

GENERAL SURGERY OPEN ACCESS

Long-Term Outcomes of Patients With Adductor-Related Groin Pain: Assessing the Clinical Relevance of Imaging-Only Hernias

 Daniel O'Connor¹  | Nazim Bhimani^{1,2}  | Amanda Turner³ | Thomas J. Hugh^{1,2} 

¹Surgical Education Research and Training (SERT) Institute, Royal North Shore Hospital, St Leonards, New South Wales, Australia | ²Northern Clinical School, University of Sydney, St Leonards, New South Wales, Australia | ³Lifecare Northern Sports Physiotherapy, St Leonards, New South Wales, Australia

Correspondence: Daniel O'Connor (doco0141@uni.sydney.edu.au)

Received: 28 January 2026 | **Revised:** 9 August 2026 | **Accepted:** 26 August 2026

Keywords: groin pain | inguinal hernia | musculoskeletal diseases | physical therapy modalities | treatment outcome

ABSTRACT

Background: Groin pain is a common and diagnostically challenging presentation. Imaging often detects hernias that are not clinically evident ('imaging-only hernias') which can lead to unnecessary surgical intervention and under-diagnosis of musculoskeletal conditions like adductor-related groin pain (ARGP). This study evaluates long-term outcomes of patients diagnosed with ARGP in a variety of settings.

Methods: This was a retrospective study of patients diagnosed with ARGP (between January 2021 and June 2024) using the Groin-MAP. Patients were categorised into groups: (1) ARGP with imaging-only hernia, (2) ARGP with clinical inguinal hernia and (3) ARGP following inguinal hernia repair. Long-term patient-reported outcome measures were assessed.

Results: Follow-up was completed for 110 of 133 eligible patients at a median of 29 months (range 10–66). Group 1 ($n = 47$) reported 90% satisfaction after management of their adductor pain alone; only 1/47 had a hernia repair elsewhere. Group 2 ($n = 29$) reported 90% satisfaction with equivalent management of ARGP, but varied management for inguinal hernia. Up-front hernia repair was opted for by 14/29 and 15/29 opted for watchful waiting, of which 2 progressed to surgery. Group 3 ($n = 34$) had a higher symptom burden; yet 70% maintained mild or no activity limitation and 1/34 had revision hernia surgery.

Conclusion: ARGP is under-recognised as a cause of groin pain in surgical practice, and is best diagnosed on physical examination. Patients with ARGP have good long-term outcomes without intervention for incidental imaging-only inguinal hernias. Those with clinical inguinal hernias might delay or avoid surgical repair by addressing concomitant ARGP.

1 | Introduction

Groin pain is a common and challenging clinical presentation with a broad range of potential causes. In young male athletes, adductor-related groin pain (ARGP) is the most frequent entity, commonly occurring with other entities like inguinal- or iliopsoas-related groin pain [1–3]. Causes of groin pain in older, non-athletic

populations are less researched, but referred groin pain from the hip is the most common, particularly in patients with longstanding symptoms [4]. Inguinal and femoral hernia are also common conditions, defined by a palpable swelling that is mostly either painless or only mildly uncomfortable [5, 6]. When the patient's primary concern is focal, acute groin pain and not a palpable swelling, a wide range of musculoskeletal conditions should be considered.

This is an open access article under the terms of the [Creative Commons Attribution](https://creativecommons.org/licenses/by/4.0/) License, which permits use, distribution and reproduction in any medium, provided the original work is properly cited.

© 2026 The Author(s). ANZ Journal of Surgery published by John Wiley & Sons Australia, Ltd on behalf of Royal Australasian College of Surgeons.

The *Doha Agreement Meeting* classification system captures the common musculoskeletal entities of non-hernia groin pain in young, athletic populations [7]. These ‘Doha entities’ are also relevant to the general adult population as they are self-evident with the exception of inguinal-related groin pain (IRGP), which has a potentially confusing delineation from a clinically evident inguinal hernia [7]. This delineation is not intuitive, as hernias are defined by a physical deformity and frequently painless or only mildly uncomfortable. The presence of a radiologically detected but clinically inapparent inguinal hernia (referred to from here onwards as an ‘imaging-only’ hernia) creates diagnostic uncertainty. Imaging is not recommended for the routine diagnosis of either groin hernias or IRGP but nevertheless is still widely used despite published clinical guidelines [5, 8, 9]. Consequently, secondary care specialists like hernia surgeons will frequently manage patients that present with positive findings from inappropriate imaging.

Groin ultrasound (GU) is commonly used to investigate groin pain; however, it is highly operator dependant and prone to both under- and over-diagnosis of groin hernias, as well as the misinterpretation of normal anatomical variants [10–12]. The increasing use of GU as a diagnostic tool in Australia has been implicated in the rising rates of unnecessary bilateral inguinal hernia repair [9]. This misattribution of imaging-only hernias is likely resulting in the under-detection of the common musculoskeletal entities that are not reliably detected on GU [13, 14]. Both hernia and the many musculoskeletal pathologies of the groin are best detected with specific physical examination manoeuvres [1, 5, 15]. This may be difficult for hernia surgeons who see patients with undifferentiated groin pain but usually have not received specific training in musculoskeletal assessment techniques for the groin [16, 17].

