THE PROBLEM
Groin pain during (or after) running is the most common functional limitation experienced by athletes with a groin injury. At the initial assessment (and at each subsequent re-assessment) the clinician needs to make a clinical decision about running i.e. whether the athlete should cease, commence or continue running. The decision to ‘commence running’ is considered one of the most important milestones in groin pain rehabilitation. For the sports medicine clinician, the ‘running decision’ is unusually difficult because there are few guidelines and there is an associated risk of an exacerbation or recurrence of groin pain.

WHY IS THE RUNNING DECISION SO DIFFICULT?
1. It can be difficult (often very difficult) for the clinician to diagnose the specific patho-anatomy responsible for the groin pain because:
   • there are a large number of patho-anatomical conditions,1
   • there is usually more than one source of groin pain,2,3
   • there are no clinical tests or radiological investigations currently recognised as a ‘gold standard’ diagnostic test.
2. Radiological findings do not appear to predict the capacity to run4
3. It is difficult to decide if running is contraindicated by any of the following musculoskeletal problems that are commonly associated with athletic groin pain:
   • insufficient core stability,
   • insufficient strength in single leg stance,
   • insufficient hip flexor function,
   • increased tone in adductor longus, psoas, tensor fascia latae/anterior gluteus medius etc and
   • decreased range of motion at the hip joint.

Careful assessment of these musculoskeletal problems will predict what rehabilitation is required but does not predict when the athlete can safely

WHEN WILL I BE READY TO RUN?
AN IMPORTANT REHAB DECISION FOR ATHLETIC GROIN PAIN

– Written by Anthony Hogan, Australia
resume running. The rehabilitation timeline for these problems can take weeks or months, so it would be useful for the clinician to know whether the athlete could be running while these problems are being rehabilitated. Trial and error (i.e. asking the athlete to run and then report the groin pain experience) is a very crude method of answering this important clinical question. In addition, there is a risk that the athlete will lose faith in the clinician if a wrong decision is made and groin pain recurs. What the clinician needs is one or more clinical tests that indicate when the athlete can resume running without risk of further groin injury.

**THE SOLUTION**

In 1998, Hogan and Lovell presented a paper to the 4th World Football Symposium that reported the successful use of objective and reliable clinical tests to decide when a footballer could safely return to running during a groin rehabilitation programme. This decision-making process has stood the test of time and has been successfully used in many football clubs and elite sporting organisations throughout the world since.

**The groin pain provocation tests used in the running decision:**

- Walking/dynamic warm-up.
- Squeeze test.
- Resisted Hip Adduction test.
- Pubic Stress tests.

**the clinician needs clinical tests that indicate when the athlete can resume running without risk of further groin injury.**
Walking/dynamic warm-up

To be considered ready for running, the athlete needs to demonstrate an unlimited capacity for pain-free walking. For example, to be able to walk at a normal pace for 2 km (on grass) without groin pain during walking, after walking or walking the next morning. In addition, the athlete needs to complete a 10-minute dynamic warm-up without groin pain during the warm-up, after the warm-up or the next morning.

The Squeeze test

The Squeeze test is the ‘traditional’ groin pain provocation test. The clinician places their fist (or crossed hands) between the knees of the athlete and asks them to squeeze as hard as possible (i.e. adduct both legs at the same time) and to report any groin pain. The Squeeze test can be done in various degrees of hip flexion with 0 degrees, 45 degrees and 90 degrees hip flexion being popular choices. Hogan (1996) used a sphygmomanometer to measure the Squeeze test, arguing that this device could almost always be found in medical rooms (unlike dynamometers).

Based on clinical experience over the past 15 years, the Squeeze test seems to indicate the real time status of the groin pain, i.e. the relative status of the groin pain today compared to a previous measure, say yesterday, or the same time last week. A noticeably higher max effort, P1 or P1% is associated with better function and less pain during rehabilitation exercises, running or training/playing. A noticeably lower value for these measures indicates there has been an adverse load on the groin during rehabilitation exercises, running or training/playing. It is my clinical experience that the Squeeze test is more helpful for adductor-related and pubic-related groin pain than hip-related (including hip flexor) or abdominal-related groin pain. Fortunately for clinicians, the adductor-related and pubic-related are more common in the professional football codes.

