Characteristics of Anterior Shoulder Instability and Hyperlaxity in the Weight-Training Population

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Abstract

Kolber, MJ, Corrao, M, and Hanney, WJ. Characteristics of anterior shoulder instability and hyperlaxity in the weight-training population. *J Strength Cond Res* 27(5): 1333–1339, 2013—Despite case reports implicating anterior instability (AI) as an etiological source of shoulder pain among weight-training (WT) participants, a paucity of case-controlled evidence exists to support this premise. The purpose of this study was to determine if WT participants have clinical characteristics of AI and hyperlaxity. Additionally, we investigated the role of exercise selection. One hundred fifty-nine healthy male participants (mean age 28 years) were recruited and included 123 individuals who engaged in WT a minimum of 2 days per week and 36 controls with no history of WT participation. Before testing, participants completed a questionnaire summarizing their training patterns. Upon completing the questionnaire, 3 reliable and valid tests used to identify clinical characteristics of AI were performed on both groups and included the load and shift, apprehension, and relocation maneuvers. Load and shift test results identified significantly greater anterior glenohumeral joint hyperlaxity in the WT group compared with controls ($p = 0.004$). The presence of positive apprehension ($p < 0.001$) and relocation ($p < 0.001$) tests were also significantly greater in the WT group. A significant association existed between performance of exercises that require the "high-five" position (behind-the-neck latissimus pull-downs and military press) and clinical characteristics of AI. Conversely, an inverse association between performance of external rotator strengthening and clinical characteristics of AI existed. Findings from this study suggest that individuals participating in WT may be predisposed to AI and hyperlaxity. Modification of exercises requiring the high-five position, as well as efforts to strengthen the external rotators, may serve as a useful means to mitigate characteristics associated with AI and hyperlaxity. Future intervention-based trials are needed to investigate a causative effect of exercises.

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Introduction

It has been reported that more than 45 million Americans participate in some form of resistance training regularly (3). The Centers for Disease Control analyzed data from the National Health Interview Survey to determine the prevalence of strength training in the adult population from 1998 to 2004, and estimated that nearly 20% of adults aged 18–65 years participate in some form of resistance training 2 or more times a week (3). Weight training (WT) has been advocated as a means of developing musculoskeletal performance for sports (6,11), rehabilitation of injuries (2,9), and for various health and fitness benefits (1,10,31). Although the health and performance benefits ascribed to WT are well documented, the pursuit of these benefits has not been without risk because a considerable number of WT-related injuries have been reported in the literature (13,17,18,22,28,29).

The shoulder complex accounts for a considerable proportion of injuries attributed to WT (7,8,12–16,22,27–29). Researchers have reported that up to 36% of injuries in the WT population occur at the shoulder complex (13,18,22,26) with the degree of injury being classified anywhere along the spectrum from acute to chronic disorders that manifest as pain or interfere with WT participation.

The susceptibility of the shoulder complex to injury is in part because of the stress WT places on the shoulder joints, requiring a traditionally non–weight-bearing joint to assume the role of a weight-bearing joint during the course of repetitive lifting while under heavy loads. Additionally, common WT exercises may place the shoulder in unfavorable positions requiring the arm to be horizontally extended posterior

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to the trunk or may require the abducted and externally rotated "high-five" position (Figure 1). The combination of repetitive loading while in an unfavorable position may place undue stress on the anterior shoulder tissues. This undue stress may increase the normal shoulder laxity and over time lead to excessive translation (movement) of the humeral head anteriorly (forward) on the glenoid fossa, thus rendering it unstable and increasing injury risk (14,21,23).

Although the underlying etiology of shoulder pain is multifactorial, anterior instability (AI) has been implicated as one of the more prevalent conditions attributed to WT (14,19,23). Lestos et al. (23) reported 25 cases of occult anterior shoulder instability in recreational weightlifters during a 1-year time period using a clinical examination. Specifically, the investigators used the apprehension and relocation tests because they have acceptable validity for clinically identifying AI. Gross et al. (14), surgically and clinically (using the apprehension and relocation tests), identified the anterior shoulder instability among 23 shoulders from a WT population. In both of the aforementioned studies, all subjects reported pain while in the high-five position suggesting that the assumption of this position during exercise may be an extrinsic risk factor for AI. Although the above case series investigations contribute to the current understanding of WT-related shoulder pain, the absence of a control group and relatively small sample sizes from both studies limit generalization of the findings.

