LEADING COMMENT

A brief review of the factors influencing sexuality after hysterectomy

Prevalence of sexual dysfunction after hysterectomy

The extent to which hysterectomy impacts sexual function is unclear. The estimated prevalence of sexual dysfunction among women who have undergone hysterectomy varies widely among studies and is influenced by methodological factors and characteristics of the study samples. Because pre-operative sexual dysfunction is a strong predictor of post-operative sexual dysfunction (Helström *et al.*, 1993; Rhodes *et al.*, 1999), it is perhaps more useful to examine the numbers of hysterectomized women who report an onset of new sexual problems post-hysterectomy. Few studies have made this distinction in evaluating sexual outcomes after hysterectomy. Among women who had not experienced symptoms prior to hysterectomy, estimated post-operative rates of new sexual dysfunction are 2–7% for dyspareunia, 9–21% for vaginal dryness, 5–11% for decreased sexual desire, and 2–11% for problems with orgasm (Carlson *et al.*, 1994; Rhodes *et al.*, 1999; Roovers *et al.*, 2003; Schofield *et al.*, 1991; Weber *et al.*, 1999).

Several prospective studies have found either no change or improvements in mean scores on measures of sexual function after hysterectomy (Bernhard, 1992; Farquhar *et al.*, 2002; Gütl *et al.*, 2002). Others have shown that mean frequencies of negative sexual symptoms are either unchanged or reduced one year or more after hysterectomy (Carlson *et al.*, 1994; Rhodes *et al.*, 1999; Virtanen *et al.*, 1993). Prospective studies of this nature are confounded by the fact that sexual behaviour is likely to be altered just prior to any major surgery, particularly one that is associated with sexual consequences. Reports on the numbers of women who show improvements or declines in sexual function after hysterectomy have also been published. It is estimated that, retrospectively, 20–37% of women who have undergone hysterectomy report a deterioration in some qualitative aspect of their sexuality, while 22–52% report improvements (Dennerstein *et al.*, 1977; Helström, 1994; Nathorst-Böös & von Schoultz, 1992; Weber *et al.*, 1999). These data are not associated with features particular to hysterectomy, however, and may more generally reflect the patterns of sexual outcomes after any major surgery. Two studies using non-gynaecological surgery comparison groups have reported similar sexual outcomes among women

undergoing hysterectomy and women undergoing other types of surgery (Cosson *et al.*, 2001; Galyer *et al.*, 1999).

A major limitation of these studies is that most have documented sexual symptoms without reference to their subjective impact. A recent prospective study conducted by Roovers and colleagues (2003) specifically examined the rate of 'bothersome' sexual problems among women undergoing hysterectomy. The findings from this study are consistent with other research suggesting that among women who have sexual problems prior to hysterectomy, the surgery may either reduce or exacerbate their symptoms. However, this study also found that among women with no sexual problems prior to hysterectomy, approximately 1 in 5 women developed at least one bothersome sexual symptom after surgery.

Other methodological shortcomings are apparent in much of the research on sexuality and hysterectomy. For example, many studies have failed to use validated measures of sexual function, and some have used only one or two questions in an attempt to assess global sexual functioning. The frequency of sexual activities before and after hysterectomy is one of the most common outcome measures found in the literature but is perhaps the least informative, if not altogether misleading. The reasons why women engage in sexual activity are numerous and do not necessarily reflect interest in or pleasure of sex *per se* (e.g., Leigh, 1989). Several studies have found that the frequency of sexual activity is not specifically influenced by sexual desire or enjoyment (Clarke *et al.*, 1995; Dennerstein *et al.*, 1977; Galyer *et al.*, 1999), even when positive changes are observed (Clarke *et al.*, 1995). Failure to define what constitutes sexual activity, or lack of distinction among sexual intercourse, masturbation, and other forms of sexual activity, also present problems in interpreting results. Studies have also frequently failed to control for potentially important variables such as hormonal status and type of surgery. Helström's (1994) documentation of interviews with women who had undergone hysterectomy underscores the importance of considering a multitude of health-related and psychosocial factors in evaluating outcomes of hysterectomy. Patients in that study described their sexual lives as being influenced by relationship or family problems, non-sexual complications of surgery, unrelated mental illnesses, prior sexual trauma, and partner sexual dysfunctions, among other factors. Table I lists some of the factors thought to influence sexuality after hysterectomy, as well as studies that have specifically examined these issues.

