CLINICAL PRACTICE

Sexual Desire and Arousal Disorders in Women

Rosemary Basson, M.D.

This Journal *feature begins with a case vignette highlighting a common clinical problem. Evidence supporting various strategies is then presented, followed by a review of formal guidelines, when they exist. The article ends with the author's clinical recommendations.*

A 46-year-old woman, married for 16 years, reports having had a low level of sexual desire and minimal sexual arousal during sexual activity for the past 10 years. Sexual thoughts, fantasies, and orgasms are all extremely rare. Lubrication is sufficient to allow painless intercourse. She and her husband have an eight-year-old son who was born after in vitro fertilization for unexplained infertility. How should this patient be assessed and treated?

THE CLINICAL PROBLEM

Having too little sexual desire is the most common sexual issue among women, reported by 10 to 51 percent of women surveyed in various countries.[1-3] Data from these surveys, as well as from other sources, indicate that a low level of desire is usually accompanied by low levels of arousal and sexual excitement and infrequent orgasms and is frequently associated with sexual dissatisfaction.[4-8]

Current definitions of sexual dysfunction in women reflect a change in our understanding of normal sexual response.[9] Rather than the traditional view of a sexual response progressing through discrete phases in sequence (desire, arousal, orgasm, and resolution), it is now recognized that these phases overlap and that the sequence can vary. Also recognized is the importance to sexual satisfaction of the subjective experience and of an environment and stimuli that are conducive to sexual feelings.[9]

Women have many motivations and reasons for engaging in sex, including a desire for emotional closeness, whereas sexual desire is an infrequent reason for women in established relationships.[10] Among the 2400 multiethnic women (Hispanic, white non-Hispanic, African American, Chinese, and Japanese) in six U.S. cities in midlife who completed baseline questionnaires in the prospective Study of Women's Health across the Nation (SWAN), 40 percent reported that they never or infrequently felt sexual desire.[11] Nevertheless, the majority reported being capable of arousal, and only 13 percent expressed discontent with their sexual experiences.

Disorders of female sexual function are summarized in Table 1. The prevalence of the sexual desire/interest disorder, diagnosed when a woman fails to feel desire at any stage during the sexual experience, is uncertain. Studies have focused on a lack of desire at the initiation of and between sexual experiences, as well as on a lack of sexual thoughts. However, sexual thoughts are infrequent in many women without apparent sexual dissatisfaction,[13] and the frequency of sexual fantasies or sexual thoughts has little correlation with sexual satisfaction in women.[11,13] Arousal disorders are categorized according to whether there is a lack of subjective arous-

From the Departments of Psychiatry and Obstetrics and Gynaecology, University of British Columbia; and the British Columbia Centre for Sexual Medicine, Vancouver General Hospital, Vancouver, B.C., Canada. Address reprint requests to Dr. Basson at the B.C. Centre for Sexual Medicine, Vancouver General Hospital, 855 W. 12th Ave., Vancouver, BC V5Z 1M9, Canada, or at sexmed@interchange.ubc.ca.

N Engl J Med 2006;354:1497-506.

Table 1. Definitions of Sexual Dysfunction.

APA Definition*	AUA Foundation Definition†	Comments
Hypoactive sexual desire disorder Disorder is characterized by a persistent or recurrent deficiency or absence of sexual fantasies and desire for sexual activity. Judgment of deficiency is made by the clinician, taking into account factors that affect sexual functioning (such as age and context of the person's life).	Sexual desire/interest disorder Disorder is characterized by absent or diminished feelings of sexual interest or desire, absent sexual thoughts or fantasies, and a lack of responsive desire. Motivations for attempting to become sexually aroused are scarce or absent. Lack of interest goes beyond a normal lessening with increasing age and relationship duration.	Minimal spontaneous sexual thinking or minimal desiring of sex ahead of sexual experiences does not necessarily constitute a disorder (according to data on women in sexually satisfactory, established relationships). Lack of desire triggered during the sexual encounter (i.e., responsive desire) is integral to the AUA Foundation diagnosis.
Lack of subjective arousal No DSM-IV definition addresses the lack of subjective arousal.	Combined arousal disorder Disorder is characterized by absent or markedly reduced feelings of sexual arousal (sexual excitement and sexual pleasure) from any type of stimulation, and absent or impaired genital sexual arousal (vulval swelling and lubrication).	There is no sexual excitement in the mind and no awareness of reflexive genital vasocongestion.
Lack of subjective arousal No DSM-IV definition addresses the lack of subjective arousal.	Subjective arousal disorder Disorder is characterized by absent or markedly reduced feelings of sexual arousal (sexual excitement and sexual pleasure) from any type of stimulation. Vaginal lubrication and other signs of physical response still occur.	There is no sexual excitement in the mind, but there is awareness of adequate lubrication.
Female sexual arousal disorder Disorder is characterized by a persistent or recurrent inability to attain, or to maintain until completion of sexual activity, adequate lubrication and swelling response of sexual excitement.	Genital arousal disorder Disorder is characterized by absent or impaired genital sexual arousal (minimal vulval swelling or vaginal lubrication from any type of sexual stimulation, and reduced sexual sensations when genitalia are caressed). Subjective sexual excitement still occurs from nongenital sexual stimuli.	The presence of subjective arousal (sexual excitement) from nongenital stimuli (e.g., erotica, stimulating the partner, receiving breast stimulation, kissing) is key to the AUA Foundation diagnosis.
Female orgasmic disorder Disorder is characterized by a persistent or recurrent delay or absence of orgasm after a normal sexual excitement phase.	Orgasmic disorder Disorder is characterized by a lack of orgasm, markedly diminished intensity of orgasmic sensations, or marked delay of orgasm from any kind of stimulation, despite self-reported high sexual arousal or excitement.	Women with arousal disorders rarely or never experience orgasm and are frequently given a misdiagnosis of orgasmic disorder.

