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Ulnar Nerve Conduction Studies Between Elite Badminton Players And Normal Healthy Controls: A Comparative Study

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ABSTRACT

Background: Sports activities involving repetitive force application leads to mechanical or compressive neuropathies among players. Sparse literature is available reporting such nerve pathologies among badminton players. The study was done with the objective to find out what is the influence of regular and intense practice of badminton on the nerve conduction velocity (NCV) of ulnar nerve in elite players when compared to normal healthy individuals.

Materials & Methods: 2 groups of total 20 asymptomatic male subjects, between 20-40 years age, were created where one group included elite badminton players (n=10), and another included subjects who have not participated in any of the sports activities (n=10). Conduction of velocities and distal latencies for motor and sensory part of ulnar nerve was done for subjects in both groups. Mean and standard deviation were calculated for descriptive statistics and comparison was done using 2-way ANOVA test.

Results: Distal motor and sensory latencies for ulnar nerve suggested significant delays in non-badminton players when compared to elite players (p<0.05). Comparison of sensory conduction velocities for ulnar nerve between badminton players and normal subjects showed significant difference (p<0.05).

Discussion: Delay in sensory and motor conduction and reduction of sensory conduction velocities for ulnar nerve in badminton players can be attributed to repeated excursion, peripheral location of fibers, and dominance of players.

Conclusion: The results of the study concluded that there is an influence of regular and intense practice of badminton on ulnar nerve of elite players when compared to age matched normal subjects.

Keywords: Badminton, nerve conduction, ulnar nerve, upper limb.

INTRODUCTION

The electrical conduction ability of sensory and motor nerves of the human body is generally evaluated using nerve conduction studies (NCS).[1] NCS is an objective, quantitative and reproducible measure of peripheral nerve function and is widely used in diagnosis of neuropathies.[2] The electrophysiologic procedure has become so sensitive that it not only confirms the clinical diagnosis in most patients but also detects an incidental finding in some asymptomatic subjects.[3]

Repetitive force applied during daily activities commonly leads to compression neuropathies. Several factors related to external force application can lead to compression neuropathies. External compression can be applied in several ways: (a) a present for a long period; (b) an acute focal application of a large external force or (c) repetitive application of brief large forces. Combination of stretching, shearing and/or compressive force application may result into compression.[4] Athlete suffers from various acute and chronic mechanical injuries of peripheral nerves based on physiological demands. Around elbow injuries

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are very common in racquet sports due to high repetition of motions, high muscular forces and extreme elbow positions leading to overuse.[5]

Badminton is a non-contact sport requiring jumps, lunges, quick changes in direction and rapid arm movements from a wide variety of postural positions and also rapid and repetitive wrist movement.[6] Studies reporting epidemiological data of musculoskeletal injuries in upper extremity of badminton injuries are sparse, but previous studies have shown that these injuries often are severe in character but of relatively low frequency.[7,8]

Hence, the present study intends to evaluate the nerve conduction velocity of ulnar nerves in elite badminton players and compared with normal healthy individuals.

MATERIALS AND METHODS

In this study total 20 male subjects were included, out of which 10 were elite badminton players and 10 were age matched control subjects, between age group of 20-40 years through purposive sampling technique. The elite badminton players were recruited byDakshin Kannada Badminton Association and were included only if they were training for a minimum of 1 hour per day, four days a week. The age-related asymptomatic control individuals were included if they had not participated in any of the sports activities on a regular basis. The subjects were excluded if they had significant history, signs or symptoms of peripheral neuropathy orcompression syndrome of upper extremities. All the participants were right hand dominant in this study. The details and purpose of the study were explained to all the individuals for maximum co-operation and informed written consent was signed by all of them.

Neuro Care™ - 2000, having facilities of computerized electromyography (EMG) with nerve conduction velocity (NCV) and evoked potential (EP), manufactured by Bio-Tech™, India was used to evaluate nerve conduction parameters (i.e., conduction velocities and distal latencies).

Nerve conduction studies were performed using standard techniques of supramaximal percutaneous stimulation with a constant current stimulator and surface electrode recording on both extremities of each subject. Parameters studied: 1) Latency, 2) Amplitude, 3) Conduction velocity: sensory part and motor part.

For Ulnar Nerve:

Motor component: The stimulating electrode is placed at wrist and below elbow (about 4 cm below the medial epicondyle), recording electrode: from abductor digiti minimi, reference electrode on little finger, ground electrode between stimulating and recording electrode.

Sensory component (Orthodromic study): The stimulation is done using ring electrode at interphalangeal joint of 5th digit, recording electrode along course of ulnar nerve, reference electrode: 2 cm proximal to the recording electrode, ground electrode between stimulating and recording electrode.

RESULTS

SPSS 20.0 by IBM was used for data evaluation. Mean and standard deviation were calculated for the descriptive statistics and comparison of latencies and conduction velocities of motor as well as sensory components of ulnar nerve among elite badminton players and age matched control subjects were done using two-way ANOVA. Level of significance was set at $p<0.05$.

