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EDITOR'S MESSAGE

Practicing Purpose, Gratitude, and Compassion

Lindsay Tjiattas-Saleski, DO, MBA, FACOEP, FACOFP

As we settle back into routine after the holidays, the decorations come down and the familiar rhythm of daily practice returns. Still, winter offers a moment to reflect on the year behind us, the accomplishments achieved, the challenges navigated, and the resilience built along the way. It is also a time to look forward with gratitude to the work still to be done, alongside both our work families and those at home.

This season reminds us of our role as healers and guides, particularly as winter illnesses circulate, and uncertainty continues to surround public health and science. Conversations with patients and parents, especially regarding children, require patience, compassion, and a steady commitment to evidence-based care. Listening carefully and meeting concern with clarity remains essential to protecting those who depend on us most.

This winter issue highlights women's health, including gynecologic disorders and pelvic pain, areas where attentive listening is also critical. Women's concerns deserve validation, thoughtful evaluation, and partnership in care. As osteopathic family physicians, our strength lies in hearing our patients, advocating for them, and guiding them forward with empathy and trust.

As the new year begins, may we continue to practice with purpose, gratitude, and compassion--supporting our patients, educating our learners, and caring for one another through the season ahead.

UPCOMING EVENTS

FEB 6-8 2026 — **Faculty Development Conference**
Virtual

JUN 12-19 2026 — **CME at Sea**
Seattle, WA to Alaska

APR 15-19 2026 — **ACOFP 63rd Annual Convention and Scientific Seminars**
Orlando, FL

FROM THE PRESIDENT'S DESK

Fighting Misinformation and Distrust

Gautam J. Desai, DO, FACOFP *dist.*

This month's issue of *OFP* is themed around women's health and newborn health, topics that in many ways could not be more timely.

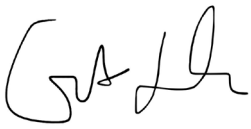
In a time of growing misinformation in American health care, osteopathic family physicians are more essential than ever. As trusted clinicians rooted in whole-person, community-based care, DOs stand on the front lines protecting the health of newborns, women, and all Americans. That role becomes especially critical as preventable diseases such as measles resurface, threatening our most vulnerable patients.

Measles is not a benign childhood illness. It poses serious risks to infants too young to be vaccinated, pregnant women, and individuals with compromised immune systems. Conflicting messages and misinformation from government leaders and public figures have sown confusion. This erosion of trust divides patients from physicians and undermines decades of public health progress. Measles, which had been eradicated from the US since 2000, is spreading through multiple states, with over 2,000 cases recorded in 2025, including multiple deaths.

Osteopathic family physicians are uniquely positioned to counter this moment. Our training emphasizes prevention, patient education, and the understanding that individual health is inseparable from community health. We do not treat diseases in isolation. We care for families across generations, often from birth through adulthood. When misinformation spreads, it is the family physician who must sit with anxious parents, answer difficult questions, and advocate for evidence-based care grounded in compassion and respect.

Protecting our patients requires more than clinical skill; it demands moral clarity and professional courage. As public discourse fractures, osteopathic family physicians must continue to lead with science and personalized care. Our patients are not political abstractions. They are real people who depend on us to provide clear, science-based guidance and safeguard their health, now more than ever.

Osteopathically yours,



Gautam J. Desai, DO, FACOFP *dist*.
2025-2026 President, American College of Osteopathic Family Physicians

REVIEW ARTICLE

Managing Common Gynecologic Disorders: Clinical Approaches to PCOS, Endometriosis, and Uterine Fibroids

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KEYWORDS

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ABSTRACT

Polycystic ovary syndrome (PCOS), endometriosis, and uterine fibroids are highly prevalent gynecologic conditions that often lead to pelvic pain, menstrual irregularities, and infertility. While standard treatment relies on hormonal therapy and surgery, there is growing interest in integrative, nonpharmacologic approaches, including OMT. This review summarizes current diagnostic and treatment strategies for PCOS, fibroids, and endometriosis, and explores the role of OMT in their management.

A targeted PubMed and Cochrane Library search identified 26 relevant studies for PCOS, 18 for fibroids, 19 for endometriosis, and 8 for osteopathic interventions. Evidence supports lifestyle changes and medications like metformin and letrozole for PCOS, while uterine fibroids are managed surgically or with newer interventional and hormonal options. Endometriosis treatment includes medical suppression and excision, with emerging diagnostic biomarkers and imaging tools.

OMT shows promise in reducing pelvic pain and enhancing quality of life, particularly in endometriosis and PCOS, by addressing musculoskeletal and autonomic dysfunction. Although direct evidence remains limited, osteopathic care may complement conventional treatment. Further research is warranted to define its clinical utility in multidisciplinary gynecologic care.

INTRODUCTION

Polycystic ovary syndrome (PCOS), endometriosis, and uterine fibroids are among the most common gynecologic disorders encountered in primary care. Each condition can significantly impact women's health and quality of life, contributing to symptoms such as menstrual irregularities, chronic pelvic pain, subfertility, and other systemic effects. PCOS affects an estimated 6%–9% of reproductive-aged women, often presenting with hyperandrogenism, ovulatory dysfunction, and metabolic disturbances.[1]

Uterine fibroids (leiomyomas) are extremely prevalent, occurring in up to 70% of women by menopause,[2] and are the leading indication for hysterectomy.[3] Given their prevalence and impact, osteopathic family physicians play a crucial role in managing these disorders.

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Endometriosis, a chronic inflammatory condition characterized by ectopic endometrial tissue, is found in roughly 6%–10% of women of reproductive age and in a high proportion of those with chronic pelvic pain or infertility.[4]

This article reviews current clinical management of PCOS, endometriosis, and fibroids, emphasizing recent advances in hormonal therapies and medical management. Additionally, it discusses how osteopathic principles such as holistic patient-centered care can be applied in treating these conditions.

METHODS

A comprehensive literature review was conducted using PubMed and the Cochrane Library to identify recent human studies (published within the past 5 years) on PCOS, uterine fibroids, endometriosis, and osteopathic considerations for these conditions. We performed a systematic literature search in the PubMed database to identify relevant articles on the diagnosis and treatment of PCOS in adult women in the United States. We excluded

studies on etiology, pathogenesis, and those conducted internationally. This yielded 652 results, of which 16 were included after removing duplicates and irrelevant articles. A Cochrane Library search for PCOS returned 25 results, with 9 included, resulting in a total of 25 sources for PCOS.

