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Original Research

Ischiofemoral Impingement: Assessment of Diagnosis through MRI and Physical Examination

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ABSTRACT
Objective: The objective of this study is to assess the precision of physical examination tests in individuals diagnosed with ischiofemoral impingement syndrome (IFI), analyze magnetic resonance imaging (MRI) findings and measurements, and explore the correlation between imaging methods and physical examination tests.

Methods: The MRIs of 27 hips of 20 patients who have presented with complaints of hip/groin pain in the study group and 40 hips of 20 patients in the control group were analyzed. Patients were evaluated for the severity of pain, clinical findings, and physical examination tests. Quadratus femoris muscle (QFM) edema was graded and quadratus femoris space (QFS), hamstring tendon area (HTA) and especially ischiofemoral space (IFS), were measured on MRI.

Results: Both the IFS (12.44±3.49) and QFS (6.38±2.09) were significantly reduced in the study groups compared to the control groups (IFS:23.06±4.5, $p<0.001$; QFS:15.36±4.45, $p<0.001$). Measurements of the IFS (cut-off:≤18.58) and the QFS (cut-off:≤10.27) demonstrated high specificity (87.5%) and sensitivity (100%) in identifying IFI. The long-step walking (LSW) test was positive in 59.3% of cases.

Conclusion: The results suggest that MRI is a valuable tool for providing detailed information on various aspects related to IFI. It allows for the assessment of the narrowing of the IFS and QFS, as well as the presence of edema. MRI, when combined with LSW test, can contribute to a comprehensive evaluation and diagnosis of IFI, enabling clinicians to gather important clinical and radiological data for accurate assessment.

Keywords: Hip pain, Long-step walking test, Ischiofemoral impingement, Physical examination, Magnetic resonance imaging, Quadratus femoris muscle

INTRODUCTION

In patient experiencing hip pain, the condition arising from compression of the quadratus femoris muscle (QFM) within the ischiofemoral space (IFS) is referred to as ischiofemoral impingement syndrome (IFI) [1]. The compression of the muscle induces localized pain in the hip, aggravate by hip adduction, extension, and external rotation [2]. The IFS is defined as the distance between the ischial tuberosity of the ischium and the lesser trochanter of the femur, which is covered by the QFM [1]. The QFM is the strongest external rotator muscle of the thigh, and its proximity to the sciatic nerve highlights its importance [3]. This compression can result in pain in the back of the hip and/or groin, which can radiate towards the knee. The duration of pain can last for several months or years and gradually increases. Symptoms such as a sensation of snapping, joint locking, and difficulties while walking may accompany the pain, particularly during hip extension [4].

IFI was initially delineated by Johnson in a series of three cases [2]. Subsequent case reports [5, 6] emphasized the importance of conducting further investigations into this condition. In 2009, Torriani et al. [1] conducted a study which proposed that the disease could potentially have congenital origins, implying that certain anatomical factors present from birth may contribute to the development of the condition. When the IFS is narrowed due to congenital or acquired causes, the QFM is compressed in this space.

While imaging parameters have been the primary focus in defining IFI, a comprehensive physical examination of the hip serves as a valuable tool in identifying affected patients. Despite the lack of specific physical examination tests for IFI for many years, Gomez-Hoyos et al. [7] introduced the long stride test (LSW) and the IFI test in their study. However, the non-specific symptoms associated with IFI have contributed to its underrecognition among clinicians [5].

The objective of this study is to determine the characteristics of groin pain in patients with a narrowed IFS and to explore the relationship between pain, physical examination tests, and imaging parameters. Additionally, the study aims to analyze the magnetic resonance imaging (MRI) measurements and findings, and investigate the IFS as well as various anatomical parameters that may be associated with this syndrome.

Main Points:

- Ischiofemoral and quadratus femoris spaces exhibit high specificity (87.5%) and sensitivity (100%) for identifying ischiofemoral impingement syndrome, with cut-off values of ≤18.58 and ≤10.27, respectively.
- The affected group demonstrated significantly reduced ischiofemoral and quadratus femoris spaces compared to the control group ($p<0.001$).
- A positive long-stride walking test was associated with significantly reduced ischiofemoral space ($p<0.05$), suggesting that this test could potentially serve as a valuable diagnostic tool for the condition.

MATERIALS AND METHODS

The study was conducted utilizing cases that sought consultation at the Physical Therapy and Rehabilitation outpatient clinic and underwent MRI between the years 2013 and 2022. Ethical approval for the study was obtained from the Local Ethics Committee of the Faculty of Medicine, with the approval number 2022/115. Primarily, a statistically appropriate sample size was determined. A power analysis was conducted using G Power 3.1.9.4, which determined that a sample size of 20 subjects was needed for both the study and control groups. Individuals aged 18 and above with complaints of hip/groin pain and evidence of edema in the QFM on MRI were screened. Physical examinations and patient histories, conducted by an experienced physiatrist, were scrutinized. Subsequently, a study group comprising 27 hips from 20 cases (7 bilateral, 13 unilateral) with both LSW and IFI tests in their records was identified. Patients who had previously undergone pelvic surgery, recently experienced trauma, a lesion or tumor occupying the pelvic region, cancer in the pelvic area or metastasis to the bone or had inflammatory diseases affecting the pelvis were excluded from the study group. The exclusion criteria for the control group were the same as for the study group. In the control group, 40 hips of 20 cases without hip pain, no history of hip trauma or developmental deformities on imaging, and normal bone structure in the hip were included in the study.

In this study, pelvic or hip MRIs were assessed using axial fast spin-echo (FSE) fat-suppressed, proton density-weighted, axial FSE proton density-weighted T2-weighted, and axial T1-weighted images acquired with a 1.5T scanner (Aera, Siemens Healthcare, Erlangen, Germany) with a slice thickness of 5 mm. Routine hip MRI examinations were conducted by hospital procedures, with patients positioned neutrally; their hips and knees facing upward, and feet positioned close together.

