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Chronic Pelvic Pain: An Integrated Approach to Diagnosis and Treatment

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Chronic pelvic pain affects upward of 15% of women and is a frustrating condition for both patients and physicians. Chronic pelvic pain is not a disease, but a syndrome that results from a complex interaction between neurologic, musculoskeletal, and endocrine systems that is further influenced by behavioral and psychologic factors. Traditional approaches to this disorder have been surgical, although long-term success rates have been disappointing. Placebo response to surgery is common, and many conditions that contribute to the pain cannot be identified or treated with a surgical approach. Many patients will require a combination of both pharmacologic and nonpharmacologic treatments in addition to various types of invasive procedures. It is now recognized that many disorders contribute to the chronic pelvic pain symptom complex; thus, an integrated multidisciplinary approach to diagnosis and treatment is essential to achieve the greatest success.

Target Audience: Obstetricians & Gynecologists, Family Physicians

Learning Objectives: After completion of this article, the reader should be able to describe the pathophysiology of chronic pelvic pain, to outline the evaluation of a patient with chronic pelvic pain, and to explain the treatment options for patients with chronic pelvic pain.

Chronic pelvic pain (CPP), defined as pelvic pain of at least 6 months duration, is a complex and challenging problem that is a major cause of morbidity and disability for women. When pain is felt in the pelvic region, both patients and physicians most commonly ascribe it to an origin in the reproductive tract. Unfortunately, many women proceed to extirpative procedures only to be left with the same pain postoperatively. Population-based studies in the United States and United Kingdom have reported the prevalence of CPP among reproductive-aged women to be 14.7% and 24.0%, respectively (1,2). By extrapolating the data, more than 9 million reproductive-aged women in the United States would meet the criteria for chronic pelvic pain, with direct costs of more than $2.8 billion and indirect costs greater than $555 million (1). The pathogenesis of chronic pelvic pain is poorly understood, and, unfortunately, many patients who fail to respond to surgical intervention are erroneously labeled with a psychogenic cause of their pain.

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PATHOPHYSIOLOGY

Two neurophysiological mechanisms are implicated in the pathophysiology of CPP: nociceptive pain, which results from injury to a pain-sensitive structure and is somatic or visceral in origin, and nonnociceptive pain, which is neuropathic or psychogenic (3). Somatic pain originates from skin, muscles, bones, and joints and is transmitted along sensory fibers; it is generally described as sharp or dull

and is usually discrete (3). Visceral pain, on the other hand, is transmitted through the sympathetic fibers of the autonomic nervous system and could be described as poorly localized, dull, or crampy (4). Visceral pain is frequently associated with autonomic phenomena such as nausea, vomiting, sweating, and strong emotional reactions. Neuropathic pain is the result of an insult to the central or peripheral nervous system and typically produces burning pain, paresthesias, and lancinating pain. If no mechanism can be identified, the diagnosis of psychogenic pain might be entertained; however, this should only be a diagnosis of exclusion. It is important to remember that psychologic factors such as premorbid personality, depression, and behavioral disturbances have a definite effect on the pain experience (3).

Every structure in the abdomen and/or pelvis could have a role in the etiology of CPP. Therefore, it is essential to think beyond the organs of the upper reproductive tract and also consider contributions from the following: the peripheral and central nervous system, blood vessels, muscles and fascia of the abdominal wall and pelvic floor, the ureters and bladder, and gastrointestinal tract. Many disorders involving these organ systems are implicated in CPP, including endometriosis, interstitial cystitis, irritable bowel syndrome, and pelvic floor dysfunction. In addition, many patients have visceral hyperalgesia, an exaggerated pain response resulting from changes induced in the central nervous system from painful stimuli.

Part of the dilemma involved with the evaluation and management of CPP is the assumption that pain can be linked with some form of pathology or obvious tissue damage (5). Complex interactions occur among the reproductive organs, the urinary tract, and the colon. One phenomenon has been termed viscerovisceral hyperalgesia. Essentially, inflammation or congestion in the reproductive organs, either physiological from ovulation or menses, or pathologic from endometriosis, could enhance pain in viscera, skin, or muscle that share common spinal cord segments (4,6-8). This might be one of the explanations for menstrual exacerbation of chronic pelvic pain, a common occurrence that should not be confused with dysmenorrhea. Dysmenorrhea is prevalent in up to 90% of reproductive-aged women and is defined as pain only around the time of menstruation, and, thus, does not meet the criteria for chronic pelvic pain (9).

