

Fewer urological complications after laparoscopic inguinal hernia repair without indwelling catheter

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ABSTRACT

INTRODUCTION: The number of procedures involving transabdominal preperitoneal laparoscopic surgery for inguinal hernia (TAPP) has increased in Denmark. Optimized perioperative regimens are needed.

MATERIAL AND METHODS: This retrospective, single-institution study included consecutive patients during an eight-year period from 1 January 2002 to 31 December 2007 (period I) and from 1 January 2008 to 31 December 2009 (period II). In period II, perioperative indwelling catheter (Foley catheter) was not used routinely. Furthermore, the surgical technique was adjusted, a small team of dedicated TAPP surgeons was established, and two of the surgeons attended prearranged surgical training programmes. Additionally, period II patients were enrolled into structured patient protocols. The primary endpoint was complications within the first 30 days after surgery, and we also registered the rate of reoperation due to recurrence.

RESULTS: A total of 684 patients underwent TAPP surgery for 946 inguinal hernias. From period I to II, the number of TAPP surgeons was reduced to a third and two surgeons received TAPP training. During period I, minor urological complications were observed in 5% (confidence interval (CI) 3.1-6.9%) compared with 1% in period II (0.0-2.5%). The overall morbidity rate was 13%. Serious complications were observed in 3% (CI 3.1-6.9%) of the cases in period I and in 2% (0.0-2.5%) of the cases in period II. For the entire eight-year study period, the cumulative rate of re-operation due to recurrence was 2%.

CONCLUSION: TAPP without routine use of an indwelling catheter may reduce the risk of urological complications.

Perioperative indwelling catheters, so-called urinary Foley catheters (UFC), are used routinely in lower abdominal surgery. However, the UFC is often unnecessary in surgical procedures lasting less than one hour, and the UFC may cause urinary complications such as cystitis, urinary retention and macroscopic haematuria [1, 2]. The literature provides no specific data on complications due to UFC following transabdominal preperitoneal laparoscopic surgery for inguinal hernia

(TAPP), but large-scale studies have shown that TAPP can be conducted safely without UFC [3].

In Denmark, TAPP (**Figure 1**) accounts for approximately 16% of all inguinal hernia operations and serves as a gold standard for surgical treatment of inguinal hernia in women for recurrence after previous open hernia repair and for bilateral inguinal hernia [4, 5].

Recent European guidelines recommend either TAPP or Lichtenstein operation for primary unilateral hernia in men [6], depending on the local expertise [6]. Thus, the use of TAPP may increase in Denmark. The purpose of this study was to pass on our experience with TAPP before and after redesigning our perioperative strategy and organization with a special focus on UFC-related complications.

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FIGURE 1

Laparoscopic transabdominal preperitoneal surgery for inguinal hernia in a patient with bilateral inguinal hernia.



METHOD

Study design

This was a retrospective, single-institution study with inclusion of consecutive patients during the eight-year period from 2002 to 2009. Data were collected for the entire study and analyzed for the two periods. The first period, from 1 January 2002 to 31 December 2007, included patients operated prior to a reorganization of the department's laparoscopic inguinal hernia surgery, and the second period, from 1 January 2008 to 31 December 2009, comprised patients operated after the reorganization.

Organization

From the start of period II, routine use of UFC in all patients was abandoned. Instead, patients urinated immediately before surgery, and UFC was restricted to patients with known bladder emptying difficulties and those with a previous prostatectomy.

Before 2008, the indications for TAPP at our department were inguinal hernia in women, recurrence after previous open hernia repair and repair of primary bilateral inguinal hernia. From 2008, men with primary unilateral inguinal hernias were also offered TAPP as part of a departmental research project. From 2008, only dedicated and trained TAPP surgeons operated the patients and a structured training program for selected surgeons was introduced. Thus, self-governed TAPP operations required use of a guided camera for 20 TAPP operations and subsequently execution of 40 TAPP operations under supervision [3, 7]. Through literature review, video analysis and discussions, consensus between surgeons was reached regarding agreement on the surgical technique. As a result, in period II surgical changes included use of non-slitted mesh and dissection/paritonealisation of the ductus deferens/ligamentum rotundum and vasa testicularis from the lower peritoneal surface, and extensive lateral dissection for

exposure of the fascia spermatica as described in detail elsewhere [3].

