ABSTRACT

Objectives: The goal of this study was to determine the effect of elastic shoulder taping on cervical and shoulder posture. Background: Forward head posture “FHP” and rounded shoulder posture “RSP” are two of the most common postural problems seen in individuals that sit for prolonged periods. The use of elastic adhesive taping has been shown to improve posture in a variety of musculoskeletal conditions. Methods and Measures: Nineteen graduate students participated in the study. Cervical and shoulder posture were assessed on the dominant and non-dominant side at baseline, with initial RockTaping of the shoulder and 48 hours following the tape. Results: Immediately following the application of the Rocktape, all angles increased. After the two days of wearing the tape, postural angles returned to pre-tape values or less. There was a statistical difference in angles of pre-tape versus immediately following tape. Conclusion: Overall, there is an immediate and significant change in posture with the addition of RockTape to the dominant shoulder, however this effect does not last over a two-day period.

KEY WORDS: Posture, Kinesiology Taping, Rehabilitation, Forward Head, Rounded Shoulders

Background

Forward head posture “FHP” is a common postural deviation that is defined as the anterior displacement of the head in the sagittal plane compared to the trunk. Mechanically, a FHP results in anterior translation of the head, flexion of the lower cervical segments and/or hyperextension of the upper cervical segments. Another postural deviation, rounded shoulder posture “RSP”, commonly accompanies FHP. Rounded shoulder posture is defined as an anteriorly placed shoulder relative to a vertical plumb line in the sagittal plane. Prolonged sitting and computer work are the most common causes of FHP. Populations most prone to these postural deviations are computer programmers, secretaries and students. It has also been suggested that FHP increases with age.

An association between FHP, RSP and upper quarter pain disorders has been cited in the literature. It has been postulated that greater than 80% of individuals with myofascial pain display a FHP and RSP.

A study by Szeto et al. compared female computer workers that had cervical pain and those that didn’t and found the symptomatic group to display more cervical to head flexion. The FHP places a greater strain on the musculoskeletal system by increasing the lever arm and increasing the load to the non-contractile structures and postural muscles. Increased neck flexion angles are
linked to significantly higher activity in the upper trapezius muscle. Other upper quarter disorders that have been related to FHP are cervicogenic headaches, shoulder pain and temporomandibular disorders.

Correcting FHP appears to be one strategy to help individuals with upper quarter pain. Diab & Moustafa in a randomized controlled study found that correcting FHP with exercise minimized pain and improved nerve function in 48 individuals with cervical spondylotic radiculopathy. An adjunct to exercise is the use of elastic taping. Elastic tape can be used to treat a variety of conditions including neuromuscular, orthopedic and sports-related dysfunctions. There are several proposed theories for its benefit including increasing local circulation, decreasing soft tissue inflammation and pain, improve joint alignment, and enhance proprioceptive feedback. Studies have also shown elastic adhesive taping to have a positive effect on muscle activation, thus improving pain and range of motion in the shoulder and cervical spine. A study by Gonzalez-Iglesias et al. was one of the first studies to show the influence of elastic tape on pain and range of motion in patients with acute whiplash injury. The authors concluded that the application of elastic taping resulted in a short-term small change in pain rating and improvement in cervical range of motion. Shih et al. compared KT and exercise on horizontal forward displacement of the cervical spine, a measure of FHP, and found that both exercise and KT improved head position after 5 weeks on intervention. Yoo found that the application of Kinesio Tape (KT) to the neck reduced FHP in twelve males as they performed computer work.

Although research supports the plausibility of elastic tape having a mechanical effect, evidence regarding its influence on correcting head posture is scarce. The purpose of this study was to investigate the short term effect of elastic tape (RT) on forward head and forward shoulder sitting posture in young asymptomatic adults. Our study was different than previous published research with regards to tape brand and taping technique.

Methods

Participants

Prior to entering the study, screening questions were asked of the potential subjects that covered the inclusion and exclusion criteria. Inclusion criteria were: 1) Age between 21 to 35 years; 2) no acute or active injury of the neck or shoulder within the previous six months; 3) ability to speak English; 4) ability to complete the entire study procedure. The exclusion criteria were: 1) allergies to elastic tape; 2) history of shoulder or cervical surgery; 3) history of motor vehicle accident within the previous year; 4) pregnancy in females. Twenty physical therapy students ranging in age from 23-25 years old participated in this study. The use of graduate students who sit more than six hours/day, four days/week was a good cohort to study because of the association between FHP, RSP and prolonged sitting.

