International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2019): 7.583

Effect of IASTM versus Kinesiotaping on Maximal Grip Strength in Healthy Adults: A Single Blinded Randomized Controlled Comparative Study

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Abstract: ***The purpose of this Randomized, single-blind comparative study is to determine the immediate effect of Instrument Assisted Soft Tissue Mobilisation (IASTM) versus Kinesiotaping on maximal grip strength in healthy adults. A total of one hundred and fifty (150) healthy adults between the ages of 18 to 50 years participated in the study. Subjects were separated into three groups; IASTM, kinesiotaping and control group. The main outcome measure was maximal grip strength. It was measured using Baltimore Therapeutic Equipment (BTE) Primus RS isometric testing (with Tool 162). All subjects were assessed before and immediately after performing the intervention. Amongst all groups, statistical significant differences were found in IASTM and Kinesiotaping group when compared to the control group. However no significant difference was found between the IASTM and Kinesiotaping groups. Hence the current study supports the use of both IASTM and kinesiotape as an adjunct to conventional treatment for increasing maximal grip strength.***

Trial Registration: CTRI/2019/10/021541

Keywords: Grip, strength, IASTM, Kinesiotape

1. Introduction

Grip strength is a measure of the maximum force/tension generated by one's forearm muscles and the ability of hand muscles to grip [1]. It can be used as a screening tool to measure upper body strength and overall strength [2]. Grip strength has been used for risk stratification, to assess upper limb impairment, to predict future health problems in individuals [3] or to develop a suitable treatment plan [4]. A decrease in grip strength makes it difficult for a person to use his/her hands for many activities of daily living, and recovery from this muscle weakness becomes a major goal of rehabilitation in such subjects [5].

The search for new therapeutic approaches capable of preventing and treating musculoskeletal dysfunctions is progressively increasing in conjunction with current technological innovations[6]. Instrument-assisted soft tissue mobilization (IASTM) and taping techniques have been developed as an adjunct to the treatment, and has improved over time to provide therapeutic effects which do not hinder the functionality of the body segment.

Kinesiotape is made of elastic adhesive materials used in the prevention of sport injuries, rehabilitation of injured patients, and enhancing performance[7]. Kinesiotape provides constant cutaneous afferent stimulation of the skin. This activity stimulates sensory mechanisms, improves joint function, decreases pain as a result of a reduction in neurological activation, realigns fascia tissue function through normalizing muscle tension, enhances blood and lymph circulation to the local area by lifting fascia and soft tissue, and improves muscle function[8]. Thiago Lemos et all found that kinesiotaping augmented the handgrip strength of healthy women and the increase in grip strength was maintained for 48 hours after its application [6]. In their study, Kim et all concluded that kinesiotape can increase maximal grip strength immediately whereas nonelastic tape showed no difference in the grip strength [1].

IASTM is the use of hard tools to manipulate soft tissue and was derived from the Cyriax[9] cross-friction massage. It has recently emerged as a popular alternative to traditional manual therapy techniques. Modern-day IASTM instruments vary in material (eg, stainless steel, plastic) and design and are used to improve a variety of musculoskeletal conditions and associated outcomes [10].

The most common form of IASTM is the Graston Technique. This technique utilizes stainless steel tools varying in shape and size. Each tool has multiple beveled treatment surfaces for varying intensities in treatment [11]. IASTM technique involves applying stainless-steel instruments to localize, treat, and release soft tissue restrictions which include adhesions, thickenings and scar tissue [11]. Studies that have found IASTM facilitates the healing process through increased fibroblast proliferation, increased collagen synthesis, maturation, and alignment [12].

Laudner et al [11] found IASTM to improve 1 or more shoulder ROMs in healthy overhead athletes. Markovic[10] described increases in lower extremity ROM as compared

with foam rolling. Vardiman et al [13] examined pain and patient-reported function in the distal lower extremity; no between-groups improvements were noted in either outcomes.