IFS (Fig. 1) and quadratus femoris space (QFS) (Fig. 2) were measured according to the definition provided by Torriani et al. [1]. The edema in QFM was graded according to the classification system developed by Tosun et al. [5]. All three measurements were performed in the same axial plane, and T2-weighted images were particularly used for edema grading (Fig. 3).

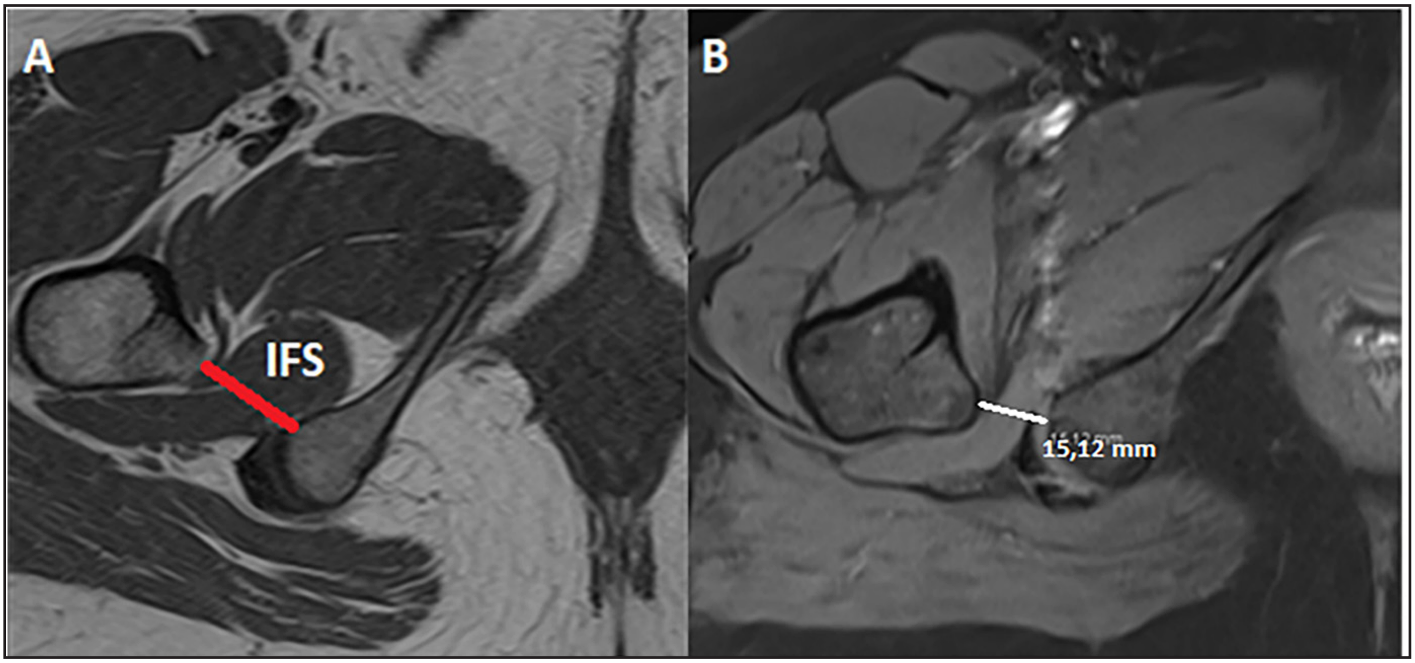

Figure 1. A Patient in the control group with a normal ischiofemoral space (IFS) in the axial plane as seen on the magnetic resonance imaging (MRI) (straight red line) and **B** The IFS measurement was acquired from the MRI of a female patient, aged 47, who presented with pain in her right hip. The patient exhibited positive results in the ischiofemoral impingement (IFI) and the long-step walking (LSW) tests

