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ORIGINAL ARTICLE

Single surgeon's series of sportsman hernia with 101 inguinal explorations in 64 patients: true hernia or not?

Hakan Kulacoglu[1] · Savas Kudas[2] · Gürhan Dönmez[3] · Burak Kunduracıoglu[4] · Mehmet Yorubulut[5]

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Introduction

Groin pain is a common problem that limits athletes' training capacity and match performance. Acute groin pain is an issue that should be addressed by sports medicine specialists, team physicians, and physiotherapists. Chronic groin pain in an athlete often requires involvement of surgeons. When groin pain lasts more than 3 months in spite of the treatment modalities for common causes such as muscles, and tendon injuries and inflammations, and osteitis pubis, sportsman hernia is questioned with a multidisciplinary algorithm. [1, 2]. The terminology related to this particular condition has evolved over time. Most terms those were have been used previously are not recommended today, nevertheless a common terminology has not been established [3]. Athletic pubalgia has been rather used widely, whereas pubic inguinal pain syndrome and groin pain syndrome are recently recommended terms [3–8], however, athletic pubalgia and sportsman's hernia are still preferred terms by some surgeons who manage this condition [1, 9–11].

Surgical treatment of sportsman hernia generally achieves good outcomes. Return to play rates following hernia surgery have been reported between 75 to 100% [12–19]. Both open and minimally invasive surgery provide satisfactory results. A recent randomized controlled study showed that open and minimally invasive repairs were similarly effective, though later technique was advantageous regarding early postoperative pain [11].

In usual definition of sportsman hernia, there is no true inguinal hernia, but a weakness in inguinal wall that may cause instability and consequently pain. Most series have reported preoperative imaging and intraoperative findings supporting this consideration. We evaluated this single surgeon's series in order to scrutinize operative findings, search the existence of a true hernia, and compare the outcomes of open and minimally invasive repairs.

Materials and methods

This study series is consisted of patients who were evaluated between June 2007 and July 2025. Most patients were professional athletes. Before evaluation for surgical treatment, all patients were assessed by three sports medicine specialists, which were also experienced professional club physicians. Ultrasound studies were carried out in different centers, whereas pelvic dynamic magnetic resonance imaging (MRI) studies with Valsalva maneuver were done in a single center with Magnetom Avanto 1.5 T scanner (Siemens, Erlangen, Germany). Accompanying pathologies such as osteitis pubis, adductor tendinitis, muscle tears, or femoroacetabular impingement were treated by these physicians or sports physiotherapists, before referring the surgeon. Some patients were consulted to the surgeon with a suspicion of sportsman hernia without a positive MRI finding for hernia.

All data were recorded prospectively and analyzed retrospectively. Patient history, findings in physical examination, radiological reports, operative findings, prosthetic meshes and mesh fixation methods were meticulously recorded.

✉ Hakan Kulacoglu
hakankulacoglu@hotmail.com

1 Ankara Hernia Center, Ankara, Türkiye

2 Medifit Sports Medicine Clinic, Ankara, Türkiye

3 Ankara Sports Medicine Center, Ankara, Türkiye

4 Faculty of Health Sciences, Bahçeşehir University, Istanbul, Türkiye

5 Department of Radiology, Acıbadem Hospital, Ankara, Türkiye

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Patients were closely followed every week through the early postoperative period. Club physicians and physiotherapists were contacted whenever possible. Primary outcome measure was "return-to-play". It is defined as athlete's returning to full competitive play as before the groin pain had started [20]. Professional players were questioned by phone or examined in the clinic periodically till their carrier ended.

Statistical analysis

The differences between frequencies of the groups were evaluated using the Pearson Chi-square test. When the subject numbers were less than 5, Fisher's exact test was used to provide a more accurate estimation of statistical significance. Student's t-test was used for the evaluation of the times to return sports activities following open surgery and MIS.

Results

Throughout the whole period, a total of 74 patients were referred, 61 by three sports medicine specialists, 10 directly by club physicians, and 3 by athletes previously underwent surgery by the same surgeon. The most frequent MRI finding related to sportsman hernia was fatty tissue protrusion over the deficient inguinal floor during the Valsalva maneuver (Fig. 1). Surgical treatment was not offered for three patients based on examination and negative MRI findings. Six patients preferred undergo surgery in other centers mostly because of costs issues, two of them were operated subsequently due to recurrent symptoms 12–22 months after surgery. Five patients did not accept surgical treatment, two of them re-admitted after 6 and 18 months, and received surgery. One patient underwent unilateral endoscopic repair first, and needed another surgery due to metachronous contralateral hernia after 11 months.

