

# Robot-assisted laparoscopic total extraperitoneal hernia repair during prostatectomy: technique and initial experience

Hasan A.R. Qazi<sup>1</sup>, Bhavan Prasad Rai<sup>1</sup>, Minh Do<sup>1</sup>, Matthew Rewhorn<sup>1</sup>, Tim Häfner<sup>1</sup>, Evangelos Liatsikos<sup>2</sup>, Panagiotis Kallidonis<sup>1,2</sup>, Anja Dietel<sup>1</sup>, Jens Uwe Stolzenburg<sup>1</sup>

<sup>1</sup>Department of Urology, University of Leipzig, Leipzig, Germany

<sup>2</sup>Department of Urology, University of Patras, Patras, Greece

**Citation:** Qazi ARH, Rai BP, Do M, et al. Robot-assisted laparoscopic total extraperitoneal hernia repair during prostatectomy: technique and initial experience. Cent European J Urol. 2015; 68: 240-244.

## Article history

Submitted: Feb. 1, 2015

Accepted: March 9, 2015

Published on-line:

May 18, 2015

## Corresponding author

Bhavan Prasad Rai  
University of Leipzig  
Department of Urology  
Liebigstraße 20D  
04103 Leipzig, Germany  
phone: +44 798 539 67 49  
urobhavan@gmail.com

**Introduction** To describe the technique of total extraperitoneal inguinal hernia repair performed during Robot-assisted Endoscopic Extraperitoneal Radical Prostatectomy (R-EERPE) and to present the initial outcomes.

**Material and methods** 12 patients underwent inguinal hernia repair during 120 R-EERPEs performed between July 2011 and March 2012. All patients had a clinically palpable inguinal hernia preoperatively. The hernia was repaired using a Total Extraperitoneal Patch (TEP) at the end of the procedure.

**Results** Sac dissection and mesh placement was simpler compared to conventional laparoscopy due to improved, magnified, 3-D vision along with 7° of movement, and better control of mesh placement. The median operating time was 185 minutes, with on average, an additional 12 minutes incurred per hernia repair. The median blood loss for the procedures was 250 ml, and the mean pathological prostate weight was 55 gm. No additional blood loss was noted and there were no postoperative complications. None of the patients had a recurrence at 12 months. We await long-term follow-up data.

**Conclusions** Robot-assisted TEP is feasible and should be considered in patients with hernia at the time of R-EERPE.

**Key Words:** robot assisted ◊ extraperitoneal ◊ hernia ◊ prostatectomy ◊ mesh

## INTRODUCTION

R-EERPE is recognized as a safe and efficacious technique for the treatment of localized prostate cancer [1-4]. In the group of men undergoing radical prostatectomy, an inguinal hernia is detected in a significant proportion of men preoperatively [5]. In addition, postoperative clinically detectable inguinal hernias can complicate prostatectomy in up to 20% of patients [6]. A subtle or subclinical hernia, not detected at the time of surgery, is thought to be one of the main risk factors for this postoperative complication [7]. It is therefore important to screen men, undergoing R-EERPE, for inguinal hernias and to carry out a hernia repair at the time of surgery, after consultation with the patient.

The repair of an inguinal hernia can be carried out in conjunction with laparoscopic or robot-assisted prostatectomy by one of two techniques: totally extraperitoneal patch (TEP) or transabdominal pre-peritoneal patch (TAPP). Both are well-established, with similar cost and complication rates, but TEP is associated with better results in terms of postoperative pain and seroma formation, and provides access to the contralateral side without the need for further incisions [8, 9]. Additionally, TEP avoids any contact of the mesh with the bowel, reducing the risk of subsequent adhesions. We have therefore employed this technique at our institution and previously published the largest series to date of TEP hernia repair during EERPE [10]. Having acquired a 4-arm DaVinci Si system, we continued to screen patients undergoing an EERPE

for inguinal hernia. Of the first 120 cases, 12 patients were found to have a clinically palpable hernia preoperatively. They were counseled and a robot-assisted TEP hernia repair was performed at the same time as the R-EERPE.

