Not all weak squeezes are created equal: a clinical reasoning framework for interpreting low hip adduction force

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Squeeze test | **Hip adduction** | **Groin pain** | **Clinical reasoning** | **Indirect deficit** | **Intersegmental control** | **Screening; Monitoring** | **Pelvic control** | **Adductor strengthening**

Headline

Groin pain affects nearly 50% of soccer players during a single season, with one in three starting the new season still experiencing symptoms (Thorborg et al., 2017). As a result, medical and performance support teams across sports are constantly looking for strategies to prevent and minimize the burden of groin injuries. Squeeze testing to assess hip adduction force and pain provocation in the groin region has become standard practice across football (Bourne et al., 2020; Esteve et al., 2018; Moreno-Perez et al., 2019), rugby (Roe et al., 2016), ice hockey (Tyler et al., 2001), Gaelic football (Nevin & Delahunt, 2014), and Australian Rules football (Prendergast et al., 2016). The squeeze test is also heavily featured in preseason screening resources used across professional sport (VALD, 2024), with normative percentile data now available for adduction force, abduction force, and adductor-to-abductor ratios by sex. The test is simple, reliable, and inexpensive. It flags something. But what exactly?

The typical decision process is often straightforward: test, find a low squeeze score, prescribe adductor strengthening. This logic assumes that a low squeeze score reflects weak adductors and that stronger adductors will fix the problem or reduce injury risk. Both assumptions deserve questioning. This is not a strawman argument. In the first author's (MB) experience, both as a practitioner and through consulting work with a large number of professional clubs across multiple sports, this shortcut is widespread, particularly among strength and conditioning staff who may have limited exposure to the clinical reasoning used by physiotherapists specialized in groin pathology. The typical response to a player presenting with groin issues is a combination of training load reduction (often simply pulling the player from sessions) and isolated adductor strengthening. This cycle of load avoidance and misdirected strengthening reflects a poor understanding of the mechanisms behind the low score, and it is precisely the pattern this paper aims to disrupt.

Having now spent time working at a high-volume specialist orthopaedic and sports medicine hospital, and witnessing first-hand how colleagues manage the large number of groin presentations that come through the clinic, it has become clear that the additional factors contributing to reduced hip adduction force, beyond the adductors themselves, go a long way toward explaining the inconsistent success of the previous approach. When you only target one potential contributor to a multi-factorial output, the results will be unpredictable. Consider a parallel: if an athlete presented with a shoulder strength deficit, no practitioner would skip the rotator cuff assessment and jump straight to deltoid, pec, and lat strengthening. Yet this is precisely what happens with groin presentations. A low squeeze score triggers adductor work while the stabilizers, synergists, and coordinators of hip function remain unexamined and unaddressed.

A note on perspective and scope. The squeeze test is designed to be simple, and simplicity invites simple responses. The problem is not with individual practitioners but with the overall performance culture around groin management: the interpretation framework used in practice has not kept pace with the evidence. Most strength and conditioning curricula do not cover the clinical reasoning required to distinguish between pain-driven, direct, and indirect deficits.

The first author (MB) only came to understand the depth of this gap through years of close collaboration with the second author, a world-class clinical specialist in groin pain rehabilitation (EK), and through exposure to the multidisciplinary groin management practices by the team at Aspetar Orthopaedic and Sports Medicine Hospital in Doha, where high-volume clinical caseloads and integrated research programs have pushed the understanding of these injuries well beyond what is typically available in a club setting. What had previously been frustrating and inconsistent clinical outcomes suddenly made sense once the full picture of what drives a squeeze score became visible. That shift in understanding is the foundation of this paper.

This paper draws on the combined perspective of both authors: one (MB) working primarily in the performance and monitoring space across elite football, the other (EK) working as a clinical specialist in groin pain rehabilitation. It is precisely because we sit on different sides of the same problem, screening and monitoring vs. assessment and rehabilitation, that the disconnect between testing and intervention became apparent. If that learning curve exists for an experienced performance practitioner, it is reasonable to assume it exists across the field.

Aim

This paper aims to bridge that gap by offering a practical clinical reasoning framework for interpreting low squeeze scores that any practitioner, regardless of clinical background, can apply.

1. What does a squeeze test actually tell you, and why are you using it?

A whole-system output. The squeeze test measures the total force an athlete can produce in the frontal plane by pressing both legs together against a resistance in a specific position (Figure 1). This force output depends on the coordinated action of multiple muscles proximal and distal to the hip joint. Neumann (2010) identified the hip adductors as primarily including the pectineus, adductor longus, gracilis, adductor brevis, adductor magnus (anterior and posterior heads), as well as secondary contributions from biceps femoris (long head), gluteus maximus (posterior fibers), quadratus femoris, and obturator externus. It is also worth noting the likely contribution of the ankle and hamstrings during long-lever squeeze testing. Beyond these muscles, the force registered depends on trunk control, pelvic position, and the athlete's ability to coordinate force production across segments (Dostal et al., 1986; King et al., 2018). A low score could originate from any of these contributors.

Fig. 1. Squeeze testing positions. Copenhagen 5-second isometric test vs. long-lever (knees straight, 0 deg) vs. short-lever (knees bent, 45 deg hip flexion).

