



International Journal of Innovative Technologies in Social Science

e-ISSN: 2544-9435

Operating Publisher
SciFormat Publishing Inc.
ISNI: 0000 0005 1449 8214

2734 17 Avenue SW,
Calgary, Alberta, T3E0A7,
Canada
+15878858911
editorial-office@sciformat.ca

ARTICLE TITLE	NARRATIVE REVIEW: LAPAROSCOPIC VS OPEN REPAIR OF INGUINAL HERNIAS IN ATHLETES: CLINICAL OUTCOMES AND RETURN TO SPORT
----------------------	--

DOI	https://doi.org/10.31435/ijitss.3(51).2026.6216
------------	---

RECEIVED	23 May 2026
-----------------	-------------

ACCEPTED	18 August 2026
-----------------	----------------

PUBLISHED	24 August 2026
------------------	----------------

LICENSE



The article is licensed under a **Creative Commons Attribution 4.0 International License**.

© The author(s) 2026.

This article is published as open access under the Creative Commons Attribution 4.0 International License (CC BY 4.0), allowing the author to retain copyright. The CC BY 4.0 License permits the content to be copied, adapted, displayed, distributed, republished, or reused for any purpose, including adaptation and commercial use, as long as proper attribution is provided.

NARRATIVE REVIEW: LAPAROSCOPIC VS OPEN REPAIR OF INGUINAL HERNIAS IN ATHLETES: CLINICAL OUTCOMES AND RETURN TO SPORT

Natalia Krupa (Corresponding Author, Email: nataliakrupa162@gmail.com)

Specialist Hospital in Kościerzyna, Kościerzyna, Poland

ORCID ID: 0009-0007-6691-0073

Aleksandra Marzec

St. Adalbert's Hospital, Gdańsk, Poland

ORCID ID: 0009-0007-7885-948X

Dominika Galińska

University Clinical Centre, Gdansk, Poland

ORCID ID: 0009-0004-8037-2679

Natalia Domańska

University Clinical Centre, Gdansk, Poland

ORCID ID: 0009-0008-6378-8903

Anna Roman

Faculty of Medicine, Medical University of Gdansk, Poland

ORCID ID: 0009-0008-7152-9880

Joanna Zajęczkowska

University Clinical Centre, Gdansk, Poland

ORCID ID: 0009-0003-4912-9809

Natalia Marzec

St. Adalbert's Hospital, Gdańsk, Poland

ORCID ID: 0009-0008-4722-7321

Małgorzata Cherek

St. Vincent de Paul Hospital in Gdynia, Poland

ORCID ID: 0009-0007-4116-1854

Weronika Praska

Polish Red Cross Maritime Hospital, Gdynia, Poland

ORCID ID: 0009-0004-1544-1404

Stanisław Maria Wardecki

Polish Red Cross Maritime Hospital, Gdynia, Poland

ORCID ID: 0009-0008-7703-490X

ABSTRACT

Background: Inguinal hernias are super common, especially in active folks like athletes and gym-goers. They can really mess things up – causing pain, tanking your performance, and sidelining you from sports for weeks. If rest, physical therapy, or other conservative fixes don't cut it, surgery's usually the best bet to get you back in the game.

There are two main surgical routes: open surgery (the classic approach) and laparoscopic surgery (the minimally invasive one). Both work well, but which one's right for you depends on factors like your hernia size, your activity level, and what your surgeon recommends.

Goal: This narrative review compares laparoscopic and open inguinal hernia treatment in athletes, emphasizing clinical results, complications, and timetables for return to sport.

Methods: A narrative literature review was performed using PubMed and Google Scholar. Studies were identified using combinations of relevant keywords, including “inguinal hernia”, “laparoscopic repair”, “open repair”, and “athletes”. Clinical studies, systematic reviews, and guidelines published primarily within the last 10 years were included. A qualitative synthesis was performed.

Results: Available evidence suggests that laparoscopic repair may be associated with reduced postoperative pain and earlier functional recovery compared with open repair. Long-term outcomes, including recurrence rates, appear comparable between techniques. However, evidence specifically addressing athletic populations remains limited and heterogeneous.

Conclusions: Both surgical techniques are effective and safe. Laparoscopic repair may offer advantages in early recovery and return to sport. Surgical decision-making should be individualized.

KEYWORDS

Inguinal Hernia; Athletes; Sports Performance; Return to Play; Laparoscopic Repair; Open Repair; Postoperative Recovery; Quality of Care

CITATION

Natalia Krupa, Aleksandra Marzec, Dominika Galińska, Natalia Domańska, Anna Roman, Joanna Zajączkowska, Natalia Marzec, Małgorzata Cherek, Weronika Praska, Stanisław Maria Wardęcki. (2026) Narrative Review: Laparoscopic vs Open Repair of Inguinal Hernias in Athletes: Clinical Outcomes and Return to Sport. *International Journal of Innovative Technologies in Social Science*. 3(51). doi: 10.31435/ijitss.3(51).2026.6216

COPYRIGHT

© **The author(s) 2026.** This article is published as open access under the **Creative Commons Attribution 4.0 International License (CC BY 4.0)**, allowing the author to retain copyright. The CC BY 4.0 License permits the content to be copied, adapted, displayed, distributed, republished, or reused for any purpose, including adaptation and commercial use, as long as proper attribution is provided.

1. Introduction

Inguinal hernias keep showing up on general surgeons' plates all over the globe; they're commonplace and strike active patients especially often. For athletes, the risk ramps up because of nonstop strain on the abdominal wall—think sprinting full tilt, sharp cuts on the field, or grinding through heavy lifts that hammer the groin (1,14).

Groin pain's turned into a real thorn in sports medicine lately, messing with workouts, match readiness, and long-term progress. Things like taking it easy or hitting physio don't always sort it out, so surgery ends up on the table. You've basically got laparoscopic repair or open mesh repair as your go-tos. In the lap camp, TAPP (transabdominal preperitoneal) and TEP (totally extraperitoneal) are the heavy hitters (2,3).

Both are staples with solid track records, yet there's no full consensus on what's ideal for athletes. What swings it? Mostly how soon you're lacing up again and if recovery's straightforward. This review gathers up recent studies to pit laparoscopic against open techniques in sports-active folks.

2. Materials and Methods

This narrative review rounds up what's out there on laparoscopic versus open inguinal hernia repairs in athletes, zeroing in on clinical outcomes and—most importantly—how quickly patients return to training or competition.

We searched databases like PubMed and Google Scholar, combining terms such as “inguinal hernia,” “laparoscopic repair,” “open repair,” “athletes,” “sports hernia,” and “return to sport” to cover the ground thoroughly.

Included were original clinical studies, systematic reviews, and key international guidelines directly addressing the issue. Priority went to papers examining postoperative results, complications, and timelines for resuming athletic activity.

As a narrative review rather than a strict systematic one, we didn't enforce formal inclusion or exclusion criteria. Instead, we selected the most pertinent and contemporary evidence for a clear, practical synthesis.

3. Pathophysiology of Inguinal Hernia in Athletes

Inguinal hernias in athletes rarely have a single cause; they're typically multifactorial, driven largely by the relentless mechanical stress from intense, repetitive training and competition. Take high-octane sports—soccer players exploding into sprints, footballers making those razor-sharp cuts, martial artists delivering powerful kicks, or weightlifters grinding through squats and deadlifts. All of it spikes intra-abdominal pressure dramatically and repeatedly, which over months or years starts to erode the strength of the posterior inguinal wall, creating that weak spot where hernias form (14,15). It's not an overnight thing; it's cumulative damage from pushing the body to its limits without enough downtime.

Beyond straightforward hernias, athletes often grapple with “sports hernia” (aka inguinal disruption or athletic pubalgia), which is sneakier—no obvious bulge or defect on physical exam or basic imaging. Instead, it's chronic, nagging groin pain stemming from microtears and inflammation in the tough tendons and muscles of the lower abdominal wall (like the obliques and conjoint tendon) and the adductor group in the inner thigh. These subtle injuries build up from the same high-stress motions, disrupting the whole pelvic floor balance (11). Diagnosis can be tricky, relying on history, targeted exams, and sometimes MRI to rule out other culprits.

Stack on top of that a laundry list of risk factors: poor core stability (you can't brace properly under load), muscle imbalances (say, quads overpowering weak glutes or hip stabilizers), straight overuse from back-to-back high-volume sessions, and cutting corners on recovery—skipping rest days or ignoring fatigue signals (15). Poor biomechanics, like faulty running form or inadequate warm-ups, just pour fuel on the fire. No wonder groin disorders plague both elite pros and dedicated amateurs across sports from running to CrossFit. Catching it early with smart prevention—like core-focused strength work and periodized training—can head off a lot of this trouble.

4. Surgical Techniques

4.1 Open Repair: Lichtenstein Tension-Free Mesh Procedure

When it comes to open repair, the Lichtenstein method is the one you'll see most often in practice for inguinal hernias. It starts with a standard 5-8 cm incision right over the inguinal ligament, parallel to it and starting from the pubic tubercle. You carefully go through the skin, Scarpa's fascia, and then split the external oblique aponeurosis to open up the canal. From there, it's about finding the hernia—indirect sacs get high-ligated, direct ones get reduced—and clearing out any cord lipoma. The key step is sliding in that flat polypropylene mesh sheet, sized to overlap the defect by a good 2 cm all around. Sutures go in selectively: a few to anchor it to the pubic bone medially, running along the shelving edge below (watching for the nerve), under the internal ring laterally, and up to the conjoint tendon. No pulling tight—it's all tension-free. Cord back in place, close the external oblique, and skin approximated with whatever works—subcuticular or staples (8).

What keeps it so popular after all these years? For one, it's dead simple for any surgeon with basic training; you can do it under local anesthetic in a clinic setting without breaking the bank on equipment. Recurrence stays low—around 1-3% over five years from big trials—because the mesh spreads the load across a wide area, which holds up well even when patients like athletes ramp up activity. That reliability is why it's still first-line in resource-limited or high-volume centers (7). On the other hand, that bigger cut means patients feel it more in the first week or two—more pain meds needed, and full return to sports might take 4-6 weeks. You also see seromas or hematomas in 5-10% of cases, infections around 1-2%, and unfortunately chronic pain lingers in 10% or so for some folks.

4.2 Laparoscopic Repair: TEP and TAPP Techniques

Laparoscopic repairs shift things to a whole different level with TEP and TAPP, both targeting the preperitoneal space through tiny ports—usually two 5-mm and one 10-12 mm optic site. General anesthesia, CO₂ at 12 mmHg or so, and you're in with a crystal-clear view of the entire myopectineal triangle.

TEP keeps it extraperitoneal from the jump: small infraumbilical nick, blunt dissection or balloon to pop open the space, then systematic clearance—peritoneum up off the cord structures, hernia sac reduced way high,

all the way to the iliac vessels laterally and symphysis medially. Mesh rolls in (10x15 cm typical), unfolds nicely over Hesselbach's, Cooper's ligament, and up above the cord, fixed with tacks or glue only where needed to avoid nerves.

TAPP takes a transabdominal route first: peritoneum incised along the medial umbilical fold, flap down for the same dissection, mesh placed, then sew the peritoneum shut to keep bowel off the patch (18).

The payoff shows up quick—pain scores drop 20-30% versus open in the early days, wound issues barely register (<1%), scars fade nicely, and athletes often walk out same-day, jogging in a week, full tilt by month one (5,6). Recurrence? On par at 1-4% long-term, and bilaterals are a breeze without extra incisions. Downside is the expertise barrier—guidelines say 50-100 cases to get good, ops run 45-75 minutes, and you need the lap suite. TAPP carries a tiny peritonitis risk if not closed right, but it's rare (2,3). For someone training daily, the faster rehab tips the balance.

5. Clinical Outcomes

Choosing the right surgical technique for inguinal hernia repair—especially in athletes—hinges on a handful of key postoperative metrics: pain control, complication profiles, recurrence risk, and above all, the speed and quality of functional recovery back to sport. The literature paints a fairly consistent picture, though nuances emerge based on patient factors and surgeon experience.

Right off the bat, laparoscopic approaches (TEP/TAPP) edge out open Lichtenstein in terms of early postoperative pain. Multiple randomized trials and meta-analyses peg the difference at 20-30% lower VAS scores in the first 24-48 hours, likely tied to smaller incisions, less dissection around sensory nerves (ilioinguinal, genitofemoral), and no big muscle-splitting (7,8). This translates practically to quicker mobilization, shorter hospital stays (often outpatient), and less opioid or NSAID use—critical for athletes itching to rehab without fogging their training mindset.

Return to activity follows suit. Pooled data from studies like the EU Hernia Trialists Collaboration show laparoscopic patients hitting normal daily function 7-14 days sooner and sports-specific loads (running, weights) by 2-4 weeks versus 4-6 for open (5,6). That gap narrows in high-volume open surgeons or with optimized protocols (e.g., early PT, local blocks), but holds for most athletic cohorts where every week counts.

Complications stay low across the board—under 5% major for both—but patterns differ. Open carries higher wound morbidity: seromas (8-15%), hematomas (3-5%), superficial infections (1-2%), from the larger exposure. Laparoscopy flips it with rare intra-abdominal issues (bowel/ bladder injury <0.5%, mostly TAPP), plus occasional port-site hernias or port pain; expertise drops these risks sharply (2,6).

Recurrence? Neck-and-neck at 1-4% over 3-5 years when guidelines are followed—mesh size/overlap, fixation technique matter more than approach (4,5). The stubborn outlier is chronic postsurgical pain (inguinodynia), hitting 10-20% long-term regardless, but slightly more with open due to nerve handling; it can derail full athletic return even if the repair holds (17).

Bottom line, both deliver solid fixes, but laparoscopy's early advantages in pain and rehab make it appealing for athletes prioritizing minimal downtime—provided the surgeon's got the laps dialed in.

Table 1. Comparison of laparoscopic and open inguinal hernia repair in athletes

Feature	Laparoscopic repair	Open repair
Main techniques	TEP and TAPP	Lichtenstein repair
Surgical access	Small incisions, preperitoneal approach	Groin incision, anterior approach
Early postoperative pain	Usually lower	Usually higher
Wound complications	Less common	Slightly more common
Return to daily activity	Usually faster	Usually slower
Return to sport	Often earlier	Usually takes longer
Recurrence risk	Similar to open repair	Similar to laparoscopic repair
Chronic groin pain	May be lower	May be higher
Technical difficulty	Higher; requires experience	Lower; more widely available
Best suited for	Athletes needing faster recovery, bilateral or recurrent hernias	Primary unilateral hernias, limited laparoscopic access

6. Return to Sport

Getting athletes back in the game is what really counts when we're talking hernia surgery outcomes. From the studies I've pulled, laparoscopic fixes like TEP or TAPP seem to let people start moving again a bit sooner than the open Lichtenstein way, but the exact weeks vary a lot depending on who you read and what sport they're studying (9,11).

Take lap repair: some reports have guys doing light stuff—easy runs, bike rides, basic gym—by 2 to 4 weeks out. But that's not universal. It hinges on the hernia details, how bad the pain was before, the athlete's age and fitness, plus their sport. A soccer player might wait longer than a swimmer. Either way, jumping straight to matches isn't smart; you need a step-by-step rehab plan with physio guiding the way. That full competition green light? Often 6 weeks or more, sometimes pushing 8-12 if it's contact heavy (9).

Open surgery tends to mean more waiting before full go—light work around 3-5 weeks, sports clearance 6-8 weeks typically. The good news is both approaches get most people (90%+) back to their old level eventually, usually within 3-6 months.

A few things make or break the timeline. Solid rehab matters most—programs with progressive strength, balance drills, and sport drills shave weeks off. Sport type plays in too: high-impact team games like football or rugby call for baby steps to avoid stressing the repair too soon, while distance runners or cyclists can ramp faster. And don't overlook the head game—some athletes hold back from worry about it popping again, so building confidence is key alongside the physical side (13,15).

7. Evidence hierarchy and clinical decision-making in hernia repair

Picking between lap or open for inguinal hernia boils down to what the evidence says—and it's built on RCTs, meta-analyses, and big registries like the HerniaSurge guidelines. Both come out looking safe and effective overall, with low morbidity and solid fixes when done right.

A few solid papers point to laparoscopy pulling ahead in certain spots. For instance, (6) and (6) highlight less pain early on and quicker bounce-back to daily life or work in selected groups—think younger, active patients. That tracks with the reduced dissection and smaller scars. But take it with a grain of salt: studies aren't apples-to-apples. Surgeon skill varies wildly (high-volume lap experts vs. occasional open doers), patient mixes differ (athletes vs. elderly), and outcome measures shift (VAS at day 1 vs. week 4, or "light activity" vs. "full gym"). Makes head-to-head tough.

On recurrence, it's a wash—1-4% long-term for both if you nail the mesh technique (size, overlap, fixation), (6). So that's not the tiebreaker.

What tips the scale then? Pain control, recovery speed, and time to sport or heavy work. Those hit home hardest for athletes, where sitting out a month can mean lost season or fitness drop. Laparoscopy often wins there, letting training resume 1-2 weeks earlier, preserving muscle and morale. For everyday cases, open's fine and cheaper. Decision's patient-driven: bilateral? Lap. Recurrent? Lap if open failed before. Surgeon comfort? Huge factor—bad lap beats good open any day. Weigh costs, access, and goals, and you're set.

8. Chronic Groin Pain and Long-Term Functional Outcomes

Chronic pain in the groin after inguinal hernia surgery counts as a serious issue, above all for active patients and athletes. When it lasts over 3-6 months, it limits everyday life quite a bit. Often there's no hernia coming back to explain it. Figures in the literature run 5-15%, depending on how researchers measure it.

Work like Campanelli's from 2017 shows laparoscopic methods with lower rates, say 6-8%, against 11-13% for open repair. Haladu and colleagues in 2022 back that up. Still, not all studies agree—some find the difference disappears if surgeons have lots of experience. Open surgery can hurt nerves more from the bigger cuts, lap from tacks gone wrong. Using thinner mesh and fewer stitches helps both.

Quality of life looks better early with lap saw higher scores on pain and movement in SF-36 tests right after (4) noted people doing normal things faster. Athletes benefit from less time off. After 6 months or so, both groups end up similar as healing finishes.

This suggests picking based on the patient. Lap for quick recovery if the surgeon knows it well. Things like nerve shots or fixing later help bad cases. Both do the job long term, but avoiding pain keeps athletes performing.

9. Chronic groin pain and long-term functional outcomes

One of the tougher problems after hernia surgery is chronic groin pain that sticks around—this hits active people like athletes hardest. It messes with their performance in sports and can last even when the repair looks good, no recurrence. Research often shows laparoscopic surgery leading to less of this pain than open repair, but results vary between studies (17;6).

Quality of life data drives home why technique matters. Reviews of open and lap cases indicate minimally invasive approaches give better early results, especially for physical tasks and pain levels (4). In the long run, however, scores level off between methods. Early gains seem to fade as healing advances and patients resume normal activities.

10. Discussion

Surgeons still weigh laparoscopic against open inguinal hernia repair when treating athletes, and it's not a clear-cut call. Both methods have proven track records in everyday use, but their strengths play out differently based on things like the patient's age and fitness, the surgeon's hands-on experience, and the particular physical demands of the sport involved.

At the top of the list for any athlete is time to get back playing. Trial after trial points to laparoscopic repair letting patients pick up physical activity sooner—light training in 2-4 weeks compared to 4-6 weeks or more with open approaches (9,11). The reason makes sense: smaller cuts mean less pain right after surgery and less disturbance to the muscles and nerves around the groin. In competitive settings, where every session counts toward peak form, even a couple weeks' edge can make a real difference in maintaining season momentum or avoiding lost fitness.

That said, open repair isn't going anywhere—it's still the mainstay for many clinics and delivers dependable results. The procedure is technically easier to perform, relies on basic instruments without needing a full laparoscopic tower or trained OR staff, and fits well in scenarios like primary unilateral hernias or outpatient local anesthesia cases (2). In hospitals or regions where laparoscopic resources are scarce or costs run high, open just makes practical sense without compromising quality.

Surgeon expertise comes into play big time here. Laparoscopic outcomes improve sharply with volume—learning curves stretch 50-100 cases for safe, efficient TEP or TAPP, per guidelines (2,3). Open repair feels more straightforward and consistent, even for less specialized teams, which helps in community hospitals or training environments.

We have to note the literature's shortcomings too. Plenty of studies lump together all comers—elderly, obese, sedentary—not honing in solely on athletes (12). That muddies direct application to sports populations. Add varying definitions of "return to sport" (light jog vs. full match?) and inconsistent rehab plans, and comparing studies gets tricky.

Rehab stands out as a major lever, regardless of surgical path. Well-structured, personalized programs—with progressive loading, core stability work, and sport drills—can shave weeks off recovery and lower re-hernia odds (13). View surgery as one piece of a wider plan involving physiotherapists, trainers, and sometimes sports docs.

Guidelines from groups like HerniaSurge stress tailoring to the patient (1). For athletes, run the numbers on sport specifics (high-impact contact like rugby needs slower ramp than swimming), competition tier (pro vs. amateur), and personal recovery targets.

To wrap up, laparoscopic repair often shines for quicker early recovery and sport return, but open remains a reliable, versatile choice. The right pick balances evidence on outcomes with real-world factors like expertise and access, always putting the individual athlete first.

11. Conclusions

Inguinal hernia repair in athletes works well with either laparoscopic or open techniques—both prove safe and get the job done effectively. Laparoscopic methods like TEP and TAPP stand out for cutting down on early pain and speeding up the path back to training and competition, which fits perfectly for high-level performers who can't afford much downtime.

Open Lichtenstein repair holds its own as a dependable option that's easy to do anywhere, with strong results stretching years out. Ultimately, the call should fit the person: match patient goals, sport requirements (contact vs. endurance), and what the surgeon does best.

More targeted research on athletes specifically would help fine-tune surgery choices and rehab plans down the line.

Author's Contribution:**Conceptualization:** Natalia Krupa and Aleksandra Marzec**Methodology:** Dominika Galińska, Natalia Marzec and Weronika Praska**Resources:** Joanna Zajączkowska, Natalia Domańska, Stanisław Wardęcki and Anna Roman**Data curation:** Małgorzata Cherek, Natalia Marzec and Weronika Praska**Formal analysis:** Natalia Krupa, Aleksandra Marzec, Joanna Zajączkowska and Natalia Domańska,**Investigation:** Natalia Krupa, Stanisław Wardęcki and Anna Roman**Supervision:** Aleksandra Marzec, Natalia Marzec and Weronika Praska**Writing-rough preparation:** Natalia Krupa, Aleksandra Marzec, Dominika Galińska, Natalia Marzec and Weronika Praska**Writing-review and editing:** Natalia Krupa, Aleksandra Marzec, Natalia Marzec and Weronika Praska

All authors have read and agreed with the published version of the manuscript.

Funding Statement: The study received no external funding.**Conflicts of Interest:** The authors declare no conflict of interest.**REFERENCES**

1. Simons, M. P., Aufenacker, T., Bay-Nielsen, M., Bouillot, J. L., Campanelli, G., Conze, J., et al. (2018). International guidelines for groin hernia management. *Hernia*, 22(1), 1–165. <https://doi.org/10.1007/s10029-017-1668-x>
2. Bittner, R., & Schwarz, J. (2012). Inguinal hernia repair: Current surgical techniques. *Langenbeck's Archives of Surgery*, 397(2), 271–282. <https://doi.org/10.1007/s00423-011-0875-7>
3. Köckerling, F., & Simons, M. P. (2018). Current concepts of inguinal hernia repair. *Visceral Medicine*, 34(2), 145–150. <https://doi.org/10.1159/000487278>
4. Aiolfi, A., Cavalli, M., Micheletto, G., Lombardo, F., Bonitta, G., Morlacchi, A., Bruni, P. G., Campanelli, G., & Bona, D. (2019). Primary inguinal hernia: Systematic review and Bayesian network meta-analysis comparing open, laparoscopic transabdominal preperitoneal, totally extraperitoneal, and robotic preperitoneal repair. *Hernia*, 23(3), 473–484. <https://doi.org/10.1007/s10029-019-01964-2>
5. Grant, A. M., & EU Hernia Trialists Collaboration. (2002). Laparoscopic versus open groin hernia repair: Meta-analysis of randomised trials based on individual patient data. *Hernia*, 6(1), 2–10. <https://doi.org/10.1007/s10029-002-0050-8>
6. Haladu, N., Alabi, A., Brazzelli, M., Imamura, M., Ahmed, I., Ramsay, G., et al. (2022). Open versus laparoscopic repair of inguinal hernia: An overview of systematic reviews. *Surgical Endoscopy*, 36, 4685–4700. <https://doi.org/10.1007/s00464-022-09161-6>
7. Sanderson, R., De-Marchi, D. D., Cesário, J. C. B., Dias Sanderson, L. G., & Zilberstein, B. (2024). Quality of life using EuraHS-QoL scores after surgical treatment of inguinal hernia: Laparoscopic transabdominal preperitoneal (TAPP) and Lichtenstein techniques. *Arquivos Brasileiros de Cirurgia Digestiva*, 37, e1798. <https://doi.org/10.1590/0102-672020240005e1798>
8. Köckerling, F., & Lammers, B. (2018). Open inguinal hernia repair. *Surgical Clinics of North America*, 98(3), 593–605. <https://doi.org/10.1016/j.suc.2018.02.003>
9. Huerta, S., & Garza, A. M. (2025). A systematic review of open, laparoscopic, and robotic inguinal hernia repair. *Journal of Clinical Medicine*, 14(3), 990. <https://doi.org/10.3390/jcm14030990>
10. Almarhabi, Y. (2025). Laparoscopic versus open inguinal hernia repair: Retrospective cohort study. *Journal of Current Medical Science*, 11(5). <https://doi.org/10.22317/jcms.v11i5.1949>
11. Piozzi, G. N., Cirelli, R., Salati, I., Maino, M. E., Leopaldi, E., Lenna, G., et al. (2019). Laparoscopic approach to inguinal disruption in athletes. *Sports Medicine - Open*, 5(1), 25. <https://doi.org/10.1186/s40798-019-0201-4>
12. Paajanen, H., Brinck, T., Hermunen, H., & Airo, I. (2011). Laparoscopic surgery for chronic groin pain in athletes is more effective than nonoperative treatment: A randomized clinical trial with magnetic resonance imaging of 60 patients with sportsman's hernia (athletic pubalgia). *Surgery*, 150(1), 99–107. <https://doi.org/10.1016/j.surg.2011.02.016>
13. Meyers, W. C., McKechnie, A., Philippon, M. J., Horner, M. A., Zoga, A. C., & Devon, O. N. (2017). Experience with sports hernia. *Annals of Surgery*, 266(4), 656–665. <https://doi.org/10.1097/SLA.0000000000002366>
14. Thorborg, K., & Sheen, A. J. (2026). Inguinal-related groin pain and/or disruption in athletes: Current understanding, assessment and management strategies. *Open Access Journal of Sports Medicine*, 16, 510774. <https://doi.org/10.2147/OAJSM.S510774>

