

Detection of Inguinal Hernia in Patients with Groin Pain on Ultrasound

Muhammad Arif Afridi^{1*}, Imran Khan¹, Adnan Ahmed², Ibrar Ahmad¹, Mehmood Khan¹, Malik Mairaj Khalid³

¹Khyber Medical University, Peshawar Pakistan

²Helping Hand Institute of Rehabilitation Sciences, Abbottabad, Pakistan

³Bolan Medical College, Quetta, Pakistan

*Corresponding Author

Muhammad Arif Afridi
drarifafri@gmail.com

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Abstract

Objective: To establish ultrasound's contribution to precise diagnosis and to differentiate between inguinal hernia from other diseases in patients with groin pain.

Methodology: This descriptive cross-sectional study was conducted in Hayatabad Medical Complex, Peshawar from January to June 2023, with permission of Research Board Ethics Committee. The inclusion criteria comprised patients of all ages and genders with right or left lower quadrant pain suspected of having a hernia. Exclusion criteria included patients who had undergone other ultrasound examinations for lower quadrant pain, diagnosed male prostatic pain, and pregnant women with groin pain. Data collection involved the use of a self structured questionnaire after obtaining ethical approval and informed consent.

The collected data was analysed using SPSS version 25. Descriptive statistics, including frequencies, percentages, mean, and standard deviations, were used to present the data.

Results: A total of 323 patients were presented with groin pain and swelling. Out of 323 patients 280 (86.7%) were male patients and 43 (13.3%) were females patients included in our study. All of 323 patients were evaluated for inguinal hernia by ultrasound examination during the study period. Out of 323 patients 56 patients of ultrasonographic examinations shows other diseases of groin region which includes 40 patients (12.4%) of enlarged lymph nodes, 10 patients (3.1%) were mass and 6 patients (1.9%) were abscess noted. Thus, ultrasound diagnosed accurately inguinal hernia detection and differentiated us inguinal hernia from other diseases in patients with groin region pain or swelling.

Conclusion: Routine Ultrasonography is a helpful and accurate imaging modality performed before general surgery to identify inguinal hernias in groin discomfort patients or swelling.

Keywords: Ultrasound, Risk Factors, Inguinal Hernia, Groin Pain, Pakistan

Introduction

A hernia is when an organ protrudes through the muscle wall of the cavity that surrounds it, through an abdominal hole.¹ It occurs in selected regions, specifically those where the aponeurosis and the fascia lack the protective support of striated muscle and are susceptible to abdominal wall hernias. The "normal" person already has several of these areas, but others might be added through surgery, trauma, or muscle atrophy.²

The groin, the umbilicus, and the linea alba are the three most typical locations for hernias because of their anatomical connections. Reducible hernias, on the other hand, can be forced back into the abdominal cavity on occasion (such as when straining or standing), while

irreducible hernias, on the other hand, do not return to the abdominal cavity at all. The most typical signs of a hernia are abdominal discomfort, groin enlargement, and a sense of weight in the abdomen, particularly while coughing, lifting, or stooping.³ The factors that contribute to a hernia's development, such as muscular weakness and strain, determine how long it takes to manifest. An uncomfortable or painful hernia may extend into the scrotum. After therapy, the problem may return in one or both groin (bilateral hernia or unilateral hernia), depending on where it occurs (recurrent hernia).⁴ Up to 20% of affected adults have a bilateral inguinal hernia. Due to the right testicles' later descent and the related process of vaginitis, with a 2:1 ratio, it is more abundant on the right than the left. It has been claimed that another factor contributing to its more frequent incidence on the right side is an appendectomy scar. Hernias are substantially more common in males with varicose veins, in those who have hemorrhoids, in those who have prostatic hypertrophy symptoms, and in skinny men. These relationships can be a result of elevated abdominal pressure. Obesity may operate as a preventative measure because hernias are less common when a person is overweight or adipose.⁵

Groin hernias are the most frequent indirect hernias in both men and women. 75% of abdominal wall hernias are inguinal hernias, with a life-long risk of 27% in males and 3% in females.⁶ Inguinal hernias are the most prevalent type of abdominal wall hernias. Men are much more common than women to have inguinal hernia. They might also be more prevalent among older people and white people; congenital or acquired inguinal hernias are also possible.⁷