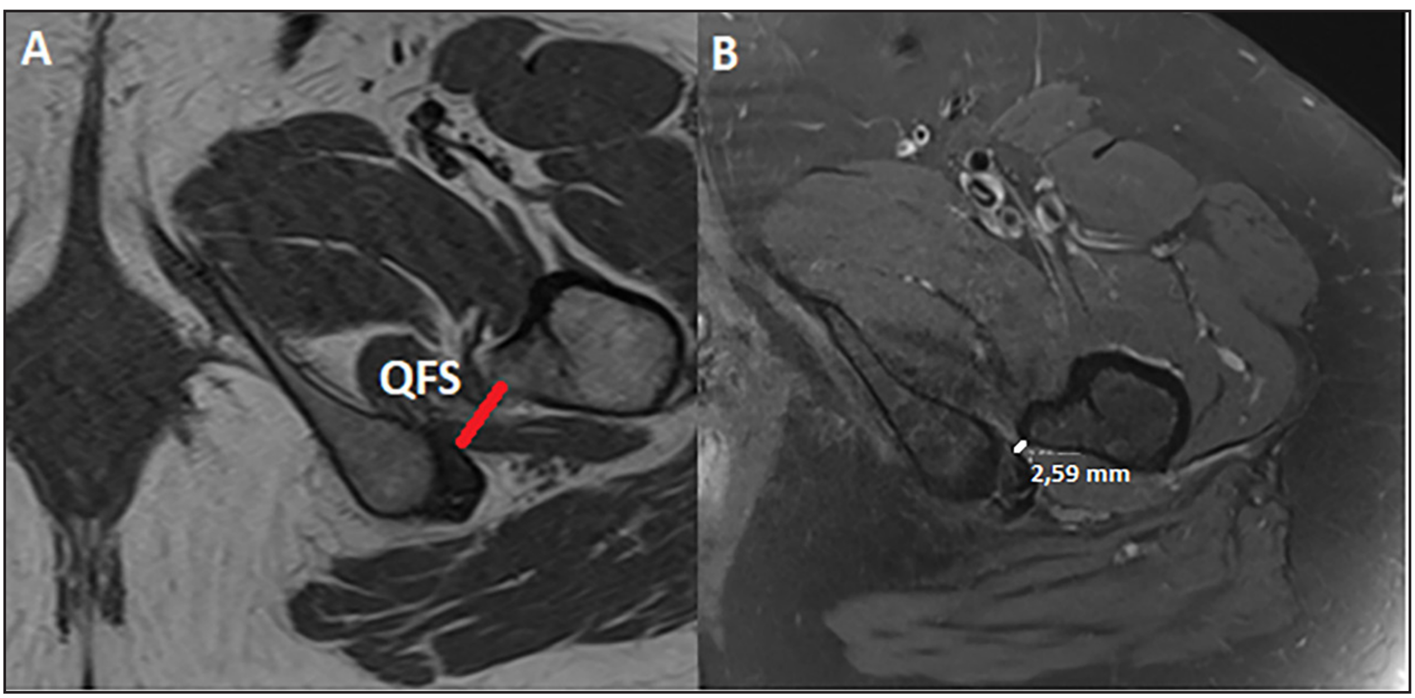

Figure 2. A Patient in the control group with a normal quadratus femoris space (QFS) in the axial plane as seen on the magnetic resonance imaging (MRI) (straight red line) and **B** The QFS measurement was acquired from the MRI of a female patient, aged 57, who reported left groin pain. The patient yielded a negative result in the ischiofemoral impingement (IFI) test and a positive result in the long-step walking (LSW) test

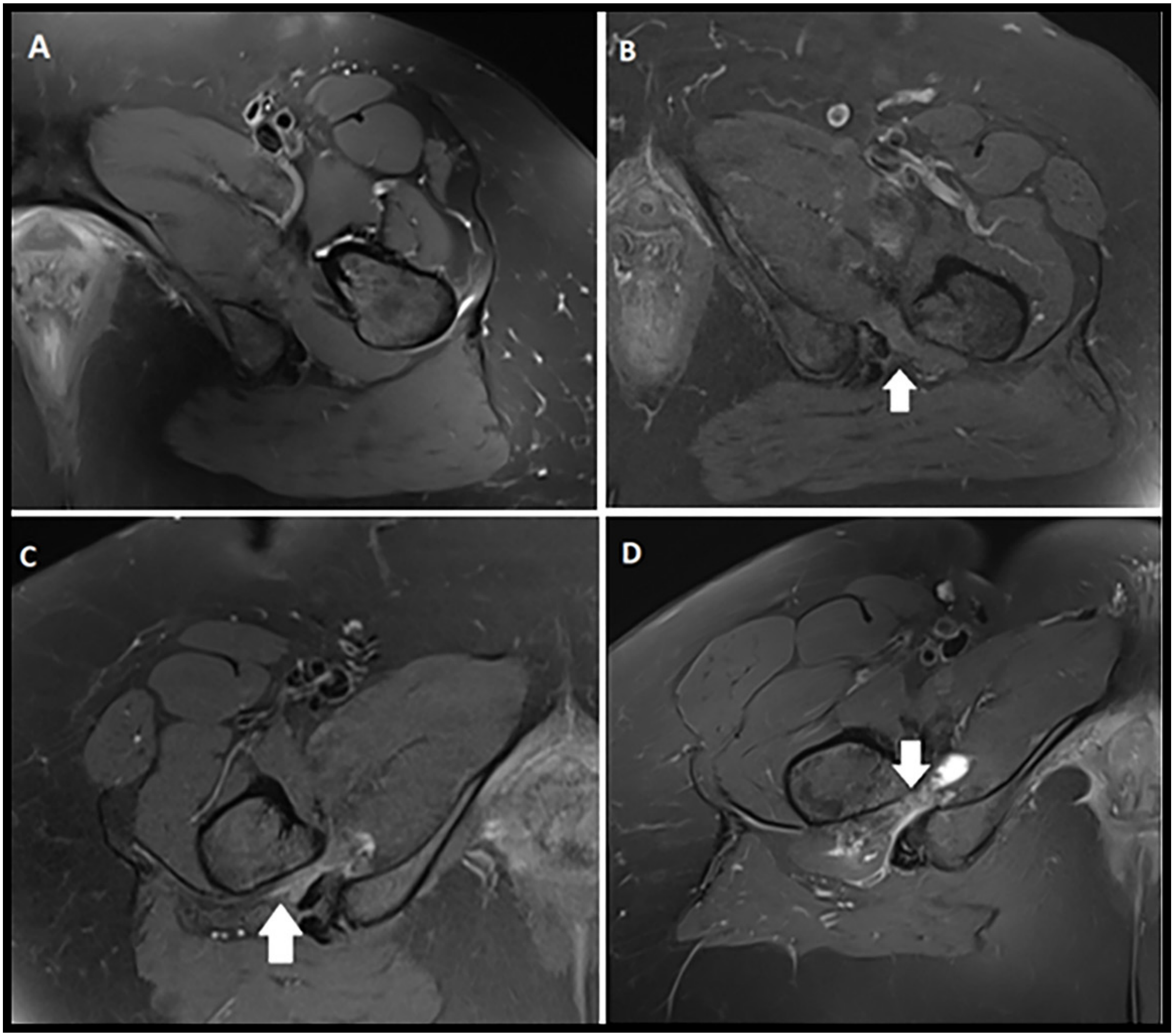

Figure 3. Grading of edema in the quadratus femoris muscle (QFM) on axial T2 MRI: **A** Grade 0 (no edema), **B** Grade 1 (mild edema), **C** Grade 2 (moderate edema), **D** Grade 3 (severe edema). White arrows indicate the location of the edema

According to this classification:
Grade 0 (none): Normal QFM density,
Grade 1 (mild): Presence of focal edema within the muscle,
Grade 2 (moderate): Presence of edema that spreads outside the area where IFS is measured but remains within the muscle,
Grade 3 (severe): Presence of edema that extends into the surrounding soft tissues.

The area where the tendons of the biceps femoris, semimembranosus, and semitendinosus muscles connect to the ischial tuberosity is referred to as the hamstring tendon area (HTA). The HTA was calculated on the axial plane of the MRI at the level where IFS and QFS were measured (Fig. 4).