We then performed a systematic literature search in the PubMed database to identify relevant articles on diagnosis and treatment of uterine fibroids or leiomyomas in adult women in the United States. We excluded studies on etiology, pathogenesis, and those conducted internationally. This yielded 136 results, with 12 included. The Cochrane Library search for uterine fibroids returned 23 results, with 9 included, totaling 21 sources.

An additional systematic literature search in the PubMed database was done to identify relevant articles on diagnosis and treatment of endometriosis in adult women in the United States. We excluded studies on etiology, pathogenesis, and those conducted internationally. This yielded 101 results, with 14 included. A Cochrane Library search for endometriosis returned 10 results, of which 5 were included, yielding a total of 19 sources.

Finally, we performed a systematic literature search in the PubMed database to identify relevant articles on utilization of osteopathic manipulative medicine in adult women in the United States for the above conditions. This resulted in 72 studies, with 5 included. A Cochrane Library search for osteopathic medicine returned results, but none were relevant. Thus, 5 sources were used for osteopathic medicine.

RESULTS

Polycystic Ovary Syndrome

PCOS is a common endocrine disorder in reproductive-age women, affecting up to 10% globally.[5] It is highly variable, encompassing metabolic dysfunction, menstrual irregularities, hyperandrogenism, and infertility. Variations in phenotype, such as lean vs obese PCOS and differing degrees of insulin resistance, contribute to diagnostic and management complexity.[6,7]

Treatment

Lifestyle modification remains first-line therapy.[5] Interventions combining caloric restriction, exercise, and behavioral support have demonstrated significant weight loss, improved insulin sensitivity, and decreased testosterone, all which improve symptoms of PCOS.[7,8] High-intensity interval training (HIIT) is particularly effective for metabolic improvement.[9] Probiotic supplementation alongside lifestyle changes further improves body mass index (BMI) and hormonal parameters.[10]

Combined oral contraceptives (COCs) remain first-line pharmacologic therapy for managing hyperandrogenic symptoms and cycle regulation. Cochrane Library reviews show COCs are more effective than metformin for acne and hirsutism relief.[11] Progestogens alone can effectively control irregular bleeding.[12]

Insulin-sensitizing agents, such as metformin, help lower insulin levels, reduce androgen production, and improve ovulatory function.[13] Because infertility is a consequence of PCOS, pharmacologic therapies with lifestyle changes are recommended to boost fertility chances.

Combining metformin with clomiphene increases pregnancy rates compared to clomiphene alone.[14] Glucagon-like peptide-1 (GLP-1) receptor agonists (eg, liraglutide) offer additional weight loss and metabolic benefits, and possibly increase fertility chances.[15,16] They have demonstrated improved insulin sensitivity compared to metformin, with additional benefits in menstrual regularity and androgen reduction.[17] Thiazolidinediones also improve insulin resistance but carry risks of weight gain, an already known symptom of PCOS.[18]

Emerging Therapies

Anti-androgens remain pivotal for hirsutism and acne. Meta-analyses confirm their efficacy in reducing testosterone.[19] However, side effects and teratogenicity require careful contraceptive counseling.

Letrozole, an aromatase inhibitor, is now considered first line for ovulation induction, with higher live birth rates and fewer multiple pregnancies compared to clomiphene.[20] It is currently used off label for PCOS patients. Gonadotropins remain effective but carry higher risks of ovarian hyperstimulation.[21] Dexamethasone combined with clomiphene can improve ovulation in resistant cases.[22] Ultrasound-guided ovarian drilling improves ovulation in clomiphene-resistant women but carries surgical risks.[23]

Inositol supplementation may improve ovulation and metabolic profiles, though evidence remains low-quality.[24] N-acetylcysteine demonstrates modest benefits for reproductive outcomes and insulin sensitivity.[25] Carnitine and tea consumption are emerging adjuncts for metabolic control.[26,27] Curcumin combined with metformin shows synergistic improvements in testosterone and inflammation.[28]

Acupuncture is also gaining recognition as a complementary therapy for PCOS. Evidence from animal and clinical studies suggests acupuncture may regulate the hypothalamic-pituitary-ovarian axis, improve insulin sensitivity, reduce hyperandrogenism, and promote ovulation. It may also modulate key molecular pathways such as PI3K/AKT/mTOR and enhance ovarian angiogenesis. While not a

replacement for conventional therapies, acupuncture offers a nonpharmacologic option that may benefit patients with poor tolerance to medications or those seeking integrative approaches.[28]

Recent clinical trials have also explored novel pharmacotherapies for PCOS. Sodium-glucose cotransporter 2 (SGLT-2) inhibitors (eg, dapagliflozin) show promise in reducing body weight, insulin resistance, and androgen levels, while also improving cardiovascular markers. Dipeptidyl peptidase-4 (DPP-4) inhibitors (eg, sitagliptin) offer moderate metabolic benefits and may be suitable for patients intolerant to metformin.

Combination therapies, such as metformin with sitagliptin, have shown enhanced ovulation rates and embryo quality in assisted reproduction settings. These agents represent a shift toward individualized phenotype-specific treatment strategies in PCOS care.[17]

Additionally, gonadotropin-releasing hormone (GnRH) antagonists (eg, elagolix, relugolix, linzagolix), which are FDA approved for endometriosis, appear to offer a promising therapeutic option for managing the hormonal and metabolic dysfunctions associated with PCOS. Studies have shown that GnRH antagonist protocols lead to lower rates of ovarian hyperstimulation syndrome (OHSS), reduced stimulation duration, and gonadotropin consumption compared to GnRH agonist protocols. Their ability to lower androgen levels and potentially improve insulin sensitivity and metabolic health highlights their role in comprehensive PCOS management. However, further research is necessary to validate these benefits and fully elucidate the clinical significance and long-term safety of GnRH antagonist therapy in PCOS patients.[17]

Uterine Fibroids

Uterine fibroids (leiomyomas) are the most common benign gynecologic tumor in premenopausal women. Over 11 million women in the United States alone have been diagnosed with this condition based on history, physical examination, and some type of imaging, commonly pelvic ultrasound. Common symptom presentation includes pain, pressure, abnormal vaginal bleeding, possible infertility, and decreased quality of life. Treatment is focused on reducing signs and symptoms, decreasing fibroid volume, and maintaining or improving fertility outcomes. Based on individual preferences, standardized treatment may change.[30]

Treatment

The standard treatment for uterine fibroids is laparoscopic or open surgery, depending on the size of the fibroid. An open myomectomy removes the fibroid and is associated with shorter surgical procedural time. A laparoscopic myomectomy is less invasive and has advantageous postoperative benefits such as less blood loss, shorter hospital stays, fewer pelvic adhesions, and quicker return to normal activities. Both procedures have similar rates for fertility as well as fibroid recurrence postoperatively.[31]

Nonsurgical treatments have become more popular with advancing technology. Uterine artery embolization (UAE), high-intensity focused ultrasound (HIFU) or magnetic resonance imaging (MRI)-guided ablation, and percutaneous microwave ablation are three examples of this.[32,33] A large cohort study found myomectomy to be associated with lower long-term reintervention rates compared to UAE, endometrial ablation, and hysteroscopic myomectomy, especially in younger and fertile patients.