The purpose of this study was to determine if men who participate in WT present with clinical characteristics of shoulder hyperlaxity and AI. Additionally, we sought to determine if there is a significant difference between the presence of these conditions among WT participants when compared with a control group. Lastly, we set out to investigate the association of exercise selection with clinical characteristics of AI.

METHODS

Experimental Approach to the Problem

This investigation was a descriptive analysis of the nondominant shoulder of men who participate in WT. The independent variables were group assignment consisting of the WT and control group. The dependent variables measured to describe the clinical characteristics of AI were the (a) load and shift, (b) apprehension, and (c) relocation tests. Additionally, the load and shift test has documented validity for identifying hyperlaxity. It is important to note that hyperlaxity describes the passive looseness of a joint, which indeed is one component of AI (32). A distinction between hyperlaxity and AI lies in the clinical production of symptoms from AI (32). To our knowledge, there are no previous investigations that have compared the presence of either AI or hyperlaxity in the WT population with a control group. Additionally, a detailed questionnaire was provided to participants to document their specific training patterns that included frequency, presence of pain, and exercise selection. We sought to determine if there was a relationship between exercise selection and clinical characteristics of AI and hyperlaxity.

Subjects

All participants completed and submitted a Nova Southeastern University Institutional Review Board approved informed consent document before participation. One hundred fifty-nine participants aged 19–48 (mean age 28) years were recruited from a university setting and local fitness centers over a 2-year duration. Participants included 123 individuals who participated in recreational upper extremity WT at a frequency of 2–5 days per week (mean 3 days) with WT experience before data collection ranging from 12 weeks to 25 years (mean 9 years). Thirty-six individuals who did not perform any upper extremity WT or competitive sports with their nondominant arm served as controls for this study. Participants were surveyed on the type of upper body exercises that they routinely performed as part of their WT program. All the WT participants recruited for this study reported performing at least 3 or more of the following exercises: (a) flat bench press, (b) incline bench press, (c) chest flies (supine or incline), (d) military press (dumbbells or barbells), (e) behind-the-neck latissimus pull-downs, and (f) lateral deltoid raises as part of their routine. The nondominant arm was used for data collection in both groups to control for factors common to the dominant extremity, which may confound the results, such as compulsory use. In cases where participants reported ambidextrous use, their writing or preferably throwing arm was considered their dominant arm. Participants were excluded if they participated in professional bodybuilding, competitive power lifting, or competitive overhead sports with their nondominant extremity. Participants in the WT group were surveyed regarding the presence of shoulder pain in their nondominant arm during WT in the previous year and the past 72 hours. Additionally, the control group was surveyed for the presence of pain in the past 72 hours. None of the control group participants reported pain in the past 72 hours. Fifty-nine percent of WT participants reported pain during the course of training in the previous year, whereas 21% reported pain during the past 72 hours. Statistical analyses revealed no significant differences ($p \geq 0.07$) between the WT and control groups for the variables of age, mass, height, and body mass index (Table 1).

Procedures

Standardized warm-up exercises were completed by all participants before testing and included the pendulum exercise performed both clockwise and counterclockwise for 10 repetitions each and standing scapular adduction without resistance performed with a 10-second hold for 10 repetitions. The warm-up required approximately 3 minutes and was not intended to offer a mobilization effect. The principal investigator (M.J.K.), a licensed physical therapist with a specialist certification in orthopedics, performed all measurements. A trained assistant recorded all measurements on a data collection sheet, which the investigator was blinded to during data collection. The investigator was not blinded to group assignment.

