



Review – Sexual Medicine

Women's Sexual Dysfunction: A Review of the "Surgical Landscape"

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Abstract

Objectives: To assess the impact of urogynaecologic surgery for stress urinary incontinence, oncologic pelvic surgery, and hysterectomy on women's overall sexual health.

Methods: We used Ovid and PubMed (updated January 2006) to conduct a literature electronic search on MEDLINE that included peer-reviewed English-language articles. We analysed all studies identified that provided any functional outcome data about urogynaecologic surgery for the treatment of stress urinary incontinence, radical cystectomy for bladder cancer, surgery for rectal cancer, and hysterectomy. Because of the substantial heterogeneity of outcome measures and follow-up intervals in case studies, we did not apply meta-analytic techniques to the data.

Results: Most studies showed that either urogynaecologic or oncologic pelvic surgery may have a significant impact on women's sexual health. Epidemiology varied widely among the studies and reported either improvement or impairment of postoperative sexual functioning, due to different definitions, study designs, and small cohorts of patients. An increasing number of studies have prospectively examined this issue and have found often controversial findings about the role of pelvic and perineal surgery in women's sexual health.

Conclusions: Although numerous controversies exist, data demonstrate an overall positive impact of the surgical repair for stress urinary incontinence on resolution of coital incontinence, coupled with an improvement of overall sexual life. In contrast, genitourinary and rectal cancers are commonly associated with treatment-related sexual dysfunction, but few studies rigorously assessed women's postoperative sexual function after major oncologic pelvic surgery. Data about the functional outcome after hysterectomy are often contradictory. Adequately powered prospective clinical trials are needed.

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1. Introduction

Sexual dysfunction (SD) in women has been defined as a multifactorial condition with anatomic, physiologic, medical, psychological, and social components. Sexual difficulties are common among women [1–3]; however, a problem becomes an SD only if it causes distress, as opposed to a normal physiologic response to difficult circumstances [4]. Based on the previous classification criteria and the recent reconsideration of the American Foundation of Urologic Disease, SDs have been subdivided into (1) sexual desire/interest disorder; (2) subjective sexual arousal disorder (SAD); (3) genital arousal disorder; (4) combined SAD (with a marked or absent subjective sexual arousal—feelings of excitement and pleasure, combined with either reduced or impaired genital sexual arousal—vulval swelling, lubrication); (5) persistent SAD, which represents a quite rare and distressing syndrome; (6) orgasmic disorder; (7) vaginismus; and (8) dyspareunia [4]. The rationale for the last classification system is that it considers a woman's sexual function (WSF) as a consequence of the current psychosocial and interpersonal context, which is determined to some point or degree by her sexual and medical history and current or previous medications [4].

Prevalence of these categories is poorly known. According to the National Health and Social Life Survey, approximately 43% of American women suffer from SD of some type [1]; SD is associated with various psycho-demographic characteristics such as age, education, and poor physical and emotional health. More recently, the Global Study of Sexual Attitudes and Behaviors (GSSAB) [2], a multicountry survey that involved 13,882 women aged 40–80 yr, reported that lack of interest in sex and difficulty in reaching orgasm were the most common SDs across the world regions, ranging between 26–48% and 18–41%, respectively.

Some investigators have debated the prevalence and predictors of women's SD (WSD) across Europe [3,5]. Ponholzer et al. [3] reported that in a cohort of Austrian women aged 43 ± 15 yr, 22% complained of sexual desire disorders, 35% of arousal disorders, and 39% of orgasmic disorders. It confirmed that all these complaints increased with age [3,6].

An increasing number of papers have raised the issue of sexual function (SF) in women who underwent either oncologic or urogynaecologic pelvic surgery. Therefore, this review, which is based on everyday clinical practice according to the most updated peer-reviewed publications, focuses on the potential correlation between women's SF (WSF) and some peculiar area of surgical interest, such as

procedures for stress urinary incontinence (SUI), radical cystectomy (RC), pelvic surgeries for rectal malignancies, and hysterectomy.

2. Surgical procedures for SUI

Urinary incontinence (UI) is a common health problem among women, with 12–55% of women having experienced UI at some point [7,8]. Shaw [9] summarised the results of a number of English-written peer-reviewed papers from 1980 to 2001 that reported the prevalence of coital incontinence (CI) or the impact of UI on WSF. The great methodologic heterogeneity of the studies notwithstanding, the analysis showed a prevalence of WSD of 0.6%–64%. More recently, we have shown a prevalence of SD of 46% among white women who complained of UI or recurrent or persistent lower urinary tract symptoms [10].