In both periods I and II, 80% of the TAPP operations were performed in a day-care setting, and in both periods 10% of the patients were admitted to hospital from the day-care department. However, half of the admitted patients were discharged the same evening (periods I and II). All patients were telephoned by a nurse the day after surgery. Complications in discharged patients were recorded by systematic follow-up through the hospital system (Green System) and by structured interviews using standard questionnaires 30 days after TAPP.

Study endpoints

The primary endpoint was complications within the first 30 days. Cystitis was defined as dysuria and positive reagent strip. In addition, surgery duration and reoperation rate due to recurrence were registered. Before data collection, complications were graded as severe or less severe. Severe complications were defined as potentially fatal complications and/or complications that required reoperation [8]. Treatment of superficial wound infection or haematoma with cleavage of the skin were defined as reoperations. Furthermore, prior to data collection, we predetermined and defined potential surgical and medical complications associated with hernia surgery [9].

Statistics

Complication risk was calculated on the basis of the number of operations. For statistical reasons, we only registered one complication per operation and only the most serious complication [10]. Data on operation time was collected through the department's prospective local anaesthesia database and from the medical records, the central hospital system (i.e. Green System) and the Danish Inguinal Hernia Database. Data are expressed as frequencies and percentages. CIs with 95% limits are given as appropriate. The reoperation rate due to recurrence was illustrated with a Kaplan-Meier plot.

RESULTS

Details on the type of hernia, surgery duration and number of operating surgeons are shown in **Table 1**. There were 684 patients (78 women and 606 men) with TAPP operations with a total of 946 inguinal hernias. One patient was re-operated with TAPP after a single day because of early relapse. The patients had a median age of 62 years (range 18-88 years). A total of 670 patients were operated electively and 14 patients underwent acute/subacute TAPP.

From period I to II, the number of TAPP surgeons was reduced to one third, and the number of operations per surgeon was thereby increased considerably (Table

 TABLE 1

Distribution of uni- and bilateral inguinal hernias, operation time and number of surgeons in transabdominal preperitoneal laparoscopic surgery for inguinal hernia in 684 patients.

Laparoscopic inguinal hernia repair (n = 946 hernias in 684 patients)	2002-2007 (509 patients)	2008-2009 (175 patients)
Unilateral (424 patients)		
Number of repairs	286	138
Operating time (min) (median, range)	47 (19-178)	52 (18-119)
Bilateral (260 patients)		
Number of repairs	224	37
Operating time (min) (median, range)	93 (31-188)	82 (33-142)
Surgeons		
Number	13	5
Operations per surgeon (no.) (median, range)	11 (1-328)	31 (12-59)

1). Thus, in period II the surgical team consisted of three surgical specialists (all with TAPP experience > 80 operations) and two surgeons in training (one specialist and one registrar). The operation time varied between the two periods with a median of five and 11 minutes for uni- and bilateral hernias without any clear pattern (Table 1).

Two patients (period I) and 0 patients (period II) suffered perioperative bladder lesions. In the entire study period, 4% of the patients suffered from a urological complication (Table 2). During period I (routine UFC-period), minor urological complications were observed in 5% of the patients (CI 3.1-6.9%) compared with 1% in period II (UFC not used routinely) (0.0-2.5%) (Table 2). Thus, period I saw 12 patients with urinary retention, eight patients with macroscopic haematuria and four patients with cystitis (a total of 24 patients; 23 men and one woman (retention)). In period II, one patient had cystitis and another macroscopic haematuria (a total of two male patients). Both patients had an indwelling catheter placed because of known bladder emptying difficulties (Table 2).

In period II, there was no use of unplanned peroperative UFC.

The overall morbidity rate was 13% with no significant differences between the two study periods (Table 2). Severe complications were observed in 3% of the patients (CI 3.1-6.9%) in period I and in 2% (0.0-2.5%) of the patients in period II, and 10% suffered less severe nonurological complications in either period. There was no difference in morbidity between elective and sub-acute/acute patients. No significant differences were seen in surgeon-related complications between untrained and experienced surgeons. No deaths occurred within 30 days.

The cumulative re-operation rate due to recurrence for the entire study period was 2% (18/946) (Figure 2).



FIGURE 2

Kaplan-Meier plot of the rate of re-operation due to recurrence as a function of time after laparoscopic transabdominal preperitoneal surgery for inguinal hernia in 684 patients operated at the same surgical department. Results are based on data from the Danish Hernia Database.

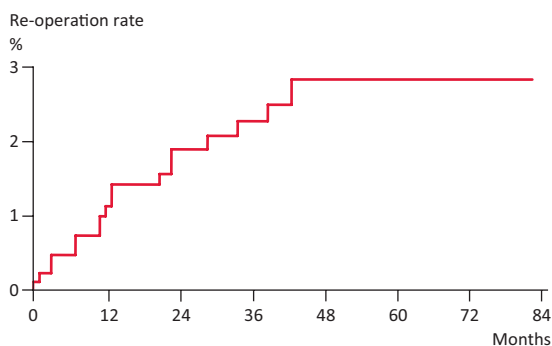


TABLE 2

Complications, re-laparoscopies without pathology (negative re-laparoscopy) and conversions to open surgery (Lichtenstein procedure) in transabdominal preperitoneal laparoscopic surgery for inguinal hernia in 684 consecutive patients.

Laparoscopic inguinal hernia repair (n = 946 hernias in 684 patients)	2002-2007 509 patients	2008-2009 175 patients	2002-2009 684 patients
<i>Severe complications, no.</i>			
Bowel lesion	1	-	1
Early trocar hernia with incarceration	-	1 ^a	1
Early recurrence with strangulation	-	1 ^b	1
Bladder lesion	2	-	2
Vena femoralis lesion	1	-	1
Arteria epigastrica lesion	1	1	2
Intraabdominal bleeding	4	-	4
Abdominal wall haematoma (needing operation)	2	-	2
Bleeding from trocar	3	1	4
Aspiration	1	-	1
Acute myocardial infarction	1	-	1
Severe complications in total, no.	16 (3%)	4 (2%)	20 (3%)
<i>Less severe complications, no.</i>			
Urological (urinary retention /haematuria/cystitis)	24 (5%)	2 ^c (1%)	26 (4%)
Seroma	4	1	5
Wound infection	3	3	6
Inguinal haematoma	14	11	25
Coprostasis (> 3 days)	4	1	5
Less severe complications in total, no.	49 (10%)	18 (10%)	67 (10%)
All complications, no.	65 (13%)	22 (13%)	87 (13%)
Negative re-laparoscopy within 3 days, no.	2 (0,4%)	1 (0,6%)	3 (0,4%)
Conversion to Lichtensteins procedure	3 (0,6%)	0	3 (0,4%)

a) Richter hernia and incarceration of the small bowel in the umbilical port.

b) Acute strangulation of the sigmoid colon 14 days after transabdominal preperitoneal laparoscopic surgery for inguinal hernia for a lateral sliding hernia.

c) Insertion of indwelling catheter was planned in two patients because of known urinary retention (one patient developed postoperative macroscopic haematuria and one patient developed cystitis).

Thus, 17 patients were re-operated for 18 recurrences. In six patients, the primary repair was for primary unilateral hernia, and in 11 patients the primary repair was for bilateral hernia. At reoperation, 16 patients had unilateral relapse and one had bilateral relapse.

DISCUSSION

The results from this study indicate that UFC is unnecessary in TAPP and that avoiding UFC may reduce the risk of minor urological complications. However, the present study was retrospective, and detailed results from the many specific interventions from period I to II may be difficult to interpret.

Perioperative risk of damage to the bladder and postoperative urinary complications in the form of urinary tract infection, macroscopic haematuria and urinary retention are well known in relation to abdominal surgery [11]. Thus, UFC is significantly related to minor urological complications after laparoscopic gynaecological operations and laparoscopic cholecystectomy [1, 2]. The consequences of not using UFC as a standard in TAPP

have not previously been studied. In the present study, we found a surprisingly high 5% risk of urological complications; a rate which fell to 1% when abandoning routine use of UFC. The relatively high frequency of urinary retention observed in period I seems difficult to explain in relation to the use of UFC per se. However, in period II, patients were encouraged to empty their bladder before operation, and the lack of such encouragement in period I may have influenced the risk of urinary retention. However, we assume that the higher urological complication rate observed in period I was due mainly to the use of indwelling catheter rather than to suboptimal perioperative organization and treatment. In our study, TAPP without UFC was not related to the incidence of bladder injuries, and almost all TAPP operations were completed without using UFC when patients urinated immediately before surgery. In the present study, there were probably more patients suffering from cystitis than detected. Thus, only patients with dysuria were tested and patients with minor symptoms may have been overlooked. Finally, since most patients were discharged on the day of operation, some may have received treatment from their general practitioner.

In accordance with international experience [3, 12-14], we found a high overall complication risk of 13% and a risk of severe complications of 3% after TAPP. A recent Cochrane review [13] analyzed the results after laparoscopic surgery versus open surgery for inguinal hernia. The authors found a significantly larger risk of visceral complications (especially vesicular lesions) and vascular lesions after TAPP than after the Lichtenstein operation. Moreover, a large prospective study of 8,050 TAPP procedures found that laparotomy prior to TAPP was a significant risk factor for visceral injuries [3]. In our study, one of three patients with visceral injuries had significant intraabdominal adhesions after previous laparotomy (Table 2). One patient had a lesion of the vena femoralis. Prior to the TAPP procedure, this patient had undergone a McVay hernia repair. During the TAPP procedure, severe adhesions and fibrosis were observed in the area of the annulus profundus and vena femoralis. Therefore, we believe that early conversion from TAPP to open repair should be considered in case of severe intra-abdominal adhesions and/or fibrosis with an unclear anatomy.

The learning curve in TAPP is probably between 40 to 60 TAPP operations [3, 12, 14, 15]. A sub-analysis of surgeon-related complications in the present study showed no significant differences in complications between untrained and experienced surgeons. Large prospective and retrospective learning-curve studies on TAPP have shown a significant reduction of serious complications from 9% to 3% and a decrease in re-operation rate due to recurrence from 5% to 1% owing to surgical experience when using small surgical teams and struc-

tured training programs [3, 12, 14, 15]. From 1 January 2008, we introduced a surgical team of three trained TAPP surgeons with experience from > 80 TAPP operations. In the beginning of 2008, two surgeons started their surgical TAPP training in accordance with international recommendations (guided camera for more than 20 TAPP procedures and a requirement for execution of 40 TAPP operations under supervision) [3, 7]. In our study, we could only detect a slight tendency towards fewer severe complications from 3% in period I to 2% in period II, and no clear difference was observed in relation to operation time. A possible explanation for these findings may be that results from period I mainly reflected the results of a single surgeon, and that many TAPP procedures in period II were used for surgical training.

In conclusion, our study indicates that TAPP may be performed without routine use of UFC with less risk of urological complications than with routine use of UFC. In addition, TAPP performed under standardized conditions with a few dedicated surgeons facilitates the introduction of structured patient protocols and prearranged surgical training programs.

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