ARGP is an important musculoskeletal entity that should always be considered as a primary driver of groin pain. It can occur concomitantly with a clinically evident groin hernia, and physical assessment should aim to determine which pathology is the more prominent driver of a patient’s symptoms. ARGP is also a potential driver of complex postoperative groin pain after hernia repair, highlighting the value in carefully assessing for this pre-operatively. Unfortunately, there are no data available about the prevalence of ARGP in typical adult populations, let alone in patients presenting with imaging-only hernias or those with symptoms following a previous hernia operation. A recent systematic review of chronic postoperative groin pain does not mention ARGP or any musculoskeletal pathologies as potential contributors [18].

The aim of the current study is to evaluate the long-term outcomes of patients with a clinical diagnosis of ARGP in a variety of presentations. We hypothesise that most patients with ARGP and an imaging-only hernia will have favourable outcomes with conservative treatment of their adductor pain and no treatment for the incidental imaging finding. We also hypothesise that patients with ARGP and a clinically evident groin hernia can avoid or delay hernia surgery with treatment of their adductor pain, provided that it is determined to be the predominant driver of their symptoms through history and physical examination.

2 | Methods

Ethics approval was obtained from the Human Research Ethics Committee of the Northern Sydney Local Health District (2019/ETH00061).

2.1 | Study Design

A consecutive series of patients with a clinical diagnosis of ARGP (between January 2021 and June 2024) were identified from a prospective database maintained by a single surgeon (TJH). Patients with neuropathic type pain as the presenting symptom were not included in this study. Relevant patient information was extracted from the database including age, gender, date of initial appointment, date and side of the clinical ARGP diagnosis and any clinical hernia diagnosis, imaging type, radiological hernia diagnosis and the details of any relevant surgery before or during the study period.

2.2 | Diagnostic Labels and Additional Descriptors

All participants received a standardised clinical assessment for a groin hernia (examination in the supine and standing position), as well as a musculoskeletal assessment for ARGP using the Groin-MAP protocol as outlined in a recent publication from our group [15]. The following definitions were used to diagnose patients:

ARGP: Defined by reproduction of the patient’s groin pain using the recommended tests outlined in the Groin-MAP protocol (adductor longus enthesis palpation, plus adductor stretching and strength testing) [15].

Clinically evident groin hernia: Defined by the presence of a distinct palpable inguinal or femoral swelling or a cough impulse on physical examination in the lying or standing position, and irrespective of the imaging findings.

Previous groin hernia surgery: Defined by a history of inguinal hernia repair prior to the presentation. This was either noted as part of the clinical history or detected during the physical examination.

Additional descriptors were used for the purpose of discussion and comparison to other studies but not for diagnosis or categorisation:

‘Imaging-only hernia’: This was defined by the absence of a clinically evident groin hernia and a radiologist explicitly reporting the presence of either an inguinal or femoral hernia on any imaging modality.

IRGP: Defined by tenderness on palpation of the inguinal region [7].

2.3 | Groups

The diagnostic labels were then used to allocate participants to one of the following three groups:

Group 1: Patients with ARGP only (no clinically evident groin hernia).

Group 2: Patients with ARGP and a clinically evident inguinal hernia. This group was further divided into their most predominant entity. Group 2a contained those who had large hernias or agreed that the hernia was the more predominant entity or Group 2b if the ARGP was the more predominant issue.

Group 3: Patients with ARGP and a prior inguinal hernia repair but with no clinically evident hernia recurrence.

It should be noted that Group 1 must be labelled with the phrase 'groin hernia' as it included patients with imaging-only femoral hernias. The term 'inguinal hernia' was used for Group 2 and Group 3 as all participants in this study with clinical hernias were inguinal.

2.4 | Treatment Strategies

This was an observational study; however the treatment recommendations were relatively uniform within each group and can be summarised.

2.4.1 | ARGP Management

All patients were counselled about ARGP and informed that surgery for the adductor pain was not warranted. They received written and verbal advice about activity modification, and were advised that multi-modal physiotherapy was the best treatment for ARGP [19]. All patients were referred to a local sports physiotherapist with a special interest in groin pain, or referred to their own preferred physiotherapist if requested.

2.4.2 | Hernia Management

The advice and treatment regarding hernia differed between each group:

Group 1: All were advised that they did not have a clinically evident groin hernia and that repair was not indicated for an imaging-only groin hernia and that ARGP was the likely primary cause of their pain.

Group 2a (Hernia symptoms more troublesome than ARGP): All were booked for a delayed inguinal hernia repair after 4–6 weeks of physiotherapy for their ARGP. This was a day-only anterior repair with mesh.

Group 2b (ARGP symptoms more troublesome than hernia): Were advised against upfront hernia surgery and monitored with a typical 'watchful waiting' (WW) approach whilst focusing on equivalent ARGP management.

Group 3: All patients were informed that they did not have clinical evidence of a hernia recurrence, advised against revision surgery and recommended the above ARGP management.

2.5 | Questionnaire

For long-term follow-up, participants were contacted by telephone and assessed using a study-specific questionnaire of patient-reported outcome measures (PROMs). This incorporated selected items (P1, PA1, Q2 and Q3) adapted from the Copenhagen Hip and Groin Outcome Score (HAGOS) [20], supplemented with additional questions assessing pain, intensity and overall satisfaction. The HAGOS items were included for their relevance to groin-related function, but the current questionnaire was not intended to reproduce the validated HAGOS. One open-ended item was also included to detect all groin pain related treatment each participant had received since diagnosis. This included surgical interventions, minor procedures such as radiologic guided injections and treatment or consultation with any clinician.