A dual outcome measure. While in healthy players it is mainly about force changes, in athlete with pain, there are two potential outcome measures from a squeeze test: force and pain. An improvement in squeeze function can therefore be interpreted as three different things: more force with the same pain, less pain with the same force, or improvement in both. Tracking force and pain separately provides more clinical information than treating the squeeze as a single number in athletes with groin pain. Several studies have reported both squeeze force and pain provocation data as part of in-season monitoring (Wollin et al., 2018a; van Klij et al., 2021) and rehabilitation tracking (King et al., 2018), supporting the value of this dual approach.

Why are you testing? Three purposes, three interpretations

Before discussing what a low squeeze score means, it is worth asking why you are testing in the first place. The squeeze test serves three distinct purposes, each with different implications for interpretation:

Diagnostics/Early Warning. The squeeze test is one of the primary pain provocation tests for the adductor-pubic region. The test is sensitive: if there is a problem in these tissues, it will likely pick it up. However, it is not specific: pain on a squeeze does not reliably tell you which structure is responsible (Falvey et al., 2016). Conversely, a pain-free squeeze can help rule out adductor-pubic involvement. The squeeze test also has discriminative capacity, differentiating symptomatic from asymptomatic players (Delahunt et al., 2011; Nevin & Delahunt, 2014).

Screening. At preseason or during baseline testing, the squeeze provides a reference value. This allows you to profile where a player sits relative to their own history and to the squad (Esteve et al., 2018; DeLang et al., 2020; van Klij et al., 2021). Establishing precise benchmarks for injury risk is difficult given the multifactorial nature of injuries, but values below 465 N (or 7.0 N/kg) have been associated with a substantially increased probability of groin injury in elite football (Moreno-Perez et al., 2019). Normative percentile data from large testing databases (VALD, 2024) can also provide useful reference points, with median adduction force values around 413 N for males and 351 N for females, and an adductor-to-abductor ratio of 1.00 for males and 1.09 for females at the 50th percentile. An adductor-to-abductor ratio below 0.80 has been associated with a 17-fold increase in the risk of adductor muscle strain in professional ice hockey (Tyler et al., 2001). Players flagged as below benchmarks enter the decision process described in this paper.

Monitoring. During the season, serial squeeze testing tracks an athlete's response to training and match load (Buchheit et al., 2017; Crow et al., 2010; Roe et al., 2016; Wollin et al., 2018b). A drop from a known baseline signals that something has changed and needs interpretation. The combination of squeeze values and pain provocation responses provides more information than force alone (van Klij et al., 2021).

Each of these purposes generates a different type of "low score," and may warrant a different response. This paper proposes a clinical reasoning framework that replaces the reflexive "low squeeze = adductor strengthening" approach with a structured process for identifying the actual cause and matching it to the appropriate intervention.

Key limitations of squeeze testing

It is bilateral. The test produces a single combined force value (Figure 1). It cannot identify unilateral deficits, which are common in athletes with groin pain and healthy populations and are often clinically relevant.

It is isometric and tested towards inner range. The test captures force in a static position, typically at 45 degrees of hip flexion (Figure 1), yet most adductor mechanism injuries occur in outer range adduction combined with external rotation, hip flexion during kicking, or on the stance leg during change of direction (Serner et al., 2019). We would not test hamstring function only at 90 degrees of knee flexion and claim to know about their capacity in outer range. Yet this is essentially what we do with the adductors. Contraction mode also matters: Thorborg et al. (2014) showed that eccentric hip adduction strength was significantly lower in symptomatic players while isometric strength showed no difference, suggesting eccentric loading may be more sensitive to clinically meaningful deficits. While short-lever and long-lever tests produce different absolute values (Bourne et al., 2020), all adductor muscles contribute at all angles, so mapping specific muscles to specific positions is an oversimplification. That said, the long-lever position (0 degrees hip flexion) generates a larger adductor moment arm, which is why it is often more provocative clinically and may be more sensitive for detecting pain-related deficits.

For these reasons, unilateral assessment should be considered a necessary complement to the bilateral squeeze. Our recommended starting point is the eccentric break test, which likely offers the best balance of clinical sensitivity, practicality, and accessibility in a team sport setting (Baida et al. 2021, Thorborg et al. 2014; Mosler et al. 2017). Where equipment and time allow, isometric testing at specific joint angles or isokinetic dynamometry through range can provide additional information, particularly around range-specific deficits.

Lever arm length. Force values in squeeze testing are typically reported in Newtons or Newtons per kilogram of body mass. Neither accounts for differences in lever arm length. A 200 cm basketball or AFL player and a 176 cm football player producing the same force value are not producing the same joint moment, because the longer limb creates a larger moment arm at the point of force application. This means that absolute force thresholds and even body-mass-normalized values may systematically underestimate relative strength in taller athletes and overestimate it in shorter ones. Torque-based reporting (force multiplied by lever length) would address this, but is rarely available in practice. This is not unique to squeeze testing: the same limitation applies to Nordic hamstring testing and most other isometric assessments used in sport. Practitioners should be aware of this when comparing athletes of different statures against population benchmarks, and when applying published thresholds across sports with different anthropometric profiles.

