

Effect of Different Positions of Body in Measuring Grip Strength in Tennis Elbow

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ABSTRACT

Grip strength is taken as an important measure to find effect as well as affection in tennis elbow. Measuring pain free grip strength is (PFGS) an important outcome measure for Tennis Elbow (TE). The different positions of elbow give change in the value of PFGS. This study aims to examine effects of two different position of body on PFGS in tennis elbow patients.

Aims: To find out better position for measuring PFGS in tennis elbow.

Methods and Material: A cross sectional study done in the Physiotherapy department. Unilateral chronic tennis elbow patients were included in the study according to inclusion and exclusion criterias after getting written informed consent. Jammer hand held dynamometer was used to measure the PFGS. PFGS was measured in sitting position with elbow flexion 90° and supine lying position with elbow extension. Average of three trials was taken with rest of 1 minute in between.

Results: On comparing both positions there is significant difference ($p < 0.05$) found in PFGS measurements in male and female at 95% confidence limit. There is significant increased PFGS noted in sitting position with elbow flexion 90° than with supine lying position with elbow extension.

Conclusions: There is higher comparable PFGS (6.6%) noted in sitting with elbow flexion 90° position than with supine lying with elbow extension position. So it is better to measure PFGS in sitting with elbow 90° flexion position.

Keywords: Pain free grip strength, supine lying, chair sitting, grip strength measurement, dynamometer

INTRODUCTION

Pain free grip strength (PFGS) is an amount of grip force generated by the patient up to the onset of pain. ¹ PFGS is considered as an important outcome measure in patients of tennis elbow. ² Tennis elbow (TE) or lateral epicondylitis is a painful overuse tendinopathy affecting lateral epicondyle of humerus region. According to Smidt et al 2002, PFGS is measured in a relaxed supine position with legs straight and feet apart using a grip dynamometer. ^{1, 3} While Balogun et al 1991 and Hillman et al 2005 has reported to measure PFGS in sitting position with the elbow supported in 90°

flexion. ^{4,5} So this study is done to find out and compare the results of supine lying (elbow extension) and sitting position (elbow flexion 90°) for measuring PFGS.

MATERIALS & METHODS

Clinically diagnosed cases of unilateral chronic tennis elbow were included in the study according to inclusion and exclusion criterias after getting written informed consent. Patients having symptoms for ≥ 3 months, NPRS ≥ 4 at rest, Resisted Wrist Extension Test (Cozen's Test), Mill's Test, Resisted Middle Finger Extension Test – if any two or more tests positive than they

were included in the study. Both male and female were included. This study was approved by institutional ethical committee. Jammer hand held dynamometer was used to measure the PFGS. All patients were positioned first in sitting in chair with shoulder in neutral position, arm adducted, elbow joint flexed 90°, forearm in mid-prone position, wrist and fingers in

comfortable position of handling the dynamometer and elbow supported. The dynamometer's handle was set at 2nd position as they feel more comfortable during the testing at this position of handle in both body positions and it is also recommended by American society of hand therapists.⁶



Figure 1: Jamar handheld dynamometer



Figure 2: Sitting position PFGS measurement



Figure 3: Supine position PFGS measurement

They were asked to squeeze the handle of dynamometer slowly up to the point where they began to feel discomfort before onset of pain. Three trials were taken with rest of 1 minute in between to minimize fatigue effect and average of three trials was noted.⁷ Rest of 5 minutes was given and PFGS measurements again taken in supine lying position with shoulder in neutral position, arm adducted, elbow joint in extension, forearm in mid-prone position, wrist and fingers in comfortable position of handling the dynamometer. Average of three trials was noted with 1-minute rest in-between.

Statistical Analysis Microsoft excel 2016 used for statistical analysis (t test).

RESULT

Total 24 patients with unilateral chronic tennis elbow were included in study. Amongst which 11 were male and 13 were female with mean age of 44.25 ± 8.53 years. Table 1 shows mean age, hand dominance and mean BMI values in male and female tennis elbow patients. Table 2 shows PFGS values in males and females in supine with elbow extension and sitting with elbow flexion positions.

There is statistically significant difference found between two positions in both males and females at 95% confidence interval. While comparing both the positions PFGS is found to be higher in sitting

position with elbow 90° flexed than with supine lying position with elbow extension. There is 6.6% decrease in PFGS noted in elbow extension in supine lying position

when compared it to elbow flexion 90* in sitting position (Table 3).

9 out of 24 patients had reported increase in pain after grip strength measurements in supine lying position.

Table 1: Mean age, BMI, Dominancy and sample size according to gender

	N	Dominant side affected	Mean AGE (years)	Mean BMI(kg/m ²)
Male	11	11	43.09±8.90	22.75±2.68
Female	13	13	45.23±8.42	24.1±2.62

Table 2: PFGS values in both positions

	PFGS (Mean±SD)		t value	p value <0.05
	Sitting (Elbow flexion)	Supine (Elbow extension)		
Male	23.44±3.13	22.22±3.20	3.398	0.006
Female	22.61±4.56	20.24±3.92	3.238	0.007
Both male and female	22.54±3.49	21.15±3.67	6.472	0.00001

Table 3: Difference in elbow flexion 90* and elbow extension in PFGS

No. of patients	Average PFGS in Elbow Flexion 90°	Average PFGS in elbow extension	Individual percentage decrease in PFGS from flexion to extension
24	22.54±3.49	21.15±3.67	6.6%

DISCUSSION

Patients with lateral epicondylitis have difficulty in doing activities involved with gripping. PFGS is commonly used as an outcome measure in patients of tennis elbow which measures hand grip force before the onset of pain.¹ It shows the degree of impairment associated with lateral epicondylitis.⁸ PFGS is measured clinically in tennis elbow patients as they have reported to reproduce the patient’s lateral elbow pain in gripping tasks.⁹

Higher PFGS measurement was found in sitting position with elbow 90° flexion than with supine lying with elbow extension. Muscle length tension relationship may have affected these results. Another reason for this could be in sitting position the elbow joint is placed into just greater than its resting position (70° flexion)¹⁰ and in this position muscles are found to be strongest.¹¹ In this position there is optimal overlap between the actin and myosin filaments also which contributes to greater force generation.^{12, 13}

Probable reason for reporting increased pain after supine lying measurements may be position of elbow extension in supine lying increases tension in the elbow extensors and may causes discomfort and puts compressive forces between the extensor muscles (ECRL and ECRB) and the

capitellum of the humerus pain while gripping in this position.⁸

Hillman et al. (2005) measured hand grip strength in the supine and sitting positions and found that grip strength measurements were significantly greater in sitting (with elbow unsupported- as synergistic muscle actions of other muscles helps)¹⁴ than those in bed and in sitting (with elbow supported- when forearm and wrist are stabilized grip strength measurements are highly repeatable)¹⁵ therefore, he recommend grip strength measurement with the elbows supported in an armchair rather than in a chair with the elbows unsupported in the clinical situation⁵ which supports our clinical findings.

CONCLUSION

It proves that position has impact on pain and grip strength. PFGS measurement in elbow flexion position gives higher value compared to elbow extension position. So, PFGS should be measured in sitting position with elbow 90°flexed.

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