Totally 64 patients were operated, and 101 inguinal explorations were carried out (Fig. 2). Among 64 patients, 56 were soccer players (51 professional, 3 amateur, 2 recreational regular), 4 basketball players, 1 handball player, 1 sprint athlete, and 2 soccer referees. Only 4 of the patients in the present series were not diagnosed previously with other causes of groin pain like osteitis pubis, adductor or iliopsoas tendinitis, and hip pathologies. The rest received proper treatment modalities for these pathologies, and were referred to hernia surgeon because of persisting groin pain.

The most frequent finding upon preoperative physical examination is tenderness on fingertip palpation through the superficial inguinal ring. Typical protrusion was detected in only four inguinal examination (Table 1). The mean duration of pain before surgery was 6.8 months (range, 1–26 months). June, May, and September were the most frequently chosen months for surgical treatment (Table 2).

During the early period of study series open surgery was used. Anterior exploration was done through a transvers

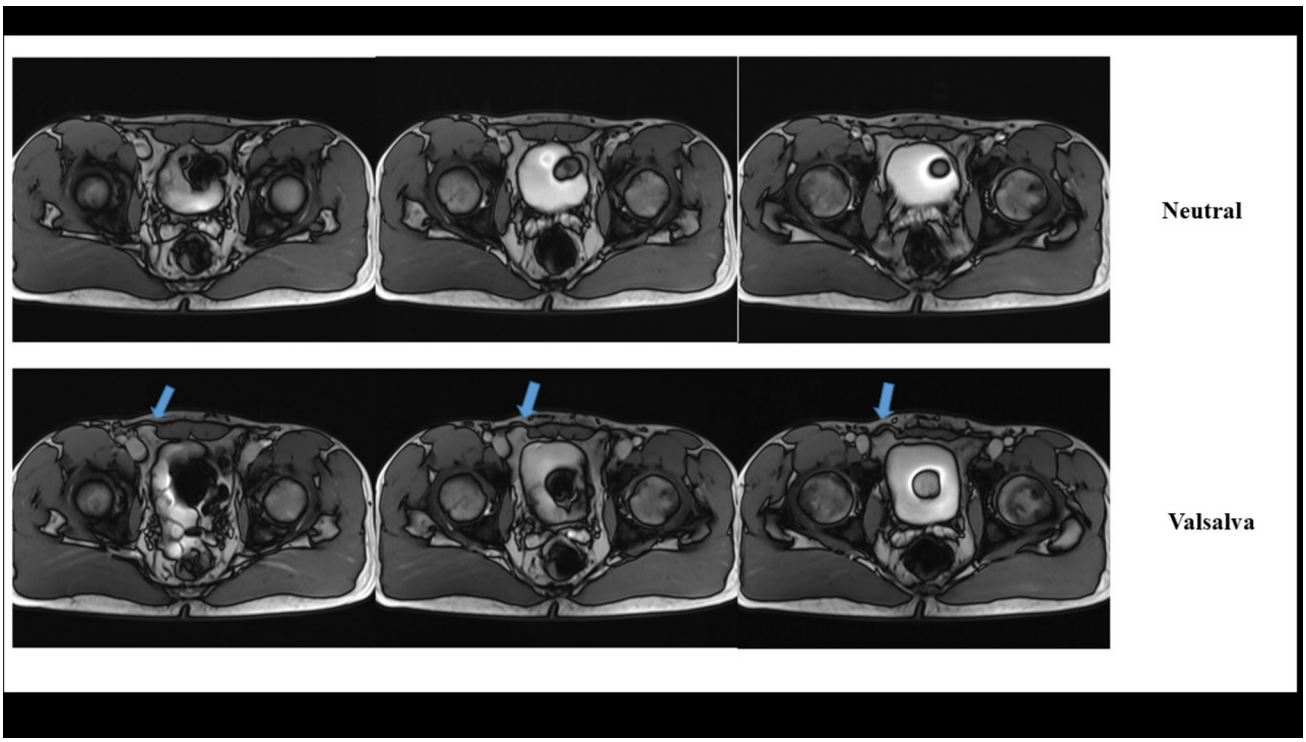

Fig. 1 Fatty tissue protrusion over the deficient inguinal floor during the Valsalva maneuver in dynamic MRI study