Context modifiers. A single squeeze reading is almost meaningless without context. Squeeze strength drops acutely post-match (Buchheit et al., 2017; Sanchez-Migallon et al., 2022; Roe et al., 2016; Wollin et al., 2018a), fluctuates across the season (Moreno-Perez et al., 2022; Wollin et al., 2018b), and declines by approximately 0.5% per year of age (Esteve et al., 2018). Players with past-season groin pain lasting longer than six weeks show 12-15% lower adductor strength at preseason compared to those without (Esteve et al., 2018), and this reduction relates more to symptom duration than to injury history itself (Mosler et al., 2017). Testing timing, match schedule, training load phase, and injury history all need to be considered before interpreting a number. This raises practical questions: how do you decide who is weak? What constitutes a meaningful change from baseline? How are you judging the number against the squad?

2. Four reasons a squeeze score is low

If we step back from the complexity, there are fundamentally four reasons why an athlete's squeeze score can be low.

Pain. The athlete has pain during the test, which limits their ability to push maximally. This may not be a strength problem in terms of the capacity of the adductor muscles directly; it is a pain problem with reduced output due to inhibition to protect the painful structures. This outcome does not tell us exactly where the pain is coming from, what the driver of symptom development has been or what management pathway is now needed to best resolve these symptoms. It simply flags irritability in the region, which should trigger a more comprehensive diagnostic and rehabilitation process.

Direct deficit. The adductors themselves lack the capacity to produce force. This can involve structural factors (atrophy, tissue quality) or neural factors (reduced ability to recruit the muscle that is there). A direct deficit means the "prime mover" is genuinely deficient, and this would warrant further examination to ascertain which adductors and in what ranges/planes those deficits need to be addressed. It is worth noting that having a “strong squeeze” may not correlate with hip adductor strength in other planes and ranges.

Indirect deficit. Something other than direct adductor strength is limiting the system's ability to produce force in the squeeze test position. This includes deficits in the stabilizers that enable force production (obliques, gluteus minimus, deep hip rotators), in the synergists that contribute to the test (psoas, gluteus medius, hamstrings, gluteus maximumus), or in the central nervous system's capacity to coordinate the action (fatigue, post-match central depression, chronic deconditioning of the coordinative system).

The distinction between direct and indirect is important because it determines the intervention. The ability of every muscle to produce force is influenced by structure and neural drive. But the question for the clinician is whether the primary limiting factor is the adductor itself (direct) or something else in the system (indirect) - similar to what we see at the shoulder relating to the contribution of the rotator cuff vs the prime movers of the shoulder. While a deficit or drop can be identified with a squeeze test, the distinction as to what is driving that deficit can only be made through a structured assessment.

Test execution. Perhaps the most overlooked reason for a low score: the athlete simply did not produce a true maximal effort. This can reflect poor compliance, unfamiliarity with the test (particularly in new players who have never been squeezed before), inadequate cueing, or insufficient warm-up. A squeeze test only has value if the effort is maximal. Before attributing a low score to pain, a direct deficit, or an indirect deficit, the practitioner should first be confident that the test was performed correctly. Standardized positioning, consistent verbal cueing, and a familiarization trial for first-time testers are basic requirements that, when missed, can generate false flags.

3. Evidence: strength explains very little of the improvement

There are two lines of evidence that challenge the "weak squeeze = only strengthen adductors" logic: biomechanical research in healthy populations showing that force production around the hip is influenced by pelvic position and intersegmental coordination, and rehabilitation research in injured populations showing that squeeze scores improve without targeted adductor work. The framework proposed here should be interpreted as a clinically reasoned model supported by biomechanical principles, rehabilitation outcome studies, and expert practice, rather than a causal model in which each indirect contributor has been independently validated as a determinant of squeeze force.

Fig. 2. Small muscles coordinate the system for larger muscles to function. Left: biceps femoris long head activation across the gait cycle at 4, 5, and 6 m/s running speeds, showing how hamstring force demands increase substantially with speed (adapted from Mao et al., 2024). Right: quadratus femoris EMG activation during the gait cycle, demonstrating high activity levels relative to maximum despite its small size, reflecting its role as a femoral head stabilizer during dynamic movement (adapted from Semciw et al., 2015). These examples illustrate a general principle: the output of large force-producing muscles depends on the coordinating activity of smaller stabilizers throughout the kinetic chain.

Pelvic position and coordination influence force output. Before considering the clinical evidence, it is worth grounding the argument in basic biomechanics. The actions of hip muscles, including whether the adductors contribute to flexion, extension, or rotation, change depending on the position of the pelvis relative to the femur (Dostal et al., 1986; Neumann, 2010). Vasilikos et al. (2024) directly demonstrated that altering pelvic tilt angle significantly changes hip extensor torque production and alters agonist-antagonist force ratios, even in healthy individuals performing the same test. This means that two athletes with identical adductor muscle strength could produce different squeeze scores simply because of differences in pelvic control during the test. The squeeze number reflects the position the system is in, not just the muscles it contains.

