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## **Gestion du drainage urinaire en chirurgie colorectale**

### ***Urine drainage management in colorectal surgery***

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## **Abstract**

**Introduction.** Enhanced recovery after surgery (ERAS) is aimed at reducing a patient's surgical stress response, specifically by reducing the duration of catheterization. In cases of colorectal surgery, there is pronounced heterogeneity in urinary catheterization, which is largely explained by fear of acute urinary retention (AUR).

**Objective.** The objective of the work is to report on the current literature on postoperative urinary catheterization following colorectal surgery, particularly in the context of AUR, and thereby contribute to the standardization of perioperative practices.

**Results.** In colon surgery without preoperative urinary disorders, catheterization must not exceed 24 hours. In rectal surgery, catheter removal starting on postoperative D2 seems reasonable in the absence of AUR risk factor (RF). Male sex, past history of lower urinary tract obstruction, abdomino-perineal amputation (APA) and low rectal anastomosis are AUR risk factors that must be taken into account when deciding to carry out urinary catheter removal. While the role of a suprapubic catheter is not clearly defined, it may be of use following APA. The epidural catheter is another AUR risk factor, but it seems possible to withdraw the urinary catheter on postoperative D1, before the epidural catheter, provided that the other risk factors have been taken into full account. Lastly, up until now no satisfactorily conducted study has assessed the prophylactic interest of systematic perioperative alpha-blocker treatment in colorectal surgery.

## **Key words**

Colorectal surgery; Transurethral probe; Suprapubic catheter; Acute urinary retention; Alpha blockers; Epidural analgesia

## **Introduction**

Enhanced recovery after surgery (ERAS) is aimed at reducing a patient's surgical stress response, specifically by reducing the duration of catheterization [1]. Bladder catheters are particularly targeted by ERAS programs insofar as they present well-established cause-specific morbidity. In cardiothoracic, colorectal or orthopedic surgery, urinary catheterization exceeding 2 days is a significant risk factor (RF) for urinary infection, increased length of stay in hospitals and increased 30-day mortality [2]. On the contrary, several authors have concluded that early urinary catheter removal was one of the keys to ERAS success [3,4]. That is why, in 2014, the *Société Française de Chirurgie Digestive* (SFCD) and the *Société Française d'Anesthésie Réanimation* (SFAR) recommended a 24-hour limit to urinary catheterization following colon surgery; on the other hand, no specific time limit was suggested for the aftermath of rectal surgery [5].

In routine clinical practice, urinary catheterization procedures in colon or rectal surgery are heterogeneous. Different studies report catheterization duration ranging from 0 to 5 days according to team, suprapubic catheter use [6,7] and, in some cases, preparation by alpha blockers [8,9]. The wide range of procedures undoubtedly stems from fear of acute urinary retention (AUR), which creates a need for insertion of a new catheter, procedure entailing a heightened risk of urinary infection, catheter malposition, urethral stenosis and patient discomfort [3,10].

Given these factors, urinary catheterization should at once be short enough to improve surgical outcomes and reduce the risks of urinary infection, and yet long enough to limit the risk of AUR,

particularly in the aftermath of rectal surgery. The objective of this review is to describe the state of the literature concerning perioperative urinary catheterization in colorectal surgery, particularly as regards AUR, and thereby contribute to the standardization of perioperative practices.

## **Methods**

To carry out this review, literature search was carried out using the PubMed and Cochrane Library data bases and taking mainly into account the relevant articles published between 2009 and 2019. The keywords utilized were: “urinary catheter”, “foley catheter”, “postoperative retention”, “colectomy”, “colorectal surgery”, “rectal surgery”, “urinary drainage”, “alpha blocker”, “suprapubic catheter” and “epidural analgesia”. The selected articles were comparative prospective or retrospective studies taken from reviews on surgery and anesthesia in English and in French.

## **Definition and rationale of AUR**

By definition, AUR is the sudden and often painful inability to void despite having a full bladder [11]. Postoperative AUR following colorectal surgery occurs in 2 to 50% of cases according to different authors [2,11,12] and to the criteria selected (**Table 1**). It is characterized by either post-void residual urine exceeding 200 mL, by need for an indwelling (Foley) catheter, or by drainage through a urethral catheter.

Three interrelated causes explain postoperative urinary disorders following colorectal surgery: (a) damage to the vegetative innervation of the bladder, mainly during pelvic dissection [23]; (b) posterior tilt of the bladder due to the dead space arising after rectal resection, a factor favoring dysuria [12] and (c) the drugs utilized, a key example being morphinics, which are more favorable to AUR incidence than non-morphinic analgesics (Clonidine or Sufentanil) in perioperative and postoperative analgesia [24].

## **Objectives of urinary catheterization**

Urinary catheterization initially had two objectives: (a) to monitor diuresis or urinary output during long and potentially morbid surgical interventions and (b) to prevent postoperative AUR. In rectal surgery, perioperative urinary catheterization also helps to empty the bladder and thereby contributes to small pelvic dissection.

- **The monitoring of diuresis**

Initially necessary in the context of laparotomy surgery entailing imperceptible losses, the monitoring of diuresis is no longer systematically recommended [25]. An indication for urinary catheterization should be discussed (but not always adopted) prior to each operation [20]. Ideally, fluid management is monitored by Oesophageal Doppler monitor (ODM), but its benefits with regard to surgical outcomes have yet to be demonstrated in comparison with “goal-directed” fluid therapy or other modalities [26,27].

- **AUR prevention**

AUR prevention remains a major issue insofar as AUR occurrence complicates 2 to 50% of colorectal surgeries [2,11,12]. Colon surgery is less impacted, with AUR rates ranging from 2 to 14% [16,20,25,28], whereas in the aftermath of rectal surgery, it ranges from 5 to 25% [11,25,28]. In the framework of an ERAS protocol in colonic surgery, the two major AUR risk factors are male sex and epidural analgesia catheter [16]. Perioperative filling exceeding 3 liters and operating time exceeding 2.8 hours likewise increase AUR risk [15]. Interestingly, neoadjuvant radiation therapy in rectal cancer and benign prostatic hyperplasia are not risk factors [15]. Given its high frequency and the large number of identified and non-modifiable risk factors (male sex, epidural catheter and rectal surgery), urinary catheterization remains suitable in at-risk patients as a means of preventing AUR.

### **Urinary catheter management in colon surgery**

In the ERAS framework, French recommendations on urinary catheterization in colon surgery favor catheter removal 24 hours after colon resection surgery in patients without preoperative urinary disorders [5]. Should this not be the case, and when catheterization duration needs to be prolonged (more than 5 days), a suprapubic catheter is indicated [5]. More recently, the *Groupe francophone de Réhabilitation Améliorée après Chirurgie* (GRACE) recommended that urinary catheterization not take place in patients without AUR risk factors [29]. And in 2019, the ERAS (Enhanced Recovery After Surgery) group [25] recommended that urinary catheterization be maintained as a measure of postoperative AUR prevention for 1 to 3 days in the event of an identified risk factor: male sex, epidural catheter and pelvic surgery.

With regard to colectomies, several authors have evaluated the absence of urinary catheterization in a prospective study [20] in which 39 out of 65 patients (60%) had not received a urinary catheter during their hospitalization for programmed laparoscopic colon surgery (mainly sigmoidectomy, right colectomy, left colectomy and total colectomy). Postoperative AUR (9%) was comparable to the rates observed in the literature [14,30].

One of the main risks in transurethral catheterization is urinary infection (**Table 1**). That much said, simple measures can substantially decrease its likelihood. In a series of 811 patients having undergone colon surgery, two consecutive measures led to urinary infection reduction first from 6.9% to 2.7%, and subsequently to 0.8%. They consisted in (a) daily evaluation of the need for urinary catheterization and (b) catheterization in a sterilized surgical site [31]. Moreover, and in compliance with an ERAS protocol, in colon surgery early removal of urinary catheter can decrease urinary infections from 4.1% to 0.8% [3].

In the aftermath of colon surgery, urinary catheterization is consequently not indispensable and its continuation immediately after an operation should be open to discussion. And even if the above recommendations await validation in satisfactory prospective studies, in view of (a) improving surgical outcome and (b) lowering the risk of urinary infection, catheterization should in principle be of the shortest possible duration, with removal programmed for postoperative D1. Catheter insertion in the operating theater is also an option to be recommended.

### **Urinary catheter management in rectal surgery**

In contrast to colon surgery, which is intra-peritoneal, subperitoneal rectal surgery is a major source of AUR [12]. Chaudhri et al. [32] reported that while 68% of patients experienced



spontaneous voiding recovery in the 72 hours following colorectal surgery, its restoration was delayed in rectal as opposed to colon surgery (6 vs 3 days;  $p=0.0015$ ).

Current recommendations favor not only urinary catheterization over at least the first three days following rectal surgery, but also the placement of a suprapubic catheter when catheterization duration is estimated at 5 days [5]. A transurethral probe is placed at the outset of an operation for the purposes of bladder emptying, and also helps to avoid urethral injury during anal canal dissection [33]. The same probe can be used at the end of the operation to inflate the bladder and to place, if needed, a suprapubic catheter.

One of the first randomized controlled studies on the topic compared rates of postoperative urinary infection following rectal surgery according to early (D1) or late (D5) urinary catheter removal [13]. While AUR was significantly greater (25 vs 10%;  $p<0.05$ ) in the early group, the urinary infection rate, including asymptomatic bacteriuria, was significantly lower in the same group (20 vs 42%;  $p<0.01$ ). In this trial, of which the results were published in 1999, the laparotomic approach may have contributed to the high AUR rate due to higher degrees of postoperative pain and to consequently heightened levels of morphine consumption. Excluding low rectal cancers from consideration, the groups were comparable in terms of AUR. In conclusion, the authors recommended urinary catheter removal at D1 except in cases of low rectal cancer [13]. This was confirmed in 2015 by Yoo et al. in 2015 [18], who reported comparable AUR whether the urinary catheter was removed on D1 or D2 or later (4.8% vs 4.7%;  $p=1.0$ ), in preoperatively selected patients (after exclusion of preoperative urinary diseases) in whom a laparoscopic approach was applied in 95% of cases.

That much said, the literature is not uniformly favorable to early urinary catheter removal; several authors have reported AUR rates ranging from 20 to 30% when the catheter remains in place  $\leq 2$  days [17,19,21]. In their studies, AUR risk factors included: male sex, catheter removal before 2 days, past history of obstructive urinary disease, age  $>65$  years, obesity, an anastomosis less than de 6 cm from the anal verge, APA, laparoscopic approach, perioperative hydration  $> 2000$  mL, blood transfusion and metastatic diseases [17,19,21,22,34] (**Table 2**).

These different risk factors are explained by differences between male and female anatomy that have a bearing on (a) the technical difficulty of mesorectal excisions and (b) variations of surgical technique according to tumor topography. For example, men generally possess a narrower pelvic cavity than women, which renders dissection more difficult; in addition, due to the absence of vagina the pelvic plexus is located close to the lower rectum, increasing the risks of nerve injury [17,19,21]. On the same token, extent of dissection is directly associated with the level of the tumor and, as a result, of the anastomosis; so it is that a low rectal or anal anastomosis increases the risk of injury to the pelvic nerves innervating the urinary bladder [21].

Obesity complicates rectal surgery due to a need for additional manipulation of the bladder and to problems connected with mesorectum dissection that are liable to exacerbate postoperative urinary dysfunctions [22]. Moreover, according to Lee et al.[17], the laparoscopic approach represents a risk factor for AUR, which is explained by the transient neuropraxia occasioned by the instruments used during exposure and by increased compression of the kidney parenchyma with the pneumoperitoneum, which reduces renal blood flow, thereby aggravating urinary dysfunction. That much said, in numerous and more recent studies, laparoscopy has not been identified as a risk factor for AUR [15,19,22,34]. The neurotoxicity of oxaliplatin, which is used as

a neoadjuvant in metastatic patients, may create a predisposition to postoperative urinary dysfunction [22].

From an ERAS standpoint, pelvic surgery is a risk factor for AUR, of which the frequency is estimated at between 15 and 25% in cases of removal on postoperative D1; that is why removal from D2 is recommended by the ERAS group [25]. On the contrary, Kwaan et al. [19] reported that early urinary catheter removal, on postoperative D1 compared to D3 or later, resulted in reduced length of hospital stay ( $p=0.005$ ), an outcome confirmed in 2018 by Patel et al. ( $p=0.03$ ) [8].

Several authors have striven to define the factors predictive of a need to recatheterize. In a recent retrospective study, Imaizumi et al. [35] identified a certain percentage of bladder voiding as a risk factor for AUR necessitating reinsertion of a urinary catheter. More precisely, bladder voiding less than or equal to 20% was associated with a high risk of AUR (OR=25.70). That said, the study design and the voiding limit adopted by the authors do not justify use of their criteria in routine practice, even though their work could be of pronounced interest in a future prospective study.

In conclusion, it is difficult in the absence of high power randomized controlled studies to deliver clear recommendations on catheter management following rectal surgery. However, when there are no AUR risk factors, urinary catheter removal from postoperative D2 seems reasonable.

## **Role of the suprapubic catheter in colorectal surgery**

Even though urinary draining is widely used in general abdominal surgery, there exists no consensus regarding the superiority of either suprapubic catheterization or transurethral

draining [36]. It is necessary to be aware of the contraindications for suprapubic catheterization:

(a) previous bladder tumor and (b) extra-anatomic vascular bypass surgery in the area [11].

The most recent (2014) French SFAR and SFCE recommendations suggest preferential suprapubic catheterization in patients likely to require urinary draining for at least 5 days, especially those undergoing low rectal surgery [5]. According to a recent meta-analysis on postoperative urinary infections in colorectal surgery, suprapubic or intermittent catheterization is preferable to a urinary catheter in the event of draining duration exceeding 5 days [37]. Several studies comparing suprapubic and transurethral catheterization have highlighted the interest of catheters as means of reducing (a) pollakiuria, (b) the need to renew urine drainage systems, (c) urinary infection rates and (d) patient discomfort [6,7,38]. That much said, in a retrospective cohort study including 399 patients, rate of drainage system removal at D5 was 10% in patients with a suprapubic catheter versus 44% in patients with transurethral (indwelling) catheterization ( $p<0.01$ ) [7]. The most recent relevant meta-analysis reported that the transurethral catheterization was significantly associated with increased bacteriuria (OR=2,02;  $p<0.001$ ) and with increased pain and discomfort (OR=2.94;  $p=0.004$ ), but not with a significant increase in catheter reinsertion rate (OR=1.97;  $p=0.213$ ) [36].

Klaaborg and Kronborg [7] dealt with spontaneous voiding recovery following placement of a suprapubic catheter in the aftermath of colorectal surgery. For them, the suprapubic catheter was to be recommended in cases of APA because it permitted restoration of spontaneous voiding with control of post-void residual urine, reduced bacteriuria and lessened patient discomfort. These results were congruent with those of Chaudhri et al. [32], who concluded that the catheter facilitated complete functional recovery of the lower urinary tracts.

So it is that, as ERAS achieves prominence, numerous studies have shown that reduced duration of postoperative urinary drainage subsequent to colorectal surgery is advantageous for patients, and that immediate placement of a suprapubic catheter would be invasive. These considerations are to be compared with the above-mentioned AUR risk factors. The ongoing GRECCAR 10 randomized trial, which is aimed at comparing urinary drainage by suprapubic catheter and by urethral probe after total mesorectal excision and low rectal anastomosis (colorectal or colo-anal, manual or mechanical anastomosis) in male rectal cancer patients, is likely to yield a precise response.

### **The role of alpha blockers in colorectal surgery**

From an ERAS standpoint, and in order to facilitate postoperative bladder function recovery and use of bladder and suprapubic catheters, alpha blockers could constitute a worthwhile alternative. Indeed, they can relax the smooth alpha adrenergic muscle fibers present at the level of the prostatic urethra and the bladder neck, which are highly stimulated by surgically induced pain [39].

These medicines are favorable to voiding and are of proven efficacy following at least 48 hours of impregnation, with maximal efficacy achieved in a fortnight [11].

Only one alpha blocker, Alfuzozin, has been awarded market authorization (MA) in France as adjuvant therapy of catheterization after an acute episode of urinary retention (AUR) in males.

As for Tamsulosin, which has received MA for functional symptoms of benign prostatic hyperplasia, it is presently under assessment as possible AUR treatment. These two drugs are

administered by mouth only, should be taken in the evening, and are characterized by sustained release [40]. Intake on the evening of an operation is compatible in an ERAS protocol with early feeding.

Several studies grouped together in a meta-analysis have underlined the interest of alpha blockers for AUR prevention in the context of inguinal hernia surgery, mainly as regards men over 50 years of age [41].

By analogy, Tamsulosin has also been studied in rectal cancer in women and men, at a dose of 0,2mg by day during the first seven postoperative days, with catheter removal taking place on D2. There was no significant difference between the Tamsulosin group and the control group (23.4 vs 21.3% respectively,  $p = 0.804$ ), with male sex being the only risk factor for AUR ( $p = 0.023$ ) [42]. In practice, alpha blockers are not recommended for use by women, except in cases of multiple sclerosis, given that there is no actual sub-bladder obstruction [40].

Another study has retrospectively evaluated the interest of Tamsulosin intake in men over 50 years of age having undergone colorectal surgery [9]. The catheter was removed on postoperative D2 in the framework of an ERAS protocol. Out of 157 patients, 100 had received Tamsulosin at a dose of 0.4 mg a day, without a precise protocol, from 3 days prior to hospitalization until hospital discharge. AUR occurred in 11.5%, and urinary infection in 5.1% of cases. In multivariate analysis, only postoperative ileus was a predictive risk factor for AUR [9]. AUR and urinary infection rates did not vary according to Tamsulosin intake or rectal location.

In addition, Prazosin, a non-selective alpha blocker, was orally administered to 142 men having undergone colorectal surgery including subperitoneal dissection in the middle or lower rectum [8]. Indications for this drug were chronic inflammatory intestinal disease (103 cases: 73%) or

cancer (30 cases: 21%); patients with benign prostatic hyperplasia or an epidural catheter were excluded. Statistical analysis demonstrated the non-inferiority of urinary catheter removal on postoperative D1, 6 hours after oral intake of 1mg of Prazosin (a non-selective alpha blocker), with 8.5% of patients presenting with AUR as opposed to 9.9% in the D3 urinary catheter removal group ( $p = 1.0$ ).

All in all, the literature on the role of alpha blockers in colorectal surgery is rather disappointing. A new study would be necessary in order to evaluate the prophylactic interest for males of pre, peri or postoperative alpha blocker impregnation.

### **Catheterization in cases involving epidural catheter during colorectal surgery**

Indications for epidural analgesia by epidural catheter placement are less frequent in the ERAS context. While epidural analgesia slows postoperative recovery in patients having undergone laparoscopic surgery [43], it seems on the contrary to improve recovery in patients having undergone open surgery [44]. Nowadays, 57% of colectomies are still carried out by open surgery, and duration of urinary catheterization can be impacted by epidural analgesia [45].

In this respect, the non-controlled prospective study by Basse et al. [30] seemed to show that urinary catheter removal after laparotomic colon surgery is possible at postoperative D1, notwithstanding the presence of a continuous-flow epidural catheter, which remains in place until postoperative D2. Only 9% of patients had to be recatheterized due to AUR, a proportion comparable to the one recorded without epidural analgesia. Moreover, Alyami et al. [20] have shown that in selected patients (excluding ASA IV patients, rectal surgery, emergency contexts, and stoma operations), presence of an epidural analgesia factor was not a risk factor for AUR in

the aftermath of colon surgery ( $p=1.0$ ). Epidural analgesia is consequently not systematically synonymous with urinary catheterization.

That much said, the literature on the subject is far from unequivocal, and other studies have highlighted an increased number of AUR cases in groups of patients with an epidural catheter (12-14%) [14,16]. In one study, the epidural catheter was even found to be an independent AUR risk factor [16].

To summarize, the epidural catheter seems to be a potential AUR risk factor; however, when certain risk factors (male sex, operation duration, terrain) are taken adequately into account, the urinary catheter can be removed prior to the epidural catheter, as early as postoperative D1, with an acceptable proportion of AUR. While the absence of a urinary catheter notwithstanding the presence of an epidural catheter seems possible, only subsequent to a targeted study can it be unreservedly recommended.

### **In the event of failed urinary catheter weaning**

If a patient presents with AUR on removal of urinary catheter, it is necessary to recatheterize and proceed to a bacteriological urine test in the event of signs suggesting an underlying urinary infection (functional signs, pelvic pain, infectious syndrome). [46]. In addition, it is necessary to seek out factors favorable to AUR, to discontinue morphine-based or other treatments provoking AUR, to search and evacuate fecal impaction or a deep pelvic abscess, and to treat possible urinary infection [47]. Postoperative ileus is another risk factor associated with AUR, as renewed bowel function renders urinary catheter weaning more likely [9].



A suprapubic catheter, rather than a transurethral probe, may in the event of failed urinary catheterization be indicated by a urologist. In men, an alpha blocker treatment is indicated as an adjuvant treatment complementing a urinary catheter (success rate at 63% vs 50%,  $p < 0.001$ ) [48]. In the event of underlying benign prostatic hyperplasia and the absence of renewed spontaneous voiding during a second weaning procedure, a prostate unclogging procedure can be proposed and performed remotely.

In the event of failed weaning, a patient classically leaves the hospital with an indwelling transurethral probe, which unfortunately entails morbidity, risk of urinary infection, and lengthier hospitalization [47]. As an alternative to the indwelling transurethral probe, intermittent self-catheterization of bladder could be the method of reference for urinary drainage in the event of AUR in men and women alike, whatever the etiology, and patients should ideally be taught how to perform self-catheterization during hospitalization or the succeeding weeks. Following discharge, a urological consultation will be called for [49].

## **Conclusion**

Catheterization is a “traumatism” that may slow down postoperative recovery. In colon surgery, it is recognized that except in cases involving AUR risk factors, the catheter should remain in place for at most 24 hours, but in certain selected patients, it may not be perioperatively installed. Solutions are less clearly evident in rectal surgery or in patients with epidural analgesia. Since postoperative AUR is more frequent, in the absence of risk factors urinary catheter removal on postoperative D2 seems reasonable. A suprapubic catheter can prove beneficial subsequent to more than 5 days of draining, especially in low rectal surgery and APA. Randomized controlled

studies evaluating the benefits of short-duration catheterization with regard to morbidity and AUR-related consequences are necessary in view of issuing reliable recommendations.

### **The essential points**

- In colon surgery, a urinary catheter should remain place for 24 hours at most.
- In rectal surgery, urinary catheter removal at postoperative D2 seems reasonable in the absence of a risk factor for acute urinary retention.
- The suprapubic catheter is limited to men undergoing low rectal surgery.
- The epidural catheter is a risk factor for acute urinary retention.
- The role of alpha blockers in AUR prevention remains undefined.

### **References**

- [1] Mariani P, Slim K. Enhanced recovery after gastro-intestinal surgery: The scientific background. *J Visc Surg.* 2016;153:S19-25.
- [2] Wald HL, Ma A, Bratzler DW, Kramer AM. Indwelling urinary catheter use in the postoperative period: analysis of the national surgical infection prevention project data. *Arch Surg* 2008;143:551-7.
- [3] Okrainec A, Aarts M-A, Conn LG et al. Compliance with urinary catheter removal guidelines leads to improved outcome in enhanced recovery after surgery patients. *J Gastrointest Surg* 2017;21:1309-17.

- [4] Eskicioglu C, Forbes SS, Aarts M-A, Okrainec A, McLeod RS. Enhanced recovery after surgery (ERAS) programs for patients having colorectal surgery: a meta-analysis of randomized trials. *J Gastrointest Surg.* 2009;13:2321-9.
- [5] Alfonsi P, Slim K, Chauvin M, Mariani P, Faucheron JL, Fletcher D. French guidelines for enhanced recovery after elective colorectal surgery. *Journal of Visceral Surgery.* 2014;151:65-79.
- [6] Perrin LC, Penfold C, McLeish A. A prospective randomized controlled trial comparing suprapubic with urethral catheterization in rectal surgery. *Aust N Z J Surg* 1997;67:554-6.
- [7] Klaaborg KE, Kronborg O. Suprapubic bladder drainage in elective colorectal surgery. *Dis Colon Rectum* 1986;29:260-2.
- [8] Patel DN, Felder SI, Luu M, Daskivich TJ, N Zaghiyan K, Fleshner P. Early urinary catheter removal following pelvic colorectal surgery: a prospective, randomized, noninferiority trial. *Dis Colon Rectum* 2018;61:1180-6.
- [9] Ghuman A, Kasteel N, Karimuddin AA, Brown CJ, Raval MJ, Phang PT. Urinary retention in early urinary catheter removal after colorectal surgery. *Am J Surg* 2018;215:949-52.
- [10] Slim K. Fast-tracking en postopératoire : chasse aux sondes, marche et alimentation précoce. *Anesthésie & Réanimation.* 2015;1:429-34.
- [11] Latteux G, Faguer R, Bigot P, Chautard D, Azzouzi AR. Rétentions aiguës d'urine complètes. *EMC - Urologie* 2011:1-12.

- [12] Delacroix SE, Winters JC. Voiding dysfunction after pelvic colorectal surgery. *Clin Colon Rectal Surg* 2010;23:119-27.
- [13] Benoist S, Panis Y, Denet C, Mauvais F, Mariani P, Valleur P. Optimal duration of urinary drainage after rectal resection: a randomized controlled trial. *Surgery* 1999;125:135-41.
- [14] Stubbs BM, Badcock KJM, Hyams C, Rizal FE, Warren S, Francis D. A prospective study of early removal of the urethral catheter after colorectal surgery in patients having epidural analgesia as part of the Enhanced Recovery After Surgery programme. *Colorectal Dis* 2013;15:733-6.
- [15] Kin C, Rhoads KF, Jalali M, Shelton AA, Welton ML. Predictors of postoperative urinary retention after colorectal surgery. *Dis Colon Rectum* 2013;56:738-46.
- [16] Grass F, Sliker J, Frauche P et al. Postoperative urinary retention in colorectal surgery within an enhanced recovery pathway. *J Surg Res* 2017;207:70-6.
- [17] Lee SY, Kang S-B, Kim D-W, Oh H-K, Ihn MH. Risk factors and preventive measures for acute urinary retention after rectal cancer surgery. *World J Surg* 2015;39:275-82.
- [18] Yoo BE, Kye BH, Kim HJ, Kim G, Kim JG, Cho H-M. Early removal of the urinary catheter after total or tumor-specific mesorectal excision for rectal cancer is safe. *Dis Colon Rectum* 2015;58:686-91.
- [19] Kwaan MR, Lee JT, Rothenberger DA, Melton GB, Madoff RD. Early removal of urinary catheters after rectal surgery is associated with increased urinary retention. *Dis Colon Rectum* 2015;58:401-5.

- [20] Alyami M, Lundberg P, Passot G, Glehen O, Cotte E. Laparoscopic colonic resection without urinary drainage: Is It « Feasible »? *J Gastrointest Surg* 2016;20:1388-92.
- [21] Kim HO, Cho YS, Kim H, Lee SR, Jung KU, Chun H-K. Scoring systems used to predict bladder dysfunction after laparoscopic rectal cancer surgery. *World J Surg* 2016;40:3044-51.
- [22] Duchalais E, Larson DW, Machairas N, Mathis KL, Dozois EJ, Kelley SR. Outcomes of early removal of urinary catheter following rectal resection for cancer. *Ann Surg Oncol* 2019;26:79-85.
- [23] Vidart A, Mozer P, Chartier-Kastler E, Ruffion A. Neurourological consequences of gynaecological surgery (endometriosis, simple hysterectomy, radical colpohysterectomy), colorectal surgery and pelvic radiotherapy. *Prog Urol.* 2007;17:381-4.
- [24] Jackson J, Davies P, Leggett N. Systematic review of interventions for the prevention and treatment of postoperative urinary retention. *BJS Open.* 2019;3:11-23.
- [25] Gustafsson UO, Scott MJ, Hubner M et al. Guidelines for perioperative care in elective colorectal surgery: enhanced recovery after surgery (ERAS®) society recommendations: 2018. *World J Surg* 2019;43:659-95.
- [26] Srinivasa S, Lemanu DP, Singh PP, Taylor MHG, Hill AG. Systematic review and meta-analysis of oesophageal Doppler-guided fluid management in colorectal surgery. *Br J Surg.* 2013;100:1701-8.
- [27] Xu C, Peng J, Liu S et al. Goal-directed fluid therapy versus conventional fluid therapy in colorectal surgery: A meta-analysis of randomized controlled trials. *Int J Surg.* 2018;56:264-73.

- [28] Changchien CR, Yeh CY, Huang ST, Hsieh M-L, Chen J-S, Tang R. Postoperative urinary retention after primary colorectal cancer resection via laparotomy: a prospective study of 2,355 consecutive patients. *Dis Colon Rectum*. 2007;50:1688-96.
- [29] <https://www.grace-asso.fr/>.
- [30] Basse L, Werner M, Kehlet H. Is urinary drainage necessary during continuous epidural analgesia after colonic resection? *Reg Anesth Pain Med* 2000;25:498-501.
- [31] Nagle D, Curran T, Anez-Bustillos L, Anez-Bustillo L, Poylin V. Reducing urinary tract infections in colon and rectal surgery. *Dis Colon Rectum* 2014;57:91-7.
- [32] Chaudhri S, Maruthachalam K, Kaiser A, Robson W, Pickard RS, Horgan AF. Successful voiding after trial without catheter is not synonymous with recovery of bladder function after colorectal surgery. *Dis Colon Rectum* 2006;49:1066-70.
- [33] Valverde A. Chirurgie du cancer du rectum par laparotomie et laparoscopie. *EMC - Techniques chirurgicales - Appareil digestif*. 2018;14:1-29.
- [34] Bouchet-Doumenq C, Lefevre JH, Bennis M et al. Management of postoperative bladder emptying after proctectomy in men for rectal cancer. A retrospective study of 190 consecutive patients. *Int J Colorectal Dis*. 2016;31:511–8.
- [35] Imaizumi K, Tsukada Y, Komai Y et al. Prediction of urinary retention after surgery for rectal cancer using voiding efficiency in the 24 h following Foley catheter removal. *Int J Colorectal Dis*. 2019;34:1431–43.

- [36] McPhail MJW, Abu-Hilal M, Johnson CD. A meta-analysis comparing suprapubic and transurethral catheterization for bladder drainage after abdominal surgery. *Br J Surg* 2006;93:1038-44.
- [37] Han CS, Kim S, Radadia KD et al. Comparison of urinary tract infection rates associated with transurethral catheterization, suprapubic tube and clean intermittent catheterization in the postoperative setting: a network meta-analysis. *J Urol* 2017;198:1353-8.
- [38] Ratnaval CD, Renwick P, Farouk R, Monson JR, Lee PW. Suprapubic versus transurethral catheterisation of males undergoing pelvic colorectal surgery. *Int J Colorectal Dis* 1996;11:177-9.
- [39] Pertek JP, Haberer JP. Effects of anaesthesia on micturition and postoperative urinary retention. *Ann Fr Anesth Reanim.* 1995;14:340-51.
- [40] Game X, Cornu JN, Karsenty G. Les médicaments de l'urètre. *Prog Urol.* 2013;23:1287-98.
- [41] Clancy C, Coffey JC, O'Riordain MG, Burke JP. A meta-analysis of the efficacy of prophylactic alpha-blockade for the prevention of urinary retention following primary unilateral inguinal hernia repair. *The American Journal of Surgery* 2018;216:337-41.
- [42] Jang J-H, Kang S-B, Lee S-M, Park J-S, Kim D-W, Ahn S. Randomized controlled trial of tamsulosin for prevention of acute voiding difficulty after rectal cancer surgery. *World J Surg* 2012;36:2730-7.
- [43] Borzellino G, Francis NK, Chapuis O, Krastinova E, Dyevre V, Genna M. Role of Epidural Analgesia within an ERAS Program after Laparoscopic Colorectal Surgery: A Review and Meta-Analysis of Randomised Controlled Studies. *Surg Res Pract.* 2016;2016:7543684.

- [44] Hughes MJ, Ventham NT, McNally S, Harrison E, Wigmore S. Analgesia after open abdominal surgery in the setting of enhanced recovery surgery: a systematic review and meta-analysis. *JAMA Surg.* 2014;149:1224-30.
- [45] Moghadamyeghaneh Z, Masoomi H, Mills SD. Outcomes of conversion of laparoscopic colorectal surgery to open surgery. *JSLs.* 2014;18.
- [46] Broggi E, Bruyère F. Prise en charge des prostatites aiguës. *EMC – Urologie.* 2012;5:1-6.
- [47] Boissier R. Prise en charge d'une rétention aiguë d'urine. *J Eur Urgences Reanim.* 2012;24 :78–85.
- [48] Fitzpatrick JM, Desgrandchamps F. Management of acute urinary retention : a worldwide survey of 6074 men with benign prostatic hyperplasia. *BJU Int.* 2012;109:88-95.
- [49] Raibaut P, Terrier A, Jacq C, Hubeaux K, Sheikh Ismaël S, Amarenco G. Intérêt de l'auto-sondage en cas de rétention urinaire. *Prog Urol.* 2008;18:29-34.

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Table 1 : Incidence of acute urinary retention and urinary infections according to means of postoperative urinary catheter removal following colorectal surgery

Authors	Year	Study design / Number of patients	Type of surgery	Post op urinary catheter removal	AUR rate (%)	Urinary infection rate (%)
<b>Benoist [13]</b>	1999	RCT	Rectal	- D1	25	20
		126 patients	resection	- D5	10	42
<b>Stubbs [14]</b>	2012	Prospective 210 patients	Colorectal resection	- D1 - D3 with epidural catheter	6.7 0.9	
<b>Kin [15]</b>	2013	Prospective 143 patients	Colorectal resection	- D1 - D3 if rectum	22.8 21.9	4.9
<b>Grass [16]</b>	2015	Retrospective 513 patients	Colorectal resection	- D1 - D3 or D4 if rectum	14 20	10
<b>Lee [17]</b>	2015	Retrospective 352 patients without UD	Rectal resection	- D1 or D2	13.6	

<b>Yoo [18]</b>	2015	Retrospective 189 patients without UD	Rectal resection TME	- D1 - D2 and more	4.8 4.7	
<b>Kwaan [19]</b>	2015	Retrospective 205 patients	Rectal resection	- Before D2 - D2 and more	30.8 18.4	
<b>Alyami [20]</b>	2016	Prospective 65 patients	Colonic resection	- D0	9.2	1.5
<b>Kim [21]</b>	2016	Observational prospective 110 patients	Laparoscopy c rectal resection	- D1	29.1	
<b>Okraïneç [3]</b>	2017	Retrospective 1897 patients	Colonic resection	- D1 (ERAS) - D3 (non- ERAS)	4.9 1.9	0.8 4.1
<b>Ghuman [9]</b>	2018	Retrospective 244 patients	Colorectal resection	- D2 +/- alpha blocker	11	5
<b>Patel [8]</b>	2018	Prospective randomized non- inferiority 142 patients	Sub- peritoneal colorectal resection	- D1 + alpha blocker - D3	8.5 9.9	0 11.3

<b>Duchalais [22]</b>	2018	Retrospective 417 patients	Rectal resection	- D1	41	

AUR: acute urinary retention

ERAS: Enhanced Recovery After Surgery

RCT: Randomized controlled trial

UD: Urinary dysfunction

TME : Total Mesorectal Excision

Table 2 : Data in the literature on risk factors for postoperative acute urinary retention following rectal surgery

Authors	Year	Study design / Number of patients	Type of surgery	Risk factors for AUR	Odds ratio (95% CI)
<b>Benoist [13]</b>	1999	RCT 126 patients	Rectal resection	- Lower rectum carcinoma - Lymph node metastases	
<b>Lee [17]</b>	2015	Retrospective 352 patients without UD	Rectal resection	- Male sex - UC removal at D2 or less - Peri-op hydration >2L - Laparoscopy	2.24 (1.04-4.81) 3.65 (1.27-10.52) 3.79 (1.90-7.57) 2.42 (1.12-5.22)
<b>Yoo [18]</b>	2015	Retrospective 189 patients without UD	Rectal resection TME	None	
<b>Kwaan [19]</b>	2015	Retrospective 205 patients	Rectal resection	- Male sex - UC removal at D2 or less - Transfusion	3.94 (1.7-9.0) 3,77 (1.4-10.5) 1.24 (1.04-1.48)

<b>Bouchet-Doumenq [34]</b>	2015	Retrospective 190 patients	Rectal resection	- Diabetes	2.9 (1.2-7.7)
				- UD past history	2.9 (1.2-7.6)
				- TME resection	5.2 (2.3-13.5)
<b>Kim [21]</b>	2016	Observational prospective 110 patients	Laparoscopic rectal resection	- Male sex	4.91 (1.32-18.30)
				- Age > 65 years	7.84 (2.16-28.43)
				- Anastomose at 6cm or less from anal verge	5.01 (1.42-17.74)
<b>Duchalais [22]</b>	2018	Retrospective 417 patients	Rectal resection	- Male sex	2.58 (1.58-4.30)
				- Obesity	1.74 (1.08-2.82)
				- UD past history	2.28 (1.18-4.49)
				- APA	3.04 (1.30-7.51)
				- Metastatic disease	2.14 (1.07-4.36)

AUR: Acute urinary retention

95% CI: 95% confidence interval

RCT: Randomized controlled trial

UD: Urinary dysfunction

UC: Urinary catheter

TME : Total Mesorectal Excision

APA: Abdomino-Perineal amputation