Potential mechanisms by which hysterectomy impacts sexual function

Psychological factors

It has been found that most aspects of female sexual function, including sexual desire, orgasm, and sexual satisfaction, are influenced by depressive symptoms (Frohlich & Meston, 2002). Richards (1974) observed a higher incidence of self-reported depression among women who had undergone hysterectomy than among other female surgical patients matched for age and date of surgery. However, more recent studies suggest that improvements in psychological symptoms and well being after

TABLE I. Factors associated with sexual outcomes following hysterectomy.

Variable	Studies finding an influence on sexual outcomes	Studies finding little or no influence on sexual outcomes
Surgical approach (e.g., vaginal v. abdominal)		Carlson *et al.*, 1994 (DE, DY, SA); Gütl *et al.*, 2002; Rhodes *et al.*, 1999 (DE, DY, LU, OR); Roovers *et al.*, 2003 (AR, LU, OR)
Removal of cervix (total v. subtotal procedure)	Kilkku, 1983 (OR) Kilkku *et al.*, 1983 (DY) Saini *et al.*, 2002 (OR, SA)	Kilkku, 1983 (DE) Kim *et al.*, 2003 (DE, OR); Roovers *et al.*, 2003 (AR, LU, OR); Saini *et al.*, 2002 (DE, DY); Thakar *et al*, 2002
Age at hysterectomy	Kilkku *et al.*, 1983 (DE) Rhodes *et al.*, 1999 (OR) Weber *et al.*, 1999	Dennerstein *et al.*, 1977; Rhodes *et al.*, 1999 (DE, DY, LU)
Pre-operative menopausal status	Gütl *et al.*, 2002	Rhodes *et al.*, 1999 (DE, DY, LY, OR)
Ovarian removal/ preservation	Bellerose & Binik, 1993 (AR, DE, DY, LU); Farquhar *et al.*, 2002 (DE); Nathorst-Böös & von Schoultz, 1992; Nathorst-Böös *et al.*, 1993 (DE, LU, SA); Rhodes *et al.*, 1999 (OR); Saini *et al.*, 2002 (SA)	Bellerose & Binik, 1993 (OR); Farquhar *et al.*, 2002 (OR); Rhodes *et al.*, 1999 (DE, DY, LU)
Estrogen replacement after oophorectomy	Dennerstein *et al.*, 1977 (DY)	Dennerstein *et al.*, 1977 (DE, LU, OR, SA); Nathorst-Böös *et al.*, 1993 (LU, SA); Rhodes *et al.*, 1999 (DE, DY, LU, OR); Utian, 1975 (DE)
Androgen replacement after oophorectomy	Bellerose & Binik, 1993 (AR, DE); Sherwin *et al.*, 1985 (AR, DE); Shifren *et al.*, 2000 (OR)	Bellerose & Binik, 1993 (OR); Sherwin *et al.*, 1985 (OR); Shifren *et al.*, 2000 (AR, DE)
Severity of gynecological symptoms preceding hysterectomy	Gütl *et al.*, 2002; Helström *et al.*, 1994	
Pre-operative psychiatric morbidity	Rhodes *et al.*, 1999 (DE, DY, LU, OR)	Helström *et al.*, 1994 (DE, DY, OR)
Pre-operative sexual function/activity (factors that influence post-op sexuality)	Dennerstein *et al.*, 1977 (coital frequency); Gütl *et al.*, 2002; Helström *et al.*, 1993 (DE, OR, coital frequency); Rhodes *et al.*, 1999 (DE, DY, LU, OR)	Helström *et al.*, 1993 (DY)
Partner relationship/ support	Helström *et al.*, 1993; Helström, 1994; Rhodes *et al.*, 1999 (LU)	Dennerstein *et al.*, 1977; Rhodes *et al.*, 1999 (DE, DY, OR)