There is also a broader principle at play: small torque-producing muscles coordinate the environment in which larger muscles operate. The quadratus femoris, for example, produces relatively low absolute force, yet EMG data show it is highly active during both walking and running (Semciw et al., 2015), stabilizing the femoral head and enabling the larger hip muscles to function effectively (Figure 2). The EMG activity of the hamstring visually maps this during running as force demands increase substantially with running speed (Mao et al., 2024) (Figure 2). These muscles do not work in isolation; they work in sequence and in concert, and the output of any single test reflects the coordination of the whole chain. A deficit in a small stabilizer may limit the output of a much larger prime mover.

This has a direct practical implication: if pelvic position and stabilizer coordination influence force output, then improving pelvic control and deep hip muscle function could improve squeeze scores without any change in adductor muscle strength.

Rehabilitation evidence: what the clinical data shows. The following evidence comes from athletes who presented with athletic groin pain. While the mechanisms are likely relevant to painless populations (given the principles above), the clinical findings cannot be directly applied to the painless, below-benchmark pathway.

Baida et al. (2021) studied 42 athletes with athletic groin pain (AGP) and 36 matched controls. After a rehabilitation program targeting intersegmental control, with no specifically directed adductor strengthening, all baseline hip strength deficits resolved. The critical finding: hip strength changes explained only 11% of the improvement in HAGOS Sports and Recreation scores. Adductor strength change was not even selected by the regression model. Furthermore, these athletes' HAGOS scores remained stable during the 6-month post-discharge follow-up, which underscores the long-term durability and efficacy of the intersegmental control intervention. This is supported by previous work by King et al. (2018), which further supports this picture on 205 consecutive patients with AGP rehabilitated using intersegmental control. Squeeze test values improved (ES: 0.49-0.68), 89% returned to play pain-free at 10 weeks.

Three potential mechanisms explain how squeeze scores improved without targeted adductor work in this population: pain resolved, allowing athletes to push harder; intersegmental control work improved the synergists' ability to support force production in the squeeze position; or the general lower limb loading inherent in the program (squatting, lunging) provided an indirect stimulus to the adductors, even though direct adductor exercises were not prescribed.

The conceptual switch. These findings, combined with the biomechanical evidence from healthy populations, point to a fundamental insight: hip adduction force production can improve as a byproduct of improving how the whole system coordinates. When a squeeze score goes up after intersegmental rehab, it does not necessarily mean the adductors got stronger in isolation. It means the system became better at producing force in that test position because pelvic control improved, trunk/hip stability improved, or synergist coordination improved (Dostal et al., 1986; Neumann, 2010; Vasilikos et al., 2024). The squeeze test measures system output, and the system has improved.

4. The decision tree: from outcome score to intervention

Figure 3 presents the clinical reasoning framework for interpreting a low squeeze score. The decision tree applies to all low scores, whether from a painful or painless context, and converges on a common assessment and intervention pathway.

Painful squeeze. When the squeeze is painful, the immediate question is what the diagnosis is and whether the athlete requires medical or rehabilitative management. The pathway flow should identify the pain source and manage it through medical or rehabilitative pathways as appropriate. Ongoing squeeze testing (both force and pain) can be used to track rehab progress, make transition decisions (e.g. return to run, return to kick), and support RTP decisions throughout the recovery process. Once in the rehabilitative management pathway, it feeds directly into the same full assessment used for painless presentations, as resolution of the identified direct and indirect deficits will drive the rehabilitation process and restoration of high pain-free squeeze force output. As symptoms improve, a more comprehensive analysis of other physical factors (e.g., explosiveness, reactive strength, running and change of direction mechanics) should be included and addressed as appropriate.

Pain-free low squeeze. When the squeeze is low but pain-free, the first question is context: has the score changed from a known baseline (monitoring context), or was it low when first measured (screening context)?

Score dropped (monitoring context). Post-match squeeze reductions are well-documented, with trivial to small decreases observed immediately and at 24 hours, typically recovering by 48-72 hours (Buchheit et al., 2017; Roe et al., 2016; Sanchez-Migallon et al., 2022). The first step is therefore recovery: allow 48-72 hours of appropriate rest and re-test. This does not mean the athlete should stop training by default. The first step is load management: modifying participation for a short period rather than removing the player entirely. In practice, this typically means dropping a session or two, or more commonly, partial participation where the most demanding elements (e.g., small-sided games, extensive kicking drills) are removed while the rest of the session continues. If the score recovers with this adjusted load, continue the current program. If it remains low despite load modification, a period of complete rest combined with treatment may be warranted. If the score still does not recover, the athlete enters the full assessment pathway, as something beyond transient fatigue is likely contributing.