An increasing number of peer-reviewed studies have investigated the potential impact of the surgical procedures for UI and pelvic organ prolapse on women's sexual health (WSH). However, both the statistical and clinical power of the results was very low in the large majority of these studies, because most of these analyses were not scheduled to assess overall WSF and WSD since the beginning.

Synthetic meshes are increasingly used to manage SUI. A survey that aimed to determine the trends in the surgical management of SUI among members of the International Urogynaecology Association showed that the preferred primary continence procedure is tension-free vaginal tape (TVT), with colposuspension or trans-obturator tape (TOT) the preferred secondary procedure [11].

Ghezzi et al. [12] prospectively assessed the impact of a TVT for treating SUI on CI and overall sexual life at 6-mo follow-up. The objective cure rate for SUI was 98%. CI was cured in 20 of 23 patients (87%). Thirty-three (62.2%) women reported no change in SF after surgery and 18 (34%) reported an improvement. No significant difference in the incidence of dyspareunia was found postoperatively, but two patients (3.8%) reported intercourse to be worse after surgery, one because of vaginal erosion and one mainly because of de novo anorgasmia. Preoperative CI was also experienced by 49% of 53 sexually active women who underwent TVT or intravaginal slingplasty operation in a cohort of patients that were recently studied by Glavind and Tetsche [13]. Half the patients who were cured of their CI experienced a better sexual life. Five patients (7%) cited reduced libido after the operation, two of whom (3%) felt that the operation was

the cause. Mazouni et al. [14] reported an impairment of the overall SF in 20% of their cohort of patients after TVT, including dyspareunia in 14.5% and loss of libido in 5.4%. Nearly 20% of women considered intercourse to be worse postoperatively, although not all women reported dyspareunia [15]. Moreover, among the same patients, symptomatic vaginal narrowing was rare, even after a simultaneous posterior repair. Women who were either premenopausal or on hormone replacement therapy (HRT) were more likely to be sexually active after surgery (46%) than those not on HRT (17%). Overall, the percentage of women who were sexually active was apparently unaffected by a vaginal suspension procedure for incontinence. In contrast, a previous study showed that there was no significant change in the overall SF or activity after the TVT procedure [16].

Roumequere et al. recently used a validated questionnaire (Contilife) to investigate the 1-yr follow-up functional results and quality of life (QOL) outcome of the TOT in the treatment of SUI [17]. The overall global satisfaction of women was 78%, coupled with good scores based on daily and effort activities, self-image, and emotional and sexual activities [17].

Although polypropylene is safe and effective, there is concern that the material in the vagina may adversely affect SF. Baessler et al. [18] recently reported that although 71% of the sexually active women in their cohort resumed sexual intercourse without difficulties after the surgery, dyspareunia was a severe indication for removing the posterior intravaginal slingplasty with a multifilament polypropylene mesh. In contrast, Shah et al. found no change in the overall SF in women who underwent placement of a mid- to distal polypropylene urethral sling [19]. Specifically, they reported neither a deleterious effect nor a statistically significant improvement in sexual desire, arousal, lubrication, orgasm, satisfaction, or pain compared with the preoperative baseline values [19].

Baessler and Stanton also debated the effect of Burch colposuspension for SUI for sexually active women with concomitant CI on vaginal penetration, orgasm, or both, after a minimum 6-mo follow-up [20]. In their cohort, SUI symptoms were successfully treated in 77% of patients. CI was cured in 70% and improved in another almost 7%, which suggests that CI is likely to be cured or improved when UI is successfully treated by Burch colposuspension.

Comparative studies between the laparoscopic colposuspension procedure and other surgical procedures are relatively few, but seem to suggest that it is less successful than open colposuspension or

TVT for curing SUI [21]. To the best of our knowledge, no data assess the potential different outcome in terms of SF in patients with SUI who underwent laparoscopic versus open colposuspension.

