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# THE VALUE OF DIAGNOSTIC ULTRASOUND FOR DETECTING OCCULT INGUINAL HERNIA IN PATIENTS WITH GROIN PAIN

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**ABSTRACT**

***Aims**: chronic groin pain caused by an occult hernia can be a difficult clinical diagnosis and may require additional investigative modalities. The aim of this study was to demonstrate the accuracy of ultrasound in diagnosing occult hernia in patients with recurrent inguinal pain and a negative clinical examination.*

***Patients and methods**: over a period of three years, a total of 76 patients were referred for ultrasound examination with clinically suspected occult inguinal hernia. Patients with positive US scans were offered surgery, while those with negative US findings were offered further imaging or other diagnostic tests. The ultrasound examination of the inguinal region was conducted using a 5-10 MHz linear probe. The scan was performed with the patient in the supine and erect positions, in a relaxed state, as well as during coughing and during a Valsalva manoeuvre.*

***Results**: overall, ultrasound diagnosed 31 inguinal hernias and all 31 patients with positive scans underwent surgery. Surgery confirmed the ultrasound diagnosis in 30 patients, having only 1/31 no hernia at operation (100% ultrasound sensitivity and 96.9% specificity). Patients undergoing surgery showed complete symptom resolution at a three-month follow-up.*

***Conclusions**: this study confirms that ultrasound is capable of accurately diagnosing groin hernia and this may justify its use in patients with chronic groin pain due to a suspected occult hernia.*

***Key words**: Ultrasound, occult inguinal hernia, groin pain.*

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## Introduction

Occult inguinal hernias represent, along with musculotendinous diseases, one of the most common causes of chronic pain in the inguinal region (inguinodynia) that affects male patients and, in particular, young adults who perform heavy works or competitive sports activities. Recent papers highlights the degeneration of a sphincter-like structure as possible cause of this disease[(1)]. In the recent past, the radiological study of the abdominal wall by means of intraperitoneal injection of non-ionic contrast medium, known as peritoneography or, more specifically, as herniography[(2)], when used selectively for the evaluation of the inguinal regions, has demonstrated valuable not only in cases of congenital bilateral hernia[(3,4)], but also in adult population[(5-10)], in the study of occult hernias not detected by clinical examination. Herniography has a sensitivity of over 96.6% and a specificity of 98.5%[(11)], but, although well tolerated, it remains an invasive procedure, with a small percentage of complications[(9,10)]; for this reason, other imaging techniques have been proposed for the study of the inguinal region such as ultrasonography (US), magnetic resonance (MRI) and computerized tomography (CT). CT-scan and MRI are not always available for this type of pathology and burdened by high costs; these methods are usually employed in case of strangulated hernia or in obese patients. US represents a viable non-invasive solution, quickly available and low cost, to investigate inguinodynia. This method may be effective even in patients who had

undergone hernioplasty, in case of a suspected recurrence not clinically identifiable, as demonstrated by a recent retrospective analysis[12].

## Patients and methods

From January 2008 to December 2011, 76 male patients, with a mean age of 60 (range: 24-86) and chronic recurrent inguinal pain, came to our care. A written informed consent was obtained from all the patients. Inguinal pain was described as persistent and oppressive, exacerbated by physical exertion or prolonged standing; physical examination, performed with standing and lying patient, exploring the whole inguinal canal and completed by Valsalva manoeuvre, did not allow to identify any sign compatible with the considered clinical condition. Suspecting an occult inguinal hernia, all patients were evaluated by US, using a 5-10 MHz linear probe. Patients were analysed in standing and lying position, at rest position and on exertion (contraction of the recti muscles, cough, Valsalva manoeuvre). Ecographic diagnosis of groin hernia was delivered when a herniary sac was recognized over inguinal ligament, on exertion[13]: indirect inguinal hernias were detected laterally to deep inferior epigastric vessels, direct ones were diagnosed medially to the above cited vessels. Femoral hernias were recognized medially to femoral vessels and lower to inguinal ligament.

## Results

Thirty-one out of 76 visited patients resulted positive for occult inguinal hernia and underwent surgical intervention. In 30 patients the surgical intervention confirmed the ecographic finding; only in one case, an obese patient, adipose tissue probably simulated a false image of visceral dislocation (false positive). Patients eligible for the surgical intervention ranged from 24 to 55 years old and all of them performed heavy works or competitive sports activities. In 23 cases an indirect hernia was recognized, whereas in seven cases it was a direct hernia. All patients underwent surgical intervention with positioning of a dynamic prosthesis[14]; the obese patient was treated by means of a reinforcement of the abdominal wall, following our experience in the field of abdominal wall defects[15-17]. For the remaining 46 patients who did not show ecographic signs of hernia, a CT-scan or a MRI of the inguinal region were performed in order to evaluate the possible presence of a musculotendineous disease. After three months, the patients who underwent surgical intervention referred a complete remission of the algic symptomatology; 37 out of 46 patients with negative US referred a total remission of inguinal pain after rest and anti-inflammatory therapy; 19 of them, showed a muculotendineous disease at MRI and started a program of physical therapy.