2.6 | Statistical Analysis

The questionnaire results were entered into the REDCap electronic data capture platform (Vanderbilt University, Nashville, TN, USA) and exported to Microsoft Excel (Microsoft Corporation, Redmond, WA, USA) for analysis. Data were analysed using descriptive methods. Continuous variables (e.g., age, duration of follow-up) were summarised as medians and ranges. Categorical variables (e.g., treatment modality and PROMs) were reported as absolute frequencies and percentages. Each survey item was analysed individually and not combined into a summary score. Summary tables were used to illustrate outcomes for each study group, but no inferential or comparative statistical analyses were performed as the study was exploratory and descriptive in nature. Subgroup comparisons based on physiotherapy attendance or other non-surgical treatment modalities were not performed, as the primary objective of this study was to describe long-term clinical trajectories and evaluate the safety of non-surgical management decisions.

3 | Results

3.1 | Patient Characteristics

A total of 133 patients were identified from the prospective database. Of these, 21 were not contactable and two declined to participate, leaving 110 patients (83%) who are the subject of this study. In this cohort, 94 (85%) were male and 16 (15%) were female; the median age was 60 years (range 17–90). Baseline demographic and diagnostic characteristics were comparable between responders and non-responders, minimising the likelihood of selection bias.

3.2 | Diagnostic Characteristics

Table 1 shows a diagnostic summary of each group including a tally of hernias present on physical exam and those reported on imaging.

Group 1: Consisted of 47 patients, all presented with a hernia, reported on imaging (nine bilateral, 38 unilateral). There were

TABLE 1 | Diagnostic features of each group.

Group 1: ARGP, no hernia (N=47)	Total	US detected hernia	Clinical hernia	Clinical IRGP
Presented w/ ultrasound, <i>n</i> (%)	47 (100)	47 (100)	0 (0)	12 (26)
No ultrasound, <i>n</i> (%)	0 (0)	—	—	—
Group 2: ARGP and hernia (N=29)	Total	US detected hernia	Clinical hernia	Clinical IRGP^a
Presented w/ ultrasound, <i>n</i> (%)	26 (90)	26 (100)	26 (100)	—
No ultrasound, <i>n</i> (%)	3 (10)	—	3 (100)	—
Group 3: ARGP and previous repair (N=34)	Total	US detected recurrence	Clinical recurrence	Clinical IRGP
Presented w/ new ultrasound, <i>n</i> (%)	2 (6)	1 (50)	0 (0)	0 (0)
No ultrasound, <i>n</i> (%)	32 (94)	—	0 (0)	15 (47)

Abbreviations: ARGP, adductor-related groin pain; IRGP, inguinal-related groin pain; *n*, number; US, ultrasound.

^aHernia is an exclusion criterion for IRGP.

TABLE 2 | Treatment modalities received during observation period.

	Group 1	Group 2a	Group 2b	Group 3
Total	47	14	15	34
Physiotherapy, <i>n</i>				
Yes	20	7	7	16
No (modified activities only)	27	7	8	18
Hernia repair, <i>n</i>				
Yes, up-front hernia repair	0	14	0	0
Yes, after a period of WW	1	0	2	0
No	46	0	13	34
Other operations, <i>n</i>				
Radiofrequency denervation	1	0	0	0
Epididymectomy	1	0	0	0
Mesh removal and orchidectomy	0	0	0	1
Total hip replacement	3	1	0	0

Abbreviations: *n*, number; WW, watchful waiting.

no hernias evident on clinical exam; hence all were defined as follows: Imaging only hernias. IRGP on palpation was reported in 12/47 (26%).

Group 2: Contained 29 patients all of whom had a clinically evident inguinal hernia. Ultrasound-detected hernias were noted in 26 patients (21 unilateral and five bilateral). Only 18 of the 26 (69%) ultrasounds were concordant with the clinical

exam. Of the 21 ultrasounds reporting a unilateral inguinal hernia, 16 clinical exams were concordant, four were clinically bilateral and one hernia was detected on the contralateral side. Of the five ultrasounds that reported bilateral inguinal hernia, only two were concordant; three had only a unilateral inguinal hernia.

Group 3: A highly selected cohort of 34 patients with a history of prior groin inguinal hernia surgery. All of these patients presented with groin pain due to ARGP, and none had a clinically evident recurrent hernia. Details about the original hernia procedure were only available in 56% of these patients but overall, they presented at a median of 32 months post-surgery (range 4–94 months). IRGP on palpation was reported in 15/34 (44%).

3.3 | Follow-Up

All surveys were conducted during between April 21 and August 8, 2025. The median duration between diagnosis of ARGP and the survey was 29 months (range 10–66 months). The results of the questionnaire are divided into the treatment modalities reported by the patients and then the long-term PROMS.

3.4 | Treatment Modalities

Table 2 shows the treatment modalities that patients had after the diagnosis of ARGP, including any surgical intervention. Only 50 patients (45% of total) reported having a course of physiotherapy, despite a physiotherapy recommendation being given to all. The treatment received was not standardised.