These findings are critical when counseling patients on uterus-preserving options years before menopause.[34] Mifepristone has also been added in conjunction with nonsurgical treatments to further decrease lesion volume and improve symptoms. It also helps to reduce the number of punctures and ablation treatment time.[35]

Currently, long-term pharmacologic options for fibroid treatment remain limited. COCs and progestin-only products are often used initially but lack FDA approval for fibroid-specific indications. Selective progesterone receptor modulators (SPRMs) such as mifepristone, ulipristal acetate, and asoprisnil effectively control bleeding and reduce fibroid size, though they are generally less effective than GnRH agonists like leuprolide acetate.[36] Hormonal therapy has shown limited efficacy in reducing symptoms as well as fibroid volume. Improved hemoglobin levels are present, but hormonal side effects have shown decreased quality of life.[37,38] Mifepristone alone has shown reduction in volume and heavy bleeding, improved hemoglobin levels, and decreased pelvic pain. Side effects include endometrial thickening, and the long-term safety of the medication is unclear.[39]

GnRH agonists (leuprolide, goserelin, triptorelin) are well-established for reducing fibroid volume and improving hemoglobin levels, but they induce hypoestrogenic side effects (eg, bone loss, hot flushes). Add-back therapy with low-dose estrogen/progestin helps mitigate these effects and maintain bone density, especially important for aging women.[40]

GnRH antagonists, a newer class of oral medications, have shown promise in treating heavy menstrual bleeding (HMB) associated with fibroids. These include elagolix, relugolix, and linzagolix, which offer rapid onset, reversibility, and dose titration to balance symptom control with minimal hypoestrogenic effects. However, long-term safety data are limited to 2-year studies, and symptoms typically resume after discontinuation. Cost-effectiveness analyses are still needed to guide broader clinical use.[41]

TABLE 1: Management for PCOS.

Treatment Option	Research Support	Mechanism/Procedure	Benefits	Limitations
Lifestyle modification	Yes – Strong evidence supports combined diet, exercise, and behavioral interventions	Caloric restriction, exercise (especially HIIT), behavioral support	Weight loss, improved insulin sensitivity, decreased testosterone, symptom improvement	Requires sustained effort and adherence
Probiotics	Mixed – Some studies show benefit when combined with lifestyle changes	Supplementation alongside lifestyle changes	Improved BMI and hormonal parameters	Limited standalone evidence
COCs	Yes – Cochrane Library reviews support efficacy for hyperandrogenic symptoms	Hormonal regulation via estrogen and progestin	Cycle regulation, acne and hirsutism relief	May not address metabolic dysfunction
Progestogens alone	Yes – Effective for controlling irregular bleeding	Hormonal therapy	Control irregular bleeding	Do not treat hyperandrogenism or metabolic issues
Metformin	Yes – Well-supported for insulin sensitization and ovulatory improvement	Insulin sensitizer	Lowers insulin, reduces androgens, improves ovulation	GI side effects, not effective for all symptoms
Metformin + clomiphene	Yes – Combination improves pregnancy rates over clomiphene alone	Ovulation induction with insulin sensitization	Enhanced fertility outcomes	Requires monitoring and may cause side effects
GLP-1 receptor agonists	Yes – Recent studies show metabolic and fertility benefits	Enhance insulin sensitivity, reduce weight, regulate menstruation	Improved insulin sensitivity, weight loss, androgen reduction	Cost, limited long-term data
Thiazolidinediones	Mixed – Effective for insulin resistance but cause weight gain	Insulin sensitizer	Improve insulin resistance	Weight gain risk
Anti-androgens	Yes – Meta-analyses confirm efficacy for hirsutism and acne	Block androgen receptors or reduce androgen production	Reduce testosterone, improve acne and hirsutism	Teratogenicity, require contraceptive counseling
Letrozole	Yes – Higher live birth rates and fewer multiple pregnancies than clomiphene	Aromatase inhibitor for ovulation induction	Effective ovulation induction	Off-label use, requires monitoring
Gonadotropins	Yes – Effective but with higher OHSS risk	Stimulate ovulation	Effective ovulation induction	OHSS risk, high cost
Dexamethasone + clomiphene	Mixed – Shown to help in resistant cases	Steroid plus ovulation induction	Improves ovulation in resistant cases	Steroid side effects
Ovarian drilling	Mixed – Effective in clomiphene-resistant women	Surgical intervention	Improves ovulation	Surgical risks
Inositol	Mixed – Some benefit but low-quality evidence	Supplementation	Improves ovulation and metabolic profile	Low-quality evidence
N-acetylcysteine	Mixed – Modest benefits reported	Antioxidant supplementation	Improves insulin sensitivity and reproductive outcomes	Limited efficacy
Carnitine and tea	Mixed – Emerging adjuncts with preliminary support	Dietary supplementation	Metabolic control	Limited evidence
Curcumin + metformin	Mixed – Synergistic effects reported	Anti-inflammatory and insulin sensitization	Improves testosterone and inflammation	Emerging evidence
Acupuncture	Mixed – Animal and clinical studies suggest benefit	Regulates HPO axis, modulates molecular pathways	Improves insulin sensitivity, ovulation, androgen levels	Not a replacement for conventional therapy
SGLT-2 inhibitors	Yes – Recent trials show metabolic and hormonal benefits	Reduce glucose reabsorption	Weight loss, improved insulin resistance and cardiovascular markers	Limited long-term data
DPP-4 inhibitors	Mixed – Moderate benefits, useful for metformin intolerance	Enhance incretin effect	Moderate metabolic benefits	Less effective than other agents
GnRH antagonists	Mixed – Promising but requires further validation	Suppress gonadotropin release	Lower OHSS risk, reduce androgens, improve insulin sensitivity	Need more research on long-term safety