3. Radical cystectomy for urologic malignancies

Life-threatening bladder cancers represent one of the most challenging and problematic surgical approaches in women. Indeed, besides survival, chronic treatment-induced distressful symptoms may negatively affect QOL. Sexual problems, for instances, can result from any aspect of cancer disease and treatment. Genitourinary cancers are commonly associated with treatment-related SD, which vary from mild to severe [22]. After an RC, regardless of the type of urinary diversion, the primary sources of self-assessed symptom-induced distress in a population of bladder cancer (bCA) survivors are related to SD [22].

To our knowledge, few peer-reviewed data have been either partly or totally dedicated to the evaluation of WSF after major urologic surgery for bCA [23,24].

From a pathophysiologic standpoint, during RC the neurovascular bundles (typically located on the lateral walls of the vagina) are usually removed or damaged when the bladder, urethra and, usually, anterior vaginal wall are removed [25–27]. Moreover, the clitoris may be significantly devascularised when the distal part of the urethra is removed [25].

Marshall and Treiger reported that anterior exenteration in women can be performed accurately with a disciplined anatomic approach [27]. Stenzl et al. [26] described the results of their anterior exenteration and en bloc lymph node dissection (LND), coupled with an ileal low-pressure reservoir. The authors pointed out that special attention is to be directed towards dissection and resection of the inner female genitalia (with the resection only of the vaginal fundus and the anterior vaginal wall down to the level of the subsequent urethral dissection). More recently, researchers have reported that complete resection of the cranial two thirds of the vagina with the caudal border of resection just below the bladder neck may cause the dissection of most of the autonomic nerves to the urethra and vagina [28].

Original data that were reported by Bjerre et al. [29] evaluated the sexual profile after urinary diversion in 17 women who underwent a RC with the continent Kock reservoir and 20 women with the ileal conduit diversion. At the median follow-up of

0.8 yr and 4.6 yr, respectively, no significant differences in WSH were found between the groups; coital frequency remained similarly either unchanged or increased in 44% of patients with a continent reservoir and in 18% of ileal conduit patients, respectively, with no statistically significant difference. Among those who reported SD, almost one third gave physical problems or decreased desire as the reason and 30% felt less sexually attractive. A higher frequency of dyspareunia among patients with a continent reservoir was an unexpected finding [29]. Nordstrom et al. [30] reported that 83% of women who were treated by RC with an ileal conduit urinary diversion (who were preoperatively sexually active) complained of either a decrease or cessation of coital sexual activity postoperatively. The main problems were a decrease in sexual desire, dyspareunia, and vaginal dryness. However, some women increased their sexual activity after the operation [30].

Horenblas et al. report their preliminary results of a modified cystectomy aimed at preserving SF in men and women, called "sexuality preserving cystectomy and neobladder" [24]. The objective of this approach was to conserve as much tissue as possible, which could result in preserved normal SF and satisfactory urinary tract reconstruction. In women, this operation consisted of cystectomy alone with preservation of all internal genitalia; an ileal neobladder was thus anastomosed to the urethra. This approach was suggested for women who suffered from bCA stages T1-T3, with absent tumour growth in the bladder neck and absent invasive tumour in the bladder trigone. The authors reported that, at that time, three women underwent their sexuality preserving cystectomy and neobladder; normal vaginal lubrication throughout sexual activity was successfully preserved.

Zippe et al. [25,31] reported objective outcome data about 34 sexually active women who underwent RC for bCA. At the 24.2-mo mean follow-up, they showed a significantly ($p \leq 0.05$) decreased total score of the Female Sexual Function Index (FSFI) [32]. The most frequently reported complaints were that reaching orgasm was either difficult or impossible (45%), vaginal lubrication decreased (41%), sexual desire decreased (37%), and dyspareunia occurred (22%). Only 48% of the patients were able to have successful vaginal intercourse after surgery; 52% complained of a significant decrease in overall sexual satisfaction. Zippe et al. [31] also segregated the results according to the type of surgery; their findings did not seem to support any advantage regarding the SF outcome when data from women after RC with Studer orthotopic

neobladder, Indiana cutaneous diversion, and ileal conduit diversion were compared.