3.4.1 | Surgical Interventions

Per the surveys, 23 patients received a surgical procedure, with each patient receiving only one surgery. This comprised 17 inguinal hernia repairs and six non-hernia groin operations. The

non-hernia procedures comprised three total hip replacements, one radiofrequency denervation, one epididymectomy and one hernia revision.

Group 1: Only one patient reported having a hernia repair elsewhere. This was a bilateral inguinal hernia repair for left-sided groin pain. A further three patients had total hip replacements, all on the symptomatic side. One patient had a radiofrequency denervation of the ilioinguinal nerve on the symptomatic side.

Group 2a: All patients (14/14) had an anterior inguinal hernia repair; one patient had a total hip replacement on the symptomatic side.

Group 2b: After WW, 2/15 progressed to an anterior inguinal hernia repair; this occurred at 8 months and 38 months after their initial diagnosis. The remaining 13 did not have hernia surgery for a clinically evident inguinal hernia. There were no non-hernia procedures.

Group 3: Only one patient underwent hernia revision surgery after seeking an alternative opinion. This involved mesh removal and an orchidectomy. The remaining 33/34 had not had any surgical intervention at the conclusion of the study period.

3.5 | PROMs

The results of each of the five PROMs are shown in Tables 3–7.

Group 1: Overall, 90% were mostly or very satisfied with their outcome. A total of 89% reported no pain or mild pain, and 89% experienced pain once per month or less. Mild or no activity limitation was reported by 81%.

Group 2: Overall, 90% of patients were mostly or very satisfied with their outcome. A total of 90% reported no pain or mild pain, and 87% experienced pain once per month or less. Mild

or no activity limitation was reported by 86%. The additional subgroups of 2a and 2b can be seen in Tables 3–7. Group 2a, who had upfront surgery, had slightly better pain scores than 2b; however, they reported more activity modification than those managed with WW. The two patients that progressed to surgery after WW were both ‘very satisfied’ and reported no pain.

Group 3: Only 64% were mostly or very satisfied. This group had a higher symptom burden with 36% reporting moderate to severe pain, and 41% with weekly pain or worse. Despite this, 70% of patients reported mild or no activity limitation.

An additional analysis of patients with IRGP is shown in each of Tables 3–7. These patients had similar PROMS to other participants of the same group.

4 | Discussion

This study highlights the importance of musculoskeletal assessment for patients with groin pain. These data also demonstrate the importance of detecting ARGP in the setting of a possible groin hernia and the limited clinical utility of ultrasound and other imaging modalities in the management of both entities.

Patients who undergo groin imaging without structured physical examination are at risk of having their pain misattributed to imaging-only hernias, which are very common in asymptomatic people [21]. Group 1 had excellent outcomes, despite all patients having an imaging-only hernia, and 46/47 not requiring or seeking any surgical intervention for this finding. Instead, their management was focused on the ARGP and mostly consisted of advice and education, relative rest and a course of multimodal pelvic stabilisation physiotherapy. This aligns with previous evidence in favour of non-surgical management of ARGP [22], and against the surgical repair for imaging-only hernias [5, 8, 23]. However, these positive

TABLE 3 | Pain severity.

Q: ‘How would you rate your current level of groin pain?’						
	Total	None	Mild	Moderate	Severe	Extreme
Main groups, n %						
Group 1	47	23 (49)	19 (40)	5 (11)	0 (0)	0 (0)
Group 2	29	18 (62)	8 (28)	2 (7)	1 (3)	0 (0)
Group 3	34	10 (29)	12 (35)	8 (24)	4 (12)	0 (0)
Additional subgroups, n %						
Group 2a	14	9 (64)	4 (29)	0 (0)	1 (7)	0 (0)
Group 2b (No surgery)	13	7 (54)	4 (31)	2 (15)	0 (0)	0 (0)
Group 2b (surgery)	2	2 (100)	0 (0)	0 (0)	0 (0)	0 (0)
Group 1 + IRGP	12	6 (50)	4 (33)	2 (17)	0 (0)	0 (0)
Group 3 + IRGP	15	4 (27)	2 (13)	7 (7)	2 (13)	0 (0)

Abbreviations: IRGP, inguinal-related groin pain; n, number; Q, question.

TABLE 4 | Pain frequency.

Q: 'How often is your groin painful?'						
	Total	Never	Monthly	Weekly	Daily	Always
Main groups, <i>n</i> %						
Group 1	47	25 (53)	17 (36)	4 (9)	0 (0)	1 (2)
Group 2	29	19 (66)	6 (21)	0 (0)	3 (10)	1 (3)
Group 3	34	10 (29)	10 (29)	9 (26)	4 (12)	1 (3)
Additional subgroups, <i>n</i> %						
Group 2a	14	10 (71)	3 (21)	0 (0)	1 (7)	0 (0)
Group 2b (no surgery)	13	7 (54)	3 (23)	0 (0)	2 (15)	1 (8)
Group 2b (surgery)	2	2 (100)	0 (0)	0 (0)	0 (0)	0 (0)
Group 1 + IRGP	12	6 (50)	4 (33)	2 (17)	0 (0)	0 (0)
Group 3 + IRGP	15	3 (20)	2 (13)	5 (33)	4 (27)	1 (7)

Abbreviations: IRGP, inguinal-related groin pain; *n*, number; Q, question.**TABLE 5** | Activity modification.