Hernia's primary risk factors are pregnancy, weightlifting, constipating and overweight. The individual should contact a doctor in case of pain or obvious swelling on the belly, pelvic bone, or groin or if there are any other hernia symptoms. When the patient touches the affected area or stands up straight, they can feel the protrusion.⁸ They may also occur in the upper thigh, navel and inguinal areas.⁹ The purpose of this study was to establish a connection between groin pain and inguinal hernia and the significance and feasibility of its detection on ultrasound among the locals of Peshawar visiting Hayatabad Medical Complex. This study was conducted to establish a correlation between physical examination findings (palpable mass or bulge) and ultrasound diagnosis.

Methodology

The cross-sectional study was conducted at Hayatabad Medical Complex Hospital in Peshawar from January to June 2023. The study had ethical approval with the approval letter number NS/539/2022, dated December 1, 2022. A sample size of 323 patients was determined based on a prevalence of morbidity of 50% with a precision of 5%. Convenience sampling was used to select the participants. All patients included in the study were diagnosed by the same radiologist, who has seven years of hands-on practice experience.

The inclusion criteria comprised patients of all ages and genders with right or left lower quadrant pain suspected of having a hernia. Exclusion criteria included patients who had undergone other ultrasound examinations for lower quadrant pain, diagnosed male prostatic pain, and pregnant women with groin pain. Data collection involved the use of a self-structured questionnaire after obtaining ethical approval and informed consent.

The collected data was analysed using SPSS version 25. Descriptive statistics, including frequencies, percentages, mean, and standard deviations, were used to present the data. The analysis included examining inguinal hernia measures, patient age, and gender. For the association inguinal hernia between palpable or bulge appearance and detection on ultrasound machine was assessed using the Chi-square test.

Results

A total of 323 patients who presented with complaints of groin region pain and suspicious inguinal region mass or bulge appearance on physical examination were included. Among these patients, 280 (86.7%) were male and 43 (13.3%) were female, as determined by ultrasound evaluation. The demographic results revealed a higher proportion of males (86.7%) compared to females (13.3%) among the patients included in the study.

In this study, all study participants (100%) reported a history of inguinal pain. However, the presentation of pain varied depending on the type of pain in the inguinal region. Among the study participants, burning pain was reported by 167 (51.7%), sharp pain by 265 (82%), shooting pain by 217 (67.2%), dull pain by 101 (31.3%), and pinching pain by 108 (33.4%) out of 100% observed. Sharp and shooting pain were the most commonly reported types of pain among all study participants (Table 1).

Table 1: Distribution of pain types among the study participants

Pain	Frequency	Percentage
Burning	167	51.7
Sharp	265	82
Shooting	217	67.2
Dull	101	31.3
Pinching	108	33.4

In this study, participants reported experiencing discomfort in various positions such as walking, sitting, standing, exercising, weight lifting, and changing positions. Specifically, 172 (53.3%) reported discomfort while walking; 247 (76.5%) while sitting; 250 (77.4%) while standing; 22 (6.8%) while exercising; 173 (53.5%) while weight lifting, and 228 (70.6%) while changing positions, as shown in Table 2. The most common positions as-

sociated with discomfort were sitting and standing.

The selection of the transducer (probe) is mostly the same for all participants. The probe of choice for a diagnosis of inguinal hernia is a linear probe and was used for all 323 participants. The position of the participant depends on the participant's physical condition, like obesity, weight, etc. The position most people prefers over others is supine. In this study, we diagnosed 297 (92.0%) participants in a supine position. Study included 26 (8.0%) participants diagnosed in standing positions because of some factors like obesity or difficulty in diagnosis in prone and supine positions, and no participant is diagnosed in a prone position (Table 2).

Table 2: Distribution of discomfort reported in different positions

Symptoms	Frequency	Percentage
Walking	172	53.3
Sitting	247	76.5
Standing	250	77.4
Exercise	22	6.8

The sites of pain in this study include the right, left, and bilateral inguinal regions. In all 323 participants, right-side pain was observed in 147 (45%) participants, 141 (44%) participants had left-side pain and the remaining 35 (11%) participants had both sides of bilateral pain in their inguinal region, as shown in Figure 1.