Symbols refer to the specific aspects of sexual function that were addressed by the studies referenced above; AR = arousal, DE = desire/interest, DY = dyspareunia, LU = vaginal lubrication, OR = orgasm, SA = satisfaction/enjoyment. Studies referenced without these symbols refer to non-specific or overall outcomes.

hysterectomy are more common than negative outcomes. A series of three uncontrolled prospective studies conducted by Gath and colleagues (Gath *et al.*, 1982; Osborn & Gath, 1990; Gath *et al.*, 1995) found that psychiatric morbidity

decreased after hysterectomy for benign menorrhagia. In a cross-sectional study, Ferroni and Deeble (1996) reported that women who had undergone hysterectomy for benign gynecological conditions reported less severe depressive symptomatology than women who had not received treatment for similar conditions. Rannestad *et al.* (2001) found no differences in psychosocial well being among three groups: women with current gynecological illness, women who had previously undergone hysterectomy for similar conditions, and a healthy community sample. General life satisfaction among older women who had undergone hysterectomy was similar to or even higher than that among women of similar age who had never undergone hysterectomy (Kritz-Silverstein *et al.*, 2002).

Bernhard (1992) noted that improvements in sexual function observed after hysterectomy were largely accounted for by improvements on a psychological symptoms subscale. Results of several studies have suggested that the most apparent psychological improvements post-hysterectomy are related to health and psychosomatic complaints associated with the gynaecological illness (Carlson *et al.*, 1994; Lambden *et al.*, 1997; Rannestad *et al.*, 2001; Schofield *et al.*, 1991). In fact, sexual outcomes may be most positive among women who experienced the most severe impairments prior to hysterectomy (Gütl *et al.*, 2002; Helström *et al.*, 1994). In addition to relief of symptoms, cessation of menstrual periods and the elimination of pregnancy fears are often viewed as positive contributors to sexual outcomes. Prospective studies have concluded that, on average, reports of low sexual desire or interest among women undergoing hysterectomy become less frequent after the surgery (Carlson *et al.*, 1994; Clarke *et al.*, 1995; Farquhar *et al.*, 2002; Virtanen *et al.*, 1993). There is evidence that sexual desire changes after hysterectomy are similar to those occurring after other, non-gynaecological surgeries (Cosson *et al.*, 2001; Galyer *et al.*, 1999), suggesting that health-related improvements are salient factors in sexual outcomes.

By contrast, however, some women who undergo hysterectomy view themselves as de-feminized, mourn the end of their childbearing capacity, feel a sense of loss or emptiness, and experience negative body image due to scarring or hormonal changes (Bellerose & Binik, 1993; Ferroni & Deeble, 1996; Gütl *et al.*, 2002; Rannestad *et al.*, 2001; Wade *et al.*, 2000). All of these may affect post-operative sexuality, although the extent and duration of their direct influences are unknown. Dennerstein *et al.* (1977) found that pre-operative anxiety about sexuality was associated with decreased sexual desire and greater dyspareunia following hysterectomy, regardless of whether attempts had been made to discuss concerns with a health care provider. Despite this noteworthy finding, no further research has examined this relationship.

Hormonal factors

In the United States, approximately one-half of women undergo removal of one or both ovaries (oophorectomy) during hysterectomy (Wilcox *et al.*, 1994). Removal of both ovaries induces 'surgical menopause' with an immediate and drastic decrease in levels of oestrogen, testosterone, and other sex hormones (Beksaç *et al.*, 1983). There is evidence that hysterectomy itself may hasten ovarian failure and menopause even in

women whose ovaries are preserved, although the mechanism by which this may occur is unclear (Kaiser *et al.*, 1989; Oldenhave *et al.*, 1993; Siddle *et al.*, 1987).