Q: 'Have you modified your lifestyle to avoid potentially damaging activities to your groin?'						
	Total	Not at all	Mildly	Moderately	Severely	Totally
Main groups, <i>n</i> %						
Group 1	47	28 (60)	10 (21)	7 (15)	2 (4)	0 (0)
Group 2	29	18 (62)	7 (24)	2 (7)	2 (7)	0 (0)
Group 3	34	19 (56)	8 (24)	3 (9)	3 (9)	1 (3)
Additional subgroups, <i>n</i> %						
Group 2a	14	7 (50)	3 (21)	2 (14)	2 (14)	0 (0)
Group 2b (no surgery)	13	9 (69)	4 (31)	0 (0)	0 (0)	0 (0)
Group 2b (surgery)	2	1 (50)	1 (50)	0 (0)	0 (0)	0 (0)
Group 1 + IRGP	12	8 (67)	2 (17)	2 (17)	0 (0)	0 (0)
Group 3 + IRGP	15	6 (40)	4 (27)	3 (20)	1 (7)	1 (7)

Abbreviations: IRGP, inguinal-related groin pain; *n*, number; Q, Question.

outcomes must also be partly attributed to the natural history of the ARGP [22, 24].

At presentation, 12 patients in Group 1 did have palpable pain (IRGP) on the same side as their imaging-detected hernia, but strictly no palpable bulge of a clinically evident hernia. This pain on palpation was considered a hernia symptom in this study. However, we acknowledge that proponents of the term 'inguinal disruption' might assign significance to pain on palpation (IRGP) when it correlates with an imaging-only hernia [25]. Due to this, we felt it was necessary to do an additional breakdown of the results. Our preference would be to describe these patients as having 'combined adductor- and inguinal-related groin pain' but acknowledge the term inguinal-disruption might apply. We would also concur with current guidelines and would not take imaging findings into account when considering hernia

repair [5, 8]. The positive outcomes of this subgroup support this approach.

It should be noted that there are several studies reporting favourable outcomes for endoscopic mesh reinforcement in athletes with inguinal-disruption despite the absence of a clinically palpable hernia [25–27]. However, it may not be appropriate to extrapolate these results to the non-athlete patients of a general population as was assessed in the current study. A non-surgical approach is still recommended as first line treatment for isolated ARGP or IRGP, and for those with both [16, 25].

The current study also showed that patients with ARGP and inguinal hernia have excellent long-term outcomes without a blanket recommendation for hernia repair. By the end of the observation period, 45% of these patients had still not required a

TABLE 6 | Participation.

Q: 'Are you able to participate in you preferred physical activities for as long as you would like?'						
	Total	Always	Often	Sometimes	Rarely	Never
Main groups, <i>n</i> %						
Group 1	47	29 (62)	10 (21)	5 (11)	2 (4)	1 (2)
Group 2	29	23 (79)	5 (17)	0 (0)	1 (3)	0 (0)
Group 3	34	22 (65)	6 (18)	1 (3)	3 (9)	2 (6)
Additional subgroups, <i>n</i> %						
Group 2a	14	11 (79)	2 (14)	0 (0)	1 (7)	0 (0)
Group 2b (No surgery)	13	10 (77)	3 (23)	0 (0)	0 (0)	0 (0)
Group 2b (surgery)	2	2 (100)	0 (0)	0 (0)	0 (0)	0 (0)
Group 1 + IRGP	12	9 (75)	2 (17)	0 (17)	0 (0)	1 (8)
Group 3 + IRGP	15	10 (67)	3 (20)	1 (7)	1 (7)	0 (0)

Abbreviations: IRGP, inguinal-related groin pain; *n*, number; Q, question.**TABLE 7** | Satisfaction.

Q: 'Overall, how satisfied are you with the progress of your groin pain?'						
	Total	Very	Mostly	Neutral	Unsatisfied	Very unsatisfied
Main groups, <i>n</i> %						
Group 1	47	28 (60)	14 (30)	4 (9)	1 (2)	0 (0)
Group 2	29	17 (59)	9 (31)	2 (7)	1 (3)	0 (0)
Group 3	34	13 (38)	9 (26)	7 (21)	4 (12)	1 (3)
Additional subgroups, <i>n</i> %						
Group 2a	14	9 (64)	3 (21)	1 (7)	1 (7)	0 (0)
Group 2b (No surgery)	13	7 (54)	5 (38)	1 (8)	0 (0)	0 (0)
Group 2b (surgery)	2	2 (100)	0 (0)	0 (0)	0 (0)	0 (0)
Group 1 + IRGP	12	7 (58)	4 (33)	1 (8)	0 (0)	0 (0)
Group 3 + IRGP	15	4 (27)	3 (20)	3 (20)	3 (20)	2 (13)

Abbreviations: IRGP, inguinal-related groin pain; *n*, number; Q, question.

hernia repair. Of course, some of these patients may eventually develop symptoms and require an operation at a later date [26]. Regardless, these results generally support an upfront conservative surgical approach based on the hernia size, the predominant symptom entity and patient preference.

