The use of Kinesio Taping® in the management of traumatic patella dislocation. A case study

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INTRODUCTION

Kinesio Taping® is a technique utilizing an elastic tape developed in Japan and introduced into the United States in the 1990s. The tape exhibits its effect through the activation of neurological and circulatory systems with movement. Kinesio Tape® is used in a variety of settings for edema reduction, pain management, inhibition and facilitation of motor activity. The elastic tape is capable of stretching up to 130–140% of its resting static length to ensure free range of motion which will not allow a stretch of the muscles themselves. Kinesio Tape® can be worn continuously 3–4 days before a new application is required. The basic principle of therapeutic taping for weakened muscle contractions is to wrap the tape around the affected muscle from origin to insertion. The muscle is placed on gentle functional stretch with application of the tape at 10% of its resting static length. (Kinesio® Taping Association, 2004).

Athletes with patellar subluxation or dislocation usually describe a buckling from non contact mechanisms of injury. The patella usually will reduce when the knee is extended. Physical examination reveals motion limited by pain and effusion. The patient has tenderness along the medial patella or medial femoral condyle. Because acute patellar instability may be the terminal event in severe valgus injuries to the knee, integrity of the medial collateral ligament (MCL) and anterior cruciate ligament (ACL) must be evaluated. Plain radiographs may reveal abnormal patellar tilt or lateral displacement on tangential view and bone fragments within the joint or medial to the patellar in the retinaculum (Ivey, 1994). In athletes with first time instability episodes, no extremity malalignment or previous anterior knee pain and normal radiographs, the knee may be treated with immobilization for comfort with early range of motion exercises and physical therapy (Ivey, 1994).

Traumatic patella dislocation results in loss of range of motion, swelling, pain and decreased quadriceps muscle contraction (Ivey, 1994). Elastic tape, which can be worn continuously for 3–4 days per application, may provide proprioceptive stimulation resulting in a facilitation effect of cutaneous mechanoreceptors for motor unit recruitment that has also been noted with athletic taping (Alt, Lohrer, and Gollhorer, 1999; Lohrer, 1999; Simoeau, 1997) applied for a longer therapeutic period. Pain has also been linked to a decrease in quadriceps motor activity (Murray and Frost, 1998; O'Reilly, Jones, Muir, and Doherty, 1998). The case report will demonstrate the use of elastic Kinesio Tape® for control of pain, restriction of quadriceps muscle contraction and altered sense of weight bearing stability in patella dislocation rehabilitation.

CASE REPORT

The patient was a 49-year-old female physical therapist who sustained a traumatic left knee...
patella lateral dislocation while cross country skiing. The mechanism of injury was a slow medical rotational force in a closed chain flexed knee position. She reported immediate relocation by her ski patrol companions, oral intake of 600 mg Advil, and ice with compression wrapping. The patient then skied one mile out to the car. During the following 24–72 hours, she ambulated with toe touch weight bearing on the left, applied ice with compression and elevation, and performed ankle pumping exercises.

An examination was performed after the three days. The patient did not report a history of previous knee subluxations. She reported a history of occasional left anterior knee pain with prolonged hill running and crepitus with full squats. Peri-articular +2 swelling was noted in the left knee. Initial circumferential girth measurements were not taken. Tenderness to touch was present at the medial tibial femoral joint line and medial retinaculum and pain was 5/10 with partial weight bearing. The patient used a single point cane, demonstrating an antalgic gait due to reduced stance time on the left lower extremity secondary to 5/10 pain. Active range of motion of the left knee was 45 to 15 with pain throughout the entire range. Mobility of the patella was limited in all directions. A mild patellar tilt was present in the resting position in both knees. The patient was unable to hold a firm isometric quadriceps contraction.

The clinical picture was that of an acute traumatic patellar dislocation. The mechanism of injury and the immediate swelling and joint line tenderness might also suggest tibio-femoral intra-articular pathology. The patient, who was also a physical therapist, elected to defer physician consultation and to self manage for a four week rehabilitation period. The therapist used Kinesio Tape® in a Y configuration to facilitate the quadriceps contraction and to decrease pain. The tape was applied from origin to insertion of the quadriceps at 10% of resting static length with the knee flexed at 30° and the medial tail of the Y tape placed on the skin directly over the medial retinacular tissue. New tape was applied every 3–4 days and worn 24 hours a day. In addition to taping and daily IFC with ice, the rehabilitation consisted of static and dynamic balance training, stationary cycling, self-massage, range of motion exercises and core stabilization training.

At five weeks post injury the patient was re-evaluated by another physical therapist. The patient had continued her tape regimen, reporting a return to three hours of endurance spin cycling per week, pain free walking on level surfaces and weight training 3–4 times per week. Kneeling and eccentric weight-bearing activities were significantly limited due to pain. The patient, however, reported pain reduction with application of the elastic tape for those activities that caused discomfort.

Bilateral pronation and left foot hallux valgus were noted on examination. Quadriceps muscle atrophy was minimal. The girth measurement taken 7 cm superior to the mid patella revealed a decrease of 3 cm. While joint line circumferences were symmetrical, mild local edema was observed at the inferior medial patella. The patient ambulated without an assistive device or gait deviations. Active knee range of motion was symmetrical with normal end feels. Hamstring length was within normal limits bilaterally.