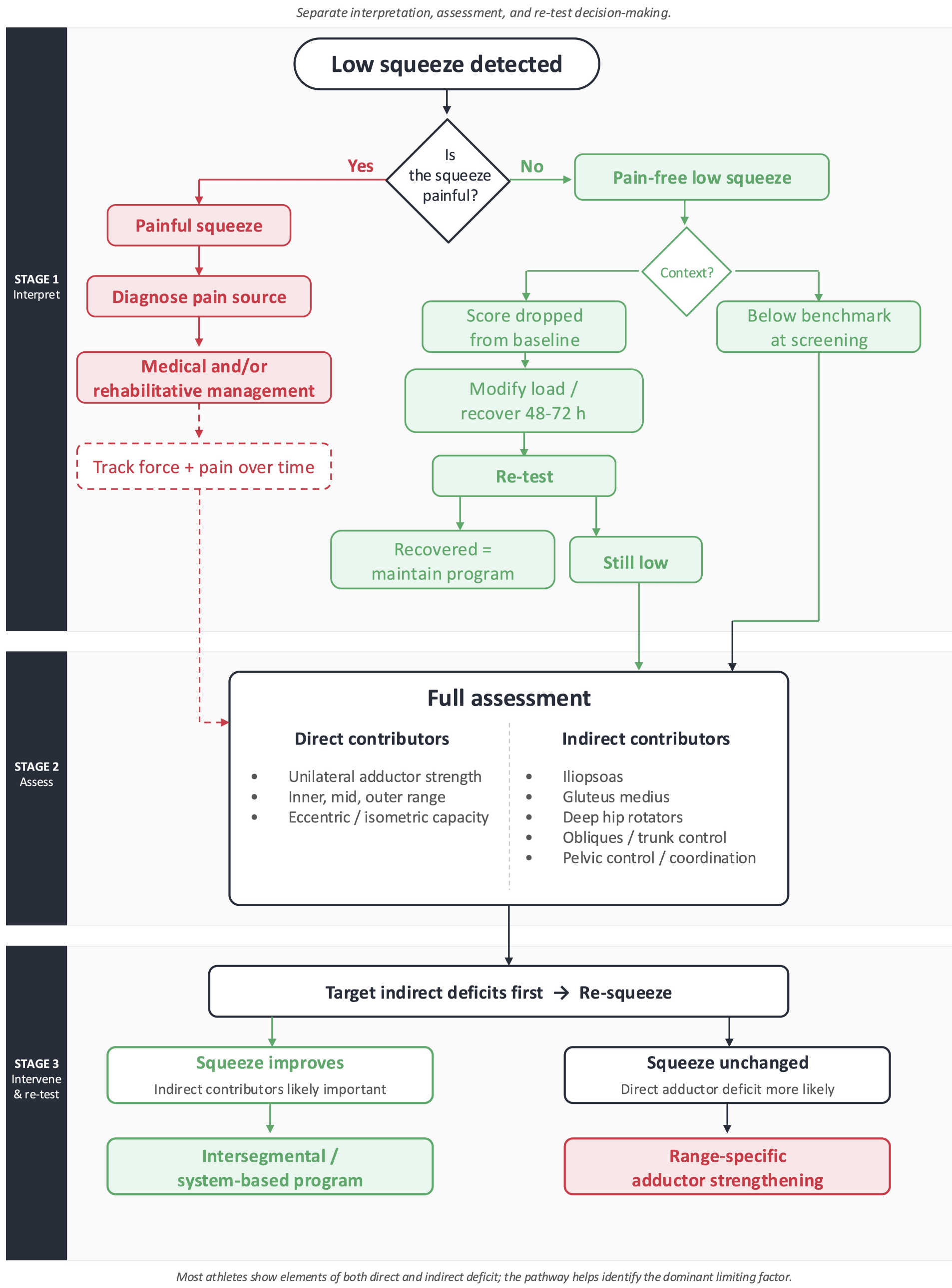

Fig. 3. Decision tree for interpreting low squeeze scores. A painful squeeze (left) leads to a medical vs. rehabilitative management decision; the rehab pathway feeds into the same full assessment used for painless presentations. A pain-free low score (right) is first contextualized (score dropped from baseline vs. below benchmark at screening). Dropped scores undergo a recovery period before further assessment. The full assessment evaluates both indirect contributors (psoas, glute med, rotators, obliques) and direct adductor strength (unilateral, across ranges). Targeted indirect intervention followed by a re-squeeze confirms whether the deficit is primarily driven by indirect (squeeze improves) or direct (squeeze unchanged) factors. Note: while the figure presents direct and indirect as separate pathways, most presentations involve elements of both. The tree allows you to clinically reason the contribution of the various factors to best individualise each intervention strategy. By doing the indirect first you get a better understanding of what contribution, if any, they are making to the squeeze outcome before doing the direct adductor work.

An important caveat: while Figure 3 presents direct and indirect deficits as two distinct pathways for clarity, the reality is that athletes rarely fall cleanly into one category. Most presentations involve elements of both. An athlete with a genuine adductor strength deficit will almost always have developed compensatory coordination patterns around it, and an athlete whose primary limitation is indirect will often show some degree of adductor deconditioning as a consequence. The decision tree identifies the dominant limiting factor to prioritize the intervention, but both components typically need to be addressed - as opposed to only targeting one (e.g. adductor strength and not getting the improvement in symptoms or force output expected).

Determining whether a drop is meaningful requires a framework for interpreting within-player change. Because there is currently no well-established smallest worthwhile change linking squeeze force to a clinical outcome, practitioners can use statistical approaches to flag significant individual variations. Two times the typical error of measurement (2xTE) provides a conservative threshold for identifying real change beyond measurement noise (Hopkins, 2000). Alternatively, monitoring the within-player coefficient of variation across repeated measures and flagging values that fall outside this individual range can serve a similar purpose. Whatever the method, the principle is the same: react to confirmed trends, not to isolated readings (Buchheit 2018).