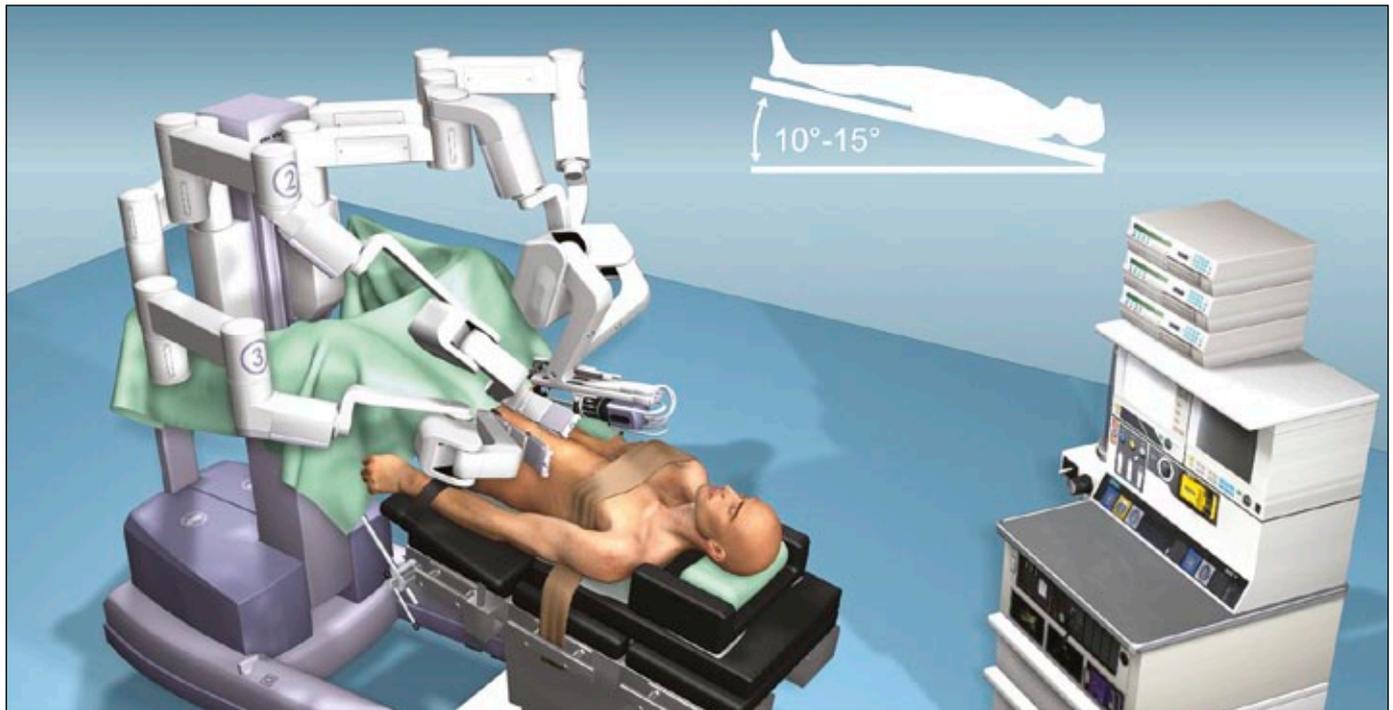
To date, there are no large series describing TEP hernia repair in conjunction with R-EERPE. We present our technique and our initial outcomes from the first 12 patients.

## MATERIAL AND METHODS

Between July 2011 and February 2012, 120 R-EERPEs were performed by one of two surgeons on a single DaVinci Si robot system at our institution. All patients were clinically assessed for inguinal hernias preoperatively. All patients found to have a palpable hernia, including subtle reducible hernias elicited only with a cough impulse, were counseled regarding a TEP hernia repair and additionally consent was obtained for the procedure. Patient parameters and operative data, as well as perioperative complications and clinical details at the 12-month follow-up are maintained within our prospective institutional database.