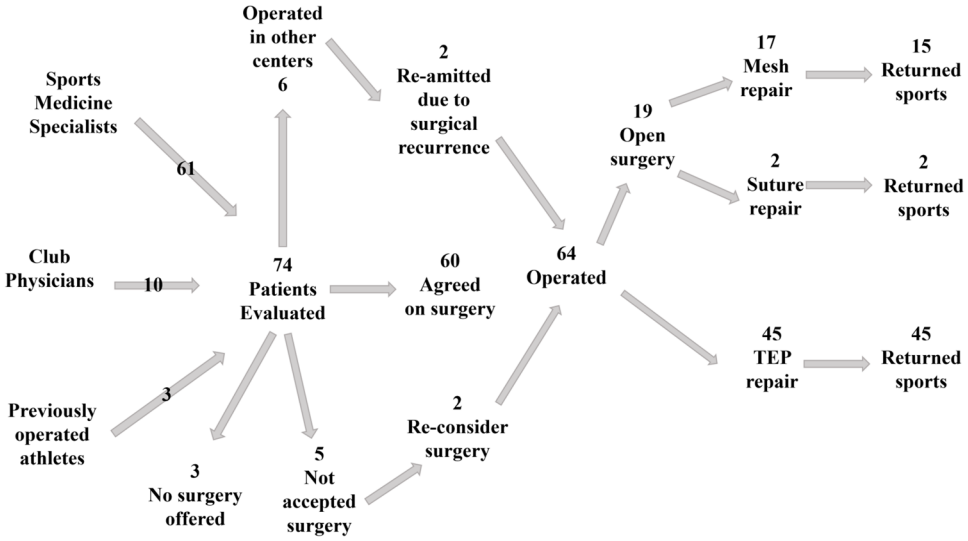

Fig. 2 Flow diagram of the case series illustrating the inclusion criteria, number of patients evaluated, and distribution according to surgical approach and outcomes

Table 1 The findings in preoperative physical examination

Findings in physical examination	n* (%)
Tenderness in fingertip palpation through the superficial inguinal ring	84 (83.2)
Enlarged superficial inguinal ring	41 (40.5)
Bulging with Valsalva maneuver	21 (20.8)
Typical protrusion	4 (3.96)

*More than one finding were recorded in some patients

inguinal incision. Local anesthesia with mild intravenous sedation was applied in 17 patients, whereas 2 patients preferred general anesthesia. After 2015, almost all patients underwent minimally invasive surgery, but 2 patients who specifically preferred open repair. In total, open surgery was carried out in 25 repairs in 19 patients (bilateral repairs in 6 patients). The intraoperative findings in open surgeries were listed in Table 3. Most frequent pathology was posterior inguinal wall weakness with Valsalva maneuver (Fig. 3). Prosthetic meshes were used in 23 cases with Lichtenstein-Amid method. Mesh materials were standard polypropylene in 13, lightweight polypropylene in 3, and composite lightweight mesh (Ultrapro -polypropylene+polyglactin-Ethicon New Jersey, USA) in 7. Mesh fixation was done with 8 interrupted 2/0 polydioxanone sutures. Two patients requested suture repair, and minimal repair with 2/0 polypropylene was performed. Additional procedures were done in 8 repairs [release of tense external oblique aponeurosis at medial edge in 4, and nerve decompression because of nerve kinking in cases.

Minimally invasive surgery was used in 45 patients in 10 years. One patient underwent surgical repair for metachronous contralateral hernia with an interval of one year. Unilateral repair was done in 16 cases, whereas 30 simultaneous bilateral repairs were performed. Most frequently encountered intraoperative findings were posterior inguinal wall weakness consistent with sportsman hernia, and cord lipoma. The findings in TEP surgeries were listed in Table 3. Most frequent lesion was cord lipoma (Fig. 4). Nyhus Type I (indirect hernia sac with normal internal inguinal ring) was also a common finding (Fig. 5). ProGrip laparoscopic self-fixating mesh sized 12 × 16 cm was used in 12 repairs (Medtronic, Minneapolis, USA), and Bard 3D Max mesh sized 10.8 × 16.0 cm (BD, New Jersey, USA) was used in 64. Meshes were fixated with one to three resorbable tackers in most cases with AbsorbaTack (Medtronic, Minneapolis, USA) or SecureStrap (Ethicon, New Jersey, USA). Permanent titanium tackers (Medtronic, Minneapolis, USA) were used in several early cases, and omitted afterwards. Also, no fixation was employed in some cases.

There was a statistically significant difference for bilaterality between patients who underwent open and MI surgeries. It was 31.6% within patients treated with open technique, whereas 66.7% for the patients who received MIS ($p=0.01$). Some pathologies found intraoperatively also differs. Cord lipomas were more frequently detected during MIS in comparison with open explorations (73.7% vs 32.0%, $p=0.001$). On the other hand, posterior inguinal wall weakness which consistent with the definition of sportsman hernia was recorded in similar rates in open and TEP repairs. Similarly, no difference was found for existence of typical indirect hernia between the surgical approaches. Nevertheless, Nyhus Type I hernia sac was more frequently detected during posterior approach, but the difference did not reach a level of significance (30.3% vs 12.0%, $p=0.07$). In four open surgery cases, kinking of iliohypogastric nerve was met.