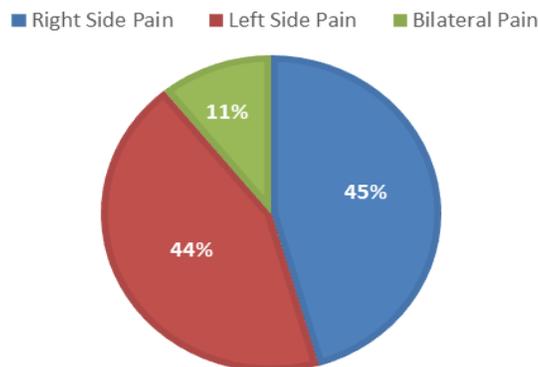


Figure 1: Sites of Growing pain

In this study, before the ultrasound examination, a physical examination was performed, who observed certain changes. 288 participants had palpable or visible mass out of all participants, and 180 participants had bulges in the groin region. So according to this condition, the physicians prefer to have participants undergo an ultrasound for a further diagnosis to find out the result. Out of 323 patients, 318 participants in the physical examination have a mass or bulge that is more prominent when coughing or standing. The Association between ultrasound findings can be seen in Table 3.

The portion of the ultrasound impression includes the diseases that are present in the participants who have been diagnosed with ultrasound. The frequencies of disease in the groin region are: enlarged lymph nodes present in 40 (12%) participants; swelling or mass in 10 (3%); inguinal hernia in 267 (83%), abscess in 6 (2%); and the femoral artery aneurysm is never recorded in this study Figure 2. The results given in Table 3, show that there is a relationship between physical mass palpable and bulge appearance with inguinal hernia, where the detection of false positive or

false negative cases of inguinal hernias on ultrasound was done on the intraoperative surgical procedures and the values of chi square test for physical mass palpable and ultrasonography were ($X^2 = 7.41, p = 0.00$) and bulge appearance and ultrasonography were ($X^2 = 16.98, p = 0.00$) in groin region pain, both p values are highly statistically significant. The percentage has been shown in Figure 2.

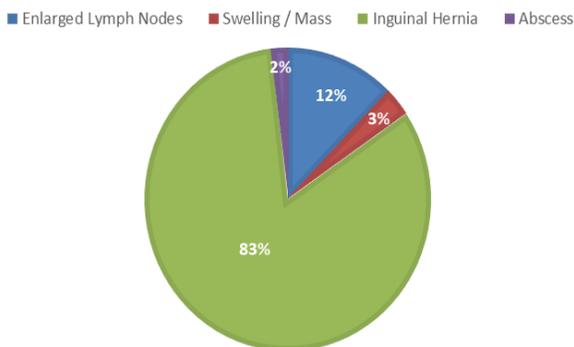


Figure 2: Showing the percentage of symptoms of organs

Table 3: Association between ultrasound findings, physical palpability, and bulge appearance in groin region (Hernia) with p-values

Yes		Ultrasound Find-inds		Total	p-value
		No	Yes		
Physically mass palpable / feel /visible	Yes	237	51	288	0.00
	No	22	13	35	
Total		259	64	323	
Bulge appearance in groin region					
Yes		Ultrasound Find-inds		Total	p-value
		Yes	No		
Bulge appearance in groin region	Yes	159	21	180	0.00
	No	100	43	143	
Total		259	64	323	

Discussion

An inguinal hernia is an outpouching of the peritoneum, with or without its contents, that occurs through the muscles of the anterior abdominal wall at the level of the inguinal canal in the groin. It is a common condition that can affect anyone at any age. It is more frequent in men than in women, according to several studies conducted in various parts of the world. Hernias are typically asymptomatic at first, appearing as a swelling that increases with strain and subsides at rest. Over time, though, they enlarge and start to cause pain and discomfort. Producing an ultrasound that is of high quality is a big duty for sonographers. A linear probe is the preferred transducer (probe) for diagnosing an inguinal hernia. The goal our study was to diagnose inguinal

7.7:1.0. Another retrospective study was conducted in Sudan with 180 participants presented with groin pain and swelling for ultrasound examination. Ultrasound diagnosis of 163 participant shows inguinal hernia of 112 were males and 51 were females included.¹¹ According to one study, the majority of the patients who were affected by inguinal hernia were under the age of 60, giving the idea that the elderly people are more susceptible to this disease.