Below benchmark (screening context). The athlete was low on their first or baseline test. Here, the question is not "has something changed?" but "where does this athlete sit relative to an expected norm?" Several benchmarking approaches exist, each with trade-offs.

Published population references provide a starting point. Preseason cross-sectional data offer sport-specific reference values (Esteve et al., 2018; van Klij et al., 2021), the VALD Practitioner's Guide to Preseason (VALD, 2024) reports percentile data from large testing databases, and prospective studies have proposed thresholds linked to injury risk (e.g., values below 465 N or 7.0 N/kg; Moreno-Perez et al., 2019; an adductor-to-abductor ratio below 0.80; Tyler et al., 2001). However, these benchmarks are population-specific and may not transfer directly across sports, playing levels, positions, or testing devices. It is also worth noting that the population underlying the VALD normative data is not specified in the published guide (Table 1), which limits interpretation. Furthermore, most published benchmarks report force in Newtons or Newtons per kilogram of body mass, but neither accounts for differences in lever arm length, as discussed above. Torque-based reporting (force multiplied by lever length) would address this, but is rarely available in practice. Practitioners should be aware of this limitation when comparing athletes of different statures against population benchmarks.

Club-specific historical data often provides a more relevant reference. Aggregating squeeze values from multiple preseasons within a club generates norms that reflect the actual demands, demographics, and testing practices of that environment. Individual athletes can then be compared against these internal benchmarks using percentile ranks or z-scores (i.e., how many standard deviations an athlete sits from the squad or positional mean). A z-score approach has the advantage of standardizing comparisons across different tests and metrics within the same profiling framework (VALD, 2024).

Regardless of the method, the purpose is the same: identify athletes who are meaningfully below the expected level so they can enter the full assessment pathway, rather than treating a single number as a diagnosis.

Table 1. Normative values for hip abduction force, hip adduction force, and adduction-to-abduction ratio using the ForceFrame strength testing system.

Percentile	Abduction Force Males (N)	Abduction Force Females (N)	Adduction Force Males (N)	Adduction Force Females (N)	ADD:ABD Ratio Males	ADD:ABD Ratio Females
10th	304	240	276	269	0.74	0.89
25th	354	283	340	310	0.86	0.99
50th	404	320	413	351	1.00	1.09
75th	455	364	479	392	1.14	1.20
90th	507	408	534	435	1.27	1.32

Normative percentile values for hip abduction force, hip adduction force, and the adduction-to-abduction force ratio measured with the ForceFrame strength testing system. Force values are presented in Newtons (N) for males and females. The ADD:ABD ratio represents adduction force divided by abduction force. Higher percentiles indicate greater force output or a higher adduction-to-abduction ratio. Taken from Vald 2024.

Full assessment

The full assessment evaluates both indirect and direct contributors to the low squeeze score in a single evaluation (Table 2). This includes:

Unilateral testing to determine which leg (or both) is involved.

Indirect contributors: Iliopsoas, gluteus medius, deep hip rotators, and obliques. These are the four muscle groups that can act to produce torque around a joint, but also due to their anatomical position stabilize to facilitate force production by the larger torque producing muscles around the hip. Their deficits commonly limit an athlete's ability to produce force in the squeeze test position independent of the adductor muscles function as well.

Direct contributors: adductor function tested unilaterally, at inner, mid, and outer range, typically via eccentric break tests using a handheld and can also be assessed isokinetically (i.e., through range) where equipment is available. This provides a map of where adductor strength sits before any intervention, which becomes critical for interpretation after the re-squeeze.

Table 2. Full assessment protocol.

Category	Tests	What does it tell you
Bilateral squeeze	Short-lever (45 deg) and long-lever (0 deg) (Figure 1)	Baseline force + pain provocation
Unilateral break tests	Adduction L/R (inner, mid, outer range) (Figure 4)	Side-specific adductor strength by range
Indirect: activation	Iliopsoas, gluteus medius, deep hip rotators, obliques (Figure 5)	Stabilizer and synergist status
Indirect: strength	Glute max, more superficial hip abductors and external rotators, hamstrings, adductor magnus	Strength of key indirect contributors

Fig. 4. **Unilateral adductor break tests used to assess side-specific adductor strength across inner-, mid-, and outer-range positions (Palladino et al. 2026; Power et al. 2026).**

HIP FLEXION - ILIOPSOAS TEST

- ***Start position:*** *Athlete lies supine with the hip placed in inner-range flexion. The tested hip is flexed, with the foot oriented toward the contralateral side and slight hip external rotation maintained.*
- ***Positioning:*** *Examiner stabilises the athlete's lower limb by holding around the knee/lower thigh, ensuring the athlete maintains the target hip position.*
- ***Cue:*** *"Hold your knee here, don't let me move it."*
- ***Test:*** *Apply a caudal and slightly lateral break force against the athlete's resistance. Slight hip external rotation may be adjusted if needed.*
- ***Scoring:*** *1/3: Easy to break - 2/3: Difficult to break - 3/3: Unbreakable*