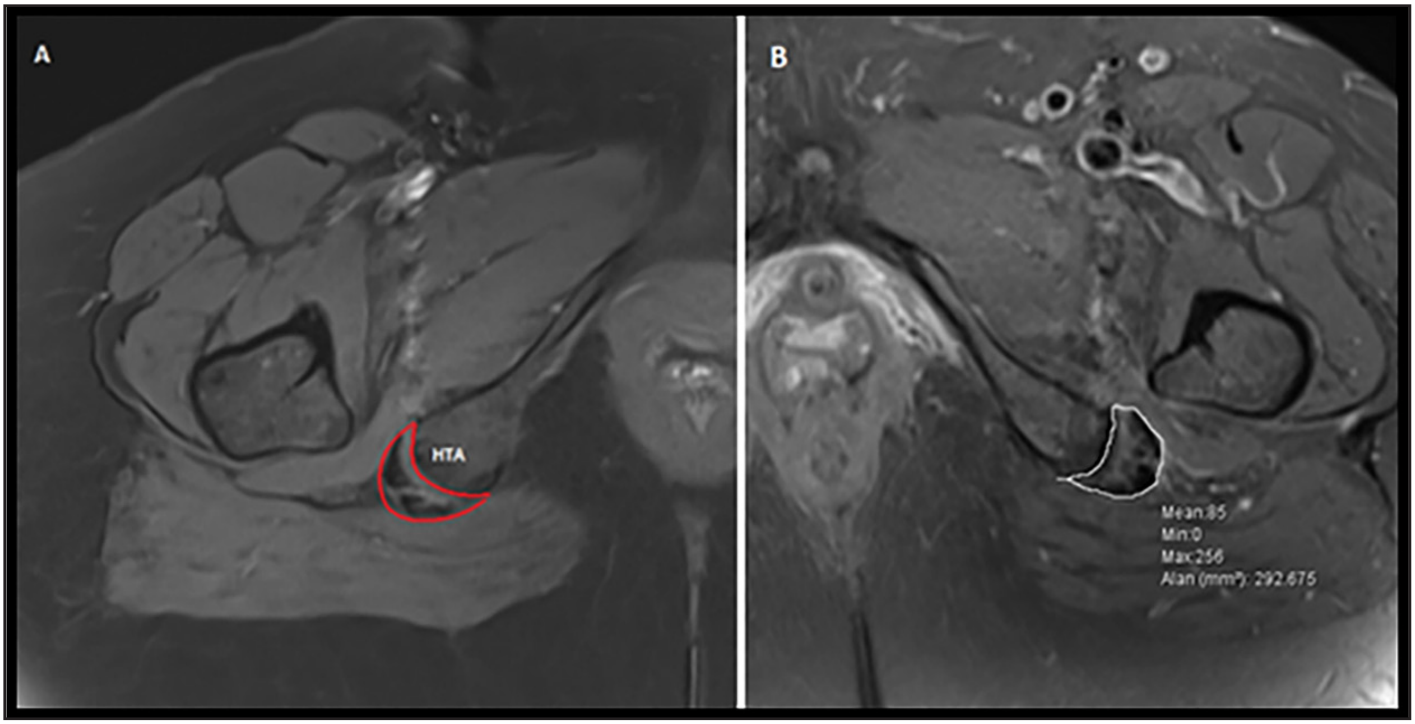

Figure 4. A Depiction of the hamstring tendon area (HTA) in the axial plane through magnetic resonance imaging (MRI), demarcated by red delineations and **B** Quantitative measurement of the HTA was derived from the MRI of a female patient, aged 59, who reported left groin pain. The patient demonstrated a negative result in the ischiofemoral impingement (IFI) test and a positive result in the long-step walking (LSW) test

In the LSW test, the anticipation is that the patient will experience hip pain when taking long strides, and a decrease in pain is expected when short strides are taken. In the IFI test, it is expected that the patient will experience pain when the affected hip is brought into adduction and extension while in positioned on healthy side, and a decrease in pain is anticipated during abduction.

An assessment was conducted by thoroughly examining the medical records of each patient to determine the positive and negative results of the LSW and IFI tests. Additionally, the study involved specifying the location and intensity of pain experienced by each patient, as well as determining the duration of the reported pain. To evaluate the frequency and intensity of pain during both movement and rest, the visual analog scale (VAS) was employed. Additionally, the severity of nocturnal pain was assessed as part of the evaluation process.

Statistical Analysis

The normality of the distribution of numerical variables was assessed using the Shapiro-Wilk test. When comparing normally distributed variables between two groups, the Student's t-test was utilized, while the Mann-Whitney U test was applied for non-normally distributed variables. The chi-square test was employed to examine the associations between categorical variables, whereas the Spearman rank correlation coefficient was used to determine the connections between numerical variables. The Intraclass correlation coefficient and Kappa test were employed to evaluate intra-observer agreement for numerical and categorical variables, respectively. ROC analysis was performed to establish the cutoff point for the IFS and QFS variables. The statistical analysis was conducted using SPSS 22.0 Windows version software. A p-value <0.05 was considered statistically significant.

RESULTS

In our study, a total of 67 hips from 40 individuals were evaluated, including 27 hips from 20 patients in the study group and 40 hips from 20 individuals in the control group. The ages of the patients in the study group ranged from 27 to 71 years (53.93±10.94), with 18 (90%) females and 2 (10%) males. The ages of the individuals in the control group ranged from 30 to 71 years (51.35±13.51), with 18 (90%) females and 2 (10%) males. No statistically significant differences were observed between the study and control groups in terms of age, gender, and side (right-left) (p>0.05). Bilateral involvement was observed in 7 (35%) of the 20 patients in the study group.

Radiological measurements of IFS, QFS, and HTA were performed in the MRI examination of 27 hips in the study group and 40 hips in the control group. The IFS and QFS were significantly reduced in the study group compared to the control group (p<0.001). However, there was no significant difference between the study and control groups in terms of HTA (p>0.05) (Table 1).

The degree of edema in the QFM was graded in the study group. Among the cases, Grade 1 edema was observed in 13 cases (48.1%), Grade 2 edema in 12 cases (44.4%), and Grade 3 edema in 2 cases (7.4%).