Conclusion

In our study, groin hernias were the most common type, and in total study participants, 100% had a history of inguinal region pain. However, the presentation of pain is different according to pain types in the inguinal region, such as burning pain sharp pain, shooting pain dull pain and pinching pain is observed out of 100% each. Sites of pain in this study include right, Left, and bilateral inguinal regions.⁹

In Saudi Arabia, a study involving 256 participants was conducted with only children.¹⁴ Physical examinations were not included in their study. While in our study physical examination was included, we also included the factor of vascularity and the portion of the ultrasound impression, which includes the diseases that are present in participants who have been diagnosed with ultrasound. Frequencies of disease in the groin region are enlarged lymph nodes, swelling or mass, inguinal hernia, abscess. All the frequency is carried out to find a ratio of individual diseases in participants with a history of groin pain. In this study, 297 participants were diagnosed while supine, and 26 were diagnosed while standing due to factors including obesity or the difficulties of diagnosing patients when prone or supine, and no participant was diagnosed while prone.

Ultrasound examination, a common diagnostic tool for inguinal hernias, revealed a high incidence of hernia detection (83%) in the study population. The correlation between physical examination findings (palpable mass or bulge) and ultrasound diagnosis was statistically significant, reinforcing the importance of clinical assessment in conjunction with imaging for accurate diagnosis.¹⁵ Notably, the study identified other groin pathologies, including enlarged lymph nodes and abscesses, emphasizing the need for a comprehensive evaluation to differentiate between different etiologies.¹⁶

However, it was observed in this study the exclusive use of ultrasound as an imaging modality might limit the detection of certain hernias, especially those in obese individuals where ultrasound sensitivity might be reduced.¹⁷ Additionally, the study does explore the potential impact of different hernia orifices area and patient comorbidities on symptomatology or diagnostic accuracy, which could provide valuable clinical context. In clinical practice, integrating a thorough physical examination with appropriate imaging techniques remains paramount for accurate inguinal hernia diagnosis. Moreover, considering the diverse symptomatology reported by patients, healthcare providers should maintain a high index of suspicion for hernias, particularly in the presence of characteristic symp-

toms or physical findings.

Future research could explore the role of advanced imaging modalities such as magnetic resonance imaging (MRI) in cases where ultrasound results are inconclusive, especially in challenging diagnostic scenarios. Additionally, investigating the impact of hernia orifices area, location, and patient-related factors on symptom severity and diagnostic outcomes could enhance our understanding of hernia pathophysiology and aid in personalized surgical treatment strategies.¹⁸

Various imaging techniques have been proposed to explore occult hernias. Magnetic Resonance Imaging (MRI) is recommended for investigating groin pain and is particularly useful in further examining musculoskeletal causes, such as osteitis pubis.¹⁹ A study conducted by van der Berg *et al.* (1999) comparing ultrasound, MRI, and laparoscopic surgical findings for clinically detectable hernias demonstrated the superior accuracy of MRI over ultrasound.²⁰ Nevertheless, MRI has not undergone comprehensive evaluation for occult hernias. Additionally, the higher cost, time consuming and non-availability of MRI in comparison to ultrasound examinations might limit its use as an initial investigative method.

Limitations

Since not all of the study's participants had positive ultrasound scans, it was impossible to determine the exact sensitivity and specificity of ultrasound. Another limitation of this study is this study excludes occult inguinal hernia and does not include a physical examination.

Authors' Contributions: MAA conceived and designed the study, participated in data collection, and contributed to drafting and revising the article. IK involved in study design and execution, contributed to data analysis, and participated in drafting and revising the article. AA contributed to study design, data collection, analysis, interpretation, and drafting/revising the article.

Conflict of interest: The authors have no conflict of interest.

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