Abbreviations: BMI, body mass index; DPP-4, dipeptidyl peptidase-4; GLP-1, glucagon-like-peptide-1; GnRH, gonadotropin-releasing hormone; OHSS, ovarian hyperstimulation syndrome; SGLT-2, sodium-glucose cotransporter-2

Other agents like danazol, a steroid hormone, and aromatase inhibitors have shown some efficacy in reducing fibroid size and bleeding, but their use is limited by side effects and inconsistent outcomes.[42,43]

Emerging Therapies

One emerging therapy includes collagenase injections directly into the fibroid itself. So far it has been safe and well tolerated with a reduction in collagen content in all treated samples. Optimal dose and interval for the injections has not been determined.[44] Interventional radiology may prove to be a promising field with new techniques including thermal ablation.[45] The Mirabilis system is a safe and noninvasive option for the outpatient setting for rapid and efficient ablation of uterine fibroids.[46]

Although research is limited, there is some evidence that integrative treatment options may be beneficial. High concentrations of vitamin D supplementation have been shown to decrease fibroid development.[47,48] Acupuncture in addition to mifepristone treatment was shown to further reduce fibroid volume.[49] Additionally, the Chinese herbal medicine Guizhi Fuling has been added to mifepristone treatment and has been shown to reduce heavy menstrual bleeding and subfertility. More research is needed to confirm and support these data.[50]

Healthy lifestyle changes such as regulating hormone levels, getting regular health assessments, and maintaining a nourishing diet are recommended for prevention of fibroids, although not guaranteed. There is some evidence of an anti-uterine fibroid diet to prevent development; however, more research is needed to determine if this is beneficial.[48]

Endometriosis

Endometriosis is a chronic, estrogen-dependent, inflammatory disease characterized by the presence of endometrial-like tissue outside the uterus, leading to pain, infertility, and often systemic inflammation and central sensitization.[51,52] This disease affects approximately 6%–10% of reproductive-aged women, or 6.5 million, with increased prevalence in those experiencing infertility or chronic pelvic pain.[52,53] Because of an endometriosis-related stigma, mean diagnostic delays range between 7–11 years. Additional symptoms include dysmenorrhea, dyspareunia, and gastrointestinal and urinary symptoms, depending on lesion location.[51]

Diagnosing endometriosis historically requires surgical confirmation via laparoscopy.[54,55] Current diagnostic strategies include: transvaginal ultrasound, MRI, and plasma/serum biomarkers, which show promising diagnostic potential using miRNAs, proteins, and metabolites.[53,56,57] Ultrasound is the first-line diagnostic test for ovarian/superficial disease (specificity >90%), while MRI better detects deep, complex, or recurrent cases (sensitivity >95%).[58] This algorithm is proposed to optimize diagnostic accuracy and resource allocation: start with ultrasound, escalate to MRI when needed.[58,59] Various studies support use of metabolomics as early noninvasive biomarkers for endometriosis, potentially reducing invasive procedures and delays.[53,56,57]

Other articles support comprehensive nonsurgical diagnostic pathways using symptoms, checklists, imaging, biomarkers, and AI models to reduce reliance on laparoscopy, enabling faster, safer, and more precise evaluation.[54,60] Current guidelines recommend combining clinical history, imaging, and biomarkers before considering diagnostic surgery. They emphasize timely, holistic, and equity-informed care.[52]

Treatment

Options include surgery consisting of laparoscopic excision or ablation. Laparoscopy remains the gold standard for treatment. Surgery can also improve fertility in selected patients.[55] Minimally invasive treatments include ultrasound-guided ethanol sclerotherapy, which is effective for ovarian endometriomas, with low recurrence and ovarian-reserve preservation.[61] Pre-operative hormonal suppression may ease surgery but does not improve long-term pain outcomes.[62]

First-line medicinal treatments include COCs, progestins, and nonsteroidal anti-inflammatory drugs (NSAIDs).[52,54] GnRH analogues (eg, leuprolide [Lupron Depot]), goserelin (Zoladex), nafarelin (Synarel), triptorelin (Decapeptyl SR) are effective for endometriosis-associated pain with expected side effects that include menopausal symptoms and bone mineral density loss. Add-back hormone therapy (eg, norethisterone acetate, medroxyprogesterone acetate [MPA], tibolone) helps mitigate these effects.[63]

Elagolix, an oral GnRH antagonist, received FDA approval in July 2018 for management of moderate to severe endometriosis-associated pain. It is the first oral treatment approved for this indication in over a decade and works to suppress luteinizing hormone (LH), follicle-stimulating hormone (FSH), estradiol, and progesterone in a dose-dependent manner. This drug has shown an improvement in dysmenorrhea, nonmenstrual pelvic pain, and dyspareunia compared to placebo.[64]

Pentoxifylline, an immunomodulator, has been studied in endometriosis-associated pain and infertility, but there was insufficient evidence to support its use.[65] A previous Cochrane Library review looked at SERMs (eg, raloxifene), which resulted in uncertainty of the effects on pain relief. The evidence was low quality with a small sample size, but current data do not support the use of SERMs for

TABLE 2: Management for uterine fibroids.

