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Review Article

Revolutionizing gynecologic pain management: Exploring modern trends and innovations

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Abstract

Gynecologic pain management remains a neglected aspect of women's healthcare despite significant advancements in obstetrics. Chronic pelvic pain (CPP), affecting 7 to 24% of the population, leads to diminished quality of life and substantial healthcare costs. Identifiable biological conditions account for some cases of CPP, but when the cause is elusive, it poses challenges for patients and clinicians. Neuropelveology, an interdisciplinary approach to identifying pelvic nerve pathologies, offers insights into CPP beyond gynecology. Neuropathic pelvic pain, characterized by sensory nerve dysfunction, presents diagnostic challenges due to its diverse manifestations and overlaps with other abdominal/pelvic pain conditions. Clinical examination remains crucial for accurate diagnosis, surpassing reliance on imaging techniques. Management often involves multidisciplinary strategies, including centrally-acting neuromodulator medications. This review encompasses various gynecologic conditions contributing to pelvic pain, including endometriosis, adenomyosis, dysmenorrhea, fibroid pain, ovarian cysts, vulvodynia, interstitial cystitis, and pelvic organ prolapse. It emphasizes the importance of gynecological examinations in promptly identifying and managing these conditions, aiming to improve women's reproductive health risks and quality of life. It discusses fertility treatments, STI screening, menstrual disorders, and gynecological surgeries, providing comprehensive insights into women's healthcare needs.

Keywords: Pelvic pain management, Chronic pelvic pain, Neuropathic pain diagnosis, Gynecologic pain assessment, Women's reproductive health.

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1. Introduction

Modern obstetric advances have improved labor management with pain medication integration, yet gynecologic pain management remains less prioritized. Chronic pelvic pain (CPP) impacts 7 to 24% of the population, significantly reducing quality of life and burdening healthcare systems.[1] Patients commonly report perineal, genital, coccygeal, and perianal pain, often linked to identifiable organic conditions such as anal fistulae, infections, or hemorrhoids.[2] When CPP lacks an identifiable cause, however, it presents a complex challenge for both patients and clinicians, requiring knowledge beyond gynecology alone.[3] Neuropelveology aids in diagnosing and treating CPP outside traditional gynecological approaches. The Neuropathic Pain Special Interest Group of the International Association for the Study of Pain defines neuropathic pain as stemming from lesions or diseases affecting the nervous system's sensory function.[4,5]

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Confirming neuropathic pain is challenging, resulting in guidelines that classify it as "definite," "probable," or "possible." Women frequently face abdominal or pelvic issues that can lead to probable neuropathic pain, with procedures like cesarean or vaginal deliveries resulting in chronic pain in 10–20% of cases and gynecologic procedures posing a 5–32% risk.[6,7] Diagnosing pelvic neuropathic pain is complicated by various differential diagnoses for abdominal or pelvic pain, making clinical examination essential for reliable detection, more so than other diagnostic tools like electrical testing, MRI, or x-rays.[8] Tissues in these areas are innervated by sensory fibers that process pain through distinct sensory fiber types. Acute pelvic pain often includes nonspecific symptoms like nausea, vomiting, and leukocytosis.[9,10]

Chronic pelvic pain (CPP) is characterized by noncyclic discomfort lasting over six months, often arising from gynecologic conditions such as adenomyosis, endometriosis, leiomyomas, adhesions, and pelvic congestion syndrome.[11] Ultrasound (US) is effective for diagnosing these conditions.[12] Diagnosing neuropathic pain requires understanding its role in central nervous system changes rather than just peripheral issues. This pain can affect sleep and mood, highlighting the need for therapies addressing brain-related problems to improve quality of life. Central sensitization may necessitate treatment with neuromodulatory medications despite peripheral symptoms.[13]

These medications, commonly classified as antidepressants, anticonvulsants, and sedative-hypnotics, are effective for managing neuropathic pain.[14] This review examines essential Gynecological health topics relevant to women's well-being, covering neuropathic pelvic pain, acute pelvic pain, endometriosis, fibroid pain, and ovarian cysts, along with insights into diagnosis and management. It also addresses dysmenorrhea, vulvodynia, interstitial cystitis, pelvic organ prolapse, birth control, STI screening, menstrual disorders, and Gynecological surgeries, highlighting critical aspects of women's health needs.[15]