Calculating P1%

Calculating P1% = (Ps/Max Effort) × 100

Example of P1% calculation (starting pressure 20 mmHg):

Max effort = 220 mmHg – starting pressure (20 mmHg) = 200 mmHg
P1 = 140 mmHg – starting pressure (20 mmHg) = 120 mmHg
P1% = [120/200] × 100
P1% = 60%

Clinical Guideline

If the groin pain is severe and irritable (takes a long time to settle) assess P1 only. Otherwise, it is very important that the athlete performs a maximal Squeeze test to get max effort and does not stop when they feel groin pain or think they will feel groin pain.

Walking/dynamic warm-up

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Squeeze tests with sphygmomanometer

By Hogan

1. Fold sphygmomanometer cuff, and inflate cuff to a standard pressure (20 mmHg).
2. Place cuff between knees.
3. Ask for a ‘gentle squeeze’. Allow them to feel what they are squeezing against.
4. Ask for a ‘maximal squeeze’. Regardless of pain, record as maximal effort (mmHg).
5. Ask patient to accurately point to where any groin pain was felt.
6. If pain was felt, ask patient to squeeze again, and instruct him/her to: “…say YES when they FIRST feel pain”. Record as Ps (mmHg).
7. Perform the Squeeze test in 0 and 45 degrees of hip flexion with feet resting on bed.
8. Perform the Squeeze test in 90 degrees of hip flexion, knees relaxed (feet off bed).

Clinical Guideline

If the groin pain is severe and irritable (takes a long time to settle) assess Ps only. Otherwise, it is very important that the athlete performs a maximal Squeeze test to get max effort and does not stop when they feel groin pain or think they will feel groin pain.

Calculating P1%

Calculating P1% = (Ps/Max Effort) × 100

Example of P1% calculation (starting pressure 20 mmHg):

Max effort = 220 mmHg – starting pressure (20 mmHg) = 200 mmHg
P1 = 140 mmHg – starting pressure (20 mmHg) = 120 mmHg
P1% = [120/200] × 100
P1% = 60%
Resisted Hip Adduction tests

The Resisted Hip Adduction test allows the clinician to assess pain and adductor muscle strength in a simulated running position with one hip flexed and the other hip in relative neutral flexion/extension (comparable to the mid-stance phase of running). The Resisted Hip Adduction test can be performed in two positions:

1. Modified Thomas test position (on the edge of the bed).

2. Side lying (on the ground).

   The magnitude of the hip adduction contraction can be assessed manually or with a dynamometer. A clinical rating of ‘weakness’ must consider all of the following possible explanations:
   - true muscle weakness (i.e. insufficient, de-conditioned),
   - pain inhibited weakness,
   - associated with pain anticipation.

**Resisted Hip Adduction tests**

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Athlete in modified Thomas test position on the edge of the bed.</td>
</tr>
<tr>
<td>2</td>
<td>Clinician manually resists unilateral hip adduction with hand on medial aspect of knee (a dynamometer can be used instead of hand).</td>
</tr>
<tr>
<td>3</td>
<td>The athlete reports the pain experience and this is compared to the pain that is usually associated with their groin injury.</td>
</tr>
<tr>
<td>4</td>
<td>Repeat test on other side and compare.</td>
</tr>
</tbody>
</table>

**Clinical Guideline**

Athlete should be able to:
- lift pelvis off the ground (indicating good strength)
- complete test without groin pain.

This indicates that they can commence/continue running.

**Side lying bridge test**

This is a useful alternative to the Resisted Hip Adduction test when a bed is not available e.g. on the training ground.

- Put athlete in side-lying position. Place foot of upper leg (the test leg) on a 30 cm high step.
- Instruct athlete to lift pelvis off the ground (as high as possible), aiming to have test leg in neutral hip adduction/abduction and neutral hip flexion/extension.
- Ask athlete to report pain experience compared to the pain that is usually associated with their groin injury.
- Repeat test on the other side and compare rating of ‘strength’ between sides (one side feels stronger/same/weaker) and/or same side compared to past tests (feels stronger/same/weaker than usual).
The Pubic Stress tests

The Pubic Stress test allows the clinician to assess the athlete in the simulated running position with one hip flexed and the other leg in relative neutral hip flexion/extension (comparable to mid-stance phase of running). The neutral hip is passively moved into positions that are comparable to the mid-stance phase of straight-line running (hip extension) or cutting (combined hip extension/abduction).