The mean values of the parameters for the right and left sides in the study and control groups were calculated to determine the side-specific differences in the IFS, QFS, and HTA parameters. No statistically significant difference was found in these parameters according to the side (p>0.05).

To ensure the reliability and accuracy of the study, all measurements were conducted twice by the same researcher at specified time intervals. The mean value of the measurements was then utilized for statistical analysis. In order to evaluate the intra-observer agreement and assess the reliability of the radiological parameters, intraclass correlation coefficients (ICC) were calculated. The ICC was 0.974 for the IFS and 0.985 for the QFS. The ICC values indicate a high level of agreement and consistency in the measurements (Table 2).

Table 1. Mean, minimum and maximum values (mm, mm²) of IFS, QFS, and HTA in the study and control groups.

	Study Group n=27			**Control Group n=40**			
	Mean±SD	**Min.**	**Max.**	**Mean±SD**	**Min.**	**Max.**	**p**
IFS-1	12.34 ± 3.66	5.29	19.84	23.33 ± 4.64	15.00	35.27	0.001*†
IFS-2	12.55 ± 3.39	4.77	18.10	22.78 ± 4.53	14.30	35.60	0.001*†
IFS Mean	12.44 ± 3.49	5.03	18.58	23.06 ± 4.5	14.65	35.44	0.001*†
QFS	6.59 ± 2.16	2.96	10.27	15.46 ± 4.67	5.97	28.43	0.001*†
QFS-2	6.17 ± 2.09	2.59	10.27	15.26 ± 4.29	7.07	28.03	0.001*†
QFS Mean	6.38 ± 2.09	2.78	10.27	15.36 ± 4.45	7.21	28.23	0.001*†
HTA-1	253.53 ± 61.96	164.99	361.33	258.12± 56.95	125.27	373.54	0.557‼
HTA-2	259.95± 55.22	180.45	357.88	255 ± 60.94	145.72	376.28	0.636‼
HTA Mean	256.74± 57.67	177.00	359.60	256.56 ± 58.25	135.50	374.91	1.000‼

* Significant at the p<0.05 level. SD: Standard Deviation. †Student t test. ‼Mann Whitney U test. IFS, QFS, HTA-1: Initial measurement of the observer. IFS, QFS, HTA-2: Second measurement of the observer. IFS, QFS, HTA-mean: Average of the first two values.

Table 2. Intraobserver reliabilities of IFS, QFS and HTA in the study and control groups

		IFS	**QFS**	**HTA**
Study Group	**ICC**	0.955	0.933	0.931
	95% CI	0.905-0.979	0.858-0.969	0.855-0.968
	p	<0.001	<0.001	<0.001
Control Group	**ICC**	0.928	0.969	0.951
	95% CI	0.827-0.961	0.941-0.983	0.910-0.974
	p	<0.001	<0.001	<0.001
Overall	**ICC**	0.974	0.985	0.940
	95% CI	0.957-0.984	0.976-0.991	0.904-0.963
	p	<0.001	<0.001	<0.001

ICC: Intraclass correlation coefficient, CI: Confidence interval

To diagnose IFI, the specificity, sensitivity, and predictive values of the radiological parameters were calculated (Fig. 5). Information was obtained about the clinical characteristics of the patients in the study group, including the presence and distribution of groin/hip pain, the duration of the pain (Fig. 6), and pain severity evaluated using the VAS (Table 3). In terms of pain duration, a majority of patients (51.9%) reported pain that lasted throughout the day. On the other hand, 37% of patients experienced pain episodes lasting less than half an hour, and 11% reported pain lasting an average of 1-2 hours.

Two physical examination tests (IFI; LSW) applied to the cases in the study group were evaluated. The IFI test and LSW test were positive in 12 cases (44.4%) and 16 cases (59.3%), respectively, with a higher positivity rate for the LSW test. IFS was significantly narrower in those who tested positive on the LSW test ($p<0.05$). There was no significant relationship between the LSW test and the radiological parameters QFS and HTA ($p>0.05$). The relationships between variables in the study and control groups were analyzed separately. In the study group, a moderate positive correlation was found between the severity of pain at rest, during activity and night pain intensity ($r=0.520$, $p=0.005$; $r=0.403$, $p=0.037$, respectively). Additionally, a moderate negative correlation was observed between edema and IFS in the study group ($r=-0.471$, $p=0.013$). In the control group, a significant positive correlation was found between IFS and QFS ($r=0.763$, $p=0.001$). Furthermore, a very strong positive correlation was observed between IFS and QFS in all cases of the study ($r=0.885$, $p=0.001$) (Fig. 7).

Table 3. The mean, minimum and maximum values of pain intensity according to VAS during activity, rest, and night in the study group.

	Mean±SD n=27	Median (Min-Max) n=27
The intensity of pain during activity	6.07 ± 2.18	6 (0 -10)
The intensity of pain during rest	3.78 ± 2.74	3 (0 -9)
The intensity of pain during the night	4.89 ± 2.56	5 (0 -10)