15. Serner, A., van Eijck, C. H., Beumer, B. R., Hölmich, P., Weir, A., & de Vos, R. J. (2015). Study quality on groin injury management remains low: A systematic review on treatment of groin pain in athletes. *British Journal of Sports Medicine*, 49(12), 813. <https://doi.org/10.1136/bjsports-2014-094256>
16. Falvey, E. C., King, E., Kinsella, S., & Franklyn-Miller, A. (2016). Athletic groin pain (part 1): A prospective anatomical diagnosis of 382 patients—Clinical findings, MRI findings and patient-reported outcome measures at baseline. *British Journal of Sports Medicine*, 50(7), 423–430. <https://doi.org/10.1136/bjsports-2015-094912>
17. Campanelli, G. (2017). Chronic pain after inguinal hernia repair. *Hernia*, 21(3), 305–311. <https://doi.org/10.1007/s10029-017-1593-z>
18. Goksoy, B., Yilmaz, G., Azamat, I. F., Ozata, I. H., & Duman, K. (2021). Laparoscopic inguinal hernia repair—TAPP versus TEP: Results of 301 consecutive patients. *Surgical Technology International*, 39, 191–195. <https://doi.org/10.52198/21.STI.39.HR1427>
19. Miserez, M., Peeters, E., Aufenacker, T., et al. (2018). Update of laparoscopic hernia guidelines. *Hernia*, 22(1), 165–176. <https://doi.org/10.1007/s10029-017-1662-3>
20. Sharma, P., Boyers, D., Scott, N. W., et al. (2018). Laparoscopic vs open repair: Outcomes and cost-effectiveness. *Health Technology Assessment*, 22(28), 1–165. <https://doi.org/10.3310/hta22280>
21. Jenkins, J. T., & O'Dwyer, P. J. (2018). Inguinal hernias. *BMJ*, 336, 269–272. <https://doi.org/10.1136/bmj.39450.428275.AD>
22. Pulikkal Reghunandanan, R., Ali Usman, A., Basheer, S., Kuttichi, L., Els Jojo, J., & Abdul Rasheed, M. F. (2023). Laparoscopic versus open inguinal hernia repair: A comparative study. *Cureus*, 15(11), e48619. <https://doi.org/10.7759/cureus.48619>
23. Fitzgibbons, R. J., & Forse, R. A. (2015). Clinical practice: Groin hernias in adults. *New England Journal of Medicine*, 372(8), 756–763. <https://doi.org/10.1056/NEJMcp1404068>
24. The HerniaSurge Group. (2018). International guidelines for groin hernia management. *Hernia*, 22(1), 1–165. <https://doi.org/10.1007/s10029-017-1668-x>