Treatment Option	Research Support	Mechanism/Procedure	Benefits	Limitations
Open myomectomy	Yes – Well-established surgical method	Surgical removal of fibroid via open procedure	Shorter procedural time	More invasive, longer recovery
Laparoscopic myomectomy	Yes – Supported by clinical outcomes	Minimally invasive fibroid removal	Less blood loss, quicker recovery	Technically demanding, equipment-dependent
UAE	Mixed – Effective but higher reintervention rates	Blocking blood supply to fibroid	Minimally invasive, symptom relief	Higher recurrence, not ideal for fertility preservation
HIFU	Mixed – Promising but limited long-term data	MRI-guided thermal ablation	Noninvasive, outpatient procedure	Limited availability, uncertain long-term efficacy
Percutaneous microwave ablation	Mixed – Emerging with limited data	Thermal destruction of fibroid tissue	Minimally invasive	Limited research, long-term outcomes unclear
Mifepristone (with ablation)	Yes – Improves outcomes with ablation	Hormonal modulation and lesion shrinkage	Reduces lesion volume and treatment time	Endometrial thickening, unclear long-term safety
COCs	Mixed – Used off label	Hormonal regulation	Controls bleeding	Not FDA approved for fibroids, limited efficacy
Progestin-only products	Mixed – Initial use, limited efficacy	Hormonal regulation	Control bleeding	Limited fibroid-specific benefit
SPRMs	Yes – Effective for bleeding and size reduction	Modulate progesterone receptors	Reduce fibroid size and bleeding	Less effective than GnRH agonists
GnRH agonists	Yes – Well-established	Suppress estrogen production	Shrink fibroids, improve hemoglobin	Hypoestrogenic side effects, bone loss
GnRH agonists + add-back therapy	Yes – Well-established	Hormone suppression + add-back estrogen/progestin	Preserves bone density, reduces side effects	Complex regimen, requires monitoring
GnRH antagonists	Yes – Promising with 2-year data	Block GnRH receptors	Rapid symptom control, reversible	Symptoms resume after discontinuation, cost concerns
Danazol	Mixed – Some efficacy	Steroid hormone suppression	Reduces bleeding and size	Significant side effects, inconsistent outcomes
Aromatase inhibitors	Mixed – Limited use	Reduce estrogen synthesis	Shrink fibroids	Side effects, limited evidence
Collagenase injection	Mixed – Early trials	Enzymatic breakdown of fibroid collagen	Safe, reduces collagen content	Optimal dosing unknown
Thermal ablation (IR techniques)	Mixed – Emerging field	Heat-based destruction of fibroid tissue	Minimally invasive	Limited long-term data
Mirabilis system	Mixed – Early safety data	Noninvasive ultrasound ablation	Rapid outpatient treatment	Limited research
Vitamin D supplementation	Mixed – Some evidence	Hormonal modulation	May reduce fibroid development	More research needed
Acupuncture + mifepristone	Mixed – Limited studies	Neuroendocrine modulation	Further reduces fibroid volume	Limited evidence base
Guizhi Fuling + mifepristone	Mixed – Traditional medicine	Herbal and hormonal synergy	Reduces bleeding and subfertility	Requires more validation
Lifestyle changes	Mixed – Preventive potential	Hormonal and metabolic regulation	May prevent fibroid development	No guaranteed prevention

Abbreviations: COC, combined oral contraceptive; GnRH, gonadotropin-releasing hormone; Guizhi Fuling, Chinese herbal medicine; HIFU, high-intensity–focused ultrasound; IR, interventional radiology; MRI, magnetic resonance imaging; SPRM, selective progesterone receptor modulator; UAE, uterine artery embolization

managing endometriosis, and SERMs may even worsen pain outcomes compared to placebo.[66]

Emerging Therapies

Emerging treatments are looking at utilizing targeted nanoparticles for site-specific drug delivery and imaging in animal models.[67]

There are no primary prevention strategies but early identification and treatment may reduce progression and severity.[52] Guidelines encourage earlier diagnostic workup and psychosocial support to mitigate long-term impact.[51,52] Future directions should include stigma reduction, provider education, mental-health integration, and public awareness to reduce diagnostic delay.[51]

Osteopathic Considerations

Although medical and surgical treatments remain the mainstay for uterine fibroids, endometriosis, and PCOS, osteopathic physicians can offer a unique perspective in managing the musculoskeletal and autonomic

contributions to pelvic health. OMT may help alleviate pelvic congestion, modulate autonomic tone, and reduce somatic dysfunction contributing to pelvic and menstrual pain. Specific techniques include high-velocity low-amplitude (HVLA), myofascial release (MFR), counterstrain (CS), soft tissue (ST), muscle energy (ME), balanced ligamentous tension (BLT), sacral inhibition, lymphatic pump, pelvic floor release, and rib raising.[68]

Evidence suggests OMT can improve quality of life and reduce chronic pelvic pain through effects on myofascial tension and lymphatic circulation.[68,69] While direct research on OMT for fibroids is limited, its circulatory and neuroendocrine effects suggest a potential role in managing pelvic pain and menstrual irregularities that often accompany fibroids, endometriosis, or PCOS. BLT, MFR, and osteopathy in the cranial field have shown promising symptomatic relief.[69]

Additionally, a retrospective study found OMT significantly reduced pelvic pain and dyspareunia in postsurgical endometriosis patients, by implementing MFR, BLT, and indirect fluidic technique.[70] Physiotherapy (restoration of the balance of the autonomic nervous system) for PCOS improved fertility outcomes by enhancing pelvic blood flow and hormonal regulation.[71] Broader osteopathic literature highlights the value of manual therapies in addressing pelvic somatic dysfunctions, which may indirectly benefit women with fibroid-related pain or reproductive challenges.[68,69,72] Integrating osteopathic principles, including attention to visceral-somatic connections and patient-centered patient care, aligns with modern multidisciplinary approaches to gynecologic conditions and offers avenues for further research.

DISCUSSION

This review demonstrates the critical role of osteopathic family physicians in the comprehensive management of PCOS, endometriosis, and uterine fibroids. While hormonal and surgical treatments remain central, integration of OMT may enhance symptom control, particularly for chronic pelvic pain and autonomic imbalance. The evidence, though limited, supports OMT's potential to improve quality of life through modulation of somatic dysfunction and pelvic circulation.

Given the prevalence of these conditions in primary care, further research is needed to evaluate OMT's clinical

TABLE 3: Management for endometriosis.