SD: Standard Deviation

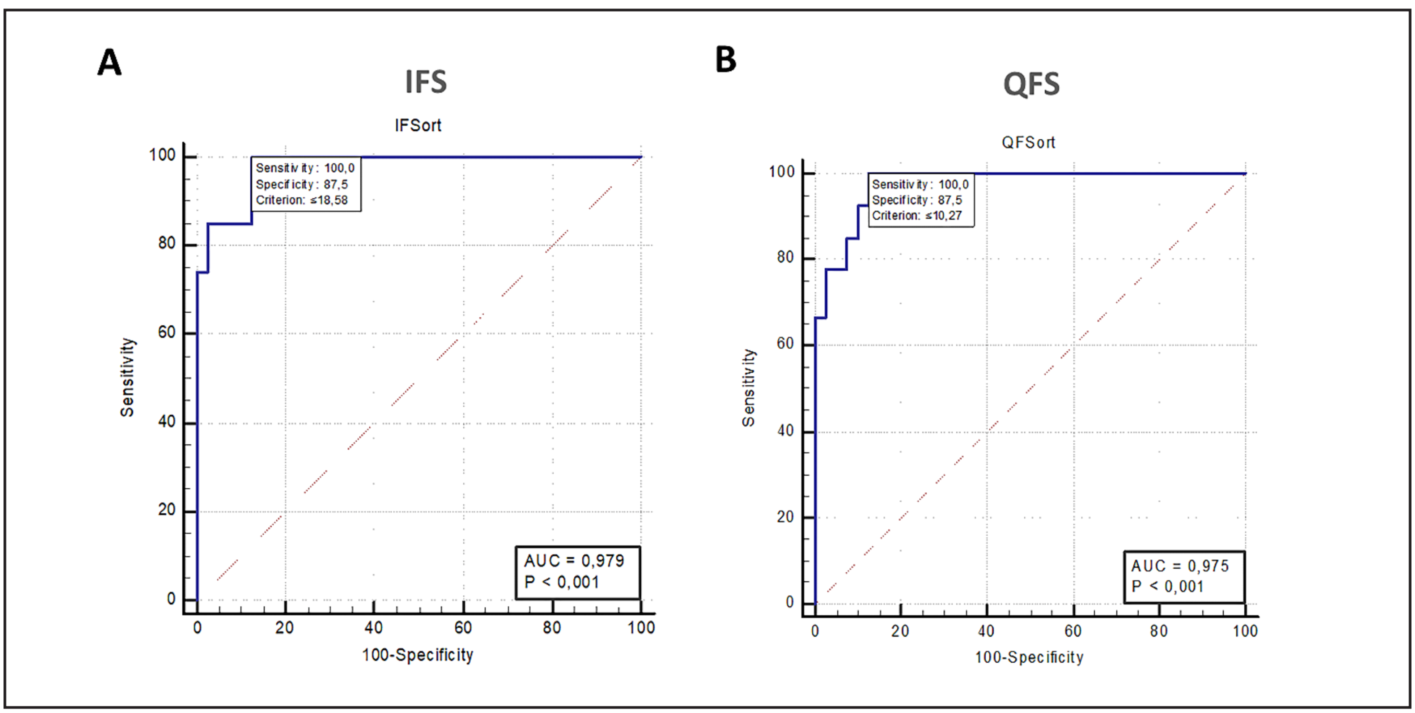

Figure 5. Specificity and sensitivity of **A** ischiofemoral space (IFS) and **B** quadratus femoris space (QFS) for ischiofemoral impingement syndrome (IFI)

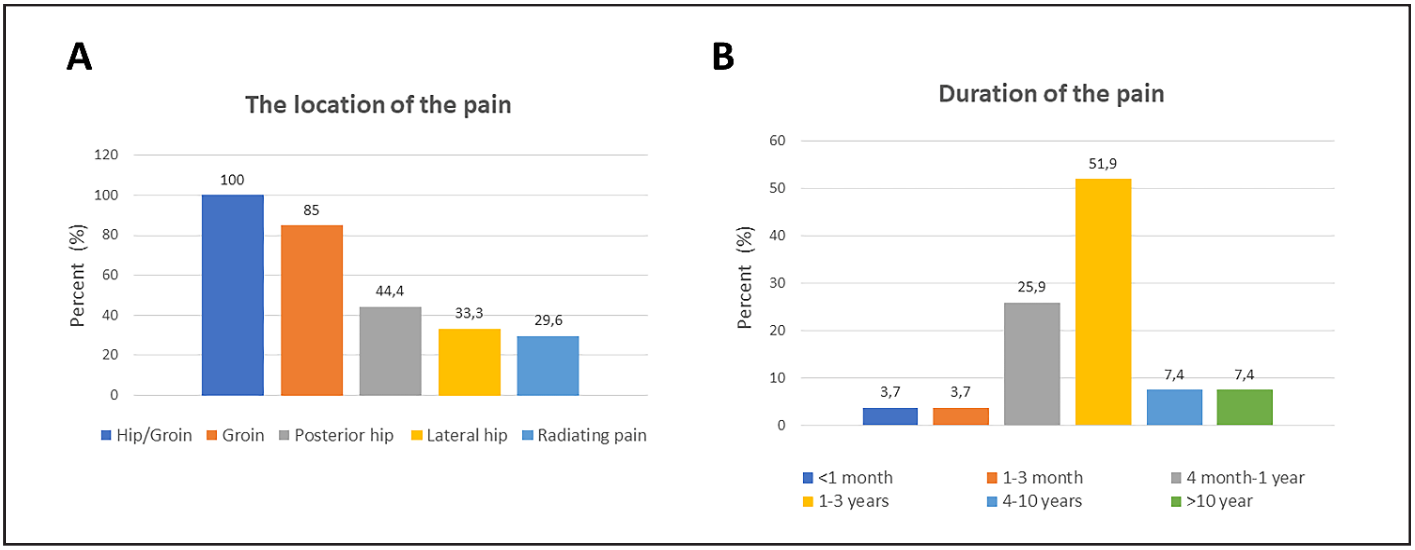

Figure 6. **A** Distribution and percentage of pain locations in cases, **B** Pain duration grouped by months and years