Table 1: Comparison of baseline characteristics of subjects (n=20)

	Control Group (n=10)		Elite Players (n=10)		t	Sig.
	Mean	SD	Mean	SD		
Age (years)	24.60	0.70	23.20	1.03	3.55	***0.002**
Weight (kg)	60.80	6.90	66.70	5.70	-2.086	0.051
Height (cm)	170.30	4.72	171.40	6.55	-0.431	0.672
BMI(Kg/m^2)	20.87	1.74	22.80	2.77	-1.865	0.079
Note: *2-tailed t-test was done with level of significance set at p<0.05						

Table-1 shows comparison of baseline characteristic which proves that there is a significant difference at $p<0.05$ for age in badminton players and control normal subjects. Other characteristics such as weight, height and BMI showed no significant difference.

Table 2: Comparison of baseline nerve conduction parameters of subjects (n=20)

Parameters	Normal (n=10)		Players (n=10)	
	Dominant	Non-dominant	Dominant	Non-dominant
ML (ms)	2.024 (0.487)	2.082 (0.382)	2.327 (0.362)	2.811 (0.462)
MNCV (m/s)	58.999 (5.098)	63.947 (4.905)	58.297 (3.618)	60.511 (3.811)
SL (ms)	1.723 (0.344)	1.632 (0.132)	1.994 (0.293)	2.020 (0.174)
SNCV (m/s)	46.871 (5.432)	44.926 (4.259)	39.872 (3.034)	39.407 (3.119)

Table-2 shows the comparison of baseline nerve conduction characteristics by comparing means and standard deviations, and at $p<0.05$ level of significance there is no significant difference between these baseline values.

Table 3: Comparison of differences between two groups using 2-way ANOVA (n=20)

Parameters	Group			Dominance		
	Sum of Squares	F	Sig.	Sum of Squares	F	Sig.
ML (ms)	0.906	8.354	***0.006**	0.906	8.354	***0.006**
MNCV (m/s)	18.92	0.8	0.377	7.081	0.299	0.588
SL (ms)	0.404	5.617	***0.023**	0.008	0.109	0.743
SNCV (m/s)	539.27	18.711	***<0.001**	6.061	0.21	0.649

Table-3 shows the comparison of differences between both groups using two-way ANOVA. Significant differences can be seen in motor and sensory latencies; SNCVs also showed statistically significant differences but MNCVs showed no significance at $p<0.05$. There was no significant difference seen in dominant and non-dominant extremity of players and control subjects in ulnar nerve.

DISCUSSION

Badminton is a sport which requires jumps, lunges, quick changes in direction and rapid arm movements from a wide variety of postural positions and rapid and repetitive wrist movement.[6] Also, many neurological injuries remain subclinical and are not identified before damage is irreversible. Many of the asymptomatic players with abnormal nerve conduction tests may have pre-symptomatic or asymptomatic neuropathy like subclinical entrapment nerve neuropathy.[5] Hence, detecting underlying nerve pathology in asymptomatic badminton players will help to prevent further deterioration and early intervention.

From our results we can infer that there is a delay in sensory and motor conduction and reduction of sensory conduction velocities for ulnar nerve in badminton players when compared with control age matched individuals.

The elbow is also the most common site for ulnar nerve compression. Potential compressive sites include the arcade or ligament of Struthers, the medial intermuscular septum, the cubital tunnel, and the medial head of the triceps. Normally, the ulnar nerve is subjected to stretch and compression forces that are moderated by its ability to glide in its anatomic path around the elbow. When normal excursion is restricted, irritation ensues. This results in a cycle of perineural scarring, further loss of excursion, and progressive nerve damage. The peripheral location of the motor and the sensory fibers may explain the usual clinical presentation in cases of early compression.[10–12.]

In a study done by Colak T et. al. (2004) on nerve conduction velocity of upper extremities in tennis players found that the sensory and motor conduction velocities of the radial nerve and the sensory conduction velocity of the ulnar nerve were significantly delayed in the dominant arms of tennis players compared with their non-dominant arm and normal subjects and this result is consistent with our results.[5]

As this study was conducted only on elite male badminton players between age of 20-40 years, we cannot generalize the results for the whole athletic population and sample size was less when two group comparisons were made.

Further study should be done using a larger sample size and in different age group and a longitudinal study can be done to find out clinical signs and symptoms in badminton players in later life who were initially asymptomatic with altered NCS.

CONCLUSION

As a conclusion, it can be stated that there is an influence of regular and intense practice of badminton on the upper extremity nerves function of elite players when compared to age matched normal subjects. Also, asymptomatic elite badminton players have underlying subclinical pathology in dominant upper extremity nerves which affect nerve conduction functions. Findings of the study can be useful in planning a preventive conditioning program, for rehabilitation of patient and for modification strategies to optimize biomechanics scientifically and to imply neuro-dynamics based rehabilitation.

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DECLARATION OF INTEREST STATEMENT

The authors report there are no competing interests to declare.

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