* Data are from the American Psychiatric Association (APA). DSM-IV denotes the *Diagnostic and Statistical Manual of Mental Disorders*, fourth edition.[12]

† Data are from the international committee sponsored by the American Urological Association (AUA) Foundation.[9]

al alone or a lack of both subjective arousal and awareness of genital congestion (Table 1). No objective measurements are used to establish diagnoses. Arousal disorders also have an uncertain prevalence; most studies focus only on vaginal lubrication. In a survey of 979 British women who were 18 to 70 years of age, 17 percent identified problems with arousal (defined as distinct from vaginal dryness)[14]; 5 percent of women in SWAN did as well.[11]

FACTORS INFLUENCING DESIRE AND AROUSAL

The basis of desire and perceived arousal in women is poorly understood, but it appears to involve

interactions among multiple neurotransmitters, sex hormones, and environmental factors.

Physiologic Factors

Genital vasocongestive responses occur in women within seconds after erotic stimulation.[15] Both parasympathetic and sympathetic nerves release nitric oxide and vasointestinal polypeptide, which mediate vasodilatation, and acetylcholine, which blocks noradrenergic, vasoconstrictive mechanisms and promotes endothelial release of nitric oxide. Pelvic sympathetic nerves also release norepinephrine, which is predominantly vasoconstrictive. The mediators of vaginal vasocongestion are less clear but include vasoactive intestinal polypeptide. The relaxation of vaginal smooth muscle permits vaginal expansion, and arteriolar dilatation increases the transudation of interstitial fluid, which promotes lubrication.

The effect of estrogen levels on sexual function is complex. Although low estrogen levels and vaginal atrophy are associated with reduced measures of vaginal congestion when the woman is not receiving sexual stimulation, the percent increase in congestion in response to erotic stimuli is similar in the presence of low and high estrogen levels.[15] Similarly, changes in the volume of the vaginal wall and clitoris and the relative volume of regional blood in response to sexual stimulation are similar before and after menopause.[16] Estrogen deficiency does not necessarily preclude adequate lubrication, provided that stimulation is sufficient.[15] However, up to 40 percent of women may have symptomatic vaginal atrophy that adversely affects sexual function.[17]

Subjective arousal is poorly correlated with genital response. For example, increases in genital vasocongestion in response to erotic videos are similar among women who report problems with arousal and women who report no problems with arousal.[15] Also, there is a low correlation between brain activation in areas controlling genital response (as assessed by functional magnetic resonance imaging of the brain) and simultaneous ratings of subjective arousal.[18]

Indirect evidence suggests that testosterone and dopamine play a role in modulating sexual response, since testosterone supplementation or treatment with a dopaminergic agonist can augment response.[5-8,19] Underproduction of androgen in women — as may occur with adrenal disease, after bilateral oophorectomy, or during normal aging — is sometimes associated with reduced desire and arousal. However, large population studies have failed to find the expected positive correlations between sexual function and serum testosterone levels.[20,21] One possible explanation is that serum levels do not reflect the intracellular production of testosterone from adrenal and ovarian precursors.[22]

Other Factors

Several factors have been associated with reduced subjective arousal. These include distractions, expectations of a negative experience (e.g., as a result of dyspareunia, the partner's sexual dysfunction, or negative experiences in the past), sexual anxiety, fatigue, and depression. Medications including selective serotonin-reuptake inhibitors[23] and oral contraceptives[24] have also been implicated. Oral contraceptives increase levels of sex hormone–binding globulin, which in turn reduces free testosterone levels; it is hypothesized that some women are particularly sensitive to these effects, which may be prolonged.[25] In a 1-year prospective study, 19 of 79 women who received oral contraceptives reported a decline in sexual desire; 37 discontinued oral contraceptive use within 12 months, many because of sexual side effects.[24]