2. Neuropathic Pelvic Pain and Gynecological examination

Previous pelvic or abdominal surgery, in addition to obstetric occurrences, constitutes substantial risk variables. Inguinal hernia repair, low abdominal trocar or drainage incisions, and Pfannenstiel incisions may possibly injure the genitofemoral and ilioinguinal nerves.[16] Interventions in the perineum, rectum, or obstetric procedures may damage the pudendal nerve or its branches. Moreover, pelvic operations and thrombosis may impair pelvic vein distribution, potentially leading to pelvic varicose veins and increasing the risk of vascular entrapment or sacral compartment syndrome.[17,18] Patients with varicose veins have a heightened susceptibility to the development of pelvic varicose veins. Clinical exams include the evaluation of the genital organs by colposcopy, supported by vaginal culture, urinalysis, vaginal pH assessment, Pap smear, and excision of aberrant vulvar areas. Rectovaginal palpation assesses the pectoral and lower sacral root nerves.[19]

The sacrum spinal nerves L5 and S1 cannot be reached through vaginal or rectal probing; however, the pudendal spinal nerve is palpable dorsomedial to the sciatic spine. The lower sacral nerve may be accessed at the sacrum, within a few millimeters from the midline.[20] Abdominopelvic neuropathic pain frequently arises after surgical procedures, with gynecologists frequently seeing it in atypical instances, such as whenever endometriosis affects pelvic neurons or when involuntary discomfort compresses nerves such as the obturator, pudendal, or lateral femoral cutaneous branches. Consultation with neurologists is advised for prevalent fascial or distant extremities neuropathies. A comprehensive surgical history, particularly about previous transverse abdominal incisions, is crucial owing to the risk of nerve injury.[21] Gynecologists generally examine mechanical sensitivity but should also consider alterations in heat sensitivity resulting from nerve damage.

3. Acute Pelvic Pain

Acute pelvic discomfort in women can arise from various gynecologic causes, categorized as obstetric or nonobstetric.[22] Evaluating premenopausal women with sudden pelvic pain necessitates first determining pregnancy status, often through human chorionic gonadotropin (hCG) level measurements.[23] Nonpregnant individuals may experience pain due to large ovarian cysts, ruptured cysts, pelvic inflammatory disease (PID), ovarian torsion, or misplaced intrauterine devices.[24,25] Postpartum pelvic pain can occur due to endometritis, retained products of conception (RPOCs), ovarian vein thrombophlebitis, or uterine rupture. More than two-thirds of advanced-stage cancer patients endure significant pain, with up to half reporting inadequate pain management.[26] This is also common in gynecologic oncology patients, who often experience acute pain from disease progression or cancer therapies. Pain severity does not always correlate with tumor size, as different cancers can variably induce tissue damage and pain responses.[27] In the cancer microenvironment, communication among neoplastic cells, the immune system, and the nervous system enhances pain signaling.[28] Recognizing pain's complexity, tailored pain management for gynecologic oncology patients should include multidisciplinary and multimodal approaches.

4. Endometriosis and Adenomyosis

Pelvic neuropathies often accompany prevalent pelvic conditions like uterine myomas, ovarian issues, retroperitoneal vascular irregularities, fibrosis in the retroperitoneum, and neurogenic tumors.[29,30] Conversely, sacral radiculopathy commonly arises from surgical injury, deep-seated endometriosis along the pelvic sidewall, and

nerve compression or entrapment due to pelvic varicose veins. Endometriosis, characterized by endometrial tissue beyond the uterus, may occur on the ovary, uterine ligaments, or peritoneal surfaces. It's an estrogen-dependent inflammatory condition affecting 5% to 15% of women of reproductive age, characterized by the abnormal growth of endometrial stroma and glands.[31] Areas less commonly affected include the vagina, bladder, cervix, cesarean section scars, abdominal scars, or the inguinal ligament.[32] When subjected to hormonal changes, displaced endometrial tissue undergoes repetitive bleeding cycles, absorption, and fibrosis, forming endometriomas, scarring, and adhesions.[33] Factors that contribute to endometriosis comprise shorter menstrual cycles, extended menstrual flow, intermenstrual bleeding, and the use of hormone replacement therapy. Symptoms manifest in approximately half to 80% of patients, comprising dysmenorrhea, abnormal uterine bleeding, painful intercourse, infertility, and persistent pelvic discomfort.[34]