Chronic pain disorders, in general, are more common among women who also exhibit more frequent pain, with higher disability ratings and greater use of health care resources as compared with men (10-12). This female predominance is not entirely explained by reproductive tract-induced hyperalgesia in common spinal cord segments because women also have a higher incidence of chronic pain conditions remote from the pelvis. Potential mechanisms include the effects of estrogen on neurogenic inflammation and other hormonal effects on the central and peripheral nervous systems (13).

Psychologic and behavioral factors are known to contribute to the pain experience. The prevalence of major depression is elevated among patients with chronic pain, with estimates of 30-54% as compared with baseline rates of 5-17% in the general population (14,15). It is unclear whether the pain–depression relationship is related to the specific diagnosis of pain or if it correlates better to the presence of a chronic illness in general, because elevated rates of depression are seen with other severe chronic medical condition (14-16). Personality disorders have a significant impact on behavioral responses to pain and are negative predictors for response to therapy and return to functionality.

PATIENT EVALUATION

History

A complete history is the most valuable tool in the evaluation of CPP. Patients should be specifically questioned about the character of the pain, exacerbating and relieving factors, the temporal course, and the relationship of the pain to the menstrual cycle. A standard method of quantifying pain severity should be adopted to measure pain at successive visits. It is also important to inquire about previous medical therapies and associated side effects as well as previous procedures and their effect on the pain. A reproductive history is important because some disorders might be temporally related to menarche or childbirth. Screening for depression is important not only as it relates to the pelvic pain, but also because attempted suicide and substance abuse could be higher in these patients (14-16). Personality disorders have a significant impact on response to therapy. Enlisting the help of a trained pain psychologist might be beneficial in screening for these disorders, and especially in more complex patients, to help devise treatment and rehabilitation programs (14).

In the review of systems, it is important to inquire about dysmenorrhea, menstrual pattern, dyspareunia, voiding dysfunction, and gastrointestinal functioning. Severe dysmenorrhea might be more predictive of endometriosis as compared with mild or moderate

dysmenorrhea (17,18). Dyspareunia might be associated with one or all of the following: endometriosis, pelvic floor dysfunction, vulvodynia, interstitial cystitis (IC), and irritable bowel syndrome (IBS). Pain, urgency, frequency, nocturia, and a history of frequent culture-negative urinary tract infections in a patient with pain are hallmarks of IC. The Interstitial Cystitis Symptom and Problem Indices are questionnaires that assess how problematic pain and voiding symptoms are to a patient. They can be self-administered or incorporated into the review of systems; scores less than 6 on either index make the diagnosis of IC unlikely (19). The prevalence of IBS in women with CPP might be as high as 65-79%, and direct questions regarding gastrointestinal function are also warranted (20-22). Symptoms suggestive of IBS include alternating constipation and diarrhea, abdominal distension, mucus per rectum, improvement in pain after a bowel movement, and the sensation of incomplete evacuation after defecation (23).

A social history allows the clinician to evaluate support systems and to screen for domestic violence. Victims of domestic violence have a higher incidence of chronic somatic complaints, exacerbation of chronic medical conditions, chronic pain, noncompliance with medical treatment, substance abuse, anxiety, depression, and suicide (24). Caution should be used in prescribing narcotics in this scenario because there could be an increased risk of substance abuse by either the patient or the batterer. It is also appropriate to inquire about a history of sexual abuse because patients with CPP have a higher lifetime prevalence of sexual abuse. However, this is only an association and does not imply a cause-and-effect relationship (16,25,26).

Physical Examination

It is common for patients with chronic pain not to appear visibly distressed as compared with patients in acute pain; close attention should be paid to posture, gait, facial grimacing, and overall general countenance. Vital signs will provide information regarding general health and should be taken at every visit; however, they are rarely abnormal as the result of chronic pain. A head and neck, pulmonary, and cardiac examination should be performed. A neurologic examination and an evaluation of the thoracolumbar spine should also be performed.

The abdominal examination should begin with inspection for scars. Palpation should be performed to rule out organomegaly or other abdominopelvic masses. The exact location of pain should be mapped to see if it corresponds to the distribution of the ilioinguinal or genitofemoral nerves. An evaluation of the anterior abdominal wall should be performed to identify tender points (pain with pressure) and trigger points (localized areas of deep muscle tenderness in a tight band of muscle) (27-29). Trigger points can be mapped with a pen for therapeutic injection (Fig. 1).