The study protocol was approved by the Internal Review Board of Rockhurst University, Kansas City, MO. Informed written and verbal consent was obtained from all participants prior to entering into the study.

Procedure

The study was designed as a prospective repeated measures pilot study. Data collection took place in the department’s research lab. Demographic data including
The Effect of Rocktape on Upper Quarter Posture

The study protocol involved capturing the static sagittal view sitting posture of subjects on three occasions: 1) pre-tape; 2) immediate tape; and 3) 48 hours tape. For this study, subject’s dominant shoulder was used for taping. The non-dominant side served as a control.

1. Posture Alignment Measurement

The posture alignment measurements for this study are commonly cited in the literature and found to be reliable and help to characterize an individual’s posture. The angles of interest were the cervical and shoulder angles using the landmarks and angles portrayed in Figure 1. The cervical angle is formed at the intersection of a horizontal line through the spinous process of C7 and a line to the tragus of the ear. Those with forward head posture would have a smaller cervical angle than those with a more upright posture. The shoulder angle is formed at the intersection of a horizontal line through the acromion and a line connecting the spinous process of C7 and the midpoint of the acromion. Those with rounded shoulders would have a smaller shoulder angle compared with normal subjects.

The data collection sessions began with identification of the anatomical points needed for angle calculations. Once identified, circular adhesive stickers were placed bilaterally on the anatomical points. Subjects were then positioned in front of a 34 x 60 inch wall-mounted video monitor with their feet flat on the ground. The monitor was placed 100 inches in front of them at eye level. An iPad 5 was used for capturing the photograph of all subjects. The iPad steadied by a flat table was set 60 inches orthogonal to the sagittal plane of the subject. The height of the iPad was adjusted to the level of each subject’s acromion.

Once the subject was in place a 10 minute video clip began showing on the wall-mounted monitor. The subject was not given any instruction on how to sit except to keep both feet on the ground. Five minutes into the video, photographs of the subject’s sagittal profile left and then right were captured. After ten minutes of video watching, RockTape was applied to the participant’s dominant shoulder. A second set of photographs were taken after taping and watching the video for five minutes. Participants were instructed to keep the tape in place for 2 days at which time they returned to the research lab and a third set of photographs were taken after video watching for 5 minutes.

Figure 1: Cervical and Shoulder Angles
2. Taping Application

All participants received a waterproof, porous, elastic adhesive tape (RockTape; Campbell, CA) to the dominant shoulder. RockTape (RT) is made from 97% cotton and 3% nylon. The adhesive is hypoallergenic, acrylic-based and contains no latex. The RockTape Company claims that their tape has more stretch than competitive brands. The tape was applied by a certified athletic trainer who had certification in RockTape. Before applying the tape, the treated area was cleaned with an alcohol wipe and devoid of hair. An “I” strip of RT was applied to the participant’s dominant shoulder starting at the coracoid process and paralleling the lower trapezius fibers to the spine with a 25% stretch. Figure 2 depicts a subject with the tape in place. Following the initial data collection, subjects were asked to keep tape in place unless they felt extreme pain, itching, noticed a rash. They could get the tape wet while bathing but were asked not to submerge the dominant shoulder for an extended period of time.

Figure 2: RockTape taping technique

Data Analysis

A single researcher calculated the cervical and shoulder angles using DartFish (Fribourg, Switzerland) software. The outcome measures for this study consisted of the Dominant side cervical angle (DC); Non-dominant cervical spine angle (NDC); Dominant side shoulder angle (DS); Non-dominant side shoulder angle (NDS). For this study, the non-dominant shoulder served as a control.

Statistics

Descriptive statistics were used for demographics. Data were statistically analyzed with SPSS software (Version 19; SPSS, Chicago, IL). Separate repeated-measures analyses of variance (ANOVA) were performed on the cervical and shoulder postural angles. Post hoc paired t-tests were applied when significance was found for the initial analysis. The level for statistical significance was set at p < .016 (0.05 with Bonferroni correction).

Outcomes
Twenty subjects were included in the study. Nineteen subjects completed the study. One subject was dropped from the study because she was involved in motor vehicle accident before completion of the study. The nineteen subjects that completed the study were 17 females and 2 males with a mean age of 23.5 ± .7 years. Eighteen subjects had a dominant side of right and one subject had a dominant side of left.

Baseline measures are found in Table 1. The baseline mean DC was 53.8 ±6.5 degrees and the mean DS was 52.2 ± 7.3 degrees. The non-dominant angles were 52.5 ± 5.7 degrees for the cervical and 52.9 ± 9.8 degrees for the shoulder. There was no statistical difference between sides at baseline.