## Discussion

Occult inguinal hernias are, by definition, difficult to diagnose by simply visiting the patient, but inguinodynia, can be caused by musculotendineous diseases, too. From data reported in this paper, inguinodynia from misunderstood inguinal hernia, can be frequently recognized in young male adults who perform heavy works or practice sports at a competitive level. Thirty out of the 76 patients resulted positive for inguinal hernia, at US scan; in 29 patients this finding was confirmed by surgery exploration. Therefore, for the considered image technique, we can report a sensitivity of 100% and a specificity of 96.9%; furthermore, US allowed to distinguish correctly direct from indirect hernias, show a positive predictive value of 95%. No false negative were observed and surgery agreed with instrumental diagnosis in all cases with negative clinical examination, except in one case (false positive), likely due to the obesity of the patient which created false images of visceral dislocation caused by the poor penetration of the ultrasonic beam. Obviously, the present retrospective study cannot evaluate exactly the real sensitivity and specificity of US, because we should have submit to surgery all patients, even those with a negative US. Certainly, US allows a perfect spatial depiction of soft tissues and it offers the possibility to perform a dynamic study by means of provocative maneuvers. For these reasons, US is very useful technique for the study of inguinal region, in case of inguinodynia of the athletes[18], or in other conditions, such as communicating hydrocele, spermatic cord lipoma and lymphadenopathy[19]. False positives can occur sometimes, in case of particularly fat patients, whom adipose tissue could prevent from identify anatomical structures and perform all provocative maneuvers, as described in our work. However, groin hernias represent the most difficult diagnostic dilemma for the surgeon, especially in comparison with other cases of viscereral herniations, such as linea alba hernias, where there is a perfect correspondence between clinical examination and US findings.

Other imaging techniques suitable for the study of inguinal region, CT and MRI, are more expensive than US and less available[20]. Their use could be justified in case of strangulated hernia in obese patients. Although US allows differential diagnosis between several soft tissue diseases, RMI has a better capacity to distinguish tissue oedema and, furthermore, it allows the study of more anatomical plans; for these reasons, MRI is properly used to diagnose the causes of inguinodynia when muscles or tendons are involved[20] Some Authors performed correlation studies between US, MRI and ernioplasty. Van Den Berg et al.[21], evaluated US and MRI in comparison with surgery: from clinical examination only one false positive resulted, producing a sensitivity of 74.5% and a specificity of 96.3%; US and MRI showed a sensitivity of 92.7% and 81.5% and a specificity of 94.5% and 96.3%, respectively. Babkova and Bozhko[19] reported a sensitivity of 84.3% for the sonographic diagnosis of indirect hernias and 71.1% for direct ones; a similar discrepancy in distinguishing direct and indirect hernias also occurred in other studies[22] and this could be likely due in most cases to obesity, the size of the hernia and the difficulty in estimating the location of the inferior epigastric vessels in relation to the hernial sac. Similarly, Kraft et al.[23] described the same difficulty in differentiating indirect inguinal hernia from the direct one, producing a percentage of accuracy of only 54% and 62%, respectively. Worth of notice is the prospective study which evaluated the accuracy of US in the correct identification of hernia type, in agreement with the unified classification system dividing inguinal hernias in 9 types – type I (indirect, small), II (indirect, medium), III (indirect, large), IV (direct, small), V (direct, medium), VI (direct, large), VII (combined), VIII (femoral), and O (other); only types I, IV, V, VII, and VIII were correctly identified by US (sensitivity and specificity of 100%)[24]. However, with the support of the studies proposed by many other Authors who have demonstrated a sensitivity and specificity of 100%[22] and a positive predictive value of 98.3%[25] for pre-operative sonographic diagnosis of occult inguinal hernia, we can state that the US represent a non-invasive and dynamic method of investigation, allowing the diagnosis of occult inguinal hernia with great accuracy. A study carried out on children, showed an accuracy of US in the diagnosis of occult inguinal hernia of 97.9%; on the other side, the accuracy of the clinical examination was 84%[26]. Similarly, the study carried out on adults showed an accuracy of 92%[27], with correct identification of incarcerated hernias[28] and a case of Spigelian hernia[29]. The peritoneography or, more specifically, the herniography, is an invasive procedure, although well tolerated and with a small percentage of complications, that uses the intraperitoneal injection of non-ionic contrast medium for the study of the abdominal wall[2]. It was largely successful not only in cases of bilateral congenital hernia of the child[3,4], but also in the adult population[5-10], demonstrating its value especially for the study of occult inguinal hernias, not detected by clinical examination, with a sensitivity of 94%, a specificity of 95%[30], and success rates of 90.5%[31]; perforations of viscera are reported in 5% of cases[32]. Furthermore, Loftus et al.[32] reported 18% of false positives and 7.9% of false negatives, suggesting that this method is not always reproducible. Another study which compared US and herniography in diagnosis of occult inguinal hernia, the sensitivity of the former was significantly higher than that of the latter[33].

## Conclusions

After an accurate clinical examination, US is a cost effective exam in the diagnosis of occult inguinal hernias, which can help in distinguishing the several causes of inguinodynia and set up the right therapy for each single specific case.

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