Moderate evidence supports the use of IASTM in injured and uninjured participants. It is recommended for improving ROM in uninjured participants and for improving pain and patient-reported function in selected injured patients. However, it is not yet recommended for enhancing strength because of limited and conflicting research [14]. This study aims to study the effect of IASTM on maximal grip strength and also compare its effect with Kinesio taping on maximal grip strength.

2. Methodology

A total of 150 healthy adults in the age group of 18 to 50 years participated in the study. The exclusion criteria included , medical history of haemophilia or other blood coagulation disorder, current complains of upper limb or cervical symptoms, metastasis, open wounds, subjects with any ligament injuries or laxity, elbow or wrist tendonitis forearm fractures or nerve injuries in the past 6 months, any known skin allergies to taping, thrombophlebitis, very hairy or very fragile skin, central or peripheral neurological deficits, or consumption of alcoholic beverages or pharmaceutical substances 1 day prior to the start of this study.

The research was approved by the Institutional Research Board (IRB) under the protocol number EC/23/2019 and the study was registered at Clinical Trial Registry (CTRI/2019/10/021541) before the participant recruitment. All subjects were informed about the details of the research procedure, and informed consent was taken prior to participation. This was in accordance with the ethical standards.

Maximal grip strength was assessed using Baltimore Therapeutic Equipment (BTE) Primus RS. Isometric testing on Primus RS was done with tool 162[15] by the trained therapist. The exercise head was positioned at number 5. Stabilization pin was placed in hole A. Grip opening was adjusted to position 2. Subjects were positioned in standing with shoulder in neutral, elbow flexed at 90°, forearm in mid prone position and wrist in neutral position. Subjects were asked to grip the handle as hard as they can for 5 seconds. 3 trials were conducted for each subject with a rest pause of 30 seconds and the mean of the 3 trials was recorded for analysis.

Subjects were randomized into 3 groups using computer generated randomization table. Group A: IASTM group. Group B: Taping group and Group C: Control group.

IASTM tool was used to release the flexor muscles of the forearm. Subjects were asked to sit on a chair with shoulder in neutral, elbow in slight flexion and forearm in supination. Graston technique was used to release the forearm muscles with tool held at 45degree angle. The strokes were parallel to the forearm muscles from origin to insertion for 2minutes (fig 1).

Figure 1: Instrument Assisted soft tissue mobilization

Standard 2inch (5 cm) kinesiotape was used for application of tape. Before applying the tape, the length of tape was measured from 2 cm inferior to the medial epicondyle of the humerus to the wrist joint line. A roll of tape was cut into a strip and then cut down the middle of the strip to produce 2 tails or a “Y-strip.” The tape was applied on the common wrist flexor muscle from the medial aspect of the elbow till the wrist (from origin to insertion) with 15-20% stretch tension with the wrist in a hyperextended position, forearm supinated the elbow in full extension(fig 2).

Figure 2: Kinesiotape Application

All the groups were given wrist flexion and extension range of motion, lumbrical and interrossei activation exercises. Subjects were evaluated twice; pre and immediately post intervention. A clinician who was blinded to treatment allocation took all baseline and post intervention grip strength measurements.

3. Results

SPSS software was used to examine the change in maximal grip strength. $p<0.05$ indicated statistical significance. The Shapiro-Wilk test was used to check the normal distribution of data before analysis. Since the collected data did not meet the normality assumption ($p<0.05$), non-parametric tests were used. For comparisons between two dependent quantitative signs, we applied the Wilcoxon signed-rank test. Kruskal-Wallis one way anova was used to compare change scores across three groups for maximal grip strength ($H= 79.00$; $p<0.001$). Differences identified by analysis of variance were assessed using Dunn’s method. As non-parametric tests were used, median values replaced mean values for comparison.