On the basis of survey data, several factors have been closely linked to women's sexual satisfaction and desire. These include stable past and current mental health,[3,4,13] positive emotional well-being and self-image,[13] rewarding past sexual experiences,[26] positive feelings for the partner,[13,26] and positive expectations for the relationship.[3,11] The partner's sexual dysfunction,[13] increased perceived stress,[3] a history of infertility especially after extensive investigation,[27] and increased duration of the relationship[11,26] are all linked with reduced desire. Certain diseases such as multiple sclerosis,[28] renal failure,[29] and premature menopause induced by chemotherapy[30] are associated with a high incidence of sexual dysfunction. In women, unlike men, vascular disease related to age does not appear to correlate with reduced sexual satisfaction.[3]

STRATEGIES AND EVIDENCE

EVALUATION

A detailed history is the main tool in the assessment and diagnosis of sexual dysfunction and is usually obtained from both partners (Table 2). Im-

Table 2. Information Needed to Assess and Diagnose Sexual Dysfunction.

Information Requested	Details from the Couple
Sexual problem and reason for seeking help at this time	Ask patients to describe problems in their own words, request clarification with direct questions, provide options rather than ask leading questions, provide support and encouragement, acknowledge their embarrassment, and reassure patients that sexual problems are common.
Duration, consistency, and priority of problems	Clarify whether problems are present in all situations. If there is more than one problem, which is most troubling?
Context of sexual problems	Assess the emotional intimacy of the couple, activity or behavior just before sexual activity, degree of privacy they have during sexual activity, degree of sexual communication, time of day and fatigue level when sexual activity occurs, use of birth control (adequacy, type), risk of sexually transmitted diseases, usefulness of sexual stimulation, and sexual knowledge.
Each partner's sexual response other than that related to the problem	Elicit this information with respect to the present and the period before the onset of the problem.
Reaction of each partner to the problem	Determine how each has reacted emotionally, sexually, and behaviorally.
Previous help sought by either partner	Assess compliance with the previous recommendations and their effectiveness.
	Details from Each Partner When Seen Alone
Partner's own assessment of the problem	Symptom severity (e.g., total lack of desire) may be easier to disclose in the partner's absence.
Sexual response with self-stimulation	Also inquire about sexual thoughts and fantasies.
Past sexual experiences	Discuss positive and negative aspects.
Developmental history	Determine relationships to others in the home during childhood and adolescence. Were there losses or traumas? Was he or she emotionally close to anyone? Was he or she given physical affection, love, and respect?
Past or current sexual, emotional, or physical abuse	Explain that questions about abuse are routine and do not necessarily imply causation of sexual problems. It is helpful to ask whether the partner has ever felt hurt or threatened in the current relationship and, if so, whether he or she wishes to give more information.
Physical health, especially conditions leading to debility and fatigue, impaired mobility, or difficulties with self-image (e.g., from the presence of stomas, disfiguring surgery, or incontinence)	Ask specifically about medications with known sexual side effects, including selective serotonin-reuptake inhibitors, beta-blockers, antiandrogens, gonadotropin-releasing hormone agonists, and oral contraceptives.
Evaluation of mood	Correlation of sexual function and mood (including anxiety and depression) warrants routine screening for a mood disorder, by means of either a questionnaire (e.g., the Beck Depression Inventory) or a semistructured series of questions.

portant aspects of the history include the quality of the couple's relationship, the woman's mental and emotional health, the quality of past sexual experiences, specific concerns related to sexual activity (such as insufficient nongenital and nonpenetrative genital stimulation), and the woman's thoughts and emotions during sexual activity.

A physical examination, including a pelvic examination (Table 3), is part of routine care, but it infrequently identifies a cause of sexual dysfunction. Its usefulness may be greater when there is associated dyspareunia. For some women with a history of coercive or abusive sexual experiences, pelvic examination may cause anxiety; explanation of what will and will not be done may reduce such anxiety.

The possibility that laboratory testing will identify causes of sexual dysfunction is low. Estro-

Table 3. Features Potentially Relevant to Sexual Dysfunction That Need to Be Assessed during a Physical Examination.