The pelvic examination should begin with inspection of the external genitalia. The vulva, vestibule, and urethra should be evaluated for lesions and point tenderness. Pain in this region in the absence of physical changes if often the result of vulvodynia, a condition that frequently is identified in women with CPP. Next, a one-finger digital examination should be performed to assess the muscles of the pelvic floor. Many patients have painful spasms of the pelvic floor musculature, including the levator ani, obturator, pubococcygeus, and deep transverse perineal muscles; sometimes specific trigger points can be identified. The finger is then rotated anteriorly to palpate the anterior vaginal wall and the base of the bladder; a woman with interstitial cystitis often has an exquisitely painful bladder. A bimanual examination is then performed to assess the uterus and adnexa. In patients in whom a pudendal nerve injury is suspected, the perineum should also be evaluated for areas of hypoesthesia or paresthesias and evaluation of rectal tone indicated. If tolerated, a speculum examination should be performed. In patients with a previous hysterectomy, the vaginal cuff should be carefully probed for areas of tenderness that might

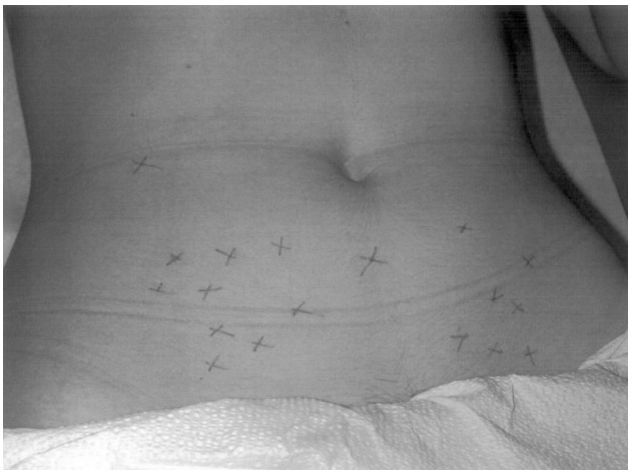

Fig. 1 Trigger points anterior abdominal wall.

TABLE 1 **Pathology involved in chronic pelvic pain**

Gynecologic	Urologic	Gastrointestinal	Musculoskeletal	Neurologic
Endometriosis	Interstitial cystitis	Irritable bowel syndrome	Pelvic floor dysfunction	Postherpetic neuralgia
Adenomyosis		Inflammatory bowel disease	Myofascial pain syndromes	Incisional neuroma
Adhesions		Chronic constipation	Fibromyalgia	Visceral hyperalgesia
Ovarian remnant syndrome			Adhesions	Pudendal neuralgia
Pelvic congestion syndrome				

represent trigger points, neuromas, or visceral referral.

DIAGNOSTIC TESTS

Evaluating the Bladder

The diagnosis of IC is made with a combination of clinical and/or cystoscopic findings. Clinical criteria include irritative voiding symptoms such as frequency, urgency, and nocturia in a patient with pain and tenderness over the anterior vaginal wall and the base of the bladder. All patients should have a urinalysis and urine culture performed to rule out microscopic hematuria and infections. Patients with hematuria should have a cystoscopy performed to rule out a bladder neoplasm (30,31). The stricter NIH–NIDDK (National Institutes of Health–National Institute of Diabetes and Digestive and Kidney Diseases) criteria also require a cystoscopy and hydrodistension with the following findings: glomerulations, submucosal hemorrhages, and terminal hematuria. Patients with advanced disease might have ulcers and a reduced bladder capacity to less than 400 mL. The advantages of the cystoscopy and hydrodistention are determining the bladder capacity, assessing the degree of inflammation, and the therapeutic benefit that 20–30% of patients enjoy for 3-6 months (31,32). Cystoscopic findings might help with prognosis, because patients with ulcers and significantly reduced bladder capacity do not respond as favorably to treatment (31,33). The NIH–NIDDK criteria can miss up to 60% of patients because the degree of pain might not be in proportion to voiding symptoms or cystoscopic findings. Additionally, the exclusion criteria include age $<$18 years and the presence of involuntary bladder contraction on urodynamics. Although it is now recognized that IC might occur in adolescents and that patients could also have involuntary contractions (31,34,35).

The potassium chloride (KCl) sensitivity test has been proposed as a diagnostic test based on the premise that patients with IC have increased epithelial permeability (36). It is positive in 66-75% of patients with IC, although false positives can occur with detrusor instability, radiation cystitis, and urinary tract infections (31,36,37). For some patients, it is a very painful procedure. The KCl test can be useful in predicting patients with altered epithelial permeability who might respond to sodium pentosan polysulfate (31,38).