Several studies have concluded that women who undergo hysterectomy with oophorectomy tend to experience poorer sexual outcomes than women who retain their ovaries (Bellerose & Binik, 1993; Farquhar *et al.*, 2002; Nathorst-Böös & von Schoultz, 1992; Saini *et al.*, 2002). The loss of ovarian hormones may affect nearly all aspects of sexual function. Oestrogen has been found to enhance vaginal blood flow and lubrication in postmenopausal women (Semmens & Wagner, 1982), whereas testosterone may enhance sexual desire, subjective arousal, and sexual sensation (Sarrel *et al.*, 1998; Sherwin & Gelfand, 1987). The mechanisms by which ovarian hormones contribute to sexual function are not entirely clear. There is evidence that both oestrogen and testosterone modulate pelvic autonomic pathways. Oestrogen receptors are commonly expressed by sympathetic neurons and are especially prevalent within the sympathetic innervation of the uterus, where they appear to regulate the amount of uterine innervation (Zoubina & Smith, 2001; 2002). Testosterone may also regulate pelvic autonomic pathways in women (Keast, 2000; Traish *et al.*, 2002). The extent to which hormonal regulation of autonomic pathways might impact sexual functioning is unknown.

Women who receive no hormone replacement therapy after hysterectomy-oophorectomy experience lower subjective arousal, more frequent dyspareunia, and a greater number of sexual complaints overall than those without oophorectomy or those receiving some form of hormone supplementation (Bellerose & Binik, 1993). Several authors have argued that traditional oestrogen replacement alone is insufficient to ensure optimal sexual outcomes in many oophorectomized women (e.g., Rako, 2000; Shifren, 2002). Studies comparing the effects of oestrogen replacement therapy to those of estrogen-androgen replacement have suggested that androgen supplementation further improves some aspects of sexual function in surgically menopausal women (Bellerose & Binik, 1993; Sherwin & Gelfand, 1987; Sherwin *et al.*, 1985; Shifren *et al.*, 2000). However, the safety and efficacy of low-dose androgen replacement therapy has not yet been firmly established (Padero *et al.*, 2002).

Anatomical/physiological factors

Hysterectomy often involves the removal of diseased tissues, such as uterine fibroids, that may contribute to painful sex. Dyspareunia is a common symptom of gynaecological disorders and is reduced significantly after hysterectomy (Carlson *et al.*, 1994; Rhodes *et al.*, 1999; Virtanen *et al.*, 1993; Weber *et al.*, 1999). Rhodes *et al.* (1999) found that the percentage of women experiencing pain-free sexual activity pre-operatively nearly doubled 12 months after hysterectomy, and that the percentage of women with frequent sexual pain dropped significantly. The onset of dyspareunia following hysterectomy is uncommon (Rhodes *et al.*, 1999; Weber *et al.*, 1999).

The autonomic nervous system provides much of the innervation to the internal genital organs and is critical to normal sexual functioning (for review, see Guiliano *et al.*, 2002). The inferior hypogastric plexus contains significant sympathetic and

parasympathetic nerve fibre content and is the immediate supplier of autonomic nerve fibres to the genital organs. This structure and its extensions are most likely to be threatened during gynaecological surgery (Maas *et al.*, 1999). Hysterectomy may affect autonomic innervation to the genitals through the excision of the cervix and separation of the uterus from its supportive ligaments (Butler-Manuel *et al.*, 2002; Hasson, 1993; Munro, 1997; Thakar *et al.*, 1997).