HIP EXTERNAL ROTATION — DEEP HIP ROTATORS TEST

- ***Start position:*** *Athlete lies supine with the tested hip flexed to 90° and placed in inner-range external rotation.*
- ***Positioning:*** *Examiner maintains the hip at 90° flexion and holds the lower leg/foot to control the position while avoiding changes in hip and knee flexion.*
- ***Cue:*** *"Hold your leg here, don't let me rotate your foot out."*
- ***Test:*** *Apply a break force into hip internal rotation while the athlete resists into external rotation. Maintain 90° hip flexion and a neutral pelvis throughout.*
- ***Key point:*** *The athlete should resist with hip external rotation only, without increasing knee flexion or compensating through changes in hip or pelvic position.*
- ***Scoring:*** *1/3: Easy to break - 2/3: Difficult to break - 3/3: Unbreakable*

ACTIVE VS PASSIVE HIP ABDUCTION — GLUTEUS MINIMUS TEST

- ***Start position:*** *Athlete lies in side-lying with the tested hip in neutral hip abduction with both legs on top of each other*
- ***Positioning:*** *Examiner stabilises the pelvis and ensures the athlete maintains a neutral hip position without hip flexion or lumbopelvic compensation.*
- ***Cue:*** *"Lift your leg as high as you can while keeping the hip and pelvis controlled."*
- ***Test:*** *Athlete performs maximal active hip abduction. The examiner then assumes the weight of the leg and passively assesses the remaining available range to compare active range of motion with passive range of motion.*
- ***Key point:*** *The athlete should maintain neutral hip alignment and avoid hip flexion compensation during the movement.*
- ***Scoring:*** *1/3: AROM >10° PROM - 2/3: AROM < PROM - 3/3: Active ROM = PROM*

UNILATERAL OBLIQUE TEST

- ***Start position:*** *Athlete lies supine with the tested hip flexed to 90°. The athlete performs contralateral trunk rotation and flexion with the ipsilateral knee and elbow approximated*
- ***Positioning:*** *Examiner stabilises the tested thigh while ensuring the contralateral leg remains in a neutral position.*
- ***Cue:*** *"Hold this position, don't let me push you back down."*
- ***Test:*** *Apply a break force through the athlete's elbow to challenge cross-body trunk rotation, while simultaneously pushing the tested thigh toward hip extension.*
- ***Key point:*** *The athlete should maintain trunk flexion and rotation without compensatory hip flexion or movement of the opposite leg.*
- ***Scoring:*** *1/3: Easy to break - 2/3: Difficult to break - 3/3: Unbreakable*

BILATERAL OBLIQUE TEST

- ***Start position:*** *Athlete lies supine with both legs elevated and knees extended and pelvis, ribs and cervical spine in a neutral position.*
- ***Positioning:*** *Athlete maintains a neutral pelvic position while both legs are lowered together in a controlled manner.*
- ***Cue:*** *"Lower your legs slowly while keeping your pelvis and ribs controlled."*
- ***Test:*** *Athlete performs a controlled bilateral leg-lowering movement with knees extended. The examiner observes the angle at which pelvic control is lost.*
- ***Key point:*** *Avoid anterior pelvic tilt, rib flare and cervical extension. Maintain knee extension throughout and start from the highest position the athlete can control.*
- ***Scoring:*** *1/3: Active hold > 30° from bed - 2/3: Active hold < 30° from bed - 3/3: Active hold to bed*

Fig. 5. Indirect activation tests used to assess function of key stabilizers and synergists, including the iliopsoas, deep hip rotators, gluteus minimus, and obliques (Palladino et al. 2026; Power et al. 2026).

5. Practical implementation

From assessment to intervention: principles, not prescriptions. There are many exercises that can target functional deficits around the hip and groin (Baida et al., 2021; King et al., 2018; Power et al., 2026; Palladino et al., 2026). What is more important than the exercise that we select is whether that exercise has the desired or intended outcome. While often our ability to clinically reason the drivers of a drop in squeeze test is the limiting factor, so too can our ability to effect change and recognise when we do or do not. Table 3 shows the likely interpretations and clinical actions based on common case presentations: what to prioritize and what to avoid. Two principles should guide intervention regardless of the specific exercises chosen.

When addressing indirect contributors, the exercise selected should immediately change or resolve the indirect test finding if it is effective. If it does not, then either the exercise was wrong or the way it was coached and executed did not achieve the desired effect. Only when the indirect test has changed can you go back and re-squeeze to interpret its contribution to the overall score. In a team setting, this can be built into the initial assessment itself: test the squeeze, identify and address indirect deficits, confirm the indirect test has changed, then re-squeeze before the athlete leaves the room. These within-session changes reflect an acute neuromuscular response, but they need to be progressed and periodized over time to achieve persistent change.

When addressing direct adductor deficits, the exercise should be pain-free, the sensation should be in the targeted muscle group, and the range and intensity should match the adaptation desired. For example, performing ball squeezes lying on the back into pain will not improve adductor strength in the sagittal plane or in outer range hip adduction. The exercise must be matched to the deficit identified in the assessment: which leg, which range, which contraction mode.