Treatment Option	Research Support	Mechanism/Proc edure	Benefits	Limitations
Laparoscopic excision/ ablation	Yes – Gold standard with consistent efficacy	Surgical removal or destruction of endometrial lesions	Improves pain and fertility in selected patients	Invasive; requires surgical expertise
Ultrasound-guided ethanol sclerotherapy	Yes – Effective for ovarian endometriomas with low recurrence	Injection of ethanol under ultrasound guidance	Preserves ovarian reserve; minimally invasive	Limited availability; specific to endometriomas
Pre-operative hormonal suppression	Mixed – May ease surgery but no long-term pain benefit	Hormonal therapy before surgery	Facilitates surgical procedure	No improvement in long-term pain outcomes
COCs	Yes – Widely used as first-line therapy	Suppress ovulation and stabilize endometrial tissue	Reduce pain and menstrual symptoms	Do not treat underlying lesions
Progestins	Yes – Effective for pain management	Suppress endometrial growth	Improve pain symptoms	Hormonal side effects; variable efficacy
NSAIDs	Yes – Commonly used for pain relief	Inhibit prostaglandin synthesis	Reduce inflammation and pain	Symptomatic relief only; no effect on disease progression
GnRH agonists	Yes – Effective for pain and lesion reduction	Suppress ovarian hormone production	Improve pain and reduce lesion size	Hypoestrogenic side effects; bone loss
GnRH agonists + add-back therapy	Yes – Well-established	Hormone suppression + low dose add-back estrogen/ progestin	Preserves bone density, reduces menopausal symptoms	Complex regimen, requires monitoring
Elagolix (GnRH antagonist)	Yes – FDA approved with strong evidence	Oral suppression of LH, FSH, estradiol, and progesterone	Improves dysmenorrhea, pelvic pain, and dyspareunia	Symptoms may return after discontinuation; cost considerations
Pentoxifylline	No – Insufficient evidence for efficacy	Immunomodulator	Potential pain and fertility benefits	Lack of supporting data
SERMs	No – May worsen pain; low-quality evidence	Selective estrogen receptor modulation	Theoretical benefit for pain	Worsened outcomes compared to placebo
Targeted nanoparticles	Mixed – Promising in animal models	Site-specific drug delivery and imaging	Potential for precision treatment	Experimental; not yet in clinical use
Early identification and support	Yes – Recommended by guidelines	Timely diagnosis and psychosocial care	Reduces progression and improves quality of life	Requires systemic changes and awareness

Abbreviations: COC, combined oral contraceptive; FSH, follicle-stimulating hormone; GnRH, gonadotropin-releasing hormone; LH, luteinizing hormone; NSAID, nonsteroidal anti-inflammatory drug; SERM, selective estrogen receptor modulator

TABLE 4: Osteopathic interventions for common gynecologic disorders.

Condition	Treatment Option	Focus	Reported Benefit
Endometriosis	MFR, BLT, and indirect fluidic technique	Myofascial tension, lymphatic circulation, somatic dysfunctions of hip/pelvis region	Relief of pelvic tension and pain; reduced recurrent pain and dyspareunia after surgery
PCOS	Physiotherapy (pelvic-focused), general OMT (pelvic alignment and mobility support)	Autonomics, circulatory, endocrine	Improved infertility outcomes, hormonal balance, and pelvic circulation; benefit in promoting endocrine balance and reducing pelvic congestion
Uterine fibroids	General OMT (pelvic alignment and mobility support)	Circulatory, neuroendocrine, somatic dysfunctions of hip/pelvis region	No direct evidence, but may relieve associated pelvic pain and dysfunction
General (all three)	HVLA, MFR, CS, ST, ME, BLT, sacral inhibition, lymphatic pump, pelvic floor release, rib raising, cranial osteopathy	Myofascial tension, lymphatic circulation, somatic dysfunctions of hip/pelvis region, autonomics	May uncover overlooked contributors to pelvic pain (eg, in vulvodynia) and visceral-somatic connections

Abbreviations: BLT, balanced ligamentous tension; CS, counterstrain; HVLA, high-velocity low-amplitude; ME, muscle energy; MFR, myofascial release; PCOS, polycystic ovary syndrome; ST, soft tissue

utility through well-designed condition-specific trials. Osteopathic physicians are well positioned to lead this work by leveraging holistic patient-centered approaches within a multidisciplinary framework. Strengthening the evidence base will help define OMT's role in gynecologic care and inform best practices in family medicine.

It is also important to note that there are various other common gynecologic disorders such as pelvic inflammatory disease, ovarian cysts, vaginal infections, gynecologic cancers, and sexual dysfunction,[73] but these were not included as part of this review.

CONCLUSION

This review illustrates the complex and evolving treatment landscape for PCOS, endometriosis, and uterine fibroids, emphasizing the wide range of available medical, surgical, and integrative options. From hormonal therapies and emerging pharmacologics to interventional procedures and nutritional or herbal adjuncts, management must be tailored to patient goals and symptom profiles. Within this context, osteopathic family physicians are uniquely positioned to integrate OMT with evidence-based conventional and alternative therapies. By addressing somatic dysfunction, autonomic imbalance, and lifestyle factors, OMT may serve as a valuable adjunct in improving outcomes and advancing holistic patient-centered gynecologic care.

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REVIEW ARTICLE

Chronic Pelvic Pain in Females: A Multisystem Perspective for the Osteopathic Physician

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KEYWORDS

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ABSTRACT

Chronic pelvic pain (CPP) is a debilitating condition that significantly impacts the quality of life of females. It is defined as pelvic pain lasting at least 6 months or longer, and stems from multiple etiologies, including gynecologic, gastrointestinal, urologic, musculoskeletal, neurologic, and psychological issues. Considering its complex presentation, CPP management often demands a multidisciplinary approach. This review describes the osteopathic approach to managing CPP. A discussion of the five osteopathic models (biomechanical, respiratory-circulatory, metabolic-nutritional, neurologic, and biopsychosocial) is evaluated, demonstrating how OMT can improve structural imbalances, fluid dynamics, autonomic tone, and mental well-being in females living with CPP. Integrating OMT with nonosteopathic approaches such as pharmacologic treatment, pelvic floor physical therapy, dietary-lifestyle interventions, and behavioral health support provides a holistic framework to manage CPP. In this review, we provide support for the role of osteopathic physicians in the multidisciplinary care of CPP and emphasize the utility of integrative approaches to optimize therapeutic outcomes.

INTRODUCTION

Chronic pelvic pain (CPP) is a multidimensional symptom that demonstrates the interrelationship between structure and function within the female pelvic system. The structures of the pelvic cavity include bones, muscles, ligaments, and fascia that work together to support the pelvic organs and physiologic functions such as continence, sexual activity, and childbirth. When the pelvic system is imbalanced, it can manifest as pelvic floor dysfunction, pelvic floor hypertonicity, or other somatic dysfunctions leading to long-lasting pain that negatively impacts physical and mental health as well as quality of life. CPP can be attributed to various etiologies, including gastrointestinal, gynecologic, musculoskeletal, neurologic, psychological, urologic, and vascular causes.[1,2]

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Although research on CPP has advanced, it is still underdiagnosed and undertreated in primary care. Treatment is typically centered on pharmacologic agents, surgery, or referrals to specialists. In addition to ordering diagnostic tests and prescribing pharmacologic treatments, osteopathic physicians contribute a complementary skillset by providing OMT, a noninvasive and nonpharmacologic option that may reduce symptoms and enhance quality of life. Recent research on OMT has reported reductions in pelvic pain and overall symptom improvement.[3-6] This evidence highlights the role of OMT in symptom reduction and its value as an adjunct to other modalities in CPP treatment. By integrating OMT with conventional care, osteopathic family physicians can expand treatment options and address somatic dysfunction in patients with CPP.