Group 3 represented a complex cohort with lower PROMS for pain and satisfaction compared to other participants. All patients in this group had a prior hernia operation, but nevertheless scored close to the other groups in quality of life and participation. These long term findings are reassuring, as these PROMS reportedly capture the functional and psychological impact of symptoms [27]. However, half of the patients in Group 3 had some inguinal pain on palpation at the site of their prior hernia repair. Various terms are used in the literature to describe these symptoms including 'mesh-related pain', 'post-herniorrhaphy inguinodynia' or 'nociceptive chronic post-operative inguinal pain'.

Clinically, none of the patients in this group had 'neuropathic' type pain, but we accept that the diagnostic criteria in relation to these symptoms is not widely agreed upon [5, 28]. One patient in Group 3 sought a second opinion and subsequently underwent mesh removal and an orchidectomy during the study period. The remaining 33 patients (97%) in this group had no further groin exploration surgery. Such interventions have inherent risk and inconsistent evidence for benefit, and consequently ARGP and other groin pain entities (hip-, iliopsoas- and pubic-) should be carefully excluded before considering these approaches.

Overall, physical examination techniques were the most important factor for diagnosis and management decisions among all patients in the whole cohort. General surgeons in Australia and New Zealand do not undergo specific training in the musculoskeletal examination techniques used within this paper. The Doha consensus document provides diagnostic features of

the various groin pain entities, and additional research has confirmed the reliability of the many specific diagnostic techniques described [3, 29–34]. Despite this, a definitive list or protocol of examinations for each entity has not been widely adopted as musculoskeletal specialists likely have their own preferences based on clinical experience. For general surgeons who do not primarily treat musculoskeletal conditions, a simple, structured examination protocol might be helpful. Our group has recently published an evidence-based protocol (The Groin-MAP) which specifically details a systematic assessment for the major musculoskeletal entities of the groin [19].

Although there are some important findings, there are also several limitations to this study. The patient cohort was managed by a single surgeon from one institution, raising the possibility of selection bias which might limit wide applicability. The long follow-up interval might introduce recall bias, especially regarding the reporting of treatments. The survey utilised PROMS drawn from the validated HAGOS, but did not administer it in its entirety, and is consequently not an externally validated questionnaire. The survey was administered at a single time-point, which limits causal inferences, and our description of results reflects this. A specific pain score at diagnosis would have been relevant to compare to other studies on similar populations. Recent literature on inguinal hernia repair candidates shows a low median preoperative pain VAS of 2/10 [35], whereas studies on ARGP tend to report much higher pain scores at diagnosis [24, 36, 37]. Pain reduction is often cited as an aim of hernia surgery, but these mild baseline pain scores make improvements modest or hard to detect [38].

In summary, this study adds valuable evidence to an under-explored area of groin pain and hernia management applicable to all clinicians that manage groin pain and/or groin hernia. The findings support the idea that physical examination is more important than imaging when diagnosing groin pathology and that patients with ARGP have positive long-term outcomes.

Acknowledgements

Open access publishing facilitated by The University of Sydney, as part of the Wiley - The University of Sydney agreement via the Council of Australasian University Librarians.

Funding

The authors have nothing to report.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

References

1. A. Dimitrakopoulou and E. Schilders, "Current Concepts of Inguinal-Related and Adductor-Related Groin Pain," *Hip International* 26, no. 1 (2016): 2–7, <https://doi.org/10.5301/hipint.5000403>.