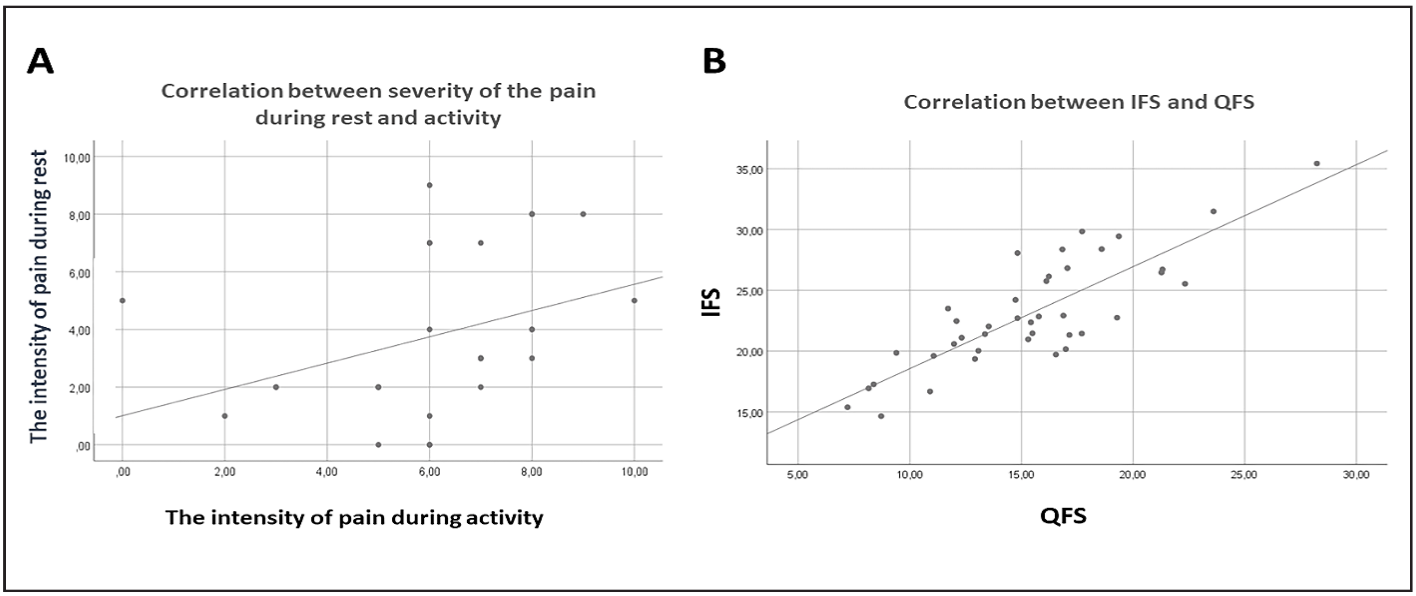

Figure 7. **A** Correlation between pain intensity during activity and rest, **B** Correlation between ischiofemoral space (IFS) and quadratus femoris space (QFS) in the control group

DISCUSSION

Hip/groin pain is a common symptom seen in many diseases, such as piriformis syndrome, hamstring tendinopathy, lumbar disc disease, spinal stenosis, and IFI [8]. Although IFI is less known, it is crucial for clinicians to be aware of it when diagnosing, as it can be confused with other illnesses. In our study, we aimed to explore the MRI findings in patients diagnosed with IFI, examine the relationship between physical examination tests and imaging methods, and identify the clinical characteristics associated with IFI.

Some studies have found that the occurrence of IFI is more common in women, while others have reported that the disease can also affect men [1, 2, 5, 9-11]. Similar to other studies in the literature, the number of women in our study has found to be higher. This gender difference is mainly attributed to the anatomical differences in the pelvis, such as a wider pelvic outlet and higher intertuberosity distance in women [12, 13]. Despite a limited understanding of the disease's etiology, it has been determined that certain causes are gender-neutral, independent of female anatomy. Other factors, including prominent lesser trochanter, coxa valga, and abnormal femoral anteversion, may also contribute to the development of the disease [14, 15].

The phenomenon of bilateral occurrence of IFI has been reported in various studies, indicating the possibility of congenital causes [1, 10, 12]. In our study, 35% of the patients exhibited bilateral symptoms, which supports the idea that there may be congenital factors contributing to the development of IFI. In the literature, the IFS has been used as an indicator of the degree of impingement by measuring the narrowing of the area where the QFM is compressed. However, it should be noted that the reduction of the IFS may also lead to a decrease in the width of the QFS. Despite this, several anatomical variations in the IFS can cause QFS narrowing without a corresponding reduction in the IFS [1]. Therefore, both IFS and QFS have been examined in studies as important parameters (Table 4) [1, 5, 7, 9, 10-12, 16-19]. Our findings, consistent with the literature, showed that the affected group demonstrated significantly reduced IFS and QFS compared to the control group.

In his study, Johnson [2] reported that the space enabling femoral rotation without contacting the ischial tuberosity during adduction, external rotation, and extension of the hip joint is approximately 20 mm. This finding has been further investigated by various researchers, particularly in relation to the use of IFS and QFS for predicting IFI. Singer et al. [16] conducted a meta-analysis of 357 cases, in which they evaluated the predictive values of IFS and QFS for IFI. Consistent with previous literature, we demonstrated that the predictive values for IFS and QFS were ≤18.58 and ≤10.27, respectively, with high sensitivity and specificity, as summarized in Table 5 [1,5,11,16].

Table 4. Studies in the literature on IFI

Study	Method	Groups	n	Age	Gender	IFS	QFS
Torriani et al. (2009) [1]	MRI	Study group	12	53 (30–71)	9F	13 ± 5	7 ± 3
		Control group	11	67 (24–95)	10F	23 ± 8	12 ± 4
Tosun et al. (2012) [3]	MRI	Study group	70	51 (14–77)	42F/8M	13.05 ± 3.87	6.91 ± 2.63
		Control group	38	47 (18–66)	25F/5M	21.95 ± 5.91	13.42 ± 4.78
Bredella et al. (2014) [12]	MRI	Study group	97	53 (18–84)	73F/11	17.4 ± 5.5	12 ± 4.5
		Control group	71	52 (22–84)	33F/18M	30.6 ± 9.3	19.3 ± 7.1
Khodair et al. (2014) [11]	MRI	Study group	14	35.2 (24–49	12F/2M	15 ± 1.8	20.5 ± 1.3
		Control group	54	34 (24–48)	17F/3M	20.7 ± 1.4	15 ± 0.9
Singer et al. (2015) [16]	MRI	Study group	24	52.4 ± 2.28	18F/3M	12.91 ± 3.82	9.94 ± 3.39
		Control group	5			17.58 ± 3.28	12.86 ± 2.81
Gomez-Hoyos et al. (2016) [7]	MRI	Study group	17	46.7 ± 13.7	14F/3M	11.2 ± 3.7	6.4 ± 2.2
		Control group	13	53.7±11.2	7F/6M	25.3 ± 7.6	16.3 ± 6.6
Akça et al. (2016) [9]	MRI	Study group	30	49.5 ± 14.45	17F/3M	16.85 ± 4.9	7.05 ± 2.1
		Control group	25	43 ± 13.98	11F/6M	26.98 ± 7.9	16.32 ± 3.64
Stenhouse et al. (2016) [17]	MRI	Study group	12	10 (4–16)	7F/2M	11.5	7.2
		Control group	13	9.8 (3–16)	10F/3M	20.7	14.3
Kivlan et al. (2017) [19]	Cadaver	Dissection	25	46–91	7F/7M	28 ± 11	
Özdemir et al. (2021) [18]	MRI	Study group	24	56 ± 10.2	24F	11.1	6.3
		Control group	27	55.2 ± 11.1	27F	20.1	12
Xing et al. (2021) [10]	MRI	Study group	91	58.1 ± 10.9	43F/15M	15.2 ± 3.9	8.9 ± 2.4
		Control group	122	53.5 ± 13.2	44F/17M	24.2 ± 4.1	16.4 ± 4
The present study	MRI	Study group	27	53.93 ± 10.94	18F/2M	12.44 ± 3.49	6.38 ± 2.09
		Control group	40	51.35 ± 13.51	18F/2M	23.06 ± 4.5	15.36 ± 4.45