Although reports of urinary, bowel and sexual dysfunction are less common in women who have undergone simple hysterectomy than more radical gynaecological procedures (Butler-Manuel *et al.*, 1999), the possibility exists that nerve damage during simple hysterectomy may alter normal pelvic nervous functioning (for review, see Hasson, 1993). Sexual dysfunction may be less commonly reported following supracervical hysterectomy, in which the cervix is left intact, than after total hysterectomy (Kilkku, 1983; Kilkku *et al.*, 1983; Saini *et al.*, 2002). However, a recent randomized clinical trial of the supracervical and more common 'total' hysterectomies revealed no significant advantage of either type with regard to general sexual outcome (Thakar *et al.*, 2002). Another recent prospective study found no significant differences in sexual outcomes between groups of women undergoing total and subtotal abdominal hysterectomy (Roovers *et al.*, 2003). The role of the cervix in the sexual response has been a topic of some debate, but its effects on sexual function, if any, are likely to be subtle (Cutler *et al.*, 2000; Grimes, 1999). In general, the value of preserving pelvic structures associated with genital autonomic innervation remains uncertain.

Although hysterectomy appears to have little effect on orgasmic ability in most women (Bellerose & Binik, 1993; Rhodes *et al.*, 1999; Virtanen *et al.*, 1993; Weber *et al.*, 1999), subjective intensity and pleasure of orgasm may change after hysterectomy in up to one-third of women (Cosson *et al.*, 2001; Farquhar *et al.*, 2002; Rhodes *et al.*, 1999, Weber *et al.*, 1999). The removal of the uterus may affect this dimension of sexual function. Uterine contractions have been associated with both sexual arousal (Kinsey *et al.*, 1953) and orgasm (Masters & Johnson, 1966). Despite considerable speculation as to how the absence of a uterus might impact the sexuality of women who have undergone hysterectomy (e.g., Hasson, 1993; Thakar *et al.*, 1997), no recent work has directly examined this phenomenon.

Unresolved issues

Qualitative changes in sexual sensation and pleasure are difficult to reliably measure and have received virtually no empirical study in hysterectomy research. Sexual satisfaction after hysterectomy has rarely been assessed directly, although two studies have concluded that 'enjoyment of sex' increases after hysterectomy for most women (Carlson *et al.*, 1994; Clarke *et al.*, 1995). Other studies have attempted to infer sexual satisfaction from self-reported frequencies of sexual activity, but without clear justification for doing so. It seems obvious that women may be more receptive to sexual activity once it is no longer prohibitively uncomfortable. To this end, the potential for changes to the sexual response itself may in many cases be outweighed by the benefit of relieving pain and other symptoms. However, changes to sexual

sensation and enjoyment cannot be inferred from an increased frequency of sex, as it is well-documented that women engage in sex for reasons other than to experience physical pleasure (Basson, 2000; Browning *et al.*, 2000; Leigh, 1989). To date there is no concrete evidence that hysterectomy has broad negative sexual consequences, or that it confers any particular improvement to a woman's sexual life beyond the relief of pelvic discomfort and menstrual difficulties.

Sexual physiology after hysterectomy is poorly understood. The only published study on physiological measures of sexual function after hysterectomy (Bellerose & Binik, 1993) used a between-subjects design to compare physiological sexual responses between women who had and had not undergone hysterectomy and measured sexual response at only one time interval. The authors found no differences in physiological measures of sexual arousal between groups, although their findings were limited by the considerable individual variability inherent to measures of physiological sexual response, and the lack of a baseline, or pre-surgery, assessment. Using similar methodology, Meston (in press) reported lower physiological sexual arousal in women who had undergone hysterectomy to treat uterine fibroids, compared to women who had a current history of fibroids. This difference was eliminated when the two groups of women exercised vigorously prior to measurement.

Finally, little is known about the population of women who report the onset of sexual dysfunction after hysterectomy. Although new sexual problems are reported by a minority of hysterectomy patients, this may nevertheless represent a large number of women, given the prevalence of hysterectomy. No studies to date have prospectively compared the incidence of sexual dysfunction in women undergoing hysterectomy with that of the general population. Moreover, little is known about pre-operative, intra-operative, or post-operative factors that may contribute to poor sexual outcomes in women with no prior history of dysfunction. Though hysterectomy is a common, elective procedure that impacts tissues thought to contribute to the sexual response, answers regarding sexual outcomes remain ambiguous for the substantial population of women who consider this procedure each year.

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