Load and Shift Test. The load and shift test is used by clinicians and researchers as a means to detect and quantify anterior glenohumeral joint translation and instability (32,33). This test (Figure 2) has been previously studied with reported intraclass correlation coefficient (ICC) values of 0.53–0.86 (20,21,33). Specifically, good reliability of the load and shift test has been reported among a population consisting of men who participate in WT (ICC = 0.86) when using a modified version of the grading scale defined by Altchek et al (4,5,21). The load and shift test required the investigator to stand behind the participant who was sitting upright on a treatment plinth. The investigator then stabilized the shoulder with one hand over the clavicle and scapular spine. The other hand grasped the humeral head with the fingers anterior and the thumb posterior to determine first if the humeral head was seated centrally in the glenoid fossa. If the humeral head was positioned anterior or posterior in the fossa, the investigator compressed the humeral head medially toward the fossa and applied a gentle anterior or posterior force to centrally seat the humeral head in the glenoid fossa as described by Magee (25). This step is the "load" component of the test. Once the humeral head is loaded, the investigator translates the humeral head anterior and slightly medial to reflect the natural orientation of the glenoid fossa. This step is the "shift" component of the test. Careful attention is made during the test to avoid scapular protraction because this may cause the humeral head to translate anteriorly in the glenoid and narrow the subacromial space (25). The investigator at this point determined the amount of humeral head translation relative to the glenoid fossa and assigned a grade based on a modified version of the ordinal ranking defined by Altchek et al. (4,5). Specifically, the ranking used for this test is a 4-level grading criteria ranging from normal mobility (grade 0) to a frank dislocation (grade 3). Anterior instability is suggested when the test is graded on the upper limits of the scale (grade 2–3), hyperlaxity when graded on the lower limits (grade 1), and zero indicating normal mobility. The validity of this test for identifying AI has been reported with a specificity of 100% and sensitivity of 50% (32).

Table 1. Demographic characteristics of participants.*

Characteristic	Total (N = 159)	Control (n = 36)	WT (n = 123)	p†
Age (y)				0.28
Mean (*SD*)	28.4 (6.3)	29.5 (7)	28.1 (6.1)	
95% CI	27.39–29.38	27.11–31.84	26.97–29.16	
Range	19–48	20–46	19–48	
Mass (kg)				0.07
Mean (*SD*)	86.8 (13.1)	82.8 (15.2)	87.9 (12.3)	
95% CI	84.72–88.83	77.67–87.98	85.74–90.13	
Range	54.6–140.9	54.6–129.6	63.7–140.9	
Height (cm)				0.12
Mean (*SD*)	177.8 (8.8)	175.5 (10.2)	178.5 (8.3)	
95% CI	176.46–179.22	172.09–179	177.03–180	
Range	147.3–200.7	147.3–195.9	152.4–200.66	
Body mass index kg/m^2				0.35
Mean (*SD*)	27.4 (4.2)	26.8 (4.5)	27.6 (4.1)	
95% CI	26.78–28.09	25.31–28.34	26.88–28.34	
Range	17.5–47.2	18.8–39.8	17.5–47.2	

*WT = weight training; CI = confidence interval.
†Independent t-test.

Apprehension Test. This test is designed to detect anterior glenohumeral joint instability and has previously been reported to have an agreement of 0.47 (32,33) when the outcome is dichotomized. When used in conjunction with the relocation test, it has reported agreement ranging from ICC of 0.76 to 0.92 (24). The test was carried out with participants in the supine position on a treatment table with the nondominant arm off the side of the treatment table (Figure 3). The investigator then placed the participants' shoulder in 90° of abduction, with the elbow also flexed to 90°. The participants' arm was supported on the investigators thigh to maintain the glenohumeral joint at 90° of

abduction. The investigator then slowly externally rotated the participants' shoulder toward the end-range external rotation until resistance or a positive test was found. The interpretation of what constitutes a positive test has varied; however, we used criteria previously reported among validity investigations (24,30). Specifically, a positive test was recorded when the participant reported a feeling of pain or apprehension. Apprehension was documented when the participant had a facial grimace or feeling of shoulder shifting during the test and an unwillingness to maintain the test position. A positive test is indicative of AI of the glenohumeral joint and has reported specificity of 99% and sensitivity of 53–68% (24,30).