The Role of Laparoscopy

The laparoscope has long been considered the gold standard for diagnosis of CPP despite the fact that it has not been shown to improve long-term outcome (21,39). The incidence of abnormal findings at laparoscopy is 35-83%. The most common findings are endometriosis and adhesions; however, it does not automatically follow that identified pathology is causally related to pain (40-42). Endometriosis, for example, is identified in 44–49% of asymptomatic women, and, conversely, over 50% of women with documented disease do not report pelvic pain (17,42). Laparoscopy might be of the most use when there is a high index of suspicion for endometriosis with severe dysmenorrhea, dyspareunia, and cul-de-sac nodularity, although it is always important to remember that many disorders that contribute to CPP cannot be identified with the laparoscope (17,18,21,39).

Some have advocated the use of microlaparoscopy under conscious sedation to identify specific lesions that are painful to avoid the pitfalls of causally relating pathology to pain (43-45). Although this technology appears attractive, there are currently no randomized, prospective studies; it is unknown if patients evaluated with conscious pain mapping have a better prognosis compared with patients who are evaluated by conventional laparoscopy. It is also unclear how referred pain and hyperalgesia affect laparoscopic pain mapping, and so more studies are required in this area.

Hormone Suppression Test

The use of gonadotropin-releasing hormone (GnRH) agonists has been proposed as a diagnostic

modality for CPP as a result of endometriosis (22,46). Although 61% of patients who are later diagnosed with endometriosis will get pain relief from GnRH agonists, the placebo response rate in this population is as high as 34% (46). Other pathology that contributes to CPP might also have temporal exacerbations associated with the menstrual cycle, and so there could be biologic reasons other than endometriosis to explain a response to GnRH agonists.

TREATMENT OPTIONS

Noninvasive Therapy

Noninvasive therapies include exercise programs, cognitive/behavioral medicine, physical therapy, nutrition, massage, and acupuncture (47). Many patients with CPP develop kinesophobia; therefore, encouraging ambulation and exercise is essential. Physical therapy deserves special emphasis because many women with CPP have a significant myofascial component (48-50). Internal manual therapy with an appropriately trained physical therapist is effective for pelvic floor hyperactivity, and up to 70% of patients will have moderate to significant improvement in pain and voiding symptoms (48-51). Dietary modification might help; acidic foods, caffeine, and alcohol are common triggers for interstitial cystitis, and patients with irritable bowel syndrome, regardless of whether they are diarrhea- or constipation-predominant, might respond to an appropriate change in diet.

Pharmacologic Management: Analgesics

The World Health Organization (WHO) guidelines for pain control can be adapted for nonmalignant pain (47,52). Initial analgesic therapy might include a nonopiod analgesic, such as acetaminophen or a nonsteroidal antiinflammatory (NSAID). Patients who do not respond can have a mild opioid added to this regimen; if the pain persists, a strong opioid can be added. Mild opioids include codeine, hydrocodone, and tramadol; strong opioids are morphine, methadone, fentanyl, oxycodone, and hydromorphone. Patients with chronic pain might do better with long-acting opioids such as methadone, which has a long half-life, or controlled-release preparations of morphine or oxycodone (53). Using an NSAID with an opioid might further increase the analgesic effect because the 2 are synergistic. Important points to consider with opioids are the risk of side effects, including respiratory depression, and the development of tolerance, dependence, and addiction. Frequent reassessment is suggested to evaluate side effects, benefit, and need for continued therapy. Many pain practitioners also find an opioid contract useful so that there is a formal written agreement specifying the conditions of opioid use (54).

Pharmacologic Management: Adjuvants

Adjuvant medications do not contain acetaminophen, NSAIDs, or opioids; they can be used alone or in combination with an analgesic (55,56). Polypharmacy is not uncommon in CPP. Unfortunately, no adjuvant medications are specifically approved by the Food and Drug Administration (FDA) for CPP but are used for many other chronic pain disorders and thus have applications for CPP.

Tricyclic antidepressants (TCAs) can be used in pelvic pain of any etiology, particularly with a neuropathic condition or interstitial cystitis. As a general rule, pain responds faster to TCAs than depression, and the doses for chronic pain are usually lower than the doses for depression (55). Typical side effects include sedation and anticholinergic effects, which tend to be less with the secondary amines such as nortriptyline and desipramine as compared with amitriptyline and imipramine (tertiary amines) (55). These side effects might make amitriptyline a better choice for patients with IC who have pain, urgency, frequency, and nocturia. Venlafaxine is a new nontricyclic antidepressant that has shown some promise for chronic pain and might be useful for patients who are also depressed (56).