Table 2 displays the values over the three instances. All angles increased following the initial application of RT. The repeated measures ANOVA were significant for NDC and DS. Table 3 presents the post hoc paired t-tests for NDC. Significance was found for the pair “baseline and immediate” (p = 0.015) and the pair “immediate and 48 hours” (p = 0.008). Table 4 presents the post hoc paired t-tests for DS. Significance was for the pair “baseline and immediate” (p = 0.003).
Table 1: Baseline measurements for all subjects (N=19)

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Dominant</th>
<th>Non-dominant</th>
<th>p*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cervical (deg)</td>
<td>53.8 ± 6.5</td>
<td>52.5 ± 5.7</td>
<td>0.065</td>
</tr>
<tr>
<td>Shoulder (deg)</td>
<td>52.2 ± 7.3</td>
<td>52.9 ± 9.8</td>
<td>0.816</td>
</tr>
</tbody>
</table>

*p < 0.016

Table 2: Repeated measures analyses for Baseline, Immediate and Post-tape measures

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Baseline (mean ± SD)</th>
<th>Immediate Post-tape (mean ± SD)</th>
<th>48 hours Post-tape (mean ± SD)</th>
<th>ANOVA results p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>D Cervical (deg)</td>
<td>53.8 ± 6.5</td>
<td>54.5 ± 6.3</td>
<td>53.0 ± 6.1</td>
<td>0.206</td>
</tr>
<tr>
<td>ND Cervical (deg)</td>
<td>52.5 ± 5.7</td>
<td>53.8 ± 5.4</td>
<td>51.4 ± 5.8</td>
<td>0.004†</td>
</tr>
<tr>
<td>D Shoulder (deg)</td>
<td>52.2 ± 7.3</td>
<td>56.1 ± 9.5</td>
<td>49.6 ± 11.1</td>
<td>0.013†</td>
</tr>
<tr>
<td>ND Shoulder (deg)</td>
<td>52.9 ± 9.8</td>
<td>53.8 ± 9.8</td>
<td>50.5 ± 9.9</td>
<td>0.157</td>
</tr>
</tbody>
</table>

D = dominant; ND = non-dominant; †p significant at ≤ 0.016
Table 3: Post hoc paired t-tests for Non-dominant cervical angle

<table>
<thead>
<tr>
<th>Paired Measures</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>Immediate Post tape</td>
</tr>
<tr>
<td>52.5 ± 5.7</td>
<td>53.8 ± 5.4</td>
</tr>
<tr>
<td>Baseline</td>
<td>48 hours Post tape</td>
</tr>
<tr>
<td>52.5 ± 5.7</td>
<td>51.4 ± 5.8</td>
</tr>
<tr>
<td>Immediate Post tape</td>
<td>48 hours Post tape</td>
</tr>
<tr>
<td>53.8 ± 5.4</td>
<td>51.4 ± 5.8</td>
</tr>
</tbody>
</table>

*p < 0.016; † significant difference

Table 4: Post hoc paired t-tests for Dominant shoulder angle

<table>
<thead>
<tr>
<th>Paired Measures</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>Immediate Post tape</td>
</tr>
<tr>
<td>52.2 ± 7.3</td>
<td>56.1 ± 9.5</td>
</tr>
<tr>
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<tr>
<td>Immediate Post tape</td>
<td>48 hours Post tape</td>
</tr>
<tr>
<td>56.1 ± 9.5</td>
<td>49.6 ± 11.1</td>
</tr>
</tbody>
</table>

*p < 0.016; † significant difference
Discussion

This study investigated the effects of RT on correcting FHP and RSP. To our knowledge this is the first study that examined the use of RT on the cervical and shoulder posture. The main findings of this study are: 1. immediate improvement in all posture angles with the addition of RT. The results were statistically significant for DS and NDC; 2. results were not sustained over 48 hours.

**Cervical Posture**

In our study, baseline cervical angles ranged from 45.3 to 60 degrees on the dominant side and 42.3 to 61.4 degrees on the non-dominant side. These values were similar to the angles found in the study by Shih et al. and Silva et al. who used the same measurement method.\(^1\, ^{21}\) Shih found a range of 47.7 – 51 degrees for their population who were slightly older than our cohort of subjects.\(^21\) Silva et al. found a value of 51.8 degrees in their subjects that were without neck pain and less than 50 years in age. In a study by Ruivo et al. an angle less than 50 degrees was considered a forward head posture. In our study, 6 out of 19 fell below the 50 degree angle.\(^2\)

Initial taping to the dominant shoulder influenced the cervical spine angle with improved positioning. This was statistically significant on the non-dominant view of c-spine \((p = 0.015)\).