DEFINITION AND EPIDEMIOLOGY

CPP is a complex and often debilitating symptom that affects millions of individuals worldwide, with a higher incidence among females. It is characterized as cyclic or noncyclic pelvic pain persisting for a minimum duration of

TABLE 1: Diagnostic criteria for chronic pelvic pain.

Criterion	Description
Duration	Persistent or recurrent pain lasting ≥6 months
Location	Localized to pelvis, lower abdomen (at or below the umbilicus, lumbosacral back, and/or buttocks)
Pain pattern	Cyclic or noncyclic
Associated symptoms	Dysmenorrhea, dyspareunia, dysuria, dyschezia
Functional impact	Pain impairs daily function or requires medical care, and is associated with negative cognitive, behavioral, sexual, or emotional consequences

6 months and may be associated with symptoms involving the lower urinary tract, bowel, pelvic floor, myofascial tissues, and/or reproductive systems.[1,2,7,8] CPP is also frequently accompanied by negative cognitive, behavioral, sexual, and psychological effects.[8] Pain is typically localized to the pelvis, the anterior abdominal wall at or below the umbilicus, the buttocks or lumbosacral region, and may cause functional disability, impede daily activities, and potentially require medical attention.[9-12] In conjunction with criteria outlined in Table 1, CPP is a diagnosis of exclusion that should be primarily informed by a comprehensive history and physical examination. Diagnostic workup may be supplemented with appropriate imaging and laboratory testing, as clinically indicated, to rule out other potential underlying etiologies as detailed in Table 2.[10,13]

TABLE 2: Differential diagnoses of chronic pelvic pain.

Cause	Mechanism	Associated Symptoms
GYNECOLOGICAL		
Endometriosis	Ectopic endometrial tissue implantation causes chronic inflammation, fibrosis, and nerve desensitization	Bowel and/or bladder discomfort, cyclical pelvic pain, dysmenorrhea, dyspareunia, infertility
Adenomyosis	Endometrial tissue invades the myometrium, leading to chronic inflammation and increased prostaglandin production	Heavy and painful menstrual periods, pelvic pain, and pressure symptoms
Chronic pelvic inflammatory disease	Persistent infection and inflammation lead to scarring, adhesions, and hypersensitization of pelvic nerves	Abnormal discharge, dyspareunia, low-grade fever, pelvic pain
Ovarian cysts	Expansion and/or rupture of cysts lead to peritoneal nerve irritation and inflammatory responses	Bloating, dyspareunia, pelvic pain
Uterine fibroids	Compression of the structures surrounding the uterus causes local inflammation	Frequent urination, heavy menstrual bleeding, pelvic pressure, and pain symptoms
Pelvic adhesion	Fibrotic bands tether organs, restricting mobility and causing pain and inflammation	Bowel and/or bladder dysfunction, pelvic pain, dyspareunia

TABLE 2: Differential diagnoses of chronic pelvic pain. *cont.*

Cause	Mechanism	Associated Symptoms
GYNECOLOGICAL		
Cervical stenosis	Narrowing of the cervical canal leads to obstruction of menstrual flow and increased intrauterine pressure	Infertility, irregular bleeding, painful periods
Obstetric trauma	Vaginal or perineal tearing, nerve damage, or pelvic floor muscle injury during childbirth can lead to chronic pain	Dyspareunia, pelvic pain, perineal discomfort, urinary and/or fecal incontinence
UROLOGICAL		
Interstitial cystitis	Chronic inflammation and dysfunction of the bladder epithelium lead to hypersensitivity and pain	Chronic bladder pain, urinary urgency, urinary frequency
Recurrent urinary tract infections	Persistent infections cause chronic inflammation and nerve irritation in the urinary tract	Dysuria, pelvic pain, urinary urgency, urinary frequency
Bladder dysfunction	Dysfunctional voiding patterns lead to bladder hypersensitivity and pain perception	Incomplete voiding, urinary urgency, urinary retention
Urethral syndrome	Chronic irritation or inflammation of the urethra leads to pain and discomfort	Burning with urination, pelvic pain, urethral tenderness
GASTROINTESTINAL		
IBS	Visceral hypersensitivity and dysmotility lead to abdominal and pelvic pain	Bloating, cramping, diarrhea and/or constipation, pain relief after defecation
IBD	Chronic mucosal inflammation and cytokine release contribute to pelvic pain	Abdominal pain, bloody stools, chronic diarrhea
Chronic constipation	Increased colonic distension and pressure on pelvic nerves cause pain.	Bloating, hard stools, pelvic pressure, straining
Diverticulitis	Inflammation and microperforations in the colon lead to localized and referred pelvic pain.	Altered bowel habits, fever, nausea, lower abdominal pain
Hernias (inguinal, femoral, obturator)	Entrapment or irritation of nerves near the hernia site contributes to pain.	Groin pain, pelvic pain
Colorectal Cancer	Tumor growth within the colon or rectum can cause obstruction, nerve compression, and inflammation	Pelvic and/or lower abdominal pain, rectal bleeding, weight loss