Anticonvulsants have long been the mainstay of neuropathic pain, and although they should be considered first-line therapy for any patient with postherpetic or pudendal neuralgia, they are also useful for variety of chronic pain conditions, including CPP. Anticonvulsants that might be considered for CPP include the following: gabapentin, tiagabine, lamotrigine, carbamazepine, topiramate, and oxcarbazepine. Gabapentin is particularly useful for burning or lancinating pain and has also shown promise for patients with interstitial cystitis (57,58).

Other adjuvants that are useful for CPP include antihistamines, muscle relaxants, α_2-agonists, and dextromethorphan. The antihistamine hydroxyzine might have an additive effect with opioids and is also useful for interstitial cystitis because mast cell activation plays a major role in the pathophysiology of

this disorder (59). Clonidine, an α_2-agonist, has nonspecific analgesic properties and is believed to have synergistic properties with morphine (60). Muscle relaxants might be beneficial for patients with pelvic floor dysfunction; tizanidine is a muscle relaxant and an α_2-adrenergic agonist, and also has analgesic properties, making it particularly useful for myofascial pain syndromes (60). Dextromethorphan is often useful for chronic pain, although it might take many weeks to see improvement.

Pharmacologic Management: Disease-Specific Medications

Interstitial Cystitis

The only FDA-approved medication for interstitial cystitis is pentosan polysulfate sodium, a polysaccharide that is one of the glycosaminoglycans in the bladder surface mucin; it is hypothesized to work by repairing the altered permeability of the bladder surface (61). It could take up to 6 months for the maximal effect, and only 28-32% of patients will have improvement with this therapy, although this is double the effect seen with placebo (61-63). Cimetidine has been proposed by some to reduce pain and nocturia, and intravesical therapies such as heparin, dimethylsulfoxide (DMSO), Clorpactin, and resiniferatoxin have all been used with varying success rates for IC (57,61).

Irritable Bowel Syndrome

Patients with a dysmotility disorder of the bowel, or IBS, have several therapeutic options; tricyclic antidepressants and anticholinergics such as dicyclomine hydrochloride or hyoscyamine sulfate might be useful for pain (64). Diarrhea and constipation can be managed with antidiarrheal agents and osmotic laxatives. Patients with constipation-predominant IBS should use opioids with the utmost caution because constipation is a major side effect.

Pharmacologic Management: Hormonal Manipulation

All patients with a cyclic component to their pain should be offered a trial of menstrual suppression with oral contraceptives, continuous progestogens, or GnRH agonists. If a 3- to 6-month trial is successful, long-term suppressive therapy should be considered. Disorders that might improve with hormonal suppression include endometriosis, interstitial cystitis, and pelvic congestion syndrome.

Invasive Therapies

Injections

Myofascial pain might respond well to trigger point injections. The taunt band of a trigger point on the abdominal wall is identified first through palpation and then with the needle before injection. A long-acting local anesthetic such as bupivacaine is the local anesthetic of choice. Eliciting the local twitch response is essential for success (65,66). Although dry needling and saline injections are also effective, the addition of the local anesthetic reduces postprocedure pain (65). Botulinum toxin A has also been described for abdominal wall trigger point injection with prolonged reductions in pain scores (67,68). Botulinum toxin A is appealing for chronic myofascial pain because it produces local, temporary muscle paralysis and is believed to reduce mediators of neurogenic inflammation (69). Botulinum toxin A has also been directly injected into the bladder smooth muscle for overactive bladder, and might also have applications for patients with interstitial cystitis (70).

Nerve blocks might be effective in some patients with CPP. The genitofemoral and ilioinguinal nerves might be implicated in groin pain posthysterectomy or trauma; an appropriate block with a long-acting anesthetic might be both diagnostic and therapeutic. Other nerve blocks to consider are a pudendal nerve block for patients with a suspected pudendal nerve injury postvaginal surgery or after delivery, and a superior hypogastric plexus block for patients with central pelvic pain.