Pelvic neuropathies are often associated with common pelvic conditions such as uterine myomas, ovarian issues, retroperitoneal vascular irregularities, retroperitoneal fibrosis, and neurogenic tumors.[29,30] In contrast, sacral radiculopathy frequently results from surgical injuries, deep-seated endometriosis along the pelvic sidewall, or nerve compression due to pelvic varicose veins. Endometriosis involves endometrial tissue outside the uterus, affecting 5% to 15% of women of reproductive age, with potential sites including the ovaries and peritoneal surfaces.[31] Displaced tissue experiences cyclic bleeding, fibrosis, and adhesion formation due to hormonal changes. Symptoms, including dysmenorrhea and infertility, affect 50% to 80% of patients.[32]

Endometriosis is a hormone-influenced condition that typically presents with cyclic menstrual pain, with pain severity often unrelated to the disease's visible extent. Endovaginal ultrasound (EVUS) is critical for diagnosing endometriomas, which typically appear as single-chambered cysts with uniform low-level echoes and increased transmission.[33,34] Adenomyosis, characterized by endometrial glands within the myometrium, presents symptoms such as irregular bleeding, dysmenorrhea, and infertility, resembling conditions like endometriosis or leiomyomas.[35] Diagnosis is complicated by nonspecific signs; ultrasound may show features like uterine enlargement and heterogeneous myometrium, with some adenomyomas displaying vascularization or cystic formations. Adenomyosis often causes dysmenorrhea and abnormal uterine bleeding (AUB),[36] making it a common AUB cause. Diagnosis is confirmed through transvaginal ultrasonography and magnetic resonance imaging, with imaging aiding in identifying adenomyosis when associated with symptoms like menstrual pain and heavy bleeding.[37] Both endometriosis and adenomyosis can cause severe menstrual cramps, pelvic pain, and discomfort during intercourse. NSAIDs can relieve mild to moderate pain, while hormonal treatments regulate hormones to alleviate symptoms.[38] In severe cases, surgical options like laparoscopy or hysterectomy may be necessary. (**Figure 1**).

Figure 1: Treatment for endometriosis and adenomyosis

5. Dysmenorrhea

Dysmenorrhea, marked by painful menstruation, affects 50% to 90% of adolescent girls and women of reproductive age.[39] Approximately 45% of those suffering seek help from primary care providers. This condition leads to decreased quality of life, increased absenteeism, and heightened risk of depression and anxiety.[40] Characterized by abdominal cramping, dysmenorrhea impedes daily activities and is often accompanied by symptoms such as headache, nausea, diarrhea, vomiting, and lumbago. It is more prevalent than other gynecological issues and is the leading cause of gynecological morbidity among women, regardless of age, nationality, or economic status.[41] The societal impact includes significant annual productivity losses, prompting the World Health Organization to recognize dysmenorrhea as a major contributor to chronic pelvic pain (CPP). Heat therapy, such as using heating pads, can help relax muscles and alleviate cramps.[42] Lifestyle changes, including regular exercise and a balanced diet, may reduce symptoms. Hormonal contraceptives, like birth control pills, can help regulate hormonal fluctuations and lessen pain.

6. Fibroid Pain

The probability of having uterine fibroid tumors, or leiomyomas, rises with advancing age in women.[43] Evidence demonstrates that their frequency in the U.S. increases from four percent in women over 20 to 30 to 11-18% in those aged 30 to 40, ultimately reaching 33% in women aged 40 to 60.[44] A considerable number of women seek advice from family physicians about fibroid-related complaints or inadvertent discoveries during medical examinations. Uterine fibroids, nonmalignant tumors inside the uterine muscle, may induce considerable discomfort affecting overall well-being.[45] Pelvic pain is prevalent, ranging from slight discomfort to severe cramps, depending on the number and location of fibroids.

