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Original Research Article

Effect of Flossing Bands on Pain and Perceived Level of Function in Collegiate Baseball Pitchers

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Abstract

Background: Tissue flossing bands are a relatively new treatment modality that have increased in popularity in recent years. There is evidence suggesting that tissue flossing could decrease pain and increase joint range of motion, but there is still a need for further studies in this matter. Thus, this study aimed to assess the effect of a single tissue flossing treatment on the perceived pain and upper extremity function among healthy collegiate baseball pitchers. Methods: Twenty apparently healthy collegiate baseball pitchers (age: 21 ± 2.49) participated in this study. Tissue flossing treatment was performed from the wrist to the elbow on the participant's throwing arm. Before and after treatment, perceived pain and upper extremity function was evaluated. Results: Following one round of tissue flossing treatment, the participants experienced a 27% decrease in perceived pain from baseline (3.05 ± 1.95 to 2.22 ± 2.04, $p < 0.05$). Participants did not experience a significant increase in perceived upper extremity function. In addition, participants did not report any complications as a result of the intervention. Conclusion: These findings demonstrated that in healthy collegiate baseball pitchers, tissue flossing bands treatment were capable of decreasing perceived pain.

Keywords: Flossing bands, Baseball pitchers, Perceived Pain.

INTRODUCTION

The incidence of shoulder and elbow injuries in adolescent baseball players has been on the rise for the past 15 years [1-3]. In fact, this problem has grown to the point that baseball organizations have begun to take steps to reduce the risk of injury by instituting limits on the number and types of pitches thrown per game, and requiring rest days between pitching [4]. Even with these attempts to limit the number of shoulder and elbow injuries occurring in baseball, the problem continues to grow [1]. As long as these injuries are a major concern, there will be the need for allied healthcare professionals to treat them.

The symptoms from these shoulder and elbow injuries can include; pain, inflammation, and decreased function [1-3]. Depending on the type and severity of the injury, the treatment options include: therapeutic exercise, pain modulating modalities, such as ice and electrical stimulation, and surgical intervention [5-7]. Generally, surgical intervention is only considered a viable option after all non-operative measures have failed [5]. Given the exorbitant costs associated with surgery, conservative methods of treating shoulder and elbow injuries are constantly being explored.

Tissue flossing is a relatively new treatment technique incorporating the use of latex bands to wrap the pathologic area prior to a brief bout of exercise [8, 9]. There are evidences indicating that tissue flossing may be a viable method of increasing joint range of motion (ROM), decreasing pain, and improving athletic performance [9]. One proposed mode of action for tissue flossing is similar to the tissue reperfusion that occurs with blood flow restriction therapy [9].

However, recent studies have not found data to suggest that tissue flossing has a significant effect on regional blood flow [8]. Despite evidence of a known mechanism, few studies suggested that tissue flossing may improve joint ROM, perceived ability to move a joint through space, and potential increased torque generation at the targeted joint [8-10].

There is a lack of standardized methodology for the use and application of flossing bands. When applying flossing bands, clinicians must rely on anecdotal evidence or previous experience when determining treatment parameters. Even though flossing bands possess numerous limitations, the potential reported positive patient outcomes, and warrant further study to determine best clinical practices with regards to application and treatment parameters. The only study assessing the effects of flossing bands on the upper extremity focused only on the perceived effects on shoulder flexibility [11]. We are unaware of any study that has addressed the effects of flossing bands on pain and perceived function of the upper extremity. Thus, the purpose of this study was to examine the effects of a single flossing band treatment on perceived pain and upper extremity function among collegiate baseball pitchers.

METHODS

Experimental Design

The proposed study was a controlled design to determine the effectiveness of a single bout of flossing band treatment. Each participant was examined twice, before and after flossing band treatment, for the assessment of perceived pain and upper extremity function.

Study Participants

Twenty apparently healthy collegiate baseball pitchers were recruited to participate in the study. Following explanation of all the details of the study, each participant signed an informed consent approved by the Institutional Review Board.

Study Procedures and Assessment

Fatiguing Protocol

The athletes completed 20-30 minutes warm up routine. It consisted of running, resistance band exercises for the shoulder, elbow, and forearm, along with throwing on flat ground until they felt that their arm was prepared to begin pitching. At this time, the athletes threw 20-25 pitches from a 10-inch mound at a distance of 60 feet 6 inches. The athletes took occasional breaks to receive instructions from their pitching coaches, but the first set of pitches took roughly 10 minutes per athlete. Following completion of the set of pitches, the athletes completed their first round of data collection and their flossing band treatment. After treatment, they completed a second set of 20-25 pitches and underwent their second round of data collection.

Flossing Band Treatment

The flossing band treatment, on the pitching arm, was completed using a 100% latex band measuring 2" x 84" (RockFloss, RockTape USA, Campbell, CA). Prior to the treatment, the subjects removed any clothing or jewelry from their wrist to their forearm. The flossing band was applied at the wrist, and then wrapped distally to proximally with 50% tension applied until the length of the band had been used (Figure 1). The athlete then performed 20 clockwise and 20 counterclockwise rotations of their wrist. Following treatment, the band was removed and rolled back up. Some athletes experienced redness on their forearms along with mild discomfort when performing the instructed wrist motions. In this study and previous studies, no severe adverse effects have been reported.

Figure 1: Flossing band treatment on the pitching arm.