Table 5. Studies in the literature on the sensitivity and specificity of IFS and QFS used in IFI

Study Name		Cut-off value	Sensitivity (%)	Specificity (%)
Torriani et al. (2009) [1]	**IFS**	≤ 17	83	82
	QFS	≤ 8	83	82
Tosun et al. (2012) [3]	**IFS**	≤ 18.05	91.43	78.95
	QFS	≤10.3	91.43	78.95
Khodair et al. (2014) [11]	**IFS**	≤17	98.1	100
	QFS	≤13	96.2	100
Singer et al. (2015) [16]	**IFS**	≤15	76.9	81
	QFS	≤10	78.7	74.1
Present study	**IFS**	≤18.58	100	87.5
	QFS	≤10.27	100	87.5

In the study of Tosun et al. [5], HTA was found to be significantly higher in the study group, but the sensitivity and specificity of the test were found to be lower. In contrast, Stenhouse et al. [17] conducted a study on children and found no significant difference between the patient and control groups. Park et al. [20] reported similar findings in their study on adult patients. Likewise, we demonstrated no significant difference between the patient and control groups. The sensitivity and specificity of HTA were determined to be 37.04% and 47.5%, respectively. These findings suggest that there may not be a relationship between HTA and IFI. Due to the lack of significant relationships between the study and control groups in most studies in the literature, as well as differences between studies, we believe that HTA may not be a reliable parameter for diagnosing the disease.

The VAS to assess pain has been limited to a few studies available in the literature, and these studies have employed diverse parameters for evaluation [7, 18]. In our study, we took a different approach by utilizing the VAS to evaluate the presence and severity of pain in patients during rest and at night. Our findings indicate that the severity of pain was highest during movement and decreased during periods of rest and at night. These results align with the expected outcomes of physical examination tests, as movement can increase the likelihood of narrowing in the IFS, which in turn triggers pain. Furthermore, the persistence of movement can exacerbate the duration of pain experienced by the patient. Our findings highlight the dynamic nature of pain experienced by individuals with IFI, with movement playing a significant role in its intensity.

The lack of a definitive physical examination test for diagnosing IFI has led researchers to investigate various approaches. Johnson [2] and subsequently Hatem et al. [21] described localized pain in the hip and groin that increases with hip adduction, external rotation, and extension. Expanding on these studies, Gomez-Hoyos et al. [7] conducted a study on the specificity and sensitivity of two physical examination tests. Furthermore, IFS measurements have been taken at various angles and positions to confirm this condition [19, 22-23]. For instance, Kivlan et al. [19] measured IFS during external rotation, extension, flexion, internal rotation, adduction and abduction. Finoff et al. [23] found that IFS was lowest during hip external rotation, extension and adduction. Despite some inconsistencies with prior literature, we explored that the LSW test was more effective in the diagnosis of IFI. It is important to note that physical examination tests, while not guarantee diagnostic precision, can still serve as valuable tools in aiding the diagnosis process and providing guidance to clinicians.

Our findings revealed a moderate positive correlation between the severity of pain during movement and the severity of pain at rest in the study group. This indicates that there was a parallel increase in pain intensity in both scenarios. Furthermore, a moderate negative correlation was observed between the severity of QFM edema and the severity of pain during movement and at rest. These findings suggest that the presence of QFM edema may contribute to the severity of pain experienced by patients, both during movement and at rest.

Limitations

It should be noted that the retrospective design of our study limits its generalizability. Specifically, the exclusion of asymptomatic patients and the use of patients without hip pain as the control group may have introduced bias. Furthermore, the selection of individuals without hip pain from the medical system as the control group instead of healthy individuals may limit the scope of our findings. Moreover, the absence of a control group for physical examination is another limitation. In routine clinical practice, patients without hip pain are typically not subjected to thorough physical examination, thus hindering the availability of a suitable control group for comparison.

CONCLUSIONS

In conclusion, pain is a significant symptom that has a considerable impact on the quality of life for patients, and identifying its underlying cause can be a challenging task for clinicians. IFI should be included in the list of potential differential diagnoses for individuals experiencing hip/groin pain. Our study makes a valuable contribution to the existing literature by conducting a thorough analysis of pain characteristics, evaluating the usefulness of physical examination tests, and investigating the relevance of radiological parameters in the diagnosis of IFI. We believe that the findings of our study provide valuable insights into different aspects of the disease, thereby enhancing the understanding and management of IFI.

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Ethical Approval: This study involving human participants was conducted in accordance with the ethical standards established by the institutional and national research committee, following the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Ethical approval for the study was obtained from the Local Ethics Committee of the Selcuk University Faculty of Medicine, with the approval number 2022/115.

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