Zippe et al. [25] specifically aimed to preserve an adequate SF. They recently reported data about the "Cleveland Clinic Foundation QOL cystectomy", and suggested some modification to ameliorate the overall surgical procedure for RC in women. We would like to emphasise the importance of three major points of that modified RC: (1) bilateral nerve-sparing (NS) surgical technique; (2) preservation of the anterior vaginal wall (to enhance lubrication) and anterior vaginal tubularisation (to preserve the depth of the vagina); and (3) avoidance of routine hysterectomy. This last point, debated as important by Zippe et al. to eliminate the risk of vesicovaginal fistula, seems even more significant because preserving the uterus may help women to maintain an adequate personal "body image" and to stabilise the so-called "orgasmic platform" within the pelvis. These authors compared the functional outcome at the 6-mo follow-up after QOL cystectomy with orthotopic bladder substitution against non-NS cystectomy [25]. In the QOL cystectomy group, the preoperative and 6-mo follow-up FSFI total scores were similar (29.8 vs. 27.6) and showed no iatrogenic decline. In contrast, women in the non-NS group showed a marked decline after surgery, with significant vaginal dryness, lack of genital arousal, and dyspareunia, which led to discontinuation of sexual intercourse.

RC is the gold standard treatment for bCA, and the laparoscopic approach is currently being evaluated worldwide. Few studies have debated the potential application of laparoscopic RC in women; reconstructive procedures are an ileal conduit, a Studer orthotopic neobladder, or a continent Indiana pouch [33]. To the best of our knowledge, short-term functional and oncologic outcomes appear favourable, but there are no data about the SF outcome in these patients.

4. Pelvic surgery for rectal cancer

Pelvic surgery is among the most common cause of organic WSF impairment [23,25,34]. SD is a major complication after radical rectal surgeries because the pelvic plexus is injured [35].

Low anterior resection (LAR) and abdominoperineal resection (APR) are still the most widely performed curative surgeries for rectal cancer (rCA). Sexual and bladder functions are quite often sacrificed when a conventional LAR and APR with an extended LND are performed to improve surgical radicality in patients with advanced lower rCA [36].

Indeed, oncologic resection of rCA is reportedly associated with a 10–60% rate of sexual and urinary dysfunction [37]. In locally advanced primary rCA and in locally recurrent rCA, extended circumferential margins are required to achieve a complete resection.

Data on this topic, completely dedicated to investigate WSH are very rare, often controversial, and, unfortunately, usually without any type of standardised method of investigation [23,25,38]. However, there is a consensus that the iatrogenic genitourinary dysfunctions are mostly caused by either a non-sphincter-sparing procedure [25,38] or a non-NS surgical approach. The surgical damage to one or more autonomic nerves consists of the paired sympathetic hypogastric nerve, sacral splanchnic nerves, and the pelvic autonomic nerve plexus. Several kinds of NS surgery for organ-confined or advanced rCA have been developed that aim to preserve genitourinary function and surgical radicality [37,39].

The practice of total mesorectal excision (TME) in rCA treatment has substantially improved autonomous pelvic nerve preservation with a consensual reduction of the SD rates [23,25,38]. Enker et al., for instance, reported that in patients who underwent TME and autonomic nerve preservation (ANP), SF was preserved in approximately 57% of patients who underwent APR versus 85% of patients who underwent sphincter preservation [40]. In a small series of four of seven women who were sexually active before they underwent the surgical procedure and open TME with ANP technique, without preoperative irradiation, Pocard et al. [41] reported that sexual activity and ability to achieve orgasm was unchanged and no dyspareunia was reported. Chorost et al. similarly reported the results of a retrospective review on the medical records of 52 consecutive patients who underwent potentially curative procedures for rCA [42]. Their first interesting discovery was that presurgical discussion about the potential risk of SD was not documented in the preoperative consent in 71% of the patients. However, of the entire cohort, only one patient of 16 (6.25%) reported SD after therapy.

Laparoscopic TME has been suggested as a potential alternative to the open TME. The laparoscopic approach for TME has similarly favourable results with regard to postoperative urogenital function, at least for tumours in the middle and upper thirds of the rectum, compared with open surgery [43]. Quah et al. [44], in a retrospective analysis of preoperative and postoperative bladder and SF in patients who had undergone open and laparoscopically assisted TME, reported a significant

difference in men, but not in women, in terms of acquired SF impairment. More recently, in an elegant and rigorous study, Jayne et al. [45] confirmed previous findings that assessed bladder and SF in patients who had undergone laparoscopic rectal, open rectal, or laparoscopic colonic resection as part of the United Kingdom Medical Research Council Conventional versus Laparoscopic-Assisted Surgery in Colorectal Cancer trial, which used the FSFI. Laparoscopic rectal resection did not adversely affect bladder function, but there was a trend towards reduced male SF; in contrast, no differences were detected in WSF [45]. Schiedeck et al. [46] used the European Organization for Research and Treatment of Cancer (EORTC) Quality of Life Questionnaire GR38 score to assess bladder and SF in patients with rCA. They reported that laparoscopic surgery in rCA may achieve the same or, in selected patients, even better results than open surgery, with no statistically significant difference in QOL.

Multimodality treatments that combine, for instance, preoperative external-beam radiation therapy, radical surgery, and intraoperative radiotherapy, reportedly improve the cure rate of both presentations of rCA [25,36,47,48]. However, these treatments can increase the chances of damaging the urogenital nerves and organs, which might result in voiding and sexual disorders [47]. Mannaerts et al. reported the sexual outcome results of a mixed population that suffered from locally advanced primary and locally recurrent rCA [48]. These authors used a multimodality aggressive approach to evaluate sexual and voiding functions during the last 6 mo before therapy as well as the median 14-mo follow-up clinical outcome. Sexual disorders were more frequently reported in women than in men, both preoperatively and postoperatively. Interest in sexual activity decreased in women from 63% to 26% after the treatments ($p=0.002$). Similarly, the preoperative ability to have an orgasm had disappeared in 50% of the women patients (45% after locally advanced primary and 57% after locally advanced recurrent rCA treatment). The mean quality of orgasm was significantly ($p=0.0001$) reduced in the primary and in the locally recurrent rCA groups. A multivariate analysis demonstrated that women older than 60 yr had significantly reduced ability to have postoperative orgasm and sexual intercourse. The same authors recently reported the long-term functional outcome after a multimodality treatment and stated that sexual inactivity was reported by 56% of the respondents [49]. In a retrospective small survey that included patients with low rCA who underwent LAR associated or not with neoadjuvant

or adjuvant radiotherapy, Chatwin et al. found that general SD was reported by 2 of the 11 sexually active women [50]. Despite their reported fecal, urinary, and sexual dysfunction, most patients were satisfied with their QOL.

5. Radical and simple hysterectomy

Hysterectomy represents the most common pelvic surgery performed in women of all ages. A number of studies has explored sexuality after hysterectomy but data regarding the SF outcome in women undergoing either simple or radical hysterectomy (RH) are controversial. The overall estimation of the percentage of women reporting a deterioration of their sexual life and sexual activities after hysterectomy ranges from 13% to 37% [25,38,51].

A comprehensive review paper reported that in women undergoing hysterectomy for nonmalignant conditions there is a marked improvement in symptoms and QOL during the early years after surgery [52]. Roussis et al. [53] reported that libido, sexual activity, or feelings of femininity did not reveal significant changes after the hysterectomy. On the contrary, Rhodes et al., for instance, in a 2-yr follow-up prospective study involving more than 1000 women, showed that sexual desire, frequency of sexual relations, and overall quality of orgasm significantly increased after hysterectomy and throughout the follow-up period ($p < 0.001$, before vs. after hysterectomy) [51]. All these results were inversely influenced by age. Postsurgical increase of sexual satisfaction has been also described [54].

Very interestingly, Frumovitz et al. [55] recently compared QOL and SF in cervical cancer (cCA) survivors treated with either RH and LND or radiotherapy (RT). At least 5 yr after initial treatment for cCA, survivors treated with RT had worse SF than did those treated with RH. Those data also suggested that cCA survivors treated with surgery alone can expect overall QOL and SF not unlike that of peers without a history of cancer.

On the other hand, several papers reported a decrease in quality and frequency of postoperative SF. The removal of the uterus could be responsible for such sexual impairments through one or more mechanisms.

First, autonomic nerve damage plays a crucial role in the aetiology of both bladder and colorectal motility disorders and SD that occur after RH [56]. Due to these potentially negative effects on women's QOL, several authors have reported data concerning different types of both NS and non-NS hysterectomy procedures [57]. Indeed, surgical pre-

servation of the pelvic autonomic nerves either in laparoscopic or traditional RH deserves consideration in the quest to improve both cure and QOL in chronic benign conditions and patients with cCA [23,25,38]. Therefore, although the so-called vaginal orgasm, consequent to the stimulation of nerve endings in the uterovaginal plexus should be hindered by hysterectomy with cervix removal, theoretically clitoral orgasm should not be damaged [58]. A recent study objectively quantified a significant sensory loss in the vagina after hysterectomy, coupled with preservation of clitoral sensation [59].