Component of Examination	Features of Interest
Nongenital	Signs of systemic disease (e.g., anemia or bradycardia of hypothyroidism), which could lead to low levels of energy, desire, or arousability Signs of connective-tissue diseases (such as scleroderma or Sjögren's syndrome) that are associated with vaginal dryness Disabilities that might preclude movements involved in caressing a partner, self-stimulation, or intercourse Disfigurements, stomas, or catheters that may decrease sexual self-confidence and lead to low level of desire or arousability
External genitalia	Sparsity of pubic hair, suggesting low adrenal androgen levels Vulval skin disorders (including lichen sclerosus) that may result in soreness on sexual stimulation Cracks or fissures in the interlabial folds, suggesting chronic candidiasis Labial abnormalities that may cause embarrassment or sexual hesitancy (e.g., particularly long or asymmetric labia)
Introitus	Vulval disease involving the introitus Pallor, friability, or loss of elasticity and moisture from vulval atrophy Lichen sclerosus Recurrent splitting of the posterior fourchette, evident as just-visible white lines perpendicular to the fourchette edge Abnormalities of the hymen Adhesions of the labia minora Swelling in the area of the major vestibular glands Allodynia of the crease between the outer edge of the hymen and the inner edge of the labia minora, typical of vestibulitis Cystocele, rectocele, or prolapse that predispose women to incontinence and reduce sexual self-image Inability to tighten and relax perivaginal muscles, often associated with hypertonicity of pelvic muscles and midvaginal dyspareunia Abnormal vaginal discharge associated with burning dyspareunia
Internal	Increased tone of pelvic muscles Presence of tender "trigger points" on palpation of deep levator ani muscle, due to hypertonicity
Full bimanual	Fixed retroversion of uterus or nodules, tenderness, or both in the cul-de-sac, fornix vaginae, or along uterosacral ligaments, causing deep dyspareunia Tenderness on palpation of posterior bladder wall from anterior vaginal wall, suggesting bladder disease

gen deficiency, for example, is best detected by taking a history and performing an examination. Even when signs of estrogen deficiency are present, it is not necessarily the cause of sexual dysfunction. In addition, as noted, serum levels of testosterone do not correlate with sexual function.[20,21] Measurement of prolactin or thyrotropin is warranted if other symptoms or signs suggest the presence of abnormal levels.

MANAGEMENT

The management of sexual dysfunction in women is guided by the history. Data from randomized trials that support the use of any particular intervention are limited.

Psychological Interventions

Cognitive behavioral therapy focuses on identifying and modifying factors that contribute to sexual dysfunction, such as maladaptive thoughts, unreasonable expectations, behaviors that reduce the partner's interest or trust (such as disrespectful behavior or lack of honesty), insufficient erotic stimuli, and insufficient nongenital physical stimulation. Strategies are suggested to improve the couple's emotional closeness and communication and to enhance erotic stimulation. The sessions vary in number and usually include both partners. Sex therapy for couples is focused on similar issues but also includes sensate focus techniques, consisting initially of nonsexual physical touch, with gradual progression toward sexual touch; partners are encouraged to alternately touch each other and to provide feedback about what touches are pleasurable. These techniques help change the undue focus on a performance goal (e.g., one partner's orgasm or mutual orgasms).[31] Controlled studies that provide support for the

use of this approach are scant, but in one that combined both cognitive behavioral therapy and sex therapy, 74 percent of women had improved sexual and marital satisfaction.[31] Satisfaction was maintained in 64 percent of women at one year, as compared with minimal improvement in a control group.

Another intervention is short-term psychotherapy, generally focused on poor sexual self-image and on nonsexual experiences in childhood that are considered to relate to current sexual function (e.g., a chaotic upbringing that predisposed a woman to need to be in control could interfere with her "letting go" sexually as an adult). Data regarding the benefits of this approach are lacking.[32]

Pharmacologic Interventions

Other than estrogen therapy for dyspareunia related to genitourinary atrophy, no medications are currently approved by the Food and Drug Administration for the treatment of sexual dysfunction in women. Several off-label uses of drugs have been considered, although data about effectiveness are sparse (Table 4).

Nonhormonal Therapies

The involvement of nitric oxide in neurogenic vasodilatation suggests that phosphodiesterase inhibitors may ameliorate genital arousal disorder. In a small, laboratory-based, randomized trial, a single 50-mg dose of sildenafil (Viagra, Pfizer) increased subjective arousal, genital sensations, and ease of orgasm in some women with genital arousal disorder.[41] The benefit was observed only among women who had a marked reduction in the normal vasocongestive response to subjectively arousing visual erotic stimulation. In two large, randomized clinical trials involving 781 women in whom arousal and desire disorders (rather than genital arousal disorder) were diagnosed, sildenafil improved no measure of sexual desire, sensation, lubrication, or satisfaction.[38]

Hormonal Therapies

Androgen Therapies

Supraphysiologic androgen therapy has been prescribed for sexual dysfunction since the 1930s, but more recently, testosterone at lower doses than originally prescribed have been studied in randomized trials. In one recent randomized, controlled trial involving 218 women who had undergone a natural or surgically induced menopause and who received 0.625 μg of esterified estrogens daily, the addition of 1.25 mg of methyltestosterone improved sexual responsiveness and the level of desire, as reported on one of two validated questionnaires used.[43] However, the frequency of desire was not affected, and measures of desire and composite sexual function were not significantly improved, according to responses on the second questionnaire. Also, the women who had undergone natural menopause were not prescribed progestin, which limited the clinical relevance of these results. Methyltestosterone is known to lower high-density lipoprotein (HDL) cholesterol, and in this study, levels fell by a mean of 12.5 mg per deciliter (0.3 mmol per liter) after four months of treatment.