Our surgical technique for R-EERPE using a 4-arm DaVinci Si system, as well as laparoscopic TEP hernia repair, has been described previously [10, 11]. Our standard antibiotic prophylaxis is comprised of a second-generation intravenous cephalosporin at induc-

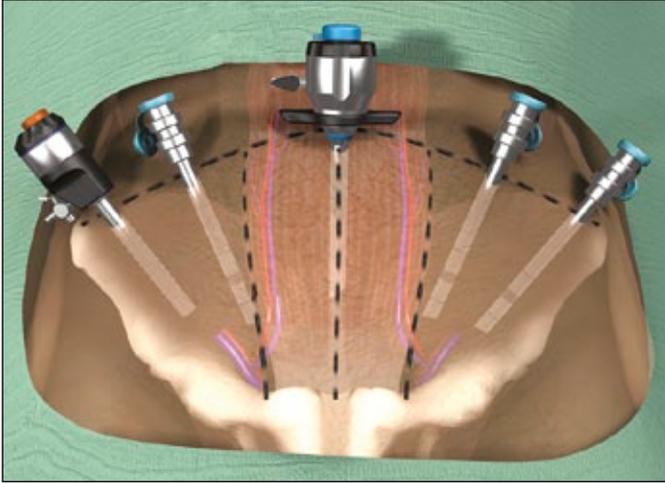
tion; no additional antibiotic prophylaxis was used. The patients were placed supine on the operating table, with the legs apart, in a 10-15 degree head-down tilt as demonstrated in Figure 1. A right paramedian port was initially introduced, through which a pre-peritoneal space was created using a balloon trocar. Then, under vision, three further 8 mm ports were placed for the robotic system along with an additional 12 mm port for the assistant, about 5 cm superomedial to the right anterior superior iliac spine (Figure 2). Following port placement, the robot was docked. At the start of dissection, prior to the prostatectomy, the hernia was identified and the hernia sac mobilized and dissected free of the cord structures. Creation of the pre-peritoneal space was found to significantly help with dissection of direct inguinal hernias, where, at the commencement of dissection, the hernia sac was found to be reduced and the gap often identifiable. For indirect inguinal hernias, further dissection was necessary. This was performed almost entirely by traction and counter-traction using robotic scissors and bipolar forceps docked in the first and second arms respectively. Any adhesions holding the sac in place were divided using scissors. Care was taken to preserve the integrity of the peritoneum. In two cases, there was a small peritoneal breach which was easily repaired with a continuous 3/0 Vicryl suture. Minimal assistance was required as the dissection was found to be signif-



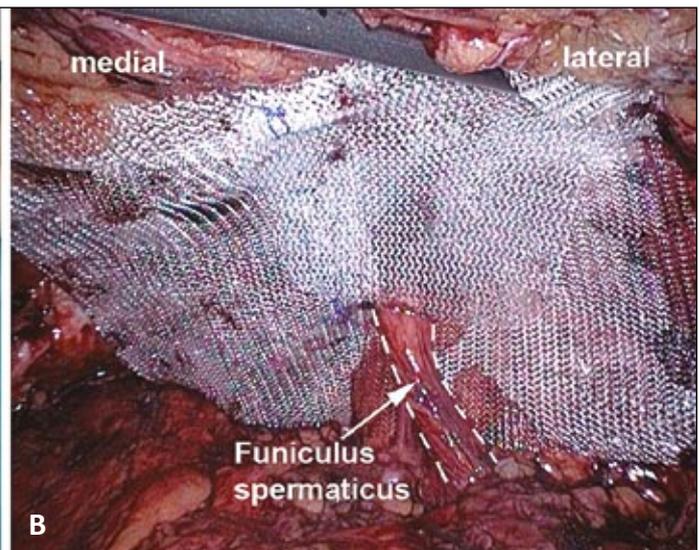
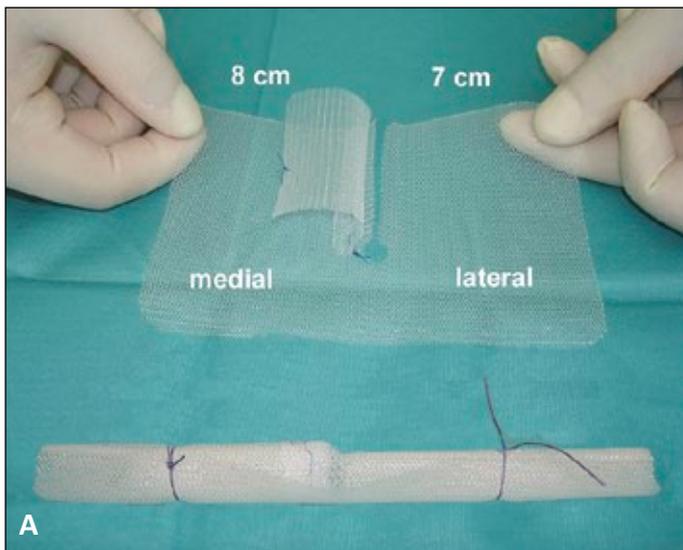
**Figure 1.** Patient position for TEP hernia repair in combination with R-EERPE. The patient is placed supine, in a 10-15 degree head-down tilt and the robot docked as demonstrated.

