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Original research

Teaching the transrectus sheath preperiotneal mesh repair: TREPP in 9 steps

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HIGHLIGHTS

- 30.000 inguinal hernias in the Netherlands are operated, as 750.000 inguinal hernias in the USA are operated annually.
- Chronic pain is a problem after Lichtenstein repair in 15–40% of the reports.
- Evolution of inguinal surgery lead to endoscopic approaches.
- An easy open technique without need of general anesthesia is needed to reduce costs.
- TREPP is gaining popularity and many surgeons in training for TREPP request a step by step description.

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ABSTRACT

Background: The preperitoneal mesh position seems preferable to reduce the number of patients with postoperative chronic pain after inguinal hernia surgery. The transrectus sheath preperitoneal mesh repair (TREPP) is gaining popularity. Teaching a new technique requires a standardized approach to achieve an optimal learning curve. The aim of this paper was to provide a step-by-step teaching module for hernia surgeons learning the TREPP.
Methods: Literature was critically reviewed and the forthcoming nine surgical steps of the new TREPP technique and its rationale are described in this article. The TREPP hernia repair technique is illustrated with an online education video and three photos of the anatomical landmarks and the proposed mesh position of TREPP.
Results: The nine steps of TREPP are described extensively and the critical steps are presented in a standardized way for surgical educational purposes. Also the rationale and technical considerations of inguinal hernia experts are presented.
Discussion: TREPP may be a promising technique for groin hernia surgery. To date there have been no major complications with the TREPP repair which is currently the subject of a RCT. The learning curve of TREPP is being investigated and teaching of this technique requires standardization for trainee surgeons.
Conclusion: TREPP potentially merges the advantages of a preperitoneal positioned mesh with an open technique. Initial results are promising and TREPP seems to be applicable in different hospitals in the Netherlands. Since the start of an active teaching program, TREPP has been introduced and accepted well by dedicated hernia surgeons in other hospitals in the Netherlands and Europe.

1. Background

New inguinal hernia repair techniques emerge and others disappear. Although the Dutch guideline recommends the Lichtenstein technique (or an endoscopic procedure) [1,2], open

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preperitoneal repair techniques popularize. This article aims to present an educational (teaching) module of such an open preperitoneal approach: the TransRectus sheath PrePeritoneal (TREPP) mesh repair for inguinal hernia.

In the Netherlands approximately 30.000 inguinal hernia repairs are performed each year [3]. The Lichtenstein repair has reduced the incidence of recurrent inguinal hernia to 2–5% [4]. Unfortunately, chronic postoperative inguinal pain (CPIP) after Lichtenstein's repair is currently the main complication estimated to occur between 15 and 40% [5–8].

Chronic pain is defined as: 'pain which lasts for more than three months [9]. CPIP is probably caused due to manipulation of the inguinal canal per-operatively (nerve damaging or stretching) or may be related to interaction of the mesh and the inguinal nerves [10].

During TREPP repair the mesh is positioned in the preperitoneal space (PPS). Besides the biomechanical advantage of placement of the mesh in the PPS [11,12], the risk of nerve damage through dissection of the inguinal canal, and the risk of nerve entrapment due to nerve suturing or nerve fixation on the mesh is reduced presumably resulting in less CPIP.

Crucial steps in the development of the preperitoneal approaches to the groin have been described extensively and resulted mainly in endoscopic preperitoneal procedures [12,13]. Randomised trials suggest less chronic pain due to the preperitoneal position of the mesh by using endoscopic and laparoscopic techniques. Some studies reported 'superiority' of endoscopic hernia repair [14,15]However, this 'superiority' compared to the Lichtenstein repair is, to date, not unequivocally demonstrated [15].

The most important drawback of endoscopic hernia repair is the considerable proportion of serious adverse events such as bladder injury, iliac vessel damaging, major bleeding or recurrence [15]. Other disadvantages of endoscopic inguinal hernia repair are the long learning curve, the need for general anesthesia, and higher costs [16,17].

An inguinal hernia technique was developed based on the valuable recommendations of Reinpold [11,12]. This technique was developed by learning from and modifying previous reported surgical methods for inguinal hernia repair [18–22]. In this TREPP technique a mesh with a memory ring is positioned without fixation in the PPS using the "upstream principle" [12]. The TREPP repair can be used for almost all inguinal and femoral hernias and is performed under spinal anesthesia.

There is a growing national and international attention for anterior (such as transinguinal preperitoneal, TIPP technique [23]) or posterior open preperitoneal repair, such as TREPP. TREPP also has a learning curve [12] but was previously labeled as 'easy to learn' by independent hernia surgeons from different hospitals during an expert-inguinal-hernia-meeting [24]. It has been reported that open preperitoneal repair requires a place in the armamentarium of the dedicated hernia surgeon [25], therefore proctoring and research are needed. Furthermore, the European Hernia Society (EHS) will inform about open preperitoneal repair in a separate paragraph in the updated European guidelines [26,27]. Learning TREPP requires a step-by-step approach to facilitate an acceptable learning curve.

2. Methods and materials

To facilitate the need for proctoring and to educate colleagues adequately and in a standardized way, the TREPP technique was described in nine surgical steps. These steps were critically discussed by TREPP experts and evaluated with dedicated hernia surgeons in training for TREPP. The TREPP procedure can be 'reduced' from a complex intervention (which inguinal hernia repair should be considered), into a logical and understandable procedure for inguinal hernia experts learning TREPP. The ongoing development ('evolution') for the best inguinal hernia repair technique and the levels of evidence of this dynamic process were taken into account when describing the nine steps [12,14,15].

3. Results

Regardless of the technique that is used, groin hernia surgery is complex according to experts and the TREPP technique is no exception to this statement [24]. The TREPP procedure comprises nine steps, which are described as follows:

Step 1. Place of incision

Anatomical marks are identified (Photo 1):

- The umbilicus
- The pubic tubercle
- The anterior superior iliac spine
- The inguinal ligament
- The iliac vessels (pulsations of the artery), which are localized under the inguinal ligament

Now the following landmarks can be identified:

- The origin of the inferior epigastric vessels and their course to the umbilicus
- The deep inguinal ring, lateral of the origin of the epigastric vessels
- The lateral margin of the abdominal rectus muscle.

Photo 1. Overview of important anatomical landmarks for TREPP. The position of this patient is drawn on the sterile drape. The picture displays a right sided TREPP procedure. Landmarks from left to right on photo 1: SIAS, incision line, *annulus internus* and pubic bone.