The results of four recent placebo-controlled, randomized trials involving a total of 1619 women who had undergone surgically induced menopause show the efficacy of a 300-μg testosterone patch applied twice weekly.[5-8] All participants were treated with estrogen (delivered transdermally in one study,[8] orally in another,[6] and by either route in two studies[5,7]), and the number of sexually satisfying events at baseline ranged from one to three per month. Pooling the data revealed that women receiving testosterone reported 1.9 more sexually satisfying events per month than they had at baseline, as compared with 0.9 more among those receiving placebo. Scores from validated questionnaires in each of the four studies showed a significant increase in sexual desire and response, and scores in three of the studies showed significant reductions in sexual distress.[5,7,8] One study also evaluated a twice-weekly patch containing 450 μg of testosterone; in contrast to the results for the lower-dose patch, no benefits were found.[6] Unwanted androgenic effects, including hirsutism and acne, were uncommon in all studies, but depilation rates were not assessed. Unlike with methyltestosterone, there were no significant changes in lipid levels.

Important limitations of these four studies include their brevity (which is of particular importance, given the expected long-term use of the drug) and that their results are generalizable only to women in whom menopause was surgically induced and who also receive estrogen therapy. In some women who have undergone natural menopause, the ovaries continue to be an important source of androgens,[44] and thus, the effects

Table 4. Off-Label Uses of Drugs for Investigational Treatment of Sexual Dysfunction.*

Type of Sexual Dysfunction	Drug	Comments
Sexual desire/interest disorder, subjective and combined arousal disorders	Bupropion (a dopamine and norepinephrine agonist)	In one small, four-month study,[19] nondepressed, premenopausal women showed increased arousability and sexual response but not initial desire.
	Testosterone (plus estrogen)	In six-month randomized trials,[5-8] women had improved "total satisfying sexual activity" and improved measures of desire and response, as reported on questionnaires. No long-term safety data or data on women lacking estrogen are available.
	Dehydroepiandrosterone (a precursor of estradiol and testosterone)	Data from trials involving women with adrenal insufficiency are conflicting.[33-35] A study of perimenopausal women with reduced feelings of well-being and low level of desire showed no benefit.[36]
	Tibolone (an estrogenic, progestogenic, androgenic steroid)	Data from small trials of postmenopausal women show improved sexual function, as compared with those receiving placebo or a regimen of 17β-estradiol (1 mg daily) plus norethindrone (1 mg daily).[37] The drug has not been studied in women with diagnosed sexual dysfunction and is associated with a possible increased risk of breast cancer.
	Phosphodiesterase inhibitors (sildenafil, tadalafil, vardenafil)†	In large multicenter trials involving pre- and postmenopausal women,[38] no benefit from sildenafil was reported.
	Yohimbine (a centrally acting noradrenergic agent) plus arginine (a precursor of nitric oxide)	In one randomized, controlled crossover laboratory study of 24 women, yohimbine (6 mg) plus arginine (6 g) increased vaginal congestion, but not subjective arousal, in response to an erotic film.[39]
	Ephedrine (agonist of α- and β-adrenergic receptors)	In one randomized, controlled crossover laboratory study of 20 women, ephedrine (50 mg) increased vaginal congestion, but not subjective arousal, in response to an erotic film.[40]
Genital arousal disorder despite estrogen-replete status	Phosphodiesterase inhibitors (sildenafil, tadalafil, vardenafil)†	In one laboratory randomized trial,[41] it was shown that only some women given a diagnosis of genital arousal disorder have demonstrably reduced genital congestion, and they alone showed evidence of benefit. It was not possible clinically to distinguish this subgroup. In one randomized study of neurogenic genital arousal disorder from multiple sclerosis,[42] treatment with sildenafil led to increased lubrication.

* Only drugs for which at least one randomized trial has been published are listed.
† All agents act by increasing levels of cyclic guanosine monophosphate (generated by nitric oxide).

of androgen supplementation may differ from those in women whose ovaries have been surgically removed. Furthermore, risks associated with the long-term use of conjugated estrogens arouse concern about the use of any postmenopausal estrogen therapy over time. Prescribing testosterone alone to women who lack estrogen would raise their already high ratios of androgen to estrogen. There are no safety or efficacy data for testosterone supplementation for estrogen-deficient women.