icantly easier given the additional advantages of X10 magnified, binocular, three-dimensional vision with tremor filtration and miniature wristed, articulating instruments with 7° of freedom.

A 10 cm by 15 cm Primalene® (B: Braun) mesh was prepared for the hernia repair as demonstrated in Figure 3(A). A 6 cm vertical cut, with a 0.5 cm hole for the



**Figure 2.** Port placement for TEP hernia repair in combination with R-EERPE. 5 Ports are used: the pre-peritoneal space is created through a right paraumbilical incision and the optic trocar introduced; this is followed by three 8 mm trocars for the Da Vinci System and one 12 mm assistant trocar superomedial to the right anterior superior iliac spine.



**Figure 3.** Creation and placement of the prolene mesh for a right sided inguinal hernia. Figure 3(A). A Prolene mesh is trimmed to measure 10 cm x 15 cm. A cut is made from the distal end of the mesh and a hole, to accommodate the cord structures, is made at the end of this cut as shown. A flap is placed medial to the cut and held in position by a suture. The mesh is rolled and a short and long tie hold the medial and lateral aspect respectively. Figure 3(B). The prolene mesh is unfurled so that it covers the fascial defect; the flap is unrolled to cover the cut through the mesh and the cord structures to pass through. It is secured in place by the peritoneum without need for suturing or stapling.

cord structures, was made and covered by a further flap of mesh. The flap was tacked down by a single suture and the whole mesh was rolled up to facilitate introduction and placement. A long tie was placed over the lateral aspect of the rolled mesh, while a shorter tie held the medial aspect in its rolled position. The mesh was introduced by the assistant through the 12 mm trocar and subsequent unfurling and placement was carried out entirely by the surgeon. The sutures were cut and the mesh was unrolled as shown in Figure 3(B). The mesh covered the visible defect, medial or lateral to the spermatic cord and was snug around the cord structures, extending from the midline to the anterior superior iliac spine laterally. No sutures or tacks were used to hold the mesh, as it was stabilized by the cord structures and snugged in place by the peritoneum as the pre-peritoneal space collapsed at the completion of the procedure.

In right-sided hernias, the assistant port was removed before the mesh was placed in its final position if it was found to get in the way of the lateral aspect of the mesh.

Patient parameters, perioperative complications and oncological and functional outcomes at 12 months were recorded and analyzed.

The 'additional time' was noted in each case: this was defined as total time taken for mesh preparation, any extra dissection of the peritoneal sac, mobilization of the peritoneum laterally to make space for the mesh as well and the time taken for mesh placement.

## RESULTS

Patient parameters and early outcome measures are recorded in Table 1.

The median patient age and preoperative prostate-specific antigen (PSA) were 66 years and 8.25 ng/dl respectively. The median operating time was 131 minutes, with on average, an additional 12 minutes incurred per hernia repair. The median total blood loss for the procedures was 250 ml, and the pathological prostate weight was 55 gm. The median duration of catheterization was 6 days. The extra steps of hernia repair did not incur any additional blood loss and there were no postoperative complications noted in this group. In the postoperative period, none of the patients reported significant inguinal, scrotal or testicular discomfort or paresthesia.

Ten patients had organ-confined disease, while two patients had pT3 disease. A total of three patients had a positive apical surgical margin.

At 6 months, only one patient had a detectable PSA at 0.07 ng/ml; his final pathology had demonstrated Gleason 4+4 pT3b disease and he was referred for radiotherapy following discussion at our tumour board meeting. None of the patients had a clinically detectable hernia recurrence at 6 months. We await long-term follow-up data.