Relocation Test. This test is used to diagnose AI and has reported agreement values of 0.71 when the outcome is dichotomized (30). As previously mentioned, the reliability of this test when combined with the apprehension test ranges from ICC 0.76 to 0.92 (24). This test was only performed on participants with a positive apprehension result. The relocation test was performed with participants still in supine at end range of external rotation, where the apprehension test symptoms were evoked (Figure 4). The investigator applied a posterior force to the humeral head relocating it on the glenoid fossa. A positive relocation test was noted if the participant felt relief of symptoms elicited with the apprehension test. Speer et al. (30) reported that the relocation test has a specificity of 100% and a sensitivity of 57% for diagnosing AI when the patient has a positive apprehension sign.

Statistical Analyses

Collected data were transferred to SPSS (version 15.0 for Windows; SPSS, Inc., Chicago, IL, USA) statistical program for analysis. Mean values, standard deviations (SD), and ranges of descriptive data from the WT and control groups were generated for comparison. Inferential statistical analyses for the dependent variables were performed with the appropriate nonparametric tests. The load and shift test for joint laxity was analyzed as ordinal data using the Mann-Whitney *U*-test to determine if a significant difference in shoulder laxity was present between the WT and control group. The apprehension and relocation tests were analyzed as nominal data using either a Pearson chi-square or Fisher's exact test. These tests were used to determine if a significant difference in the frequency of test results was present between the WT and control group. Additionally, a Pearson chi-square or Fisher's exact test was used to determine if a significant difference existed between those WT participants with a positive apprehension or relocation and the performance of specific exercises deemed to be high-risk from previous case reports, whereas a phi coefficient (Φ) was used to interpret the strength of the association. Lastly, a Pearson chi-square or Fisher's exact test was used to determine if a significant difference existed between those WT

participants with a positive apprehension and relocation sign and reported shoulder pain within the past 72 hours. A phi coefficient (Φ) was used to interpret the strength of the association.

The p-value was considered significant at the 0.05 level using a 2-tailed test ($\alpha_2 = 0.05$) for all hypotheses. An a priori power analysis using the G-Power statistical software version 3.03 determined that a total sample size of $n = 84$ would be required for 95% power if a large effect size was posited.

Results

Shoulder Laxity

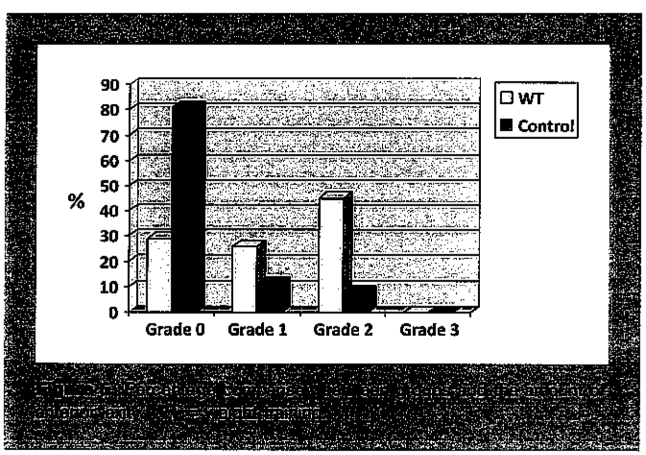
The presence of clinical findings suggestive of AI and hyperlaxity was significantly greater in the WT group when compared with the control group ($p = 0.004$) based on the ordinal results of the load and shift test (Figure 5). Seven of the 36 participants (19%) in the control group had either AI or hyperlaxity (grade 1 or 2) compared with 87 of the 123 WT participants (71%). None of the participants in either group had grade 3 results on the test, which would have implied a dislocation during testing.

