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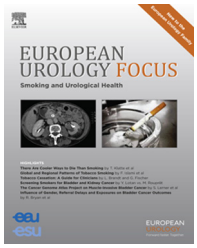


Review – Endo-urology

# Prevention and Management Following Complications from Endourology Procedures☆

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## Abstract

*Context:* Endourologic procedures are very common in daily urologic practice for treatment of benign prostatic obstruction, stone disease, urothelial tumors, or stenosis.
*Objective:* To characterize the complications following endoscopic procedures, to describe their management, and to gather information about their prevention in current urologic practice.
*Evidence acquisition:* A review of the literature was conducted using PubMed/Medline database to include the most relevant articles on the topic. The search focused on endoscopic approaches for treatment of prostate, bladder, or upper urinary tract disease. Percutaneous approaches and noninvasive extracorporeal techniques were excluded. Complications of endourologic procedures were identified through level 1 evidence, systematic reviews of the literature, or original articles assessing complications as the primary end point. Data about management and prevention of each type of complication were retrieved in a second round using specific keywords.
*Evidence synthesis:* Complications of endoscopic urologic procedures are specific to each surgical approach. Main complications after prostate surgery include transurethral resection of the prostate syndrome, bleeding and transfusion, acute urinary retention, urinary tract infection, clot retention, postoperative irritative symptoms, ejaculatory dysfunction, urinary incontinence, bladder neck contracture, and urethral stricture. Major complications after transurethral bladder tumor include severe bleeding, transfusion, bladder perforation, and urinary tract infection. The most frequent complications after ureteroscopy are fever and sepsis, bleeding, steinstrasse, and ureteral injury. Overall, the literature is very poor, with no systematic reporting of complications and underuse of classification systems. No clear protocols are available for management of complications, and most are based on studies with low levels of evidence. Good clinical practice recommendations and guidelines give useful support about technical issues, intraoperative safety, and prevention of urinary tract infection. The efficacy of these preventive measures remains poorly investigated.
*Conclusions:* Complications following endoscopic surgery are potentially numerous and vary with patient characteristics, surgical approach, and type of medical device. Improved standardization and quality of publications are warranted to improve knowledge of these issues, which are directly linked to the level of care.
*Patient summary:* We focused on the potential complications of each endoscopic approach used to treat urologic disease. We described the frequency of these complications and gathered information about how to manage them in the operating theater. We also noted caveats for the literature regarding standardization of reporting and classification systems.


☆ Cornu, and Hermann did the literature search Cornu led the data analysis. Cornu drafted the manuscript Traxer and Matlaga reviewed the manuscript for critical intellectual content and supervised the work.

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## 1. Introduction

Endoscopic procedures are widely used to treat a variety of urologic diseases. Endoscopy is usually considered a minimally invasive surgical approach because it allows surgical treatment without parietal incision, thus avoiding specific complications of surgical wounds and reducing postoperative pain. Endoscopic procedures have evolved rapidly in recent years thanks to a number of technical innovations [1] and are considered first-line options for the treatment of benign prostatic obstruction (BPO), stone disease, and non–muscle-invasive urothelial tumors [2–4].

Although these approaches have been associated with favorable results and high efficacy, they are associated with specific complications that need to be properly assessed, managed, and prevented. This paper gathers the experience described in the literature regarding complications of all endoscopy procedures currently used in clinical practice.

## 2. Evidence acquisition

A literature search was conducted in September 2015 within the PubMed/Medline database to gather available information on all types and respective occurrences of complications following endoscopic procedures related to BPO relief, ureteroscopic management of stone disease, and transurethral resection (TUR) of the bladder. The search was conducted in two steps. First, all complications were listed based on level 1 evidence from the literature, including any systematic review or study specifically focused on complications of the above-mentioned procedures. This search used the keywords *prostate* OR *ureteroscopy* OR *bladder tumor resection* associated with the keywords *complications* AND *randomized* OR *systematic review*. A pooled analysis was done to approach the overall frequency of each complication. In a second round, a specific focus was placed on each complication with an additional search using the complication type and the procedure as a research term. The relevance of each paper retrieved was evaluated by all authors. Selection of the papers was based on the authors' expertise. Only articles published after 1995 as full-text publications in the English or French language were considered. The present paper should not be considered a proper systematic review of complication epidemiology or classification but rather as a narrative review summarizing the data about management and prevention of each complication.

Because they are not strictly endoscopic procedures, nonablative techniques for BPO management, percutaneous surgery, extracorporeal shockwave lithotripsy, and laparoscopic or robotic approaches were considered to be beyond the scope of this review. Complications caused by preexisting conditions, related to anesthesia, or not directly related to surgery were also excluded.

## 3. Evidence synthesis

Reporting of complications following endoscopic procedures is far from optimal in the available studies, with a lack of standardization and overall low quality. As recently stated by the European Association of Urology (EAU) guidelines committee, there is an urgent need for more systematic, high-quality reporting of surgical procedures [5], and that is clearly lacking in the field. Furthermore, the main classification systems used in current clinical research do not necessarily fit the requirements for proper reporting of complications after surgical procedures [6–8].

Another issue regarding surgical complications is the impact of the learning curve [9]. Each specific intervention requires specific training, and lack of experience can partly explain technical failures or complications. Although beyond the scope of the current review, the authors emphasize the need for proper training as well as respect for the rules of good clinical practice to optimize complication rates.

### 3.1. Prostate surgery

Several systematic reviews and meta-analyses have been published that gathered the level 1 evidence available regarding endoscopic approaches to BPO relief [10–14]. Large cohort studies and reports specifically focused on complications were also included to detect less frequent complications.

Enough material was retrieved to describe the occurrence of each complication for various endoscopic surgical approaches, namely, monopolar TUR of the prostate (M-TURP), bipolar techniques (bipolar plasma vaporization of the prostate, bipolar plasma enucleation of the prostate [similar to plasmakinetic enucleation of the prostate]), bipolar TUR of the prostate (B-TURP), GreenLight (American Medical Systems, Minnetonka, MN, USA) photoselective vaporization of the prostate (PVP), holmium laser enucleation of the prostate (HoLEP), thulium enucleation of the prostate, and thulium vaporesection (ThuVARP) procedures. Given the number of procedures described (variants of enucleation, vaporization, resection, and combined techniques) and the growing number of devices tested (eg, different bipolar devices, successive generations of GreenLight laser), the rate of complications per technique could only be evaluated roughly. For some new emerging devices (eg, diode lasers), reliable data are sparse or do not exist to assess complication rates.

The respective occurrences of the most frequent specific complications for techniques currently used in clinical practice (level 1 validated), based on the current literature, are listed in Table 1 (perioperative complications) and Table 2 (late complications). In addition, several other complications have been described as possible but rare or exceptional. Those complications include large capsular perforation [15], rectal perforation [16], injury of ureteral orifices [17], severe urethral injury [17,18], intraperitoneal bladder rupture or explosion [17,19], migration of a device within the retroperitoneum [17], urethroperineal fistula [17], prostatosymphyseal fistula [17,20], incrusting cystitis, chronic pelvic pain, pubic osteomyelitis [21], vascular air embolism [22], acute abdominal compartment syndrome, and bone dissemination of prostate cancer after HoLEP [24]. Mortality of transurethral procedures for BPO