## DISCUSSION

The incidence of inguinal hernia in the general male population is approximately 5%. The incidence

of developing a clinically detectable inguinal hernia following radical prostatectomy had been reported in 7% to 21% of cases [12, 13, 14]. Stranne et al. demonstrated a significantly higher incidence of clinically demonstrable inguinal hernias in men with prostate cancer compared to those treated non-operatively (8.6% vs. 2.4%;  $p = 0.01$ ) [13]. Various studies have tried to identify the risk factors associated with a postoperative inguinal hernia. These include prior hernia repair, wound infection, advanced age and cigarette smoking [15]. A subtle or subclinical hernia, not detected at the time of surgery, is thought to be one of the main risk factors for this postoperative complication [7].

A concern regarding the use of a prosthetic mesh for inguinal hernia repair during EERPE is the risk of mesh infection that could potentially cause an infection of the area involving the vesicourethral anastomosis. In addition to the risk to the patient, the ensuing effects involving healing and fibrosis could be detrimental towards achieving a satisfactory postoperative functional outcome. However, mesh infection following laparoscopic inguinal hernia repair is very rare; even when the mesh is placed into contaminated or clean contaminated fields, the risk of infection is exceedingly low [16]. This should obviate the need to combine extra-peritoneal prostatectomy with transperitoneal mesh placement, a published technique which aims to prevent the mesh from coming into contact with urine [17].

Another concern regarding mesh placement is the potential risk of bowel adhesions. In order to overcome this, various groups have tried to combine laparoscopic transperitoneal hernia repair with a mesh that is retroperitonealized or by employing a mesh that is inert and resistant to adhesion formation [15]. Finley et al. [15] reported the largest series to date regarding inguinal hernia repair during robot-assisted radical prostatectomy. Forty-nine repairs were performed in 40 patients, and they reported an increase in operative time of 10 minutes with no complications over a 15-month period. However, they used a transperitoneal approach and an absorbable mesh initially, but later switched to a non-absorbable, inert mesh which was sutured over the hernia at multiple points.

A potential limitation of hernia repair at the time of R-EERPE is the inability to perform a lymphadenectomy. In our practice, we do not perform a TEP mesh repair in cases where a lymphadenectomy is performed, as we would not fenestrate the peritoneum due to the risk of bowel contact with the mesh. This would subject the patient to an unduly high risk of lymphocele development. In such cases, we advise open inguinal hernia repair subsequent to surgery.

**Table 1.** Patient parameters and perioperative data for 12 patients

Median age (range) years	66 (46-73)
Median PSA (range) ng/ml	8.25 (1.38-30)
Median operating time (range) min	131 (95-238)
Median blood loss (range) ml	250 (120-500)
Median prostate specimen weight (range) gm	55 (42-68)
Pathology	
pT2a	5
pT2c	5
pT3	2
Complications (Clavien grade)	0
12 Month follow-up	
Hernia recurrences	0
Detectable PSA	1

We have previously published the largest series to date, combining EERPE with TEP hernia repair and demonstrated the feasibility and low morbidity of the procedure without influencing the functional and oncological outcome of EERPE [10]. By using an extraperitoneal approach, the mesh did not come into contact with bowel and which, if placed appropriately, was held in position by the spermatic cord passing through it, as well as the pre-peritoneum, as the space collapsed at the end of the procedure. By obviating the need for mesh fixation by sutures or staples, we avoided the risk of stapling branches of the genitofemoral nerve which could cause postoperative neuropathic pain.

Our initial results of robot-assisted TEP compare favorably with our initial experience with laparoscopic TEP hernia repair where the average time taken for a hernia repair was 15 minutes with a mean total operating time of 165 minutes. In that series, the mean catheterization time was 8.3 days and one patient required a blood transfusion.

The primary intention of R-EERPE is, ultimately, elimination of cancer. Mesh placement does not compromise this and if the patient requires further treatment such as radiotherapy, as was the case in one of our patients, the prolene mesh does not impede this in any way.

Ours is the first reported series describing the possibility of performing TEP inguinal hernia repair at the same time as R-EERPE. While we await long-term outcome data for recurrence and gather further experience, our initial results demonstrate that the procedure can be carried out safely and conveniently without compromising the core procedure.

## CONCLUSIONS

Robot-assisted TEP is feasible and should be considered in patients with hernia at the time of R-EERPE.

## CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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