Pain relievers such as NSAIDs ease immediate pain, whilst hormonal therapy may regulate menstrual cycles and mitigate discomfort. Minimal surgical methods, such uterine artery embolization and MRI-guided targeted ultrasound imaging, provide surgical options that maintain fertility.[46] Surgical procedures, such as myomectomy or hysterectomy, are viable choices for extreme instances.[47] Alternative methods such as yoga, acupuncture, and dietary modifications augment traditional treatments, providing comprehensive comfort. Comprehensive treatment customizes therapies to meet individual requirements, enhancing the treatment of fibroid-related discomfort.

7. Ovarian Cysts

Ovary hormones, such as luteinizing hormone (LH), follicle-stimulating hormone (FSH), estrogens, and progesterone, exhibit consistent fluctuations over a period of 28 days.[48] These variations are essential for oocyte maturation and the ovulation of a single egg throughout the ovarian cycle. Simultaneously, the menstrual cycle involves alterations in the uterine lining, which is expelled if fertilization does not take place. The brain's hypothalamus secretes gonadotropin-releasing hormone (GnRH), that activates the pituitary gland's ability to discharge LH and FSH, thereby inducing the ovaries to synthesize estrogen and progesterone.[49] Periods of menstruation generally last 28 days (varying from 25 to 32 days) and begin with the desquamation of the uterine lining. An LH spike during the mid-cycle initiates ovulation and the luteal phase.[50] This hormonal alteration inhibits further release of estrogen and progesterone, resulting in menstruation and the commencement of a new cycle. The treatment of pain may include over-the-counter analgesics such as ibuprofen or acetaminophen for minor discomfort, although serious cases can need prescription drugs or surgical intervention.[51] Non-pharmacological approaches, including thermotherapy, mild physical activity, and relaxation methods, may provide alleviation, requiring consistent oversight by a healthcare professional for optimal control of pain and overall wellness.

8. Vulvodynia

Musculoskeletal and neurological disorders, coexisting pain illnesses that include fibromyalgia and irritable bowel syndrome, together with psychosocial factors, cause vulvodynia.[52,53] The Diagnostic and Statistical Manual of Mental Disorders now categorizes vulvodynia as 'genito-pelvic pain/penetration disorder,' broadening its diagnosis to encompass deep or pelvic discomfort during intercourse.[54] Besides discomfort, vulvodynia negatively influences sexual desire, excitement, frequency range, and pleasure, hence affecting the psychological well-being and relationships of both the individuals afflicted and their partners. The disorder may result in uncomfortable sexual encounters, heightening anxiety and despair, while diminishing the standards of life.[55] Treatment often requires a multimodal strategy, including physical therapy, pharmacological agents, psychosocial therapies, and modifications in lifestyles. Management of vulvodynia typically requires a multidisciplinary approach, including physical therapy, medications, psychological support, and lifestyle changes. Due to individual variability in treatment response, effective strategies can be difficult to establish. Patient education is crucial, while ongoing research aims to uncover mechanisms and develop innovative therapies for improved outcomes and quality of life. (**Figure 2**)