Left ankle active dorsiflexion was 5°. The left quadriceps was also mildly shortened with left knee flexion 105° and right knee 110° flexion at 0° hip extension. There was no asymmetrical or abnormal laxity detected of the medial/lateral collateral ligaments (MCL/LCL) or anterior/posterior cruciate ligaments (ACL/PCL). Apley’s test was negative for meniscal damage. No joint line tenderness was palpable, however mild pain was elicited at the medial retinaculum. Anteriorposterior and left lateral radiographic views taken five weeks post injury and read by an orthopedic sports medicine specialist were
negative for fracture. The tangential view was positive for either a medial retinaculum tear or an avulsion.

The patient was assessed on the NeuroCom Balance Master for motor control, movement and balance characteristics while performing three functional tests in taped and un-taped conditions. Test parameters were reported in graphic format and indicated performance outside the normal data range (see Table 1). The forward lunge quantifies movement characteristics as the individual lunges or steps forward onto the left leg, then pushes back with that leg to return to a standing position (NeuroCom International, 2004a). All parameters improved with taping and distance, as expressed as a percentage of height, was outside the normal range in the un-taped condition but normalized with tape application. Step up/over quantifies motor control characteristics as the subject steps up onto a six inch stair with the left foot, lifting the body through an erect standing position over the step, swings the other foot over the step and then lowers the body to land the swing leg onto the force plate (NeuroCom International, 2004c). Movement time and lift up index improved in the tape condition with movement time reaching the normal data range. Unilateral stance with eyes closed measures the average speed of center of gravity movement in degrees per second (NeuroCom International, 2004b). Although stability improved with tape application, the patient’s performance remained outside of normal range.

**DISCUSSION**

Atkin et al. (2000) prospectively studied 75 young active patients with primary acute lateral patellar dislocation and their recovery within the first six months of injury. The rehabilitation was a standardized program emphasizing ROM, muscle strength and return to function. At six months re-evaluation, Atkin et al. (2000) described full active and passive ROM, however, sports activity remained significantly reduced with 58% of the subjects reporting a limitation in strenuous activities. Squat and kneeling activities were the most limited. The patient in this case report utilized a similar program with the exception of the elastic tape. At five weeks, this patient’s limitations were similar to the study population at six months, suggesting an accelerated recovery rate.

A major focus of rehabilitation is improvement in post dislocation strength, pain, and swelling. Although re-evaluation revealed muscle atrophy and pain with eccentric loading activities, the patient felt her pain, stability, and quadriceps activation were subjectively improved with tape application. The functional NeuroCom evaluation suggest Kinesio Tape® application during rehabilitation may enhance strength, balance, coordination, mobility and control necessary for participation in sports or

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Functional tests using NeuroCom Balance Master for taped and untapped conditions</th>
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<tbody>
<tr>
<td></td>
<td>No tape</td>
</tr>
<tr>
<td>Forward Lunge</td>
<td></td>
</tr>
<tr>
<td>distance (% of height)</td>
<td>44*</td>
</tr>
<tr>
<td>impact index (% of weight)</td>
<td>20</td>
</tr>
<tr>
<td>contact time (seconds)</td>
<td>1.09</td>
</tr>
<tr>
<td>Step Up/Over</td>
<td></td>
</tr>
<tr>
<td>movement time (seconds)</td>
<td>1.87*</td>
</tr>
<tr>
<td>impact index (% of weight)</td>
<td>23</td>
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<tr>
<td>lift up index (% of weight)</td>
<td>34</td>
</tr>
<tr>
<td>Single Leg Stance (Eyes Closed)</td>
<td></td>
</tr>
<tr>
<td>velocity (degrees/second)</td>
<td>8.7*</td>
</tr>
</tbody>
</table>

*Indicates performance outside of normal range.
occupational activities safely and with reduced risk of injury.

There have been few publications in peer reviewed literature on the effects of Kinesio Tape™ on motor activity recruitment. Murray (2003) found that the elastic tape applied to the anterior thigh enhanced the joint active ROM and increased surface EMG activity of the quadriceps in two individuals with recent ACL reconstruction.

Application of athletic tape demonstrated little or no difference in AROM or EMG measurements. The author suggested that further research efforts include randomized controlled studies to determine short and long term efficacy and analysis of the success of the elastic taping.

It is not known how the patient’s positive results of elastic tape were mediated. The tape may have had an indirect effect on the damaged retinacular tissue through local edema control as well as mediating pain responses. Elastic tape may also contribute to a reduction in pain resulting in higher functional activity levels. Further studies are needed to quantify the effects of taping on pain levels and changes in motor activity. Hopkins and Ingersoll (2000) found that direct cryotherapy and transcutaneous neuromuscular stimulation disinhibited the quadriceps neuromuscular pool following joint effusion. Application of elastic tape may have a similar effect by mediation through cutaneous mechanoreceptors which could enhance proprioception and facilitate motor activity.

CONCLUSION

Rehabilitation of traumatic lateral patella dislocation is complicated by pain, edema and muscle inhibition. This case report supports the use of Kinesio Tape™ to promote beneficial effects on decreasing pain and enhancing quadriceps activity and weight bearing stability during functional activities. Further research is needed to determine how and why elastic tape works.

NOTES


REFERENCES