TABLE 2: Differential diagnoses of chronic pelvic pain. *cont.*

Cause	Mechanism	Associated Symptoms
MUSCULOSKELETAL		
Myofascial pain syndrome	Trigger points in pelvic muscles cause referred and localized pain	Localized pelvic pain, muscle tenderness, trigger points
Pelvic floor muscle dysfunction	Muscle hypertonicity or spasms lead to ischemia, nerve compression, and pain	Dyspareunia, pelvic pain, urinary dysfunction
Fibromyalgia	Central sensitization leads to widespread musculoskeletal pain, including the pelvis	Diffuse pain, fatigue, pelvic pain, sleep disturbances, tender points
Herniated lumbar disc	Nerve root compression can cause referred pelvic pain	Lower back pain, pelvic pain, numbness/tingling in legs, sciatica
Sacroiliac joint dysfunction	Inflammation or mechanical dysfunction of the sacroiliac joint causes referred pelvic pain	Buttock/lower back pain, pelvic pain, pain with walking and/or sitting
NEUROLOGIC		
Pudendal neuralgia	Compression or irritation of the pudendal nerve leads to burning and stabbing pelvic pain	Burning sensation, pelvic pain, perineal pain, pain with sitting
Nerve entrapment (ilioinguinal, genitofemoral, obturator)	Direct irritation or compression of peripheral nerves causes chronic neuropathic pain	Burning, shooting pelvic pain along nerve distribution, hypersensitivity
Central sensitization syndromes	Dysfunctional pain processing in the CNS amplifies pelvic pain perception	Allodynia, cognitive issues, fatigue, widespread pain
PSYCHOLOGICAL		
Anxiety, depression	Altered neurotransmitter levels and heightened pain perception contribute to chronic pain	Fatigue, mood changes, pelvic pain, sleep disturbances
Somatization disorder	Psychological distress manifests as physical pain	Vague, widespread pain without a clear organic cause
History of trauma or abuse	PTSD-related heightened pain sensitivity affects pain processing	Anxiety, avoidance behaviors, hypervigilance, pelvic pain
VASCULAR		
Pelvic congestion syndrome	Venous hypertension and reflux cause chronic ischemia and inflammation, leading to pain	Dull and achy pelvic pain, dyspareunia, lower-extremity edema
Varicose veins in the pelvis	Blood pooling leads to increased vascular pressure and nerve irritation	Pelvic heaviness, pain with prolonged standing
May-Thurner syndrome	Left iliac vein compression causes pelvic venous congestion and pain	Lower-extremity edema, pelvic pain
Deep vein thrombosis	Blood clots in the deep veins of the pelvis or legs lead to venous obstruction and inflammation	Unilateral lower-extremity edema, pelvic/lower abdominal pain
OTHER		
Postsurgical pain	Nerve damage or chronic inflammation after surgeries	Pelvic pain, scar tenderness
Chronic postinfectious pain	Residual nerve damage or persistent low-grade inflammation leads to pain	Pelvic discomfort or pain
Adhesions from surgery or infection	Fibrous bands restrict organ movement and contribute to mechanical pain	Bowel and/or bladder dysfunction, dyspareunia, pelvic pain
Physical trauma (eg, pelvic fracture, nerve injury)	Direct mechanical injury or strain leads to musculoskeletal damage, nerve irritation, or scar tissue formation	Pelvic pain and/or tenderness, bowel and/or bladder dysfunction

Abbreviations: CNS, central nervous system; IBD, inflammatory bowel disease; IBS, irritable bowel syndrome; PTSD, posttraumatic stress disorder

CPP is a significant public health burden affecting females globally. Due to variations in diagnostic criteria, patient underreporting, absence of a standardized definition of CPP, and its association with other medical conditions, CPP is often underdiagnosed, making it challenging to determine accurate prevalence rates.[14,15] CPP prevalence is estimated to be as high as 26% in individuals with female anatomy.[16] CPP is most commonly seen in females between the ages of 18 and 50 years, but it is not exclusive to this range and may extend beyond reproductive years, affecting older women as well.[17] One study demonstrates that its prevalence is comparable to asthma and lower back pain.[15] Endometriosis and bladder pain are the two most prevalent medical conditions associated with CPP, affecting approximately 60%–70% of these individuals. Additionally, other common comorbidities affecting at least 20% of CPP patients include IBS, interstitial cystitis, pelvic floor muscle tenderness, and depression.[18]

PATHOPHYSIOLOGY

The pathophysiology of CPP is multifactorial, involving the interaction between inflammatory, muscular, neurologic, and psychological mechanisms. Peripheral mechanisms of CPP occur when nociceptors are activated through tissue injury and inflammation in chronic conditions such as endometriosis, interstitial cystitis, and IBS.[19] Over time, after the inflammation subsides, a continued nociceptive action occurs, resulting in peripheral sensitization where the threshold for nociceptor activation is lowered, leading to hyperalgesia and allodynia.[20] Another mechanism leading to CPP is central sensitization, where the CNS heightens pain perception. Functional neuroimaging studies demonstrate that structural changes in the brain's pain-processing regions lead to abnormal central transmission of pain signals, which persist even after the initial injury has resolved.[21] Musculoskeletal mechanisms

include pelvic floor muscle dysfunction, hypertonicity, postural deviations, or pelvic asymmetries that lead to alterations in muscle mechanics and dynamics, causing pain and discomfort.[22] Psychosocial factors, including anxiety, depression, and trauma history, including adverse childhood experiences, are widespread among individuals with CPP.[23] These factors can regulate pain sensitivity through dysregulation of the hypothalamic-pituitary-adrenal axis and may increase the likelihood of central sensitization.[24]

CLINICAL EVALUATION

Guided by the osteopathic tenet recognizing the interdependence of structure and function, the physician should conduct a comprehensive history and physical examination to detect pathology as well as somatic dysfunctions contributing to the patient's pain. The patient interview should elicit a detailed medical, surgical, obstetric, and gynecologic history, with attention to pain characteristics including duration, location, quality, intensity, temporal pattern, exacerbating and relieving factors, prior interventions, and any correlation with menstruation, micturition, defecation, or sexual activity.[8,10,25,26] A thorough review of systems should address the gastrointestinal, genitourinary, musculoskeletal, neurologic, and psychological systems to narrow the differential diagnosis.[27] The physician should identify alarming signs such as postcoital or postmenopausal bleeding, hematuria, unexplained weight loss, fever, or pelvic masses that may indicate serious underlying pathology, such as an acute abdomen or potential malignancy, requiring immediate investigation.[9,10,28] The International Pelvic Pain Society offers a structured history and physical examination tool that streamlines systematic evaluation.[29] This free resource includes visual pain mapping, symptom quantification scales, validated screening questionnaires, and an in-depth review of reproductive, urinary, and gastrointestinal systems.[8,10] Additionally, clinicians should understand the patient's perception of the pain's origin and utilize standardized tools such as the Quality of Life Scale to assess the impact on daily function.[8,10]

A physical examination should be performed with a focus on the abdominal and pelvic neuromusculoskeletal systems.[8] This encompasses abdominal palpation and pelvic inspection for focal tenderness, surgical scars, vaginal discharge, pelvic organ prolapse, uterine enlargement, