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Review Article

**SURGICAL APPROACHES TO SCROTAL HERNIA; REVIEW  
OF CURRENT LITERATURE**

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<sup>1</sup> King Saud University<sup>2</sup> Ibn sina national College<sup>3</sup> Taibah University<sup>4</sup> King Faisal University<sup>5</sup> king Abdul Aziz University<sup>6</sup> Umm al qura University<sup>7</sup> Medical university of Gdansk<sup>8</sup> Batterjee Medical College**Abstract:**

**Introduction:** Over 20,000,000 patients undergo scrotal hernia repair surgery every year, making it the most prevalent surgical repair. Through advancement in surgical techniques, repair is almost always successful, with a rate of recurrence that is less than 11%, and very few long-term complications, such as post-operative chronic pain, are reported.

**Methodology:** We conducted this review using a comprehensive search of MEDLINE, PubMed, and EMBASE, January 1987, through March 2017. The following search terms were used: scrotal hernias, scrotal swellings, prevalence of hernias, hernia repair, hernia surgery in complicated cases, emergent hernia surgery

**Aim:** Our aim in this study is to understand the recent international guidelines on the best surgical approaches to patients with scrotal hernia, along with outcomes and quality of life following each type of intervention.

**Conclusion:** Besides being fairly successful, the surgeries are followed by a relatively large number of recurrence. Several studies has been conducted which show that mesh-based, minimally invasive surgical repair techniques, are associated with the best outcomes, better quality of life, and lower rates of recurrence and postoperative complications.

**Keywords:** scrotal hernias, scrotal swellings, prevalence of hernias, hernia repair, hernia surgery in complicated cases, emergent hernia surgery

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**INTRODUCTION:**

Surgical repair of scrotal hernia is considered to be one of the commonest surgeries that are performed over the world. It is estimated that over 20,000,000 patient undergo scrotal hernia repair surgery every year [1, 2]. The overall incidence of a groin hernia has been estimated to be up to 43% in males, during their lifetime [1, 2]. Scrotal hernia almost always presents with bothering (and sometimes severe) symptoms that make surgical repair necessary [1]. A rare subset of patients are asymptomatic, but still will eventually need to undergo surgical repair. Studies estimate that up to seventy percent of asymptomatic patients will undergo surgery within the next five years following diagnosis [1, 3]. Fortunately, surgical repair is almost always successful, with a rate of recurrence that is less than 11% [4]. About half recurrence cases occur within the next ten years following surgical repair. The other half occurs even later, and can occur sometimes even after more than fifty years [4]. Post-operative chronic pain that lasts for a period longer than three months is a common complication of hernias surgical repair, which is seen in up to twelve percent of patients [1]. Moreover, this chronic pain is very severe and causing long-term disabilities in up to three percent of patients [1]. Since the year 2014, several international societies have collaborated and continuously work and study this issue to put guidelines that best succeed in improving scrotal hernias repair outcomes. These societies include the International Endohernia Society (IEHS), the European Hernia Society (EHS), and the European Association for Endoscopic Surgery (EAES) [1, 5–9]. In this review, we will review and summarize recent international guidelines on the best surgical approaches to patients with scrotal hernia, along with outcomes and quality of life following each type of intervention.

**METHODOLOGY:**

We did a systematic search for scrotal hernias and surgical techniques using PubMed search engine (<http://www.ncbi.nlm.nih.gov/>) and Google Scholar search engine (<https://scholar.google.com>). Our search also looked for the prevalence of scrotal hernia, and outcomes and quality of life associated with surgical repair. All relevant studies were retrieved and discussed. We only included full articles. The following search terms were used: scrotal hernias, scrotal swellings, prevalence of hernias, hernia repair, hernia surgery in complicated cases, emergent hernia surgery

- Data Extraction

Two reviewers have independently reviewed the studies, abstracted data, and disagreements were resolved by consensus. Studies were evaluated for

quality and a review protocol was followed throughout.

**The study was done after approval of ethical board of King Abdulaziz University.**

**Evidence-Based Selection of Techniques:**

Over the last 100 years, more than one hundred different surgical techniques have been described and approached in the treatment of femoral, scrotal, and other types of hernia [10]. The HerniaSurge Group recently published their latest guidelines in which they recommended the use of repair techniques that are mesh-based in all patients with scrotal or femoral hernia [1]. Their recommendation was based on several studies, and most importantly, a Cochrane systematic review that included over 16 clinical trials and more than 2,500 hernia patients who underwent surgical repair. They compared the use of mesh-based surgical techniques with the use of non-mesh shouldice techniques [11]. This review concluded that Shouldice techniques were associated with a significantly higher recurrence rates (odds ratio was 3.8) when compared with mesh-based surgical techniques. However, shouldice technique was still associated lower recurrence rates when compared with other non-mesh-based techniques (odds ratio was 0.62) [11]. Rates of complications, chronic pain, and long postoperative hospital stays, did not differ significantly between mesh-based and non-mesh-based techniques [11]. Therefore, in their guidelines, the HerniaSurge Group recommended that in case of use of non-mesh-based repair, Shouldice is the best technique to be approached [1]. Ideally, mesh-based repair is the one associated with better outcomes (especially when it comes to recurrence rates). However, sometimes the use of mesh-based techniques is not an option due to poor resources, unavailability, or patients' decision [1].

In another systematic review and meta-analysis, investigators compared the use of open Lichtenstein technique with the Prolene Hernia System (PHS) techniques (where there is open mesh). Investigators concluded that rates of complications, chronic severe pain, recurrence of hernia, and delay in returning to work, did not differ significantly between the two groups [12]. Another later systematic review and meta-analysis compared the use of open Lichtenstein technique with the Prolene Hernia System (PHS) techniques and reached similar conclusions [13]. However, and despite the same outcomes of both Lichtenstein technique and the Prolene Hernia System (PHS) techniques, the HerniaSurge Group still recommends against the use of the Prolene Hernia System (PHS) techniques. The rationale behind this is the use of foreign material, the

relatively high costs, and the need to access the hernia through both anterior and posterior planes, in the the Prolene Hernia System (PHS) techniques [1]. Moreover, no enough evidence is present to support the use of preperitoneal mesh repair over Lichtenstein repair when it comes to open repair of scrotal hernia [1].

Several studies, systematic reviews, and meta-analyses have been conducted to compare open techniques in general with transabdominal preperitoneal patch plasty (TAPP), totally extraperitoneal patch plasty (TEP), which are both considered laparo-endoscopic techniques [14-18]. One of these mentioned systematic reviews and meta-analyses, compared either transabdominal preperitoneal patch plasty (TAPP), totally extraperitoneal patch plasty (TEP), with the use of open mesh Lichtenstein technique [17]. The results of this meta-analysis showed that recurrence rates were similar among groups, but transabdominal preperitoneal patch plasty (TAPP), and totally extraperitoneal patch plasty (TEP), were associated improved quality of life, shorter time to return to work, lower rates of post-surgical infections, and lower rates of post-operative chronic pain [17]. Another study compared the use of totally extraperitoneal patch plasty (TEP) with the use of the Lichtenstein technique found no significant difference between the two groups. Similarly, a study that compared the use of transabdominal preperitoneal patch plasty (TAPP) with the use of the Lichtenstein technique, and could not draw a significant conclusion regarding higher efficacy between the two techniques [19-21].

A large population-based prospective cohort, included more than 17,000 male patients who underwent surgical repair of a unilateral scrotal hernia. Of included patients, 6,833 underwent totally extraperitoneal patch plasty (TEP) repair, while the remaining patients underwent Lichtenstein repairs [22]. Results of this study showed that after adjustment for possible confounding factors, rates of recurrence, and post-operative chronic pain syndrome, were all similar among the two groups, with no significant differences [22]. However, totally extraperitoneal patch plasty (TEP) repair was associated with improved outcomes regarding rates of pain at rest ( $P = .011$ ), rates of post-operative complications ( $P < .001$ ), and rates of pain on exercise ( $P < .001$ ) [22].

Another large population-based retrospective cohort where patients were matched according to propensity scores, included about 58,000 male

patients diagnosed with a unilateral scrotal hernia who underwent surgical repair. Patients included in this study underwent either totally extraperitoneal patch plasty (TEP) repair, transabdominal preperitoneal patch plasty (TAPP) repair, or Lichtenstein repair. Results of this study showed that both totally extraperitoneal patch plasty (TEP) repair, and transabdominal preperitoneal patch plasty (TAPP), were associated with significantly lower rates of post-operative complications, pain at rest, and pain on exercise. Regarding intraoperative complications, totally extraperitoneal patch plasty (TEP) repair showed less favorable results than transabdominal preperitoneal patch plasty (TAPP) [23].

Based on the previously mentioned studies, and other evidence present in the literature, guidelines of the HerniaSurge Group recommended that males with unilateral scrotal hernia undergo laparo-endoscopic techniques surgeries, as these have been proved to be associated with less occurrence of post-operative chronic pain. However, they still recommend that the choice should be eventually made according to specifics of each case. On the other hand, in some specific populations, Lichtenstein techniques remain to be the first surgery choice [1]. The use of totally extraperitoneal patch plasty (TEP), versus transabdominal preperitoneal patch plasty (TAPP) depends mainly on patients' preference, available resources, and surgeon's experience [1]; No specific guidelines favor the use of one over the other one.

To summarize, HerniaSurge Group's recent guidelines recommend only the following three surgical modalities in the treatment of scrotal hernias: totally extraperitoneal patch plasty (TEP), transabdominal preperitoneal patch plasty (TAPP) (which are both laparo-endoscopic mesh techniques), and open mesh Lichtenstein technique. They do not recommend the use of Shouldice open technique and other non-mesh techniques unless the patients declines a mesh procedure, or resources are not enough to perform a mesh procedure [1]. Generally, they still recommend further research to be conducted especially in other subgroups and populations [1].

#### **Evidence-Based Tailored Approach:**

As we mentioned earlier, HerniaSurge Group's most recent guidelines recommended scrotal hernias surgical approach to be tailored according to several factors. These factors include surgeon's previous experience, surgeon's education, available resources, patients' preferences, and other factors related to the hernia itself [1]. So generally, there is no technique that is acceptable in all cases [1]. Therefore, surgeons

in their treatment approaches should be able to consider and distinguish between the following cases, and plan their management accordingly: primary scrotal hernia, primary scrotal hernia following a previous pelvic or abdominal surgery (like cystectomy, prostatectomy, vascular surgeries, and other examples), primary scrotal surgery in the presence of a severe pulmonary or cardiovascular disease (which will limit anesthesia choice to either spinal or local anesthesia), recurrent scrotal hernia, and emergent surgery for strangulated scrotal hernia [28].

#### **Primary Scrotal Hernia:**

According to recent guidelines that were published by the European Association for Endoscopic Surgery (EAES), the first line choice for a primary scrotal hernia is laparo-oscopic surgeries performed by a highly experienced surgeon [7-9,28]. During a laparo-oscopic surgery for the correction of a scrotal hernia, bleeding can be difficult to control, leading to relatively high rates of post-operative hemorrhages and hematomas [7,8,28]. Therefore, the European Hernia Society (EHS), in their guidelines, recommended that the first line choice for scrotal hernia, is open mesh surgical techniques [5, 6, 28].

#### **Primary scrotal Hernia in patients with history of a prior pelvic or abdominal Operations (Radical Prostatectomy, Cystectomy, Vascular Operations, Low Anterior Resections, and Ascites):**

According to recent guidelines published by the European Association for Endoscopic Surgery (EAES) and the International Endohernia Society (IEHS), primary scrotal hernias in patients with a history of prior abdominal or pelvic surgeries are considered complex case that require special management. In these cases, it is recommended the use of minimally invasive surgical techniques performed by a highly experienced surgeon [7-9, 28]. On the other hand, HerniaSurge group and the European Hernia Society (EHS), recommend the use of open-mesh Lichtenstein technique in patients with history of major pelvic or abdominal surgery [1,5,6,28]. Additionally, they emphasize the use of open-mesh Lichtenstein technique in patients with liver cirrhosis, ascites, and/or peritoneal dialysis, as it is associated with the least rates of complications in these subpopulations [28].

#### **Primary Scrotal Hernia Repair in Patients with Severe Cardiac or Pulmonary Risk Factors:**

According to recent guidelines published by the European Hernia Society (EHS) and HerniaSurge group, the open mesh Lichtenstein technique under local anesthesia is the first choice in patients where

general anesthesia cannot be used. The decision of preventing general anesthesia is made based on the American Society of Anesthesiologists (ASA) scoring system, and patients should have at least score III or IV (with severe cardiac and/or pulmonary existing disease) [1, 5,6, 29].

According to HerniaSurge group guidelines, local anesthesia is associated with shorter post-operative immobilization than general anesthesia. Moreover, local anesthesia has been linked to shorter hospital post-operative stays, less costs, and lower rates of urinary retention, postoperative pain, and other postoperative complications [1]. However, this has been found to be associated with higher rates of recurrence, especially when surgeons are not highly experienced [1]. A recent clinical trial was conducted in 384 patients with hernia, and compared the use of open mesh Lichtenstein technique under local anesthesia with the use of totally extraperitoneal patch plasty (TEP) under general anesthesia. They found that the totally extraperitoneal patch plasty (TEP) group was associated with lower rates of postoperative chronic pain, and better long-term exercise tolerance [30]. Another clinical trial was conducted and included 72 patients. Patients were randomized into two groups: totally extraperitoneal patch plasty (TEP) under general anesthesia, and open mesh Lichtenstein technique under local anesthesia. In contrast to the previous study, this one concluded that outcomes and complications are similar in both groups [31]. In another study, investigators randomized 60 men diagnosed with unilateral scrotal hernia into two groups: open mesh Lichtenstein technique under local anesthesia, and open mesh Lichtenstein technique under spinal anesthesia. They concluded that local anesthesia was associated with longer time, and higher rates of intraoperative pain. However, postoperative and chronic pain were similar in both groups. The group of spinal anesthesia was associated with significantly higher rates of other postoperative complications. Another similar study included 50 male patients with hernias, and undergoing open mesh Lichtenstein repair, and randomized them to either spinal or local anesthesia [32]. Investigators concluded that the use of local anesthesia was the safest, simplest, and most cost-effective method. Moreover, it was found to be associated with lowest rates of postoperative complications [32].

In conclusion, patients who have pulmonary and/or cardiac diseases, and a scrotal hernia that requires surgery, are at a higher risk of developing severe complications when they undergo general anesthesia. Therefore, open mesh Lichtenstein repair under spinal or local anesthesia is the recommended

modality of choice in these populations. Moreover, this population of patients are more likely to be using anticoagulants, leading to higher risk of complications like bleeding and hematomas. Therefore, the decision whether to use spinal or local anesthesia should be made on a case basis, and according to each patient.

#### **Recurrent Scrotal Hernia:**

Despite all advances in the field, and the development of new techniques, hernias are still associated with high recurrent rates following surgical repair, which can be as high as 11% [4]. Five prior systematic reviews and meta-analyses studied these issue, and compared recurrent rates following different surgical techniques and modalities. The largest of these meta-analyses, did compare between open repair and laparo-endoscopic surgical techniques in the repair of hernias that recur following prior surgical repairs (either mesh or non-mesh). The results of these meta-analysis were that rates of re-recurrence were similar among all compared groups, although less rates of postoperative infections, and shorter period of immobility were observed in groups with less invasive techniques [33]. Another large retrospective population-based cohort was conducted to compare rates of hernias recurrence following repair with either totally extraperitoneal patch plasty (TEP), or transabdominal preperitoneal patch plasty (TAPP). This study concluded that both totally extraperitoneal patch plasty (TEP), and or transabdominal preperitoneal patch plasty (TAPP), were associated with similar rates of recurrence. Moreover, both techniques were associated with the same rates of intraoperative complications, postoperative complications, and chronic postoperative pain [34]. Therefore, the use of totally extraperitoneal patch plasty (TEP), and transabdominal preperitoneal patch plasty (TAPP), is highly recommended in patients who have recurrent hernias following open surgery repair [28]. In patients who have recurrent hernias following either totally extraperitoneal patch plasty (TEP) or transabdominal preperitoneal patch plasty (TAPP), minimally invasive surgical techniques are recommended [28]. In these cases, open-mesh Lichtenstein techniques are also recommended [28]. A previous retrospective population-based study, out of more than 2,300 patients who underwent open surgical repair following hernia recurrence, only 38.5% were following recommended guidelines [35]. Investigators concluded that guidelines are not properly followed in patients who have recurrent scrotal hernias [35].

#### **Emergency Surgery for Incarcerated Scrotal Hernias:**

A previous systematic review was published recently and included seven trials, and an overall 328 patients with scrotal hernia, treated only with laparoscopic surgical techniques [38]. Analyses of included studies found that the mean time of operation was 61.3 minutes, and the mean duration of postoperative hospital stay was 3.8 days. In all included studies, 9 major postoperative complications, and 25 minor postoperative complications occurred, and resulted in a total of 17 bowel resection procedures, which were performed through laparoscopic techniques or mini-laparotomy [39]. Based on these results, the World Society of Emergency Surgery (WSES) published their guidelines in which they recommended the urgent repair of incarcerated hernias using laparoscopic surgical techniques [39]. The choice of a specific technique depends on several factors including hernia size, surgeon's prior experience, and available resources [39]. The use of mesh-based approaches is recommended in cases of intestinal incarceration with the absence of strangulation [39].

#### **CONCLUSIONS:**

Surgical repair of scrotal hernia is considered to be one of the most common surgeries that are performed worldwide. Hundreds of surgical approaches have been described and studied. However, surgical repair is still associated with a relatively high rate of hernias recurrence. Other postoperative complications include postoperative wound infection, postoperative urinary retention, long durations of hospital stays, and postoperative chronic pain (that can last for more than three months, and is associated with disabilities in severe cases). Surgical techniques to repair hernias can be either mesh-based or mesh-free. They can also be either with open surgery, or using laparoscopic techniques. Laparoscopic techniques include totally extraperitoneal patch plasty and transabdominal preperitoneal patch plasty. A large number of studies has been conducted and in general, they found that mesh-based, minimally invasive surgical repair techniques, are associated with the best outcomes, better quality of life, and lower rates of recurrence and postoperative complications.

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