A chief concern with long-term androgen use is a potential increase in insulin resistance, which could predispose a woman to the metabolic syndrome or exacerbate the syndrome if it is already present. In SWAN, low levels of sex hormone–binding globulin and higher circulating levels of androgen were strongly associated with markers of the metabolic syndrome, including a high body-mass index; a high waist-to-hip ratio; presence of glucose intolerance, hypertriglyceridemia, or hypertension; and a low level of HDL cholesterol.[20]

Dehydroepiandrosterone

Because middle-aged and older women have a physiologic decrease of as much as 70 percent in the amount of dehydroepiandrosterone produced,[22]

some researchers have suggested that supplementation with the steroid may improve sexual function. However, rigorous data that support such supplementation are lacking. Even among women with adrenal insufficiency, the results of randomized trials of dehydroepiandrosterone supplementation have been inconsistent.[33-35]

Estrogen

The role of systemic estrogen in increasing desire and subjective arousal remains unclear. In patients with vasomotor symptoms and insomnia or reduced levels of desire because of dyspareunia due to genital atrophy, it is logical to conclude that estrogen supplementation would increase sexual motivation, although this has not been rigorously tested. In the Women's Health Initiative trial, no significant differences were found between the estrogen and placebo groups in reported satisfaction after sexual activity.[45] However, sexual dysfunction was not a primary focus of the trial, and the assessment tool was inadequate.

Sexual Dysfunction Associated with Antidepressants

The prevalence of sexual disorders that are associated with the use of antidepressants in women is estimated at 22 to 58 percent, with higher rates reported for selective serotonin-reuptake inhibitors and lower rates reported for bupropion than for other drugs.[46] A recent Cochrane review of strategies to ameliorate dysfunction associated with antidepressants did not recommend any particular drug, although the potential advantages of adding bupropion were noted.[46] A drug holiday (e.g., halting the use of shorter-acting selective serotonin-reuptake inhibitors over the weekend) seems to be a logical strategy but is not recommended, owing to withdrawal symptoms and compromise of compliance.

AREAS OF UNCERTAINTY

A better understanding is needed of the endogenous and environmental factors that mediate sexual desire and arousal. Randomized clinical trials are also needed to assess the effects of psychological and pharmacologic therapies alone and in combination. The risks and benefits of long-term testosterone therapy require further study, including studies of women with a complete loss of arousal and desire.

GUIDELINES

Recommendations for the evaluation and management of sexual dysfunction in women have been put forth by the American College of Obstetricians and Gynecologists,[47] the Society of Obstetricians and Gynaecologists of Canada,[48] the North American Menopause Society,[49] and the members of the 2003 International Consensus on Sexual Medicine (organized by the International Consultation on Urological Disease, the International Society for Urology, and the International Society for Sexual Medicine).[50] These organizations advocate attention to mental and overall health and to both interpersonal and personal psychological issues. Local estrogen therapy is recommended for dyspareunia that is associated with vulval atrophy that results in reduced sexual motivation.

The Society of Obstetricians and Gynaecologists of Canada notes that testosterone therapy should be viewed as investigational and should be prescribed only by clinicians who are knowledgeable about sexual dysfunction in women.[48] The recent position statement of the North American Menopause Society provides cautious support for the use of testosterone "in appropriate post-menopausal women via transdermal patches or topical gels or creams administered at the lowest dose for the shortest time that meets treatment goals."[49] Counseling about the potential risks and benefits of testosterone use is also advocated, as is evaluation for causes of low levels of desire (including physical and psychosocial factors and medications) before treatment.

CONCLUSIONS AND RECOMMENDATIONS

For women with desire and arousal disorders, such as the woman described in the vignette, the evaluation involves taking a detailed history of sexual difficulties from both partners, preferably seen individually as well as together. Also included are an assessment of the woman's mental health (including self-image), feelings about the relationship, medical history, and her thoughts and emotions during sexual activity. On the basis of clinical experience and limited data on outcomes, I would recommend a combination of cognitive behavioral therapy and sex therapy (typically three

to six sessions). Sessions should be focused on altering maladaptive thoughts, unreasonable expectations, and misinformation about women's sexuality, as well as on discussing strategies for improving the couple's emotional closeness and communication and enhancing erotic stimulation. If the couple is excessively focused on intercourse (as is common if there is a history of infertility), they should be advised to emphasize nongenital stimulation first. Any apparent interpersonal problems should be addressed before further sexual therapy is pursued. At the present time, I would not recommend any pharmacologic therapy, pending the availability of more (and longer-term) data in support of such treatment.

I am indebted to Dr. Peter Rees for his helpful review of the manuscript and to Mrs. Maureen Piper for her assistance with the preparation of the manuscript.

Dr. Basson reports having received an honorarium from Pfizer and an honorarium from Solvay for consulting. No other potential conflict of interest relevant to this article was reported.