Pain and Upper Extremity Function Assessment

Perceived pain was measured using the Visual Analog Scale (VAS). The VAS has been used as a valid measure of pain in a number of studies [12, 13]. VAS for pain ratings have been shown to be more sensitive for chronic pain measurement, and are recommended for studies measuring pain outcomes as a result of interventions [13-15]. The athletes were asked to rate their upper extremity pain on a scale of 0 to 10. The VAS consists of one 10 cm horizontal line that is anchored with verbal descriptors of "no pain" (=0) and "worst possible pain" (=10).

In order to assess extremity function, the athletes were asked to complete the Upper Extremity Functional Scale (UEFS). The UEFS is a validated self-administered, a twenty-item, questionnaire [16]. The

UEFS assesses a person's perceived upper extremity function using a series of questions asking to rate the ability to perform a common daily task. The probable scores for UEFS ranged from "extreme difficulty or unable to perform activity" (=0) to "no difficulty" (=4) with the highest possible score being an 80 [16].

Statistical Analysis

All values are means ± standard deviation (SD). Analyses was performed using Student t-test for paired samples with Wilcoxon matched-pairs signed rank test. All statistical analyses were performed with GraphPad Prism version 6.0a (GraphPad Software, Inc. CA, USA). The level of significance was set at $p < 0.05$.

RESULTS

A total of 20 young collegiate baseball pitchers participated in all aspects of this study. The average age was 21 ± 2.49 years. The oldest athlete tested was 25 years old, and the youngest was 18 years old. None of the athletes reported any problem following flossing band treatment. The athletes' characteristics are presented in Table 1.

Table 1: Athletes Characteristics

Variable	Mean(n=20)	SD
Age, (y)	21	2.49
Height (m)	1.85	0.05
Body weight (kg)	86.75	8.86
BMI ($kg \cdot m^{-2}$)	25.47	3.55

Values are means ± SD. y, years; m, meters; kg, kilograms; BMI, body mass index.

The average values for VAS and UEFS assessments, before and after flossing band treatment, are presented in Table 2. The average VAS was 3.05 ± 1.95 cm. Following the flossing band treatment, VAS decreased significantly. Indeed, flossing band treatment promoted a 27% decrease from baseline (3.05 ± 1.95 cm to 2.22 ± 2.04 cm, $p < 0.05$). The baseline UEFS was 75.55 ± 7.44. Following the flossing band treatment, UEFS increased to 77.90 ± 3.35; however, it did not reach statistical significance.

Table 2: Pain and Function Assessments

Variable	Pre (n=20)	Post (n=20)
VAS (cm)	3.05 ± 1.95	2.22 ± 2.04*****
UEFS (score)	75.55 ± 7.44	77.90 ± 3.35

Values are means ± SD.VAS, visual analog scale; cm, centimeters; UEFS, upper extremity functional scale. * $p < 0.05$ for Pre and Post comparison as the measured characteristic.

DISCUSSION

The purpose of this study was to assess the effects of a single tissue flossing band treatment on perceived pain and upper extremity function among healthy collegiate baseball pitchers. The findings of this study indicate that a single bout of tissue flossing was capable of decreasing perceived upper extremity pain as measured using the VAS.

Pain Assessment

The VAS is a well validated method of measuring perceived pain among patients [12, 13]. When completing the VAS, a participant reports what level of pain or discomfort they are feeling on a scale of 0 (= "no pain") to 10 (= "worst possible pain"). The data for the VAS is reported as a numerical value which serves to quantify the level of pain and/or discomfort a participant is experiencing.

Within this study, the average baseline VAS was 3.05 ± 1.95 cm. Following the flossing band treatment, participants experienced a 27% decrease in perceived pain or discomfort on average (2.22 ± 2.04 cm). This represented a statistically significant decrease in perceived pain ($p < 0.05$). Given that these participants were healthy, competitive athletes, it was speculated that the perceived pain decrease might also have a clinical connotation. Athletes have previously been reported as having a different perception of pain, and they are subject to different considerations when determining how significant a finding was regarding pain [15-18].

Upper Extremity Function Assessment

The UEFS is a valid method of recording self-reported upper extremity function [16]. Data for this measure was collected using a self-administered, twenty question survey in which athletes were asked to rate the difficulty of performing an action due to limitations stemming from their upper extremities. Scores were based on a scale of 0 (= "extreme difficulty or unable to perform activity") to 4 (= "no difficulty performing the activity").

The average baseline UEFS was 75.55 ± 7.44. Following the flossing band treatment, the athletes reported an increase in UEFS at 77.90 ± 3.35. However, this increase did not reach statistical significance. The lack of statistical significance might be due to the fact of the population being tested. Healthy athletes without any major upper extremity difficulty. The improvements that were made post treatment brought the mean score on the UEFS within 2.10 points of a perfect score (i.e., =80) on the instrument. Additionally, standard error grew smaller which resulted in a more precise measurement. By not testing subjects who were already experiencing some level of dysfunction, there was a smaller amount of improvement that was possible to obtain.

Importantly, our findings reported that following a single tissue flossing band treatment session, perceived pain and discomfort decreased significantly. Presently, there have been no studies to examine the mechanism by which this pain modulation

occurs. However, further studies should be conducted to examine the potential mechanisms of action, efficacy, and safety of tissue flossing bands to provide evidence-based data and support a clinical best practices recommendation.

CONCLUSION

In conclusion, the present findings demonstrated that in young healthy collegiate baseball pitchers, tissue flossing was capable of decreasing perceived pain and discomfort. These findings support the potential use of tissue flossing bands treatment for decreasing perceived pain prior to participating in therapeutic exercise and/or activity. It is also worth noting that tissue flossing is an inexpensive and low-risk alternative therapeutic modality.

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