Seventeen patients who underwent open surgery with local anesthesia were discharged on same day. Two patients stayed in hospital overnight after open surgery with general anesthesia. All patients whom MIS was performed under

Table 2 Distribution of operation dates according to months of the year

	January	February	March	April	May	June	July	August	September	October	November	December	Total
n* (%)	6	2	2	5	9	11	3	7	9	4	3	4	65

*One patient underwent surgical repairs for both groins with an interval of one year

Table 3 Operative findings in 101 inguinal explorations

	Open Surgery (25) n* (%)	MIS (76) n* (%)	p
Posterior inguinal wall weakness consistent with sportsman hernia	20 (80.0)	51 (67.1)	n.s
Cord lipoma	8 (32.0)	56 (73.7)	p = 0.001
Nyhus Type I inguinal hernia	3 (12.0)	23 (30.3)	p = 0.07
Nyhus Type II inguinal hernia	1 (4.0)	1 (1.3)	n.s
Tears of the external oblique aponeurosis	9 (36.1)	n.a	n.a
Kinking ilioinguinal nerve at the external oblique aponeurosis	4 (16.0)	n.a	n.a
Compression of genital branch of the genitofemoral nerve	1 (4.0)	n.a	n.a

n.s. nonsignificant; n.a. nonapplicable

*More than one finding were recorded in some patients

general anesthesia kept in-hospital for one day. During the first 24 h after surgery, only two patients complained acute severe pain, while the pain subsidized on day-2. Both were professional soccer players who underwent unilateral TEP. No patients in open repair group described acute severe pain. Four patients reported 2 to 3 days bed rest after discharge. No surgical site infection was met. One patient in MIS group developed postoperative urinary retention. Postoperative complications are given in Table 4. All the patients were followed strictly. Mean follow-up was 45.5 months (range: 5–99 months, median: 44 months). The patient with the longest follow-up continues his soccer carrier in 3rd Division at the age of 38.

Sixty-two of 64 patients were able to back to sport (96.9%). When return rates were compared at first postoperative year, MIS presented better than open surgery (100% vs 89.5%). The difference between surgical techniques for outcomes was initially evaluated using the Pearson Chi-square test ($p = 0.027$). However, since the expected frequency in one or more cells was less than 5, Fisher's exact test was used as it provides a more accurate estimation of statistical significance for small sample size, and a p value of 0.085 was obtained, indicating that the difference between the groups was not statistically significant. Also, required times of return to jogging, training with ball, and playing match were slightly shorter in patients in MIS group, however the differences were not statistically significant. The type of mesh fixation methods used did not seem to have any influence on postoperative outcomes. Return-to-sport rates, rates of complaint-free return to sport, and pain-free inguinal region rates and times were given in Table 5. Because the numbers of patients from other sports branches were small, no statistical analysis could be made between branches.

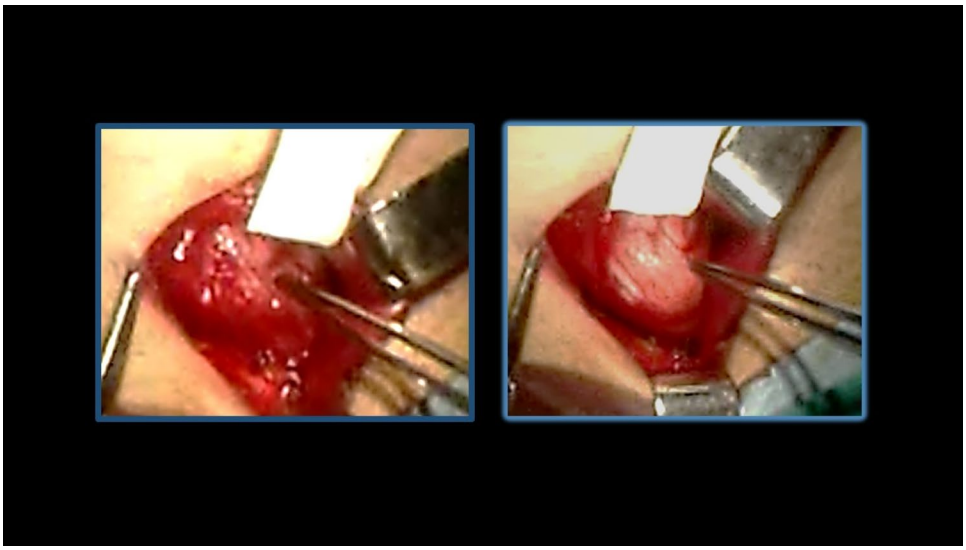

Fig. 3 Intraoperative view of the inguinal floor in open surgery with local anesthesia and conscious sedation, showing the neutral state at rest (left) and medial wall bulging during the Valsalva maneuver (right), resembling a sports hernia appearance

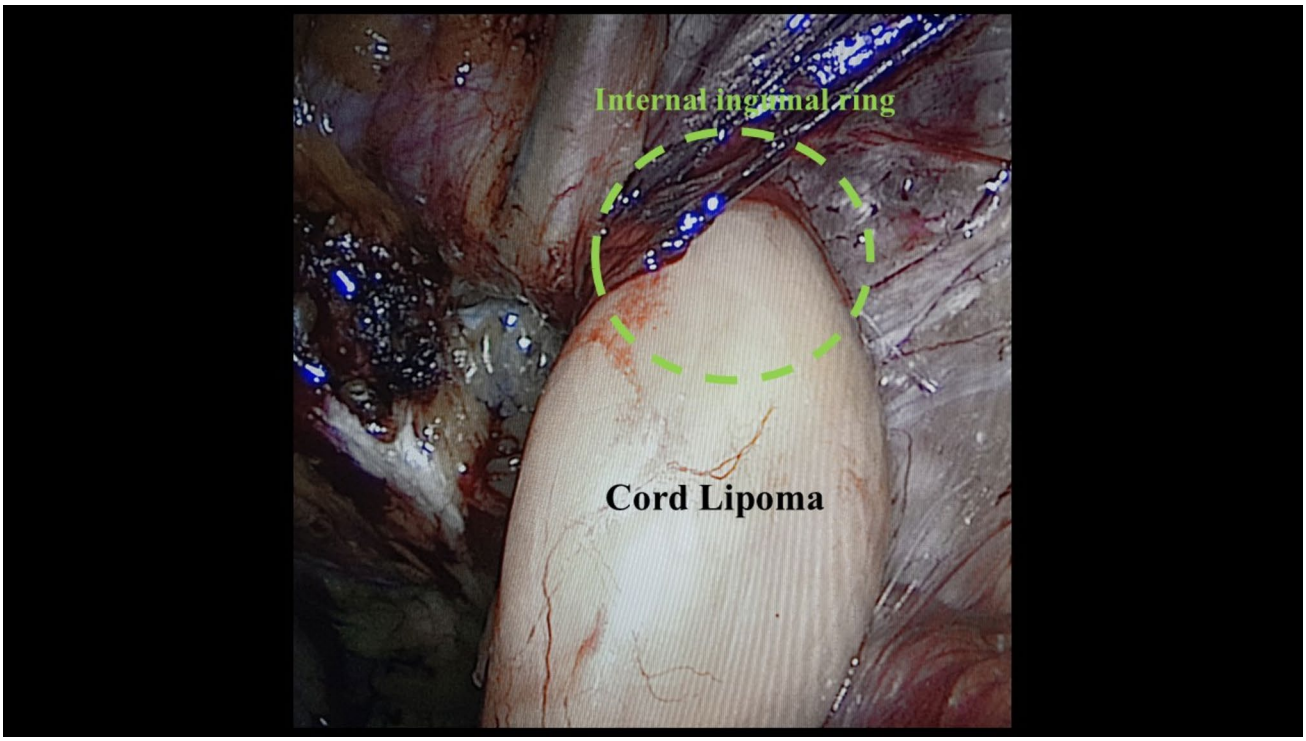

Fig. 4 Endoscopic view obtained during totally extraperitoneal (TEP) inguinal hernia repair demonstrating a large cord lipoma protruding through the internal inguinal ring

In open surgery group, one professional soccer player aged 24, started his match performance after 3 months, but not able continue his career due to pain recall afterwards. Another soccer player (amateur) aged 34 was also not able to return playing. No hernia was detected in this case intraoperatively. The ilioinguinal nerve was found to be bent via an aperture in the external aponeurosis, and decompressed surgically. However, his pain persisted after the operation, and a pelvic bone stress fracture was seen on repeat MRI. All patients in MIS group returned match performance without unexpected delays, but one professional soccer player aged 28. He already had bilateral adductor tendinitis before bilateral hernia repairs, and needed longer therapeutic measures for that pathology for another 8 months. He eventually resumed his professional career and continued playing until the age of 33. One soccer assistant referee who underwent bilateral TEP complained a protrusion and mild pain in his left groin following running. Ultrasound revealed a retained

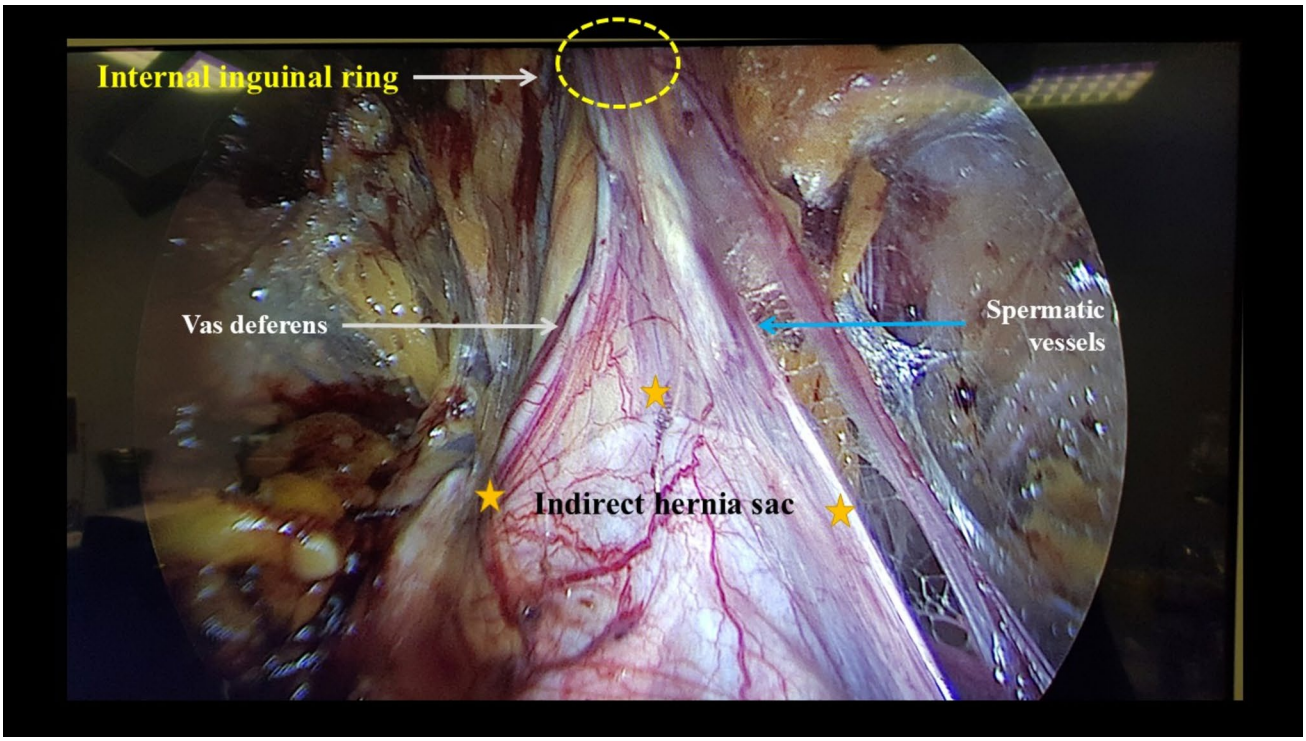

Fig. 5 Endoscopic image obtained during totally extraperitoneal (TEP) inguinal hernia repair demonstrating a small indirect hernia sac. The peritoneal sac boundaries are indicated by stars, and the relationships with the vas deferens, spermatic vessels, and internal inguinal ring are shown

Table 4 Postoperative complications

	Open Surgery (19) n (%)	MIS (45) n (%)	p
Echymosis	1 (5.3)	2 (4.4)	n.s
Seroma	0 (0.0)	0 (0.0)	n.a
Wound infection	0 (0.0)	0 (0.0)	n.a
Urinary retention	0 (0.0)	1 (2.2)	n.s

n.s. nonsignificant; n.a. nonapplicable

Table 5 Return rates and times after open and MIS repairs

	Open Surgery n (%)	MIS N (%)
Return-to-sport rate	17 (89.5)	45 (100)
Rate of complaint-free return to sport	16 (84.2)	43 (95.0)
Pain-free inguinal region rate	15 (78.9)	41 (91.9)
Return-to-jogging time (weeks)	4.13 (±0.74)	3.78 (±0.67)
Return-to-training with ball time (weeks)	5.20 (±0.56)	4.88 (±0.38)
Return-to-playing match time (weeks)	5.60 (±0.51)	5.49 (±0.50)

cord lipoma. Operative report presented that bilateral cord lipomas were reduced before mesh placement. He denied surgical exploration and was carry on continued his professional refereeing career until reaching the mandatory retirement age.

Discussion

Doha agreement meeting evaluated four clinical entities for groin pain in athletes; adductor-related, pubic-related, iliopsoas-related, and inguinal-related [3]. Combinations of these pathologies can be found in some patients [21]. Although debates about correct terminology continue, multidisciplinary management offers successful outcomes. The term sportsman hernia corresponds to inguinal-related groin pain. Soccer players, along with ice hockey and American football players [22], are the athletes most affected by this problem, however no other sports are exempt from it [23]. In the present series, most patients are professional soccer players. This group of patients is typically admitted at three distinct periods: (1) at the end of the season, following multiple attempts to manage pain during competition (May–June); (2) after the preseason training camp, when pain reoccurs (August–September); and (3) during the mid-season winter break (December–January). The main goal of surgical treatment is to enable the player participate the team as soon as possible. Therefore, return to sport time is as important as return to sport rate. This rate has been reported by different centers to range from 75 to 100%, depending on the duration of follow-up [8, 12–15, 17–19]. Very good outcomes can be achieved with either open and MIS treatments. In the present series, the rate of return to

full sports performance was high at six weeks, and in certain cases, recovery occurred as early as four weeks as previously reported by others [24, 25]. However, patients usually may tend to postpone resuming regular activities beyond the period recommended by their surgeons [26].

Minimally invasive inguinal hernia repairs have been reported to be associated with less early postoperative pain, earlier return to daily activities, and also lower risk for chronic postoperative groin pain in comparison with open mesh techniques [27–29] Recent Guidelines recommend laparo-endoscopic repairs not only for bilateral but also for unilateral inguinal hernias because of their advantages such as quicker recovery and less chronic pain [30]. Consistent with these findings, an increasing number of athletes prefer laparo-endoscopic repairs. However, excellent outcomes have also been achieved in some centers using open techniques [15, 18]. A recent multicenter RCT by experienced hernia surgeons has revealed an advantage for TEP over open minimal suture repair 4 weeks after surgery, but no difference was recorded regarding return to sports at 1 and 3 months [11]. Similarly, there is no difference in return-to-sport rates between minimally invasive and open repairs in the present series, although return times tend to be slightly longer after open surgery. In addition, the patient who was unable to return to soccer performance did so not because of surgical technique but due to a misdiagnosis.

In the present study, posterior inguinal wall weakness was more frequently observed during open repairs. In patients operated under local anesthesia and conscious sedation, increase of intra-abdominal pressure through the Valsalva maneuver facilitated more distinct intraoperative identification of the posterior inguinal wall weakness. There is another argument in favor of open anterior approach discussing the opportunity of evaluating caudal part of the rectus abdominis muscle, external oblique aponeurosis, conjoint tendon and ilioinguinal nerve [31]. Entrapment iliohypogastric, genitofemoral, and ilioinguinal has been implicated for groin pain [32, 33]. Indeed, our intraoperative findings lend support to this assumption in the context of open repairs. Tears of the external oblique aponeurosis and kinking of the ilioinguinal nerve at the aponeurosis and compression of genital branch of the genitofemoral nerve were observed in several cases. Release and decompression of the nerves were performed, nevertheless, these interventions did not yield better outcomes in comparison with the patients who underwent endoscopic posterior approach. On the other hand, the laparo-endoscopic approach enables better detection of small indirect hernia sacs, however, this advantage did not provide improved return-to-sport rates.

In our opinion, evaluation of intraoperative findings plays a pivotal role in establishing the accurate terminology for the condition requiring surgical intervention. The extent to which the intraoperative findings in athletes we operate for groin pain concur with those of classical inguinal hernia repairs may justify the appropriateness of using the term “sports hernia” for this pathology. Nevertheless, many papers on this particular subject have not clearly described the intraoperative findings, and there is also no methodological uniformity among the published reports. Sportsman hernia is usually defined as the weakness of posterior inguinal floor which results in destabilization of the pelvis and subsequent pain [8, 25, 34–36]. Reinforcement of the inguinal area with suturing or mesh placement is supposed to provide stabilization and pain relief [35, 37]. In Genitsaris and colleagues’ laparoscopic repair series of 131 athletes, a posterior wall weakness was recorded in all cases [37]. This is a deficiency at the Hesselbach triangle corresponding a direct hernia. Sheen and co-researchers reported this condition in 69% of their patients [11]. The frequency 80.6% in open repairs, and 58.8% in TEP. In the present series, the overall incidence of posterior inguinal wall weakness was 70%, while 80% in open and 67% in endoscopic groups. Although the difference between the groups was not significant, former and later series represented higher incidence for posterior inguinal wall weakness during open inguinal explorations. On the other hand, indirect hernia sac exists in fewer cases. Sheen and colleagues reported only one small ind sac of within 25 open repairs [11]. Roos encountered two true indirect hernia sacs among 24 TEP [2]. Also, Brans recorded true small inguinal hernia in 16% of TEP repairs [12]. In the present series, a typical indirect hernia was found one in each group, whereas small sacs were much more frequent. An interesting finding was that small hernia sacs in Nyhus Type I hernias were more common in endoscopic explorations, almost one in every three.

Another important entity is cord lipoma. This lesion has been reported between 3 and 20% in inguinal explorations for sportsman hernia [2, 11, 12]. We encountered cord lipoma more frequently, especially during TEP repairs, with a frequency of 73%, which is quite higher than those previously reported. Cord lipoma, which is a protrusion of extraperitoneal fat tissue, is a rather common lesion, and accompanies inguinal hernia in 21 to 75% of the repairs for typical inguinal hernias [38–43]. However, some surgeons reported prevalences as low as 9% [44]. The frequency may be parallel to the diligence during surgical exploration, or may exhibit geographical differences. Current perspective is that cord lipoma should be accepted and managed as a true hernia [43]. The importance of cord lipomas has been emphasized since 1970’s [45]. European Hernia Society defines the penetration of preperitoneal lipoma through the internal inguinal opening as a hernia [45]. Cord lipomas can be met together with indirect or direct hernias, and also in the absence of any hernia [39, 44]. It has been reported that

no inguinal hernia accompanied cord lipomas in 28% to 38% of the cases [39]. Our observation is somewhat similar. In their series of minimally invasive inguinal hernia repairs, Dias and colleagues reported no statistically significant relation between the presence of the indirect hernia and the cord lipoma [41]. These findings concur our findings for inguinal explorations for sportsman hernias. Cord lipomas can cause discomfort and pain, and this condition may be more prominent in athletes who use groin region vigorously. Symptomatic residual lipomas are considered as surgical failure, recurrence, or pseudo-recurrence [46, 47]. Nevertheless, a recent questionnaire study among Danish surgeons revealed that only one half of the surgeon routinely removed cord lipomas during open or laparoscopic repairs [47]. Symptomatic residual cord lipomas can be seen after minimally invasive hernia repairs [48]. Berney reported an interesting case in which a cord lipoma was missed twice during open and endoscopic repairs [47]. In the present series, cord lipomas were found in 73% of MIS and 32% of open repairs. These frequencies are consistent with the literature. However, it is not easy to explain this large difference between open and endoscopic explorations findings. Most of open repairs in the present series were performed with local anesthesia while the patient is conscious and able to give a cough for Valsalva maneuver. The presence of an indirect hernia sac or a cord lipoma was checked in all cases. Nevertheless, our findings may indicate that cord lipomas can be diagnosed more accurately during posterior approaches. Another interesting finding in this study is that no patient who underwent open repair subsequently complained a residual lipoma protrusion, but one patient who received TEP did. In addition, this situation developed following bilateral cord lipoma reduction. The possible reason for this situation is that the reduced cord lipoma subsequently became between the mesh and the posterior inguinal wall. This case provides an opportunity to reemphasize the clinical importance of the management cord lipomas, and controlled desufflation following mesh placement.

The primary aim of this study was not to propose a definitive nomenclature for this condition across all related specialties; however, based on our intraoperative findings, we may humbly suggest a possible refinement of its terminology, particularly for general and hernia surgeons. The latter group of surgeons usually encounters athletes after the exclusion or treatment of other potential causes of groin pain, such as osteitis pubis or adductor tendinitis. Therefore, inguinal-related pathology remains the only condition to be addressed. Our operative findings, consistent with those of many others, reveal that the vast majority of patients referred to general surgeons present with posterior inguinal wall weakness, varying degrees of direct or indirect hernias, and cord lipomas. These patients can be considered as having an inguinal hernia. In this context, while the term sportsman's hernia cannot be universally applied to all cases of athletic pubalgia, it appears appropriate for the subset of patients treated by hernia surgeons.

This present study has several limitations. First, it is a retrospective series rather than a prospective randomized comparison of surgical techniques. The choice of the repair method was primarily based on the patient's preference. As a result, the comparison of the effects of different techniques could not be performed with a high level of scientific rigor. Second, because the case series spans a long period of time, the types of meshes and fixation techniques used have varied considerably, making it difficult to make clear conclusions about the potential advantages and disadvantages of them. Some newer meshes were requested by the athletes specifically, and employed during TEP repairs. No technical complications or inability to return to sport were recorded after MIS. Therefore, there is no room to discuss the effects of different materials. In open surgery, three different types of meshes were used. Two athletes who received a composite lightweight mesh and a light-weight polypropylene mesh were not able to return play. One of these patients had pubic bone stress fracture, and no specific pathology could be documented in the other one. All patients who received standard polypropylene mesh could return to sports. Third, preoperative and postoperative pain scores were not documented with validated pain scales, consequently, this important clinical outcome could not be properly documented.

In conclusion, multidisciplinary approach to groin pain in athletes can provide very good results. Athletes who are evaluated by sports medicine specialists and radiologists before being referred to hernia surgeons benefit greatly from surgical repairs. Both open and minimally invasive techniques are successful methods in experienced hands. Return-to-sports rate is promisingly high. Most patients have inguinal pathologies correspond with hernia. The term sportsman's hernia may be appropriate for this subset of cases.

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