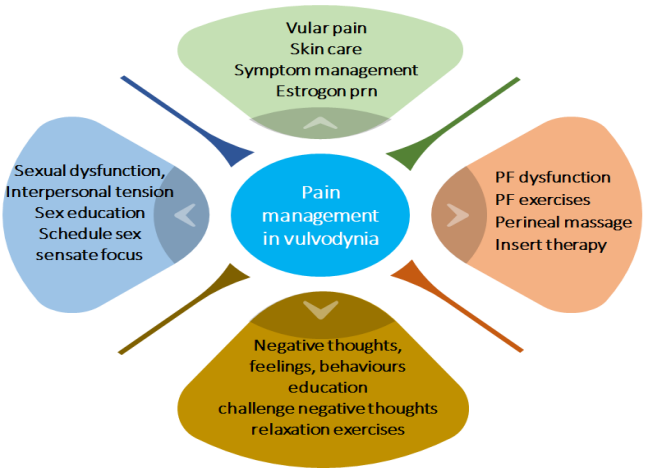

Figure 2: Pain management in Vulvodynia

9. Interstitial Cystitis

Interstitial cystitis/painful bladder syndrome (IC/PBS) manifests as a persistent condition characterized by pelvic pain and disturbances in urinary storage, including a relentless urge to urinate, frequent nighttime urination, and increased urinary frequency.[56] Although widespread, its precise etiology remains elusive, resulting in diverse treatment modalities. Early detection of IC/PBS presents difficulties due to symptom similarities with other urogynecological disorders, potentially leading to considerable deterioration in patients' quality of life.[57] By fostering interdisciplinary collaborations and advancing scientific understanding, clinicians can provide holistic care and support to individuals affected by IC/PBS, enhancing their overall health and quality of life.[58]

10. Pelvic Organ Prolapse

Urogenital prolapse leads to the downward displacement of pelvic organs, resulting in pelvic pressure or protrusion at the vaginal opening, along with symptoms like urinary incontinence, bowel issues, and sexual dysfunction.[59,60] This condition, unique to women, impacts various vaginal anatomy areas, including the anterior and posterior walls. It differs from rectal prolapse, which affects both genders, and is a common reason for hysterectomy among postmenopausal women. While not usually severe, it causes discomfort, affecting daily life. The anterior vaginal wall is often most affected, particularly with cystocele. Apical prolapse can involve the uterus, vaginal cuff, or intestines, while posterior

collapse can affect the rectum (rectocele).[61] The pelvic organ prolapse quantitation system helps assess uterovaginal support.[62] Pain management includes pelvic floor therapy, pessaries, lifestyle changes, and surgery for severe cases.[63] Regular healthcare consultations are essential for personalized treatment.

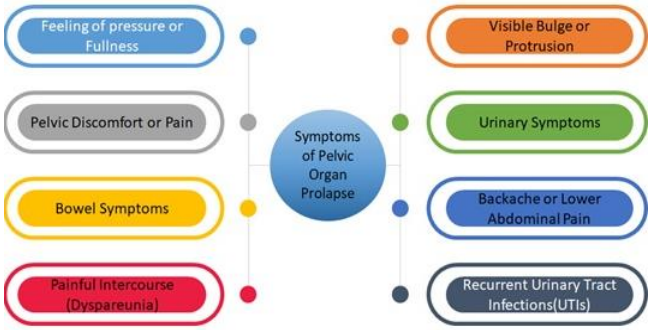

Figure 3: Symptoms of pelvic organ prolapse

11. Birth Control Management

Recent advancements in PAH medical therapy have improved hemodynamics, exercise capacity, quality of life, and overall outcomes.[64] Pregnant women with PAH necessitate comprehensive, multidisciplinary management, preferably at a specialized pulmonary hypertension referral center, focusing on vigilant monitoring before, during, and after childbirth. PAH, characterized by increased pulmonary vascular obstruction leading to high pulmonary vascular resistance (PVR) and potential right heart failure, predominantly affects young women.[65] Consequently, effective contraception and pregnancy management are crucial in this demographic. Gynecologic discomfort, common among young women with PAH, complicates the management of their condition during pregnancy. Pain management strategies should prioritize both maternal well-being and fetal safety. Non-pharmacological interventions, such as relaxation techniques, massage, and physical therapy, can alleviate symptoms while reducing medication reliance. When pharmacological treatments are necessary, their safety profiles must be carefully evaluated, as certain pain relievers may adversely impact PAH and fetal development.[66] A multidisciplinary team, including obstetricians, cardiologists, and pain specialists, is essential for optimal pain control while minimizing risks to both mother and fetus.

12. Gynecological Examination

Periodic pelvic exams, sometimes referred to as pelvic or well-woman assessments, are crucial for women's health, emphasizing ovarian wellness and the early identification of any concerns. Periodic examinations are advised for sexually active women or those aged 21 and above, such as a thorough assessment of the female reproductive system. A standard gynecological evaluation begins with an examination of the patient's medical records, followed by a chance for the patient to pose inquiries. The physical examination includes an exterior evaluation of the genital region, then the insertion of a speculum to evaluate the vagina and cervix.[67] Pap smears, conducted to test for cervical cancer and human papillomavirus (HPV), are routine throughout these examinations.[68,69] Medical professionals may also do a physical examination of the uterus and ovaries to identify anomalies, such as fibroids or ovarian cysts. Further screenings such as breast examinations, sexually transmitted disease testing, or mammograms may be advised based on the patient's age, medical history, and risk factors. Regular gynecological assessments enable healthcare professionals to inform patients about reproductive health, contraception, and preventative measures, therefore improving their general well-being and promoting the early identification of gynecological issues.

13. Gynecological Surgery

Accurate mapping of pelvic anatomy and identification of susceptible regions is crucial to mitigate the risk of ureter damage after gynecologic procedures. Preoperative imaging and real-time viewing are essential techniques. A prevalent prophylactic approach is the placement of ureteral stents for six weeks post-operatively, followed by an intravenous pyelogram (IVP) to evaluate patency.[70] Surgery such as hysterectomy and laparoscopic treatments address diseases like endometriosis and fibroids.[71] These procedures are conducted by gynecologists or oncologists proficient in minimally invasive or robotic-assisted methodologies. Patients need to confer to their medical practitioners about possible dangers, advantages, and alternatives. The complications, such as gynecologic discomfort, may persist, necessitating vigilant observation.

14. Fertility Treatments

Obesity that is severe frequently needs elevated dosages of clomiphene, sometimes reaching 200 mg on a regular basis to induce ovulation.[72] Similarly, the dose of gonadotrophins for ovulation induction often escalates with a rise in BMI. A study involving 2,660 IVF/ICSI cycles confirmed a clear association between BMI and the total amount of follicle-stimulating hormone (FSH) required.[73] Elevated BMIs significantly correlated with heightened FSH requirements for ovarian stimulation, indicating resistance to ovulation-inducing drugs in obese persons. The prognostic significance of obesity on infertility treatment results remains debatable. Some research studies indicate reduced pregnancy and implantation rates in obese women, whereas others see no significant effect with increased body weight. Obese women might have experienced reduced reproductive abilities throughout natural and assisted conception cycles due to many reasons, such as decreased implantation and pregnancy rates, elevated miscarriage rates, and heightened problems for both mother and baby. These issues are associated with endocrine and metabolic alterations impacting steroid metabolism, insulin functionality, and hormone control (e.g., leptin, resistin, ghrelin, adiponectin).[74] Such anomalies may

affect essential reproductive processes, including follicle development and endometrial responsiveness. Gynecological pain may impede therapy; potential reasons include ovarian hyperstimulation syndrome (OHSS) and underlying disorders such as endometriosis.[75] Chronic pain must be communicated to a medical professional to facilitate prompt intervention and enhance treatment efficacy.

15. Conclusion

In conclusion, gynecologic pain, particularly CPP, represents a significant challenge in women's healthcare. Despite advances in obstetrics, its management still needs to be addressed. Neuropelveology, an interdisciplinary approach focusing on pelvic nerve pathologies, offers valuable insights beyond traditional gynecology. Neuropathic pelvic pain, characterized by sensory nerve dysfunction, poses diagnostic complexities, emphasizing the importance of thorough clinical examinations and over-reliance on imaging techniques. Multidisciplinary management strategies, including centrally acting neuromodulatory medications, are often necessary for effective treatment. This review stresses various Gynecologic conditions contributing to pelvic pain, highlighting the critical role of Gynecological examinations in promptly identifying and managing these conditions to improve women's reproductive health and quality of life. It also discusses essential aspects of women's healthcare, including fertility treatments, STI screening, menstrual disorders, and Gynecological surgeries, emphasizing the need for comprehensive care to address the diverse needs of women across different life stages. Prioritizing Gynecologic pain management and women's reproductive health is essential for enhancing healthcare outcomes and promoting overall well-being.

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17. Conflict of Interest

None.

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