Table 1: Intragroup comparison of grip strength

	Study Parameter	*Mean*	*Std. Deviation*	*Median*	*IQR*	*Wilcoxon Test*	*p Value*
IASTM Group A	PRE	42.61	17.472	38	14.08	-6.154	0
	POST	50.08	17.417	45.6	10.94	Difference is Sig	
TAPING Group B	PRE	45.84	17.002	42.3	26.6	-6.106	0
	POST	51.51	17.031	47.95	27.3	Difference is Sig	
CONTROL Group C	PRE	43.02	17.548	38.3	23.05	-1.299	0.194
	POST	43.25	17.099	40	21.8	Difference is not Sig	

Table 2: All Pairwise Multiple Comparison Procedures (Dunn's Method)

Comparison	*Diff of Ranks*	*Q*	*P<0.05*
IASTM Difference vs Control Difference	72.146	8.316	Yes
IASTM Difference vs Taping Difference	12.23	1.417	No
Taping Difference vs Control Difference	59.916	6.907	Yes

Changes in grip strength for all groups are reported in table 1. Maximal grip strength was significantly increased post release using IASTM compared to the initial value in IASTM group ($p<0.05$). Similarly taping group also showed significant improvement in grip strength post taping ($p<0.05$). However there was no difference in the control group post intervention ($p= 0.194$).

Statistically significant differences were found in IASTM ($p< 0.001$) and taping group ($p< 0.001$) compared with the control group. However no significant difference was seen between the IASTM and taping groups (table 2).

4. Discussion

The purpose of this study was to compare the immediate effect of IASTM and kinesiotape on maximal force output during hand grip test. Our findings revealed significant improvements in maximal grip strength immediately after both IASTM ($p<0.001$) and kinesiotape ($p<0.001$) with no improvement in the control group (p-0.194). Inter-group comparison showed significant difference in grip strength post IASTM and kinesiotape compared to the control group, with no difference between the groups receiving IASTM and kinesiotape.

The results of the study support the use of IASTM in patients with a weakness from a musculoskeletal injury/condition. Therapists may plan out IASTM therapy before strengthening exercises or performing functional tasks that are limited by the strength of the patient [16].

From a review of literature, we may speculate that neuromuscular facilitation[17], increases of intracellular calcium within muscle tissue[18] and increased blood flow[19], are possible mechanisms by which IASTM may acutely increase muscle performance[16].

Chang et al.[20] assessed immediate effect of Kinesiotaping in flexor muscles of the wrist on the maximum grip strength and concluded that Kinesiotaping had no effect on the maximum grip strength in healthy people. Lee et al.[21] studied grip strength in three groups of neutral head and neck alignment, head and neck turned to the non-dominant arm on the transverse plane, and flexor muscles of the dominant hand being kinesiotaped. The grip strength was significantly higher in the Kinesiotape group than the other two groups. In a study to measure grip strength of 54 healthy individuals, Donec concluded that grip strength values after 30 and 60 minutes showed that while Kinesio tape significantly increased grip strength at both times, no change was detected in placebo and control groups[22]. These two studies confirm our findings regarding the effects of Kinesiotape on increasing grip strength with significant improvement in the grip strength in the group receiving kinesiotape as compared to the control group.

It is thought that the effect of Kinesiotape on muscles is because of the reflex mechanism of the nervous system. Most studies have reported that taping constantly stimulates cutaneous mechanoreceptors over the skin, providing more sensory signals to the central nervous system for information integration[4][20][22]. In addition, the recruitment of the motor unit would be influenced by reduction of motor neuron threshold induced by cutaneous stimulation that can facilitate muscle contraction, and ultimately improve muscle strength[22]. Kinesio tape also increases sensory feedback of the taped region through skin stretching, thereby facilitating contraction of inactive muscles[6].

5. Conclusion

The results of the current study support the use of both IASTM and kinesiotape as an adjunct to conventional treatment for increasing muscle strength.

6. Future Scope

But further study needs to be done to evaluate the long-term effect of IASTM and kinesiotape on muscle strength. Also effect of both IASTM and kinesiotape when done together can be studied further.

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