REFERENCES

1. Mercer CH, Fenton KA, Johnson AM, et al. Sexual function problems and help seeking behaviour in Britain: national probability sample survey. BMJ 2003;327:426-7.
2. Matthiesen S, Hauch M. Wenn sexuelle erfahrungen zum problem warden. Familiendynamik 2004;29:136-60.
3. Laumann EO, Nicolosi A, Glasser DB, et al. Sexual problems among women and men aged 40-80 y: prevalence and correlates identified in the Global Study of Sexual Attitudes and Behaviors. Int J Impot Res 2005;17:39-57.
4. Hartmann U, Philippsohn S, Heiser K, Rüffer-Hesse C. Low sexual desire in midlife and older women: personality factors, psychosocial development, present sexuality. Menopause 2004;11:726-40.
5. Buster JE, Kingsberg SA, Aguirre O, et al. Testosterone patch for low sexual desire in surgically menopausal women: a randomized trial. Obstet Gynecol 2005;105:944-52.
6. Braunstein G, Sundwall DA, Katz M, et al. Safety and efficacy of a testosterone patch for the treatment of hypoactive sexual desire disorder in surgically menopausal women: a randomized, placebo-controlled trial. Arch Intern Med 2005;165:1582-9.
7. Simon J, Braunstein G, Nachtigall L, et al. Testosterone patch increases sexual activity and desire in surgically menopausal women with hypoactive sexual desire disorder. J Clin Endocrinol Metab 2005;90:5226-33.
8. Davis SR, van der Mooren MJ, van Lunsen RHW, et al. The efficacy and safety of a testosterone patch for the treatment of hypoactive sexual desire disorder in surgically menopausal women: a randomized, placebo controlled-trial. Menopause (in press).
9. Basson R, Leiblum SL, Brotto L, et al. Definitions of women's sexual dysfunction reconsidered: advocating expansion and revision. J Psychosom Obstet Gynaecol 2003;24:221-9.
10. Caine VS, Johannes CB, Avis NE, et al. Sexual functioning and practices in a multiethnic study of midlife woman: baseline results from SWAN. J Sex Res 2003;40:266-76.
11. Avis NE, Zhao X, Johannes CB, Ory M, Brockwell S, Greendale GA. Correlates of sexual function among multi-ethnic middle-aged women: results from the Study of Women's Health Across the Nation (SWAN). Menopause 2005;12:385-98.
12. Diagnostic and statistical manual of mental disorders. 4th ed. rev.: DSM-IV-R. Washington, D.C.: American Psychiatric Association, 2003.
13. Bancroft J, Loftus J, Long JS. Distress about sex: a national survey of women in heterosexual relationships. Arch Sex Behav 2003;32:193-211.
14. Dunn KM, Croft PR, Hackett GI. Sexual problems: the study of the prevalence and need for health care in the general population. Fam Pract 1998;15:519-24.
15. van Lunsen RHW, Laan E. Genital vascular responsiveness in sexual feelings in midlife women: psychophysiologic, brain, and genital imaging studies. Menopause 2004;11:741-8.
16. Maravilla KR, Heiman JR, Garland PA, et al. Dynamic MR imaging of the sexual arousal response in women. J Sex Marital Ther 2003;29:Suppl 1:71-6.
17. Stenberg Å, Heimer G, Ulmster U, Cnattingius S. Prevalence of genitourinary and other climacteric symptoms in 61-year-old women. Maturitas 1996;24:31-6.
18. Karama S, Lecours AR, Leroux JM, et al. Areas of brain activation in males and females during viewing of erotic film excerpts. Hum Brain Mapp 2002;16:1-13.
19. Segraves RT, Clayton A, Croft H, Wolf A, Warnock J. Bupropion sustained release for the treatment of hypoactive sexual desire disorder in premenopausal women. J Clin Psychopharmacol 2004;24:339-42.
20. Santoro A, Torrens J, Crawford S, et al. Correlates of circulating androgens in midlife women: the Study of Women's Health Across the Nation. J Clin Endocrinol Metab 2005;90:4836-45.
21. Davis SR, Davison SL, Donath S, Bell RJ. Circulating androgen levels in self-reported sexual function in women. JAMA 2005;294:91-6.
22. Labrie F, Luu-The V, Belanger A, et al. Is dehydroepiandrosterone a hormone? J Endocrinol 2005;187:169-96.
23. Clayton AH, Pradko JF, Croft HA, et al. Prevalence of sexual dysfunction among newer antidepressants. J Clin Psychiatry 2002;63:357-66.
24. Sanders SA, Graham CA, Bass JL, Bancroft J. A prospective study of the effects of oral contraceptives on sexuality and well-being and their relationship to discontinuation. Contraception 2001;64:51-8.
25. Panzer C, Wise S, Fantini G, et al. Impact of oral contraceptives on sex hormone-binding globulin and androgen levels: a retrospective study in women with sexual dysfunction. J Sex Med 2006;3:104-13.
26. Dennerstein L, Lehert P. Modeling mid-aged women's sexual functioning: a prospective, population-based study. J Sex Marital Ther 2005;30:173-83.
27. Verhaak CM, Smeenk JMJ, van Minnen A, Kremer JAM, Kraaimaat FW. A longitudinal prospective study on emotional adjustment before, during, and after consecutive fertility treatment cycles. Hum Reprod 2005;20:2253-60.
28. Zorzon M, Zivadinov R, Bosco A, et al. Sexual dysfunction and multiple sclerosis: a case-control study. I. Frequency and comparison groups. Mult Scler 1999;5:418-27.
29. Palmer BF. Sexual dysfunction in men and women with chronic kidney disease and end-stage kidney disease. Adv Ren Replace Ther 2003;10:48-60.
30. Ganz PA, Desmond KA, Leedham B, Rowland JH, Meyerowitz BE, Belin TR. Quality of life in long-term, disease-free survivors of breast cancer: a follow-up study. J Natl Cancer Inst 2002;94:39-49.
31. Trudel G, Marchand A, Ravart M, Aubin S, Turgeon L, Fortier P. The effect of a cognitive-behavioral group treatment program on hypoactive sexual desire in women. Sex Relat Ther 2001;16:145-64.
32. Heiman JR. Psychologic treatments for sexual dysfunction: are they effective and do we need them? Arch Sex Behav 2002;31:445-50.
33. Arlt W, Callies F, van Vlijmen JC, et al. Dehydroepiandrosterone replacement in women with adrenal insufficiency. N Engl J Med 1999;341:1013-20.
34. Lovas K, Gebre-Medhin G, Trovik TS, et al. Replacement of dehydroepiandrosterone in adrenal failure: no benefit for