2. R. Taylor, Z. Vuckovic, A. Mosler, et al., "Multidisciplinary Assessment of 100 Athletes With Groin Pain Using the Doha Agreement: High Prevalence of Adductor-Related Groin Pain in Conjunction With Multiple Causes," *Clinical Journal of Sport Medicine* 28 (2018): 364–369, <https://doi.org/10.1097/JSM.0000000000000469>.
3. W. M. P. Heijboer, A. Weir, Z. Vuckovic, et al., "Inter-Examiner Reliability of the Doha Agreement Meeting Classification System of Groin Pain in Male Athletes," *Scandinavian Journal of Medicine & Science in Sports* 33 (2023): 189–196, <https://doi.org/10.1111/sms.14248>.
4. A. Palsson, I. Kostogiannis, H. Lindvall, and E. Ageberg, "Hip-Related Groin Pain, Patient Characteristics and Patient-Reported Outcomes in Patients Referred to Tertiary Care due to Longstanding Hip and Groin Pain: A Cross-Sectional Study," *BMC Musculoskeletal Disorders* 20 (2019): 432, <https://doi.org/10.1186/s12891-019-2794-7>.
5. The HerniaSurge Group, "International Guidelines for Groin Hernia Management," *Hernia* 22 (2018): 1–165, <https://doi.org/10.1007/s10029-017-1668-x>.
6. K. Mitura, M. Smietanski, S. Koziel, K. Garnysz, and I. Michalek, "Factors Influencing Inguinal Hernia Symptoms and Preoperative Evaluation of Symptoms by Patients: Results of a Prospective Study Including 1647 Patients," *Hernia* 22 (2018): 585–591, <https://doi.org/10.1007/s10029-018-1774-4>.
7. A. Weir, P. Brukner, E. Delahunt, et al., "Doha Agreement Meeting on Terminology and Definitions in Groin Pain in Athletes," *British Journal of Sports Medicine* 49 (2015): 768–774, <https://doi.org/10.1136/bjsports-2015-094869>.
8. Royal Australian College of Surgeons, "Choosing Wisely Guidelines NPS Medicinewise," 2016, <https://www.choosingwisely.org.au/recommendations/racs>.
9. M. L. Williams, A. S. E. McCarthy, S. J. Lord, T. Aczel, and G. L. Brooke-Cowden, "Impact of Ultrasound on Inguinal Hernia Repair Rates in Australia: A Population-Based Analysis," *ANZ Journal of Surgery* 91 (2021): 1604–1609, <https://doi.org/10.1111/ans.16845>.
10. B. M. Kraft, H. Kolb, B. Kuckuk, et al., "Diagnosis and Classification of Inguinal Hernias," *Surgical Endoscopy* 17 (2003): 2021–2024, <https://doi.org/10.1007/s00464-002-9283-y>.
11. M. C. Lilly and M. E. Arregui, "Ultrasound of the Inguinal Floor for Evaluation of Hernias," *Surgical Endoscopy* 16 (2002): 659–662, <https://doi.org/10.1007/s00464-001-8145-3>.
12. P. Robinson, E. Hensor, M. J. Lansdown, N. S. Ambrose, and A. H. Chapman, "Inguinofemoral Hernia: Accuracy of Sonography in Patients With Indeterminate Clinical Features," *AJR. American Journal of Roentgenology* 187 (2006): 1168–1178, <https://doi.org/10.2214/AJR.05.1251>.
13. B. Dallaudiere, B. Sylvain, N. Poussange, et al., "Ultrasound Feature Variants of the Adductor Longus Tendon in Asymptomatic Sportive Subjects: Management Implications," *European Journal of Radiology* 144 (2021): 109928, <https://doi.org/10.1016/j.ejrad.2021.109928>.
14. The Australian Institute of Health and Welfare (AIHW), "Musculoskeletal Conditions and Comorbidity in Australia. Arthritis Series," 2019, <https://www.aihw.gov.au/getmedia/e719c18d-d76d-46d2-b70a-a0b3c489afb4/aihw-phe-241.pdf?v=20230605184221&inline=true>.
15. D. O'Connor, N. Bhimani, A. Turner, and T. J. Hugh, "Clinical Examination of Musculoskeletal Groin Pain: A Simple Protocol for Hernia Surgeons (Groin-MAP)," *Hernia* 30 (2026): 191, <https://doi.org/10.1007/s10029-026-03693-9>.
16. K. Thorborg, M. P. Reiman, A. Weir, et al., "Clinical Examination, Diagnostic Imaging, and Testing of Athletes With Groin Pain: An Evidence-Based Approach to Effective Management," *Journal of Orthopaedic and Sports Physical Therapy* 48 (2018): 239–249, <https://doi.org/10.2519/jospt.2018.7850>.

17. General Surgeons Australia, "Curriculum: General Surgery Education and Training Program," 2021, <https://generalsurgeons.com.au/wp-content/uploads/2024/05/DOC-2021-01-01-Curriculum-Final.pdf>.
18. Z. Chu, B. Zheng, and L. Yan, "Incidence and Predictors of Chronic Pain After Inguinal Hernia Surgery: A Systematic Review and Meta-Analysis," *Hernia* 28 (2024): 967–987, <https://doi.org/10.1007/s10029-024-02980-7>.
19. A. Weir, J. A. Jansen, I. G. van de Port, H. B. Van de Sande, J. L. Tol, and F. J. Backx, "Manual or Exercise Therapy for Long-Standing Adductor-Related Groin Pain: A Randomised Controlled Clinical Trial," *Manual Therapy* 16 (2011): 148–154, <https://doi.org/10.1016/j.math.2010.09.001>.
20. K. Thorborg, P. Holmich, R. Christensen, J. Petersen, and E. M. Roos, "The Copenhagen Hip and Groin Outcome Score (HAGOS): Development and Validation According to the COSMIN Checklist," *British Journal of Sports Medicine* 45 (2011): 478–491, <https://doi.org/10.1136/bjsm.2010.080937>.
21. T. J. Crijs, A. Fatehi, B. Coopwood, D. Ring, and M. Tonn, "Asymptomatic Contralateral Inguinal and Ventral Hernias Among People With a Workers' Compensation Claim for Hernia," *Journal of Visceral Surgery* 159 (2022): 458–462, <https://doi.org/10.1016/j.jviscursurg.2021.09.008>.
22. G. N. Bisciotti, K. Chamari, E. Cena, et al., "The Conservative Treatment of Longstanding Adductor-Related Groin Pain Syndrome: A Critical and Systematic Review," *Biology of Sport* 38 (2021): 45–63, <https://doi.org/10.5114/biolosport.2020.97669>.
23. N. H. Dhanani, O. A. Olavarria, S. Wootton, et al., "Contralateral Exploration and Repair of Occult Inguinal Hernias During Laparoscopic Inguinal Hernia Repair: Systematic Review and Markov Decision Process," *BJS Open* 5 (2021): zraa020, <https://doi.org/10.1093/bjsopen/zraa020>.
24. A. Yousefzadeh, A. Shadmehr, G. R. Olyaei, N. Naseri, and Z. Khazaeipour, "The Effect of Therapeutic Exercise on Long-Standing Adductor-Related Groin Pain in Athletes: Modified Holmich Protocol," *Rehabilitation Research and Practice* 2018 (2018): 8146819, <https://doi.org/10.1155/2018/8146819>.
25. A. J. Sheen, B. M. Stephenson, D. M. Lloyd, et al., "'Treatment of the Sportsman's Groin': British Hernia Society's 2014 Position Statement Based on the Manchester Consensus Conference," *British Journal of Sports Medicine* 48 (2014): 1079–1087, <https://doi.org/10.1136/bjsports-2013-092872>.
26. L. M. Van den Dop, S. Van Egmond, J. Heijne, et al., "Twelve-Year Outcomes of Watchful Waiting Versus Surgery of Mildly Symptomatic or Asymptomatic Inguinal Hernia in Men Aged 50 Years and Older: A Randomised Controlled Trial," *EClinicalMedicine* 64 (2023): 102207, <https://doi.org/10.1016/j.eclinm.2023.102207>.
27. N. Jeyaraman, M. Jeyaraman, S. Ramasubramanian, S. Balaji, and S. Muthu, "Voices That Matter: The Impact of Patient-Reported Outcome Measures on Clinical Decision-Making," *World Journal of Methodology* 15 (2025): 98066, <https://doi.org/10.5662/wjm.v15.i2.98066>.
28. K. Andresen and J. Rosenberg, "Management of Chronic Pain After Hernia Repair," *Journal of Pain Research* 11 (2018): 675–681, <https://doi.org/10.2147/JPR.S127820>.
29. W. M. P. Heijboer, Z. Vuckovic, A. Weir, J. L. Tol, P. Hölmich, and A. Serner, "Clinical Examination for Athletes With Inguinal-Related Groin Pain: Interexaminer Reliability and Prevalence of Positive Tests," *BMJ Open Sport & Exercise Medicine* 9 (2023): e001498, <https://doi.org/10.1136/bmjsem-2022-001498>.
30. W. M. P. Heijboer, A. Weir, Z. Vuckovic, J. L. Tol, P. Holmich, and A. Serner, "Clinical Examination Tests for Adductor- and Pubic-Related Groin Pain in Athletes With Longstanding Groin Pain: Inter-Examiner Reliability and Prevalence of Positive Tests," *Physical Therapy in Sport* 66 (2024): 9–16, <https://doi.org/10.1016/j.ptsp.2023.12.008>.
31. P. Holmich, L. R. Holmich, and A. M. Bjerg, "Clinical Examination of Athletes With Groin Pain: An Intraobserver and Interobserver Reliability Study," *British Journal of Sports Medicine* 38 (2004): 446–451, <https://doi.org/10.1136/bjsm.2003.004754>.
32. A. Serner, A. Weir, J. L. Tol, et al., "Can Standardised Clinical Examination of Athletes With Acute Groin Injuries Predict the Presence and Location of MRI Findings?," *British Journal of Sports Medicine* 50 (2016): 1541–1547, <https://doi.org/10.1136/bjsports-2016-096290>.
33. F. J. Vandeputte, R. Driesen, A. Timmermans, and K. Corten, "Evaluation of Clinical Tests to Diagnose Iliopsoas Tendinopathy," *Clinical Orthopaedics and Related Research* 483 (2025): 2123–2132, <https://doi.org/10.1097/CORR.0000000000003520>.
34. M. P. Reiman, A. P. Goode, C. E. Cook, P. Holmich, and K. Thorborg, "Diagnostic Accuracy of Clinical Tests for the Diagnosis of Hip Femoroacetabular Impingement/Labral Tear: A Systematic Review With Meta-Analysis," *British Journal of Sports Medicine* 49 (2015): 811, <https://doi.org/10.1136/bjsports-2014-094302>.
35. H. J. Wong, C. Oh, and S. Towfigh, "Hidden Hernias Hurt: A Plea for Early Diagnosis and Treatment of Occult Inguinal Hernias," *Surgical Endoscopy* 38 (2024): 7525–7530, <https://doi.org/10.1007/s00464-024-11253-4>.
36. I. Tak, R. M. P. Langhout, B. M. Bertrand, et al., "Manual Therapy and Early Return to Sport in Football Players With Adductor-Related Groin Pain: A Prospective Case Series," *Physiotherapy Theory and Practice* 36 (2020): 1009–1018, <https://doi.org/10.1080/09593985.2018.1531096>.
37. S. Nazari, S. M. Sohani, J. Sarrafzadeh, H. Angoorani, and A. Tabatabaei, "The Effects of TECAR Therapy on Pain, Range of Motion, Strength and Subscale of HAGOS Questionnaire in Athletes With Chronic Adductor Related Groin Pain: A Randomized Controlled Trial," *BMC Musculoskeletal Disorders* 26 (2025): 76, <https://doi.org/10.1186/s12891-025-08304-9>.
38. H. Reistrup, S. Fonnes, and J. Rosenberg, "Watchful Waiting vs. Repair for Asymptomatic or Minimally Symptomatic Inguinal Hernia in Men: A Systematic Review," *Hernia* 25 (2021): 1121–1128, <https://doi.org/10.1007/s10029-020-02295-3>.