Apprehension and Relocation Test

A significant difference existed between groups for the presence of a positive apprehension test ($p < 0.001$). Forty-four percent of WT participants displayed a positive test compared with 2.7% of control group participants. Of those participants who displayed a positive apprehension test, a relocation test was then applied to further determine the presence of AI. A significant difference existed between the groups for a positive relocation test ($p < 0.001$) as well. Thirty-seven percent of the WT participants with a positive apprehension sign reported a reduction in symptoms when the relocation maneuver was applied, whereas none of the control participants reported a difference with the test.

Program Design Characteristics

In regard to exercise selection, 49% of WT participants performed behind-the-neck pull-downs and 58% performed military press both of which require the 90/90 (high-five) positions. Exercise selection characteristics for the participants in this investigation indicated that there was a significant difference ($p < 0.001$) for the presence of positive findings from the load and shift, apprehension, and relocation test among individuals who performed behind-the-neck pull-downs and military press and those who did not. Moreover, the presence of positive findings from the load and shift, apprehension, and relocation test among individuals who performed external rotator strengthening was significantly less than those who did not ($p < 0.001$). No significant differences ($p > 0.05$) were identified between the AI tests and performance of flat bench, incline bench, chest flies, lateral deltoid raises above 90°, and rear squats.



In regards to exercise selection, a significant ($p < 0.001$) moderate association was found between the behind-the-neck pull-down exercise and both the apprehension ($\Phi = 0.61$) and relocation ($\Phi = 0.51$) tests. A weak but significant ($p < 0.001$) association was found between the behind-the-neck pull-down and the load and shift test ($\Phi = 0.46$). A weak but significant ($p = 0.001$) association was found when comparing the behind-the-neck military press exercise and the apprehension ($\Phi = 0.44$) and relocation ($\Phi = 0.40$) tests. When performance of behind-the-neck pull-downs was clustered with the behind-the-neck military press exercise, a significant ($p < 0.001$) moderate association was present for the load and shift ($\Phi = 0.50$), apprehension ($\Phi = 0.71$), and relocation ($\Phi = 0.55$) tests. A significant ($p < 0.001$) inverse relationship was identified between performance of external rotator strengthening and the load and shift ($\Phi = -0.37$), apprehension ($\Phi = -0.37$), and relocation ($\Phi = -0.32$) tests.

Pain Reports

In regard to pain, 21% of WT participants reported having shoulder pain during WT in the past 72 hours. Significant differences ($p \leq 0.025$) were present when comparing positive findings from the load and shift, apprehension, and relocation test among individuals with and without reported shoulder pain in the past 72 hours. A significant ($p < 0.001$) relationship was identified between reports of shoulder pain in the past 72 hours and the load and shift ($\Phi = 0.32$), apprehension ($\Phi = 0.35$), and relocation ($\Phi = 0.32$) tests.

Discussion

Although WT is considered a heterogeneous activity, we recruited individuals who participated primarily for recreational purposes so that inferences may be made from the results.

From a descriptive perspective, findings from this investigation are consistent with previous case series investigations suggesting that individuals who participate in WT may be predisposed to AI.

Although significant differences were present when comparing WT participants and controls, it should be noted that previous investigations have lacked a control group, thus we are limited in our ability to directly compare our results with other studies. Despite limited research for comparison, this investigation adds to the body of knowledge because previous investigations were inclusive of small sample sizes and lacked a control group comparison.

When comparing our results to those of Lestos et al. (23) and Gross et al. (14), there seems to be a similarity in the classification of WT participation. Although the type of WT one performs may be heterogeneous, none of the participants in either study are reported to be competitively training for events such as bodybuilding or power lifting. One difference in participants that should be noted is that the 2 aforementioned studies used subjects who were seeking care for shoulder pain. In the current investigation, individuals were recruited based on WT participation as opposed to those seeking care, although a considerable portion did have shoulder pain. Although participant recruitment differences are noteworthy, the results of our investigation did not contrast research that used subjects seeking care.

A multitude of clinical examination tests have been described in the literature for identifying AI. This investigation used 3 of the more common tests that have published reliability and validity values so that the merits and limitations of our results could be reasonably interpreted. Additionally, we chose tests that have high levels of specificity to eliminate the potential for false-positive test findings. It should be recognized, however, that other tests exist and that addition of the "surprise" test may have improved our predictive ability to identify characteristics of AI (24).

