



## Why I prefer TAPP repair for uncomplicated unilateral groin hernia in adults

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My first choice of repair of an uncomplicated unilateral groin hernia of an adult person is the transabdominal preperitoneal patch technique—TAPP. Over the past 27 years, since I have started this minimal invasive repair, my conviction in making this choice became stronger and stronger, being nourished by the very good clinical outcomes and high patient's satisfaction. Based on my personal experience TAPP is the logic of groin hernia repair [1].

To understand the arguments and reasons for this evolutionary process we have to flashback about three decades. Gold standard was then the pure tissue repair, at its best the Shouldice repair. Wound healing complications belonged to surgery, acute postoperative pain too and chronic pain was not “discovered” yet. Recurrence rates from 16 to 20% were normal, 6 weeks lifting restriction to 5 kg led to incapacity for work of 6–8 weeks. Prosthetic materials were introduced to reinforce the repair (e.g. Acquaviva, Usher, Stoppa, Lichtenstein) and to improve the recurrence rate. Parallel to reduced recurrence rate the SSO and SSI rate increased. Late eighties revolutionized the classic abdominal surgery by introduction of laparoscopic cholecystectomy. The minimal invasive technique demonstrated impressively pain reduction, early recovery, short convalescence and shorter hospital stay as a consequence of diminished trauma caused by the approach. Soon after two new approaches to groin hernia repair appeared—TAPP and TEP (transabdomino-preperitoneal, resp. totally extraperitoneal). Both TAPP and TEP mimic the open Stoppa repair (Giant Prosthetic Reinforcement of Visceral Sack, GPRVS) by placing large prosthetic mesh in the preperitoneal space with the tools of minimally invasive surgery.

The result of this attempt is the following: Small wounds far from the implanted mesh, infection rates close to zero, low recurrence rates, less acute pain, clearly lower risk

of chronic pain, short hospital stay and nearly immediate resumption of normal activities.

Price to be paid: The learning curve. Not only the personal one, but a learning effect with a newly introduced procedure. Learning from anatomical errors, improving the necessary delicate dissection technique, increasing the mesh size, optimizing mesh materials, understanding the importance of macroporosity or avoiding penetrating mesh fixation.

In the meantime the societal changes influenced the patient's needs. Not only the wishful thinking mentality, but the characteristics of best possible outcome have changed. The life quality became an important parameter of any surgical therapy.

The indication range for laparo-endoscopic repair of groin hernias grew over the past years [1–11]. Being aware of the technical difficulty of TAPP, the technique was first reserved for recurrences after anterior repairs and for bilateral hernias. Chronic increase of intraabdominal pressure (as a driving force for recurrence) in patients with constipation, chronic cough, in sportsmen and heavy labor became the next candidates. The results of open non-mesh and mesh repairs in female hernias showed more postoperative pain and higher recurrence rate than in men. The fact that women have higher incidence of femoral hernias and some of these can be overlooked at the primary open repair led to logical enlargement of indication for TAPP or TEP repair in female population [12–14].

The need for standardization of TAPP technique in order to ease the teaching and ease the learning required more evidence-based data. The EBM initiated the next paradigm shift. The randomized study of limited quality and mostly statistically underpowered has higher level of evidence than a thousand fold experienced expert. Evidence over eminence! But not in a real life. Therefore, some recommendations of the existing guidelines based on weak evidence are difficult to be implemented.

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The last “piece de resistance” of indication for TAPP or TEP remained the uncomplicated unilateral inguinal hernia. Since the results of laparo-endoscopic repair after overcoming the learning curve are very satisfactory [6, 8, 18] and the initial cost issue arguments are better understood [19], it seems clear that when considering postoperative pain, recovery speed and chronic pain, the laparo-endoscopic techniques are superior to Lichtenstein repair [24]. Why should not a patient with a simple unilateral primary hernia get the best of what I can offer? [1–27].

Nevertheless, there are several valid arguments why the open mesh or non-mesh repair has to belong in the tool box of every hernia surgeon. Especially when concerning surgical education.

Does it mean that TAPP is good for all groin hernias? Let me explain why I prefer TAPP, how I tailor my choice and how I justify my decisions.

TAPP is safe; TAPP causes a little discomfort and it is adequate to repair the most of hernia conditions. TAPP allows for additional diagnostic of contralateral groin, exploratory laparoscopy and enables bilateral repair if consented prior to surgery. TAPP repair offers short convalescence and allows nearly immediate resumption of normal activities. There are no restrictions of sports or lifting weight in most cases. Risk for chronic pain is smaller than with open mesh techniques [15–18]. Recurrence rate is low, mesh infection rate is zero or very close to zero.

Patient’s information from social media can be both over-optimistic as incorrectly negative.

Realistic information about possibilities and expectations including the patient’s factors (BMI, comorbidities, hernia size), the mesh properties and behavior after implantation is necessary to prevent disappointments.

TAPP is successful in patient’s perception and, therefore, worthwhile to learn and adopt.

TAPP’s objective is to place a large macroporous mesh in the preperitoneal space. The preexisting larger working space (than in TEP) allows for better anatomical orientation, better dexterity and higher dissectional safety. The possibility to dissect in front of the peritoneum and control eventual contents behind it increases security. In case of voluminous hernias the abdominal space offers better overview. The delicate separation of the visceral and parietal peritoneal layer allows easier preservation of nerve protecting spermatic fascia than in TEP. The larger the mesh size along with perfect alignment with underlying landing zone, the smaller is the risk of recurrence and need for fixation. TAPP’s learning curve is obviously shorter than the one of TEP repair.

TAPP requires certain dexterity, basic tasks for ablative laparoscopic procedures and some elements of advanced procedures too. Suturing skills from different angles under

the still common 2D-vision have to be developed, learned and perfected. The frequency of hernia surgery and TAPP repair demonstrate an opportunity rather than challenge.

There are obvious limitations of TAPP approach. Some are quite imperative (e.g. frozen abdomen, unfit for GA, intraabdominal infection), some relative. According to recent and earlier guidelines for groin hernia repair there is a recommendation to choose anterior repair rather than TAPP/TEP in case of previous surgeries in preperitoneal space: e.g. prostatic or bladder surgery (with exception of TUR-P/B), laparo-endoscopic repair or open preperitoneal mesh repair (TIPP, PHS, UHS, Plug and patch, etc.). TAPP or re-TAPP in these preconditions is technically demanding and potentially dangerous. An exploratory laparoscopy may help in decision making. Not everything what is feasible is reasonable!

Many things have changed since the first TAPP repair was published. Surgical techniques, technology-driven (and supported) tendency to minimal invasiveness, higher technical perfection, better instrumentation, better materials, more profound understanding of mesh material induced foreign-body reaction, importance of mesh porosity rather than weight/m<sup>2</sup>, necessity or non-necessity of mesh fixation, etc. I use for TAPP repair a macroporous mesh, never smaller than 15 × 10 cm, reusable trocars and reusable instruments, fix my meshes with cyanoacrylate glue and close the peritoneum with absorbable suture. Together with reasonable duration of surgery it makes the procedure more cost-effective.

The economic progress in many countries allowed the surgical progress/growth, but the patient’s needs or demands grew too. Laparo-endoscopic techniques not only decreased the recurrence rate and postoperative surgical discomfort and nearly eliminated infectious complications, but also markedly improved patient’s quality of life. The initially elevated direct costs (general anesthesia, disposable surgical material, longer operating time, event. complications) became lower by growing cost awareness and got neutralized by decreased indirect costs (shorter hospital stay, shorter sick leave, less postoperative care) [24]. Economists and politicians publically demand to lower the costs maintaining the same quality. Alternative truth far from reality! Inform the patient about this inconsistency.

Both TAPP and TEP can achieve excellent results and superior outcomes [20–27]. With the growing expertise in each technique the importance of surgeon’s performance becomes visible. But how do we plant and grow experts? The important topic of educational needs and teaching institutions goes beyond the scope of this contribution and has to be discussed elsewhere.

Based on existing evidence and my personal experience I prefer the TAPP approach in unilateral hernia repair because

of good results, lower risk of chronic pain, short convalescence and less postoperative complications [24].

The differences between TAPP and TEP (advantages and disadvantages, intra- and postoperative complications, recommendations) may vary from country to country, from author to author, from study to study [20–23, 25–27]. This demonstrates once more that not the one or another technique, but the surgeon, his indication, his choice of the tool considering patient's factors, his own abilities and his actual performance are of outmost importance for the patient's outcome.

## Compliance with ethical standards

**Conflict of interest** The author declares no conflict of interest.

**Ethical approval** Approval from institutional board was not required for this communication.

**Human and animal rights** This article does not contain any studies with human participants or animals.

**Informed consent** For this retrospective review formal consent is not required.

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