Surgical Procedures

Neurostimulation at the third sacral nerve root (sacral nerve stimulation) is an FDA-approved implantable technology for urgency/frequency syndrome and interstitial cystitis. It is postulated to work through modulation of afferent impulses, and has been shown to reduce pain and improve voiding dysfunction in both patients with IC and patients with pelvic floor dysfunction (71-74). Neuromodulation is not considered first-line therapy. However, for many patients with refractory pelvic pain, sacral nerve stimulation might allow for a return to functioning and a reduction in medications, including narcotics (J Gunter, unpublished data).

Neuroablative procedures that have been recommended for chronic visceral pain are laparoscopic uterosacral nerve ablation (LUNA) and presacral neurectomy (6). A Cochrane review of the studies available indicates that there is insufficient evidence to recommend their use in the management of dysmenorrhea regardless of cause, although there was evidence supporting a significant difference in midline abdominal pain after presacral neurectomy (75).

Laparoscopic procedures for endometriosis and adhesions are commonly performed for pelvic pain. Although many patients with laparoscopic ablation of endometriosis will have significant improvement in pain at 6 months, there is less evidence to support long-term success because up to 44% of patients will have a recurrence of pelvic pain at 1 year (76,77). Additionally, the placebo response rate might be high. In a blinded study, 23% of patients with endometriosis who underwent a placebo diagnostic laparoscopy (sham surgery) had significant pain relief at 6 months (76,77). There is evidence to suggest, however, that more advanced stages of endometriosis have the lowest recurrence rates of pain 6 months postlaser ablation (77). Patients with severe adhesions involving the gastrointestinal tract might benefit from adhesiolysis; however, the value of this procedure in patients with loose, filmy adhesions has been questioned (40,78). Lysis of adhesions should always be performed with caution because recurrence rates are high, potentially leaving a patient with worse disease (6). Microlaparoscopy with conscious sedation had been advocated so that surgical treatment can be limited to painful adhesions; however, this recommendation is based on observational studies alone and further research is needed (43).

Hysterectomy is the most common major gynecologic procedure performed in the United States; over 600,000 procedures are performed annually, including approximately 10% for the diagnosis of CPP (79-82). The reported success rates vary significantly, from 60-95%, with the highest rates in general gynecology practices (82-86). The definition of CPP in the studies with the highest success rates not only includes CPP, but also dysmenorrhea, pain and pressure from pelvic floor relaxation, and pain from uterine leiomyoma. Depending on the study, 18-79% of women reported some degree of pelvic pain preoperatively, indicating a wide variation in the preoperative definition of CPP (83-85). In addition, there is not always a good correlation between medical records and patient interviews regarding symptoms before a hysterectomy, especially concerning pain (87). In the general gynecology population, failure of hysterectomy to relieve CPP is associated with the following: lack of pelvic pathology, age less than 30 years, lack of commercial insurance, depression, and psychologic problems (83,84). Almost 40% of women with no pelvic pathology will have persistent pain posthysterectomy, and in referral pain populations with suspected uterine pathology, 22% of patients will have continued pain posthysterectomy (82,83,86). Patients with CPP are often hyperalgesic, and even with documented uterine pathology, might have other comorbid disorders. There is currently insufficient evidence to recommend hysterectomy for the majority of patients with CPP, especially in the absence of documented uterine pathology (82).

Occasionally pelvic pain might develop after a bilateral oophorectomy when ovarian tissue is left behind, also known as ovarian remnant syndrome. These patients usually have a history of repeated surgery, and often there is a history of endometriosis or pelvic inflammatory disease (87). Diagnostic criteria include bilateral oophorectomy with a history of several abdominopelvic surgeries and histologic confirmation of ovarian tissue after surgical intervention for the pain (87). Normal estradiol and FSH levels support the presence of functioning ovarian stroma in a supposedly postmenopausal patient.

CONCLUSIONS

Chronic pelvic pain is an enigmatic syndrome that is the complex interplay of biologic and psychosocial phenomenon. Common pathology identified in this group of patients includes interstitial cystitis, pelvic floor dysfunction, endometriosis, irritable bowel syndrome, and visceral hypersensitivity. Management requires a combination of therapeutic interventions, including both medical and psychologic therapy. Many nonsurgical interventions such as trigger point injections and nerve blocks might also be effective. Although surgery could benefit a select population of women, it is always important to remember that placebo response rates to surgical procedures are high, especially in the first 12 months after surgery. CPP is a symptom, not a disease, and rarely reflects a single pathologic process. Because many factors contribute to an individual's pain experience, an integrated multidisciplinary approach to diagnosis and treatment is likely to have the highest success rate.

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