Immediate postural changes from kinesiology tape were also seen in the 2013 study by Yoo.\(^6\) With the use of neck retraction taping, Yoo found a significant decrease in forward head posture during 30 minutes of computer usage, compared to the subjects without the neck retraction taping. The immediate effect of elastic tape on forward head posture should be considered clinically significant in that it can be used as a tool that provides instant cueing to an individual for proper posture. This can be a valuable option for patients who do not fully grasp verbal postural cues given by a clinician. It also provides an opportunity to initiate an exercise program for posture improvement. Shih et al. found that both exercise and kinesiology taping were effective in correcting FHP in a group of individuals with FHP.\(^{21}\) The exercise group improved significantly more than the kinesiology tape group and control group.

The initial change in cervical angle was not sustained over a 48 hour period. Cervical angles at this point in time decreased compared to initial taping and baseline. This difference was statistically significant for the NDC \((p = 0.008)\). A loss in taping effect over time was also seen in a study by Thelen et al.\(^{22}\) These researchers found a significant change in shoulder abduction following taping, but the effects were not sustained over a three day period.

The mechanism by which the RT improved shoulder posture was not directly assessed in
taping where no stretch was applied to the tape.

The fact that the RT was applied to the dominant shoulder and these angles changed the most implies that the tape provides a sensory stimulus which brings awareness to the area. The small change in angle values makes us conclude that the change that we did see was more of a neuromuscular effect than mechanical in nature. Further, since we only taped one shoulder and saw results on both sides, one may suggest a mechanism other than mechanical.

Similar to the cervical posture angles we found that after 48 hours, the shoulder angles returned to angles that were less than baseline. Our interpretation of this finding is that the tape effect is temporary and does not last over 48 hours. This is consistent with the findings of Shih et al. that found the improvements gained from taping were lost at the 2-week follow-up.21 A study by Gak et al. found that subjects gradually improved posture for one month using kinesiology tape but these researchers re-taped subjects six times per week with a wear time of 16 hours.25 Hajibashi et al. added pectoralis minor stretching to scapular kinesiotaping and found that the female students improved RSP over a two week period.23 This improvement was not found in a group that only stretched or only had kinesiotape. No long-term follow-up was performed in this study.

Study Limitations

As a pilot study, there are several limitations to the study. These limitations include a small sample size with a narrow age range making generalizability difficult. There was no formal control group; instead we used the non-dominant, untapped shoulder as the control. Angle measurement error was possible and the angle differences we did

Shoulder Posture

The angle used to measure the shoulder position is one that has been used in the past for detecting forward shoulder posture.2,24 We used the angle created by the line bisecting C7 and the acromion and a line parallel to the horizontal plane whereas Thigpen et al.24 used a line in the vertical plane for their second line. Therefore, in our study a small angle indicates greater forward positioning of the shoulder. This is consistent with the angles that were derived in the study by Ruivo et al.2

The mean angle obtained from our subject’s dominant side was 52.2 ± 7.3 degrees and 52.9 ± 9.8 degrees on the non-dominant side. These angles were similar to other reported studies. Brink et al evaluated 15 – 17 year olds a reported a mean shoulder angle of 51.35 ± 17.2 deg. Ruivo et al. used an angle of 52 degrees to indicate a RSP. Half of our subjects presented with an angle less than 52 degrees.

The results of this study showed that initial taping did statistically improve the dominant shoulder position (p = .002). A similar result was found by Han et al. when the immediate effect of kinesiology tape on rounded shoulder posture was studied on seated male workers.7 In this study, the postural differences were analyzed between experimental kinesiotaping and placebo

this study. It can be postulated that the tape may stimulate cutaneous receptors providing neural feedback to the subjects that provides improved postural alignment.6,23 It is thought that a mechanical effect would last throughout the taping time, which is not what occurred. Additionally, the fact that we used only one strip of tape on the shoulder with minimal pull would not likely provide enough force to mechanically correct the cervical or shoulder posture.
find were small and could be a result of measurement error. We only investigated the short-term results of RT application and used a cohort of healthy subjects, a different result may have occurred in individuals with upper quarter pain.

Conclusion

Results of this study indicate there is an immediate and significant change in posture with the addition of RockTape to the dominant shoulder and non-dominant view of the cervical spine, however this effect does not last over a two-day period. The changes were small and possibly of minimal clinical significance. The results may help to improve the management of patients with neck or shoulder pain. Future studies should investigate the effect of elastic taping on posture in individuals with cervical or shoulder pathology.

References