The challenge with every athlete is to reason their presentation based on the points discussed in this paper. But even when the reasoning is sound, it will require appropriate exercise selection, coaching, and progression to achieve the desired change. It is more important that practitioners achieve consistent, measurable change with their athletes than that they select any one specific or special exercise.

Scalability and starting points. We recognize that the framework described above requires time, skill, and access that not all environments have. A full indirect assessment with re-squeeze may not be feasible in a club with one physiotherapist covering 30 players. The framework is designed to be scalable: at minimum, the painful vs. painless distinction and the recovery-first gate for monitoring drops can be applied by any practitioner with a squeeze device. The deeper assessment layers can be added as resources and expertise allow. Something structured is always better than nothing structured.

For practitioners looking for a starting point, we suggest three changes to current practice: (1) always record both force and pain on every squeeze test, not just force; (2) when a score is low, ask whether it is painful or painless before deciding on an intervention; and (3) before prescribing adductor strengthening, consider indirect contributor assessment to check whether the system around the adductors is contributing to the deficit. These three steps take less than five minutes and can fundamentally change the quality of the clinical decision.

In a team setting

Preseason screening. Use the squeeze test to flag athletes who are below benchmarks, then apply the full assessment to those flagged. Do not automatically assign everyone with a low score to an adductor program.

In-season monitoring. React to trends, not isolated readings. A post-match drop that recovers within 48-72 hours with appropriate load management is expected physiology, not a new problem. When a drop persists beyond the expected recovery window, enter the decision tree.

Rehabilitation. In a symptomatic athlete, the squeeze score is influenced by multiple factors: pain inhibition, direct adductor deficits, and indirect contributors. A low or dropping squeeze during rehab flags that something needs attention, but it does not tell you the source of pain or the driver of the force deficit. Similarly, a recovered squeeze score does not mean the athlete is ready to return: movement coordination deficits, range-specific weaknesses, or unresolved indirect contributors may persist beneath a reassuring number. The squeeze is one data point alongside movement quality assessment and patient-reported outcomes, not a standalone clearance criterion.

Table 3. Likely interpretations and clinical actions based on common case presentations: what to prioritize and what to avoid.

Finding	Likely interpretation	Immediate action	What not to do
Painful squeeze, low force	Pain-limited output	Diagnose source, manage irritability, track pain + force	Do not chase force into pain
Pain-free drop post-match	Fatigue/recovery response	Modify load, re-test 48–72h	Do not label as adductor weakness
Pain-free persistent low score	Direct or indirect deficit	Full assessment	Target direct and indirect muscle groups
Unilateral outer-range deficit	Range-specific adductor issue	Outer-range progressive loading	Do not rely on short-lever ball squeezes
Squeeze improves after indirect work	System contributor likely	Intersegmental control progression	Do not assume adductors alone were weak
Squeeze unchanged after indirect work	Direct deficit more likely	Adductor strengthening by side/range/mode	Target appropriate range, intensity and plane of movement

Case Example

A professional footballer shows a 15% pain-free drop in short-lever squeeze 24h post-match. He reports no groin pain. The score remains low at 72h despite modified training. Full assessment reveals poor right deep hip rotator control and outer-range adductor deficit. After targeted deep rotator work, squeeze improves by 8% within-session but remains below baseline. The intervention plan combines intersegmental control with progressive outer-range adductor loading.

6. Conclusion

A low squeeze score can result from pain, a direct adductor strength deficit, or an indirect deficit in the stabilizers and synergists that enable force production. Each requires a different response. The clinical reasoning framework proposed here replaces the reflexive "low squeeze = adductor strengthening" logic with a structured process: assess both indirect and direct contributors, intervene on indirect deficits first to facilitate clinical reasoning, re-test, and let the data guide the next step. The framework is a starting point, not an endpoint. It reflects our current understanding, shaped by the available evidence and our combined clinical and applied experience. We expect it to evolve as more data emerges, particularly from painless populations where the evidence base is thinner. What should not evolve is the principle: a low squeeze score deserves a question, not a reflex.

Practical applications

- Squeeze testing is widespread across team sports, but the interpretation framework has not kept pace with the evidence. Too often, a low score triggers adductor strengthening by default. This paper challenges that reflex.
- Always record both force and pain on every squeeze test. These are two separate variables that tell you different things.
- A low squeeze score can result from pain, a direct adductor deficit, or an indirect deficit. Each requires a different response. The first question: is it painful?
- For painless deficits, context matters: has the score dropped (recovery first) or was it always low (full assessment)?
- The framework: assess both indirect contributors and direct adductor strength, intervene on indirect deficits first, confirm the exercise changed the indirect test before re-squeezing, and let the re-test data tell you where the real problem sits. The concept matters more than any specific exercise.
- Adductor strengthening is the answer when a direct deficit is confirmed, but never in isolation: always alongside intersegmental control work.
- At minimum: record force and pain, check one indirect contributor before defaulting to adductor work. Five minutes that can change the quality of the decision.
- This paper is born from the collaboration between a performance support practitioner (MB) and a clinical specialist in groin rehabilitation (EK), and the learnings from colleagues both past and present. The aim is not to criticize or suggest removing the squeeze test, but to leverage its sensitivity to facilitate better understanding and individualized action points to optimize outcomes.

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