries in Tennis Players	A broad differential should guide work-up and management of wrist pain in tennis players.	Review of common hand and wrist injuries in tennis players. Emphasizes varied pathologies, work-up, and management of wrist pain.	Review of common hand and wrist injuries in tennis players. Work-up and management of wrist pain should consider broad differential.
Christian Wisdom Magtajas Valleser, Ken Ewing L. Narvasa (2017) [1]	Common Injuries of Collegiate Tennis Players	It is observed that the most commonly injured anatomical region of Filipino collegiate tennis players is the lower extremity; ankles were recorded as the most frequently injured part.	100% occurrence of at least one injury among players Average rate of 5.98 injuries per person recorded	Common injuries in collegiate tennis players: lower extremity, tendinitis, sprains. Overuse injuries prevalent, similar to findings in other tennis studies.

Author & Year	Title	Objective	Result	Conclusions
Ibrahim Hassan (2018) [18]	Common Injuries in Racket Sports: A Mini Review	The most injuries of racket sports players involve a critical association between the movement tasks and training programs strategies and can be prevented effectively with minor adjustments in the training programs, rehabilitation of essential muscles and flexibility imbalances, and awareness to proper footwear.	Common injuries in racket sports involve lower limb, more in badminton. Prevention through training adjustments, muscle rehab, and proper footwear.	Common injuries in racket sports involve movement tasks and training strategies. Majority of injuries can be prevented with adjustments in training programs and awareness to proper footwear.
Hanisha Patel, Sonali Lala, Brett Helfner, Tony T Wong (2021) [16]	Tennis overuse injuries in the upper extremity.	This article aims to describe how upper extremity overuse injuries occur in relation to tennis biomechanics and to review their imaging characteristics and implications for management.	Describes upper extremity overuse injuries in tennis biomechanics. Reviews imaging characteristics and management implications of various tennis-related injuries.	Tennis overuse injuries in the upper extremity are common. Understanding injury mechanisms and patterns aids in correct diagnosis.

These serious injuries are mainly rotator cuff tendonitis, lateral epicondylitis, muscle injuries, growth plate damage and stress fractures. In general, the most common injury due to acute trauma is ankle sprains. Such sports injuries prevent young players from participating in important tennis tournaments, and affect the development of their professional career [4].

In the study of Shanon et al., (2020), Common injuries in the upper summary remained consistent in all observations: pathological shoulder complex, elbow tendinopathy, ECU tendinopathy, and subluxation. However, less common injuries were also experienced by athletes, namely: posterior shoulder instability, distal humeral stress, MCL pain at the elbow, and ulnar collateral wrist injury at the non-dominant wrist [8].

In a follow-up of 370 division III and IV tennis players in Italy, Tagliafico and colleagues found that the Eastern grip position was associated with radial-sided wrist injuries (i.e., FCR tenosynovitis [n = 5], DeQuervain syndrome [n = 6], and intersection syndrome [n = 1]), while the Western and semi-Western grip positions were associated with ulnar-sided wrist injuries (i.e., ECU injury [n = 30], TFCC lesion [n = 5]). In particular, none of the players used a continental grip, 75% of those injured used a Western or semi-Western grip, and 25% of those injured used an Eastern grip [9].

The ball-racket impact position and grip tightness can affect the force transmission to the wrist. Off-center impacts below the racket longitudinal axis substantially increase the wrist extension torque compared to impacts occurring in the center of the racket. Increased grip pressure results in decreased racket rotation in the hand and a 20% increase in wrist extension torque compared to normal grip conditions. Ball-racket location and grip tightness are important parameters when assessing the cause of hand or elbow health problems in tennis players [9].

Some acute injuries may be caused by poor rehabilitation and/or premature return to play especially in cases of muscle injuries. This suggests that players and coaches may not manage soft tissue loads appropriately and only focus on peak performance. Compromise between training and rest will lead to suboptimal recovery and performance. Players and coaches need to be more careful to ensure the recovery period and ensure players are fit to return to play. There is indeed a role for injury prevention programs in elite tennis to reduce current injury rates, with evidence suggesting that warm-up programs, strength training, and multi-intervention training programs with balance boards reduce injury risk, while more specific muscle injury prevention programs reduce recurrent injury risk. While Pas et al. stated that an unsupervised e-health tennis injury prevention program in recreational tennis players did not reduce the risk of tennis injuries, further research is needed to investigate the efficacy of further injury prevention programs covering elite players [8][10].

4 Conclusion

The diagnosis of sports injuries can be made by physical examination that can be assisted by ultrasound and magnetic resonance imaging; thus, an adequate prognosis can be established by considering several factors: mechanism of injury, location, and extent of injury. An approach tailored to the needs of the patient and the individual, including pain management, physical therapy, and rehabilitation, has been widely recommended [6].

Regarding pharmacological treatment, athletes generally consume oral non-steroidal anti-inflammatory drugs, injectable and transdermal anesthetics, and other drugs to achieve the highest possible level of performance, despite potential side effects [6]. In this regard, preventive strategies include neuromuscular training programs, consisting of balance, coordination, strength, and agility exercises, as well as education to athletes

to avoid overtraining and high-risk maneuvers such as cutting techniques and fast distances [11].

Preventive rehabilitation approaches and training methods are still evolving, utilizing measurements and technologies that investigate neuromuscular control, muscle activation time analysis, postural and kinematics of sports movements to prevent potential musculoskeletal injuries [12]-[14]. To further minimize the risk of injury, strength and conditioning programs are recommended to focus on strengthening the upper and lower extremities, especially the wrists, ankles and shoulders. Because injuries in tennis are probably unavoidable, coaches and team physicians are advised to be prepared for recurrent injuries to the upper and lower extremities [15].

An understanding of the basic mechanisms of injury and knowledge of the patterns of these injuries will assist radiologists in making the correct diagnosis in professional and recreational tennis athletes [16]. Knowledge of sports injuries is also very important to understand the mechanisms, treatment, alleviation, management (treatment) and prevention of sports pain exposure. With treatment that includes preventive measures, appropriate therapy, and rehabilitation, athletes will regain maximum function until they return to normal. This must be done early to avoid further complications [17].

And athletes can perform optimally. To achieve these goals, sports injury management must support various disciplines or professions. There are many types and types of sports injuries, so a general or specific treatment plan is very important.

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