Clam Shells: A Unique Progression for Hip External Rotation Muscle Strengthening

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ABSTRACT
Prescription of therapeutic exercises are an important component of physical therapy. Establishing a therapeutic progression to challenge a client to his/her maximal potential is essential. The purpose of this manuscript is to identify a series of exercises designed to challenge the hip external rotators. This progression of the clam shell exercise is based on physiologic principles and is sequenced as follows: supine, sidelying, supine bridge, and sidelying plank. Emphasis is placed on proper technique, hip position, and eccentric control.

Key Words: clam shell exercise, hip external rotation strengthening

INTRODUCTION
Physical therapists prescribe therapeutic exercise to address impairments in range of motion, strength, and function. Identification of the correct exercise(s) for a given impairment is essential for an efficacious treatment. Patellofemoral pain syndrome (PFPS) and anterior cruciate ligament injuries have been associated with a decrease in hip external rotation (ER) strength. Lack of ER strength can result in a valgus moment at the knee. Failure to control valgus moments can increase the risk of knee injury. Tasks such as lunges, “fire hydrants,” standing hip abduction, mini-squats with external rotation, and “clam shells” are often prescribed to target the hip external rotators. The purpose of this manuscript is to couple components of well-known exercises to provide a creative therapeutic progression for maximal muscular recruitment. The motion targeted is hip ER. These tasks involve challenging activities that require movement against resistance while maintaining a stable core.

As stated, “clam shells” challenge the hip external rotators. This exercise is typically performed in a supine (Figure 1) or sidelying position (Figure 2). In supine, the client flexes the hips/knees in order to place the feet flat on the mat. The knees are separated into a position of hip abduction and ER. In sidelying, the lower extremities are placed on top of each other (stacked) and the hips/knees can be in varying degrees of flexion. The superior lower extremity is then moved into an abducted and externally rotated position by separating the knees while the ankles remain approximated. Despite the use of an elastic band for resistance, the supine clam shell tends to be the easier of the two exercise methods for several reasons. First, in the supine position, the trunk is stabilized by body weight. In addition, the supine task incorporates symmetrical, bilateral motion in contrary to the sidelying task that requires an isometric contraction of the inferior leg with a concentric contraction of the superior leg. The movement of the legs is also assisted by gravity in the supine position.

Given the trunk stabilization and the gravity eliminated position, the supine clam shell would be the first exercise in the therapeutic progression. This would be followed by the sidelying clam shell. In sidelying, attention should be on keeping the shoulders and pelvis perpendicular to the mat surface. Once the client is able to perform these tasks without form fatigue, the next exercise in the sequence would be a clam shell bridge (Figure 3). This task is performed as follows:

• Assume a supine position with both lower extremities flexed so that the feet are on the mat and the ankles together (elastic band around knees).
• Lift the buttocks off the mat to a position of full hip extension.
• Abduct and externally rotate both lower extremities by separating the knees (concentric).
• Slowly return the lower extremities to the adducted position (eccentric).
• Slowly lower the trunk to the mat (eccentric).

The final challenge in the sequence is to incorporate a lateral plank prior to the performance of the clam shell (Figure 4). Thus, the exercise sequence for the clam shell plank would be as follows:

• Assume a side lying position with the lower extremities on top of one another.
• Hips should be in 0°-20° of flexion and the knees flexed to a position of comfort (elastic band around knees).
• With the inferior elbow under the shoulder, lift the inferior hip up off the mat into a lateral plank (trunk should be in alignment with shoulders/feet.
The proposed therapeutic progression is based on the literature of Ekstrom et al. The researchers analyzed the percent of maximal voluntary isometric contraction for 8 muscles during 9 different exercises. Table 1 summarizes the results for the supine bridge and lateral plank. Based on these results, 5 of the 6 muscles studied demonstrated greater activation with the lateral plank than the supine bridge. The one muscle that did not have greater activity was the gluteus maximus but the standard deviations were within comparable ranges. Thus, the lateral plank requires more muscle activity than the supine bridge.

One additional consideration in the performance of these exercises is the position of the hips prior to ER. The work of Delp et al. reported that the rotational moment arms of the hip muscles change with the amount of hip flexion. They studied the influence of 5 different angles of hip flexion (0°, 20°, 45°, 60°, 90°) on 18 muscle compartments of 8 muscles. For this study, a muscle compartment was analogous to the anatomic region of a muscle, i.e., an anterior or posterior component of a muscle. They found that for many muscles of the hip, the internal rotation (IR) moment arms increased and the ER moment arms decreased as the hip flexion increased from full extension to 90° of flexion. More specifically, the gluteus medius transitioned from an ER to an IR between 20° and 45° of hip flexion. All compartments of the gluteus maximus were ER in extension. Whereas, the anterior compartments switched to an IR moment with increasing flexion (transition occurred between 45° and 90°). Muscles that were identified as “dedicated” ER were the obturator internus, obturator externus, and quadratus femoris. These were muscles that maintained an ER moment throughout the hip range of motion. The clinical implications of this information is that exercises such as clam shells should be performed in hip extension (< 20° of hip flexion) to accentuate the ER moments. Finally, Baldon et al. identified the importance of eccentric hip abduction strength in clients with PFPS. Consequently, emphasis on the eccentric portion of the clam shell exercises are warranted to control the IR moments in functional activities.

In conclusion, the goal of this manuscript was two-fold. First, to introduce a unique therapeutic progression to maximally challenge the muscles which externally rotate the hip. Second, provide evidence to emphasize hip position and how attention to the eccentric action of the exercise can enhance therapeutic effectiveness. By incorporating the additional exercises described here, the hip ER muscles can be maximally challenged to ultimately reduce knee valgus, improve patellar tracking, and decrease the risk of knee injury in patients with PFPS.

REFERENCES

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Lateral Plank</th>
<th>Supine Bridge</th>
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<tbody>
<tr>
<td>Gluteus Maximus</td>
<td>21 ± 16</td>
<td>25 ± 14</td>
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<tr>
<td>Gluteus Medius</td>
<td>74 ± 30</td>
<td>28 ± 17</td>
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<tr>
<td>Longissimus Thoracis</td>
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<td>39 ± 15</td>
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<td>Lumbar Multifidus</td>
<td>44 ± 18</td>
<td>39 ± 15</td>
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<td>External Oblique Abdominis</td>
<td>69 ± 26</td>
<td>22 ± 13</td>
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<tr>
<td>Rectus Abdominis</td>
<td>34 ± 13</td>
<td>13 ± 11</td>
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