subjective health status and sexuality in a 9-month, randomized, parallel group clinical trial. J Clin Endocrinol Metab 2003; 88:1112-8.
35. van Thiel SW, Romijn JA, Pereira AM, et al. Effects of dehydroepiandrostenedione, superimposed on growth hormone substitution, on quality of life and insulin-like growth factor I in patients with secondary adrenal insufficiency: a randomized, placebo-controlled, cross-over trial. J Clin Endocrinol Metab 2005;90:3295-303.
36. Barnhart K, Freeman E, Grisso JA, et al. The effect of dehydroepiandrosterone supplementation to symptomatic perimenopausal women on serum endocrine profiles, lipid parameters, and health-related quality of life. J Clin Endocrinol Metab 1999;84:3896-902.
37. Nathost-Böös J, Hammar M. Effect on sexual life — a comparison between tibolone and a continuous estradiol-norethisterone acetate regimen. Maturitas 1997;26: 15-20.
38. Basson R, McInnes R, Smith MD, Hodgson G, Koppiker N. Efficacy and safety of sildenafil citrate in women with sexual dysfunction associated with female sexual arousal. J Womens Health Gend Based Med 2002;11:367-77.
39. Meston CM, Worcel M. The effects of yohimbine plus L-arginine glutamate on sexual arousal in postmenopausal women with sexual arousal disorder. Arch Sex Behav 2002;31:323-32.
40. Meston CM, Heiman JR. Ephedrine-activated physiological sexual arousal in women. Arch Gen Psychiatry 1998;55:652-6.
41. Basson R, Brotto LA. Sexual psychophysiology and effects of sildenafil citrate in oestrogenised women with acquired genital arousal disorder and impaired orgasm: a randomised controlled trial. BJOG 2003;110:1014-24.
42. Dasgupta R, Wiseman OJ, Kanabar G, Fowler CJ, Mikol DD. Efficacy of sildenafil in the treatment of female sexual dysfunction due to multiple sclerosis. J Urol 2004;171:1189-93.
43. Lobo RA, Rosen RC, Yang HM, Block B, Van Der Hoop RG. Comparative effects of oral esterified estrogens with and without methyltestosterone on endocrine profiles and dimensions of sexual function in postmenopausal women with hypoactive sexual desire. Fertil Steril 2003;79:1341-52.
44. Davison SL, Bell R, Donath S, Montalto JG, Davis SR. Androgen levels in adult females: changes with age, menopause, and oophorectomy. J Endocrinol Metab 2005; 90:3847-53.
45. Hays J, Ockene JK, Brunner RL, et al. Effects of estrogen plus progestin on health-related quality of life. N Engl J Med 2003;348:1839-54.
46. Taylor MJ, Rudkin L, Hawton K. Strategies for managing antidepressant-induced sexual dysfunction: systematic review of randomised controlled trials. J Affect Disord 2005;88:241-54.
47. Basson R. Sexuality and sexual disorders in women. Clinical updates in women's health care monograph. Vol. 2. No. 2. Washington, D.C.: American College of Obstetricians and Gynecologists, 2003:1-94.
48. Blake J, Belisle S, Basson R, et al. Canadian Consensus Conference on Menopause 2006 update. J Obstet Gynecol Can 2006; 28:Suppl:1-92.
49. North American Menopause Society. The role of testosterone therapy in postmenopausal women: position statement of the North American Menopause Society. Menopause 2005;12:497-511.
50. Basson R, Althof S, Davis S, et al. Summary of the recommendations on sexual dysfunctions in women. J Sex Med 2004;1: 24-34.