To our knowledge, the load and shift test has not previously been assessed on a WT population, thus we have no data to compare our results. Because our participants were not seeking care for shoulder pain, we did not expect to identify such a high prevalence of positive apprehension and relocation tests; thus, we chose the load and shift test for its ability to identify AI along a varying spectrum of severity. Given that the apprehension and relocation tests are graded on a dichotomy and have lower levels of sensitivity, we felt that individuals with occult AI might not be identified, thus the load and shift test offered a ranking of the degree of instability.

The apprehension and relocation tests have both been validated as clinical tests for AI. Both possess high specificity and lower levels of sensitivity; however, when both tests are combined, the specificity has been reported at 100%. Retrospectively looking at our results, it is apparent that a substantial number of participants had positive test results to a greater degree than anticipated. Given this finding, one might speculate that the results are inclusive of false-positive findings; however, the tests we chose possess strong specificity, thus this concern may be eliminated. Sensitivity of the apprehension and relocation tests are lower than the specificity, thus one concern may be the presence of false-negative test outcomes. Although this is a reasonable consideration, the prevalence of positive test results identified in this investigation perhaps minimize this concern.

When assessing the association between exercise selection and clinical characteristics of AI, 3 exercises (external rotator strengthening, military press, and behind-the-neck pull-downs) had significant associations ($p < 0.001$). These results were reasonably predictable for WT participants who performed exercises in the high-five position based on previous research reports and biomechanical principles (14,23,25). Specifically, the high-five position has been found to place strain on the anterior capsule and glenohumeral ligaments (25,32), thus compulsory assumption of this position while the joint is loaded during WT may lead to anterior hyperlaxity and ultimately AI. Moreover, symptomatic patients reporting pain in the high-five position are often thought to have AI given its close resemblance of the apprehension test (25,32). Interestingly, the association between having a positive test for AI and hyperlaxity was stronger among participants performing both behind-the-neck pull-downs and the behind-the-neck military presses in comparison to either of the exercises independently. It is unclear why similar associations were not identified for other exercises, such as the rear squat and chest flies, which biomechanically place strain on the anterior soft tissue structures of the shoulder. One reason may be that the degree of external rotation and abduction for both of the aforementioned exercises is less than the high-five position. Another explanation may be related to the degree of joint loading. Exercises such as the rear squat do not load the glenohumeral joint, and thus may not produce a biomechanical strain on the soft tissue that would be expected from an exercise that loads the joint. Performance of external rotation strengthening had a significant inverse association with clinical characteristics associated with AI, which may suggest a protective effect. One plausible explanation for this is that the external rotators serve to stabilize the glenohumeral joint. Contraction of the rotator cuff muscles may cause the humerus to translate in a direction consistent with the angle of contraction (25); thus, the external rotators may provide restraint to AI. Interestingly, few participants (<15%) performed both external rotator strengthening and behind-the-neck pull-downs or military press. Of those participants who performed external rotator strengthening, only 14% had positive apprehension and relocation tests compared with 35% of participants who performed behind-the-neck latissimus pull-downs and the military press exercise. One might postulate that individuals whose programs are inclusive of external rotator strengthening may intentionally avoid at-risk exercises such as behind-the-neck pull-downs and the military press.

Although the precise etiology of the AI findings among the WT participants in this study may be uncertain, evidence is available from this investigation, and previous research to suggest that exercises requiring the high-five position may be a predisposing factor. It is important to recognize that the individuals in this study were not seeking care for shoulder pain, thus the presence of clinical characteristics of AI may be considered symptomatically occult. Long-term prospective investigations are needed to determine a causative effect.

Practical Applications

The professions involved in both the prescription of exercise and the evaluation and treatment of musculoskeletal disorders must develop guidelines that optimize safety, reduce injury risk, and prevent musculoskeletal dysfunction in the WT population. Injury risk may be mitigated through changes in exercise prescription and technique.

The ability of clinicians and strength and conditioning professionals to recognize "at-risk" training patterns requires an awareness of documented injury trends and risk factors. Addressing modifiable risk factors, such as the high-five position commonly assumed during upper extremity exercises, may serve to prevent and/or minimize symptoms resulting from AI. Modifications for some of the more common exercises traditionally requiring the high-five position, such as behind-the-neck pull-down and military press, involve bringing the bar down to the front chest. Lastly, it is recommended that individuals who participate in WT incorporate strengthening of the external rotator musculature because it may serve to mitigate risk for AI.

Acknowledgments

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Author information

Abstract

The elbow flexion test is a little known, inadequately standardized, and poorly understood clinical test for the cubital tunnel syndrome. To evaluate and define this test, 13 patients with clinical and electrophysiologic evidence of cubital tunnel syndrome were tested with elbow flexion in a standardized manner. This consisted of full elbow flexion with full extension of the wrists for three minutes. All patients noted the onset of or the increase in one or more of the symptoms of pain, numbness, or tingling with this test. Numbness and tingling followed the sensory distribution of the ulnar nerve, but pain was not limited to the ulnar nerve distribution. The symptom complex, rapid onset, and rapid resolution of symptoms support a locally induced segmental ulnar nerve ischemia as the cause of symptoms. This study demonstrates the elbow flexion test to be a useful, reliable, and provocative test for the cubital tunnel syndrome.

PMID: 3402126 [PubMed - indexed for MEDLINE]

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Reliability of Two Tests for Cubital Tunnel Syndrome

Doctors often poke and prod patients to find out exactly what's causing their pain or symptoms. In the case of nerve entrapment at the elbow , two tests are often used to diagnose cubital tunnel syndrome (CuTS). A false positive test may result in unnecessary nerve testing and even surgery. False positive occurs when the test is positive but there's nothing really wrong with the elbow.

In this study, the Tinel and elbow flexion tests are checked for reliability. The Tinel test for the ulnar nerve applies tapping pressure on the inside of the elbow where the nerve is close to the surface. A positive test is if two taps causes numbness or tingling at the elbow, down the arm, or into the hand .

In the second test (elbow flexion) the patient bends the elbow fully with the upper arms at the side. Again, numbness and tingling from the ulnar nerve after one. two, or three minutes is a positive test.

These two tests were given to 100 healthy college students who had no previous history or signs of ulnar nerve entrapment. A total of 200 elbows were tested. One doctor did all the testing.

The Tinel test was positive in 36 percent of the elbows. The elbow flexion test was positive 20 percent of the time. The authors believe these are false positive responses in this group of subjects. Neither test is useful to evaluate for possible CuTS.

At the present time no single test can be used to diagnose CuTS. These two tests can still be used but the result must be viewed with caution. History, physical exam, and other tests such as nerve conduction velocity (NCV) tests are needed to confirm or rule out CuTS as the problem.

Reference:

Stuart H. Kuschner, MD, et al. Evaluation of Elbow Flexion and Tinel Tests for Cubital Tunnel Syndrome in Asymptomatic Individuals. In Orthopedics. April 2006. Vol. 29. No. 4. Pp. 305-308.

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J Bone Joint Surg Am. 1986 Jun;68(5):735-7.

Carpal tunnel syndrome. An evaluation of the provocative diagnostic tests.

Gellman H, Gelberman RH, Tan AM, Botte MJ.

Abstract

In order to evaluate the usefulness of provocative tests (wrist-flexion test, nerve-percussion test, and tourniquet test) in the diagnosis of carpal tunnel syndrome, the results of provocative testing were evaluated in a group of patients (sixty-seven hands) with electrodiagnostically proved carpal-tunnel syndrome and in a group of fifty control subjects. The sensitivity and specificity of each test were calculated. The wrist-flexion test was found to be the most sensitive while the nerve-percussion test, although least sensitive, was most specific. The tourniquet test was quite insensitive and not very specific, and should not be used as a routine screening test in the diagnosis of carpal tunnel syndrome.

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