**Pubic stress test**

1. Place athlete in modified Thomas test position on the edge of the bed
2. Arrange non-test leg in hip flexion, but not end of range.
3. Move test leg into:
   - passive hip extension,
   - passive hip abduction,
   - various combinations of both hip extension/abduction.
4. Use firm but not maximal force. Assess pain response in each position and compare to pain usually experienced with groin injury.

**Clinical Guideline**

Pain on passive hip extension indicates caution with straight-line running.

Pain on passive hip abduction indicates caution with change of direction running.

Figure 6: Pubic Stress test (passive hip extension)
Figure 7: Pubic Stress test (passive hip abduction/extension)
Putting it all together: the ‘stop light’ analogy

As previously stated, the clinician needs to make a clinical decision regarding running at the initial assessment and at each subsequent reassessment. In other words, the clinician must decide whether the athlete should cease, commence or continue running. No single test is adequate to make this decision, so the general consensus of the tests is used. The athlete gets to know these tests and the meaning of ‘red’, ‘yellow’ and ‘green’ lights as general indicators of their ability to run.

<table>
<thead>
<tr>
<th>Walking programme and dynamic warm-up</th>
<th><strong>Red Light</strong></th>
<th><strong>Yellow Light</strong></th>
<th><strong>Green Light</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Groin pain during, after or next morning</td>
<td>Pain on contraction</td>
<td>Slight groin pain after but not next morning</td>
<td>No groin pain during, after or next morning</td>
</tr>
<tr>
<td>Slight groin pain after but not next morning</td>
<td>Weak contraction</td>
<td>Pain-free contraction</td>
<td>Strong contraction</td>
</tr>
<tr>
<td>No groin pain during, after or next morning</td>
<td>Pain on passive extension</td>
<td>Slight pain on passive extension responds to therapy</td>
<td>No pain on hip extension, abduction, or combined hip abduction/extension</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Squeeze test</th>
<th><strong>Red Light</strong></th>
<th><strong>Yellow Light</strong></th>
<th><strong>Green Light</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pt is &lt;60% of max effort</td>
<td>Pain on passive extension</td>
<td>Slight pain on passive extension, abduction, or combined hip abduction/extension responds to therapy</td>
<td></td>
</tr>
<tr>
<td>Pt is 70-90% of max effort</td>
<td>No pain on hip extension, abduction, or combined hip abduction/extension</td>
<td>No pain on hip extension, abduction, or combined hip abduction/extension</td>
<td></td>
</tr>
<tr>
<td>Pt is 90-100% of max effort</td>
<td>Strong contraction</td>
<td>No pain on hip extension, abduction, or combined hip abduction/extension</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Resisted Hip Adduction test</th>
<th><strong>Red Light</strong></th>
<th><strong>Yellow Light</strong></th>
<th><strong>Green Light</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain on contraction</td>
<td>Pain on passive extension</td>
<td>Slight pain on passive extension, abduction, or combined hip abduction/extension responds to therapy</td>
<td></td>
</tr>
<tr>
<td>Weak contraction</td>
<td>Responds to therapy</td>
<td>No pain on hip extension, abduction, or combined hip abduction/extension</td>
<td></td>
</tr>
<tr>
<td>Pain-free contraction</td>
<td>Strong contraction</td>
<td>No pain on hip extension, abduction, or combined hip abduction/extension</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Straight-line running only</th>
<th><strong>Red Light</strong></th>
<th><strong>Yellow Light</strong></th>
<th><strong>Green Light</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain on passive extension</td>
<td>Pain on passive extension, abduction, or combined hip abduction/extension responds to therapy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slight pain on passive extension responds to therapy</td>
<td>No pain on hip extension, abduction, or combined hip abduction/extension</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No pain on hip extension, abduction, or combined hip abduction/extension</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Change of direction running</th>
<th><strong>Red Light</strong></th>
<th><strong>Yellow Light</strong></th>
<th><strong>Green Light</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pain on passive extension and passive abduction</td>
<td>Pain on passive extension, abduction, or combined hip abduction/extension responds to therapy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slight pain Combined abduction/extension responds to therapy</td>
<td>No pain on hip extension, abduction, or combined hip abduction/extension</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No pain on hip extension, abduction, or combined hip abduction/extension</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1: A summary of the groin pain provocation tests and the ‘stop light’ system
CASE STUDY

Our footballer has been assessed using the guidelines described in Table 1 and a clinical decision has been made to commence running. In my opinion, the key to a successful running programme is to monitor the response to the running session. The Squeeze test is the preferred test because it can be measured and (based on clinical experience) the Squeeze test seems to indicate the real time status of the groin pain. If the max effort or P1 has decreased by more than 20 to 30 mmHg (10 to 15%) compared to the pre-run value, this indicates that the groin pain has been irritated by the running session. While this is interesting information, no clinical decisions about running should be made at this time.

The most important Squeeze test is the one taken before the next running session. Ideally, the Squeeze test will have recovered to normal values, and resisted adduction and Pubic Stress tests will give the ‘green light’ to continue running.

In Figure 8, the Squeeze test has been assessed on four occasions:
- Day 1: before run
- Day 1: after run
- Day 2: pre-treatment
- Day 3: post-treatment

The results are shown for three separate running sessions. Each running session demonstrates a different response and recovery pattern.

After the first running session, the recovery process is slow (48 hours) and relies heavily on therapy. This indicates that the footballer was only just ready to start running. Provided the resisted adduction and Pubic Stress tests are no worse, the running decision will be to repeat the same running session (with caution) and stop if any adverse sign, e.g. groin tightness, is experienced.

After the second run, the recovery is spontaneous and not reliant on therapy. This pattern indicates that the footballer coped well with the running session. Provided the resisted adduction and Pubic Stress tests are comparable, the running decision will be to repeat the running session with extra running repetitions added if there are no adverse signs.

The third running session is substantially different from the first two running sessions. There is no adverse response to running as measured by the Squeeze test. The running decision will be to increase the number of running repetitions and consider controlled change of direction running.

The key point of Figure 8 and Table 2 is that recovery from a running session is a better indicator for planning the next running session than the immediate response to that running session.

SUMMARY OF KEY POINTS

The running decision:
- Commence running
- Continue running (decrease/same/increase repetitions)
- Cease running

This is an important (and difficult) decision that clinicians have to make every time they assess an athlete with groin pain.

Key groin pain provocation tests:
- Walking/dynamic warm-up (if not started running)
- Squeeze tests
- Resisted adduction tests
- Pubic Stress tests are recommended to make the running decision (Table 1).

The green, yellow, red ‘stop light’ system (Table 1) is very useful when explaining the running decision to an athlete.

The Squeeze tests can be used to monitor the different responses to running (Figure 8) but the response to running is not as useful as the recovery from running.

The Squeeze test (max effort and P1) can be used to monitor the recovery from running and this is proving to be more helpful (than the response to running) when making the next running decision.
The Squeeze test (max effort and P1) can be used to monitor the recovery from running and this is proving to be more helpful (than the response to running) when making the next running decision.

<table>
<thead>
<tr>
<th>Running Session</th>
<th>Day 1 After run</th>
<th>Day 2 Pre-treatment</th>
<th>Day 3 Post-treatment</th>
<th>Running Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>1ST</td>
<td>Significant drop (50%)</td>
<td>Partial recovery</td>
<td>Almost full recovery</td>
<td>Repeat run Monitor closely</td>
</tr>
<tr>
<td>2ND</td>
<td>Significant drop (50%)</td>
<td>Partial recovery</td>
<td>Full recovery</td>
<td>Repeat run and add reps if ok</td>
</tr>
<tr>
<td>3RD</td>
<td>No change</td>
<td>Considered fully recovered</td>
<td>No change</td>
<td>Increase number of reps</td>
</tr>
</tbody>
</table>

Table 2: Summary of Squeeze test results

References