Interestingly, Jensen et al. [60] reported that in their cohort of women with early stage cCA undergoing RH, surgery had a persistent negative impact on patient's sexual interest and vaginal lubrication, whereas the majority of other sexual and vaginal problems disappeared over time.

Concomitant oophorectomy at the time of hysterectomy represents a second pathophysiologic aspect. Indeed, a number of studies have debated the potential role of the postoperative lack of endogenous estrogens. Flory et al. [61], for instance, in a review analysis pertaining to the psychosocial outcomes of hysterectomy, reported that although hysterectomy appears to reduce pain, there are not strong psychosexual or psychosocial effects. Nonetheless, there may be a subgroup of women (10–20%), mostly undergoing a concomitant oophorectomy, who report negative psychosocial outcomes such as reduced sexual interest, arousal, and orgasm, as well as elevated depressive symptoms and impaired body image. In contrast, Kuscu et al. found significantly lowered sexual desire and frequency of sexual attempts ($p = 0.026$ and $p = 0.01$, respectively) after a total abdominal hysterectomy (TAH) but, surprisingly, the presence of adequate estrogen replacement therapy (ERT) in the postoperative period did not make any positive difference [62].

In regards to the latter aspect, Rako [63] underlined that the ovaries are a critical source also of testosterone. Indeed, due to the fact that the ovaries provide approximately half of the circulating testosterone in premenopausal women, after surgery many women report impaired SF despite ERT; women who underwent such a procedure could thus complain of the loss of a physiologic testosterone milieu, with a subsequent decrease of sexual libido, sexual pleasure, and sense of well-being. Moreover, on removal of the uterus, even after ovary-sparing procedures, their function can be jeopardised. A review analysis of Cutler et al. strictly correlated the hormonal deficit impact on sexuality

and overall QOL in women after hysterectomy [64]. These authors stressed that estrogen, progesterone, and androgen levels all tend to be altered by hysterectomy, with a potential subsequent negative impact on several physiologic systems including the cardiovascular system, bone metabolism, cognitive function, sexual response, and sexual attractiveness [64].

A third dilemma of debate is represented by the potential different impact of different types of surgical approach with regard to SF.

A number of authors prospectively investigating possible advantages of classic intrafascial supracervical hysterectomy (CISH) over TAH, with respect to SF and health-related QOL outcomes, found that there were no statistically significant differences between the two surgical approaches [65,66].

Randomised trials indicate that QOL improves earlier after endoscopic than open surgery for a number of different diseases, including uterine disorders that require hysterectomy [67]. The same review demonstrated that laparoscopic surgery may provide better postoperative QOL in many clinical situations. Unfortunately, literature lacks well-designed randomised, controlled trials that compare laparoscopic supracervical hysterectomy with laparoscopic-assisted vaginal hysterectomy, total vaginal hysterectomy, and TAH, mainly with attention to SF.

6. Conclusions

The overall number of reports regarding postoperative anatomy, physiology, and pathophysiology of WSF and SD is rising, but data still are very limited. Pathophysiologic findings from clinical prospective studies dealing with the postsurgical SF outcome in women who suffer from SUI, a worldwide prevalent condition, must be expanded to improve the number of efficient and safe therapeutic options for patients. Genitourinary cancers are commonly associated with treatment-related WSD and vary from mild to severe. Data strongly suggest that therapeutic NS surgery should be performed when possible and that psychosocial information aspects on future QOL outcomes before surgery and psychosocial support related to the extent of treatment modality after surgery should be integrated. This significantly increased awareness will certainly help promote the development of more refined surgical techniques that are devoted to the preservation of adequate postoperative WSH. Data about the SF outcomes after hysterectomy are mostly discordant. Indeed, although few reports suggest an improve-

ment of the overall WSF, a large number underline several potential reasons for a postoperative impairment of WSH.

This review has pointed out a few exemplifying conditions of peculiar surgical interest in which WSH and WSD play a major role. In this scenario, the urologist may actively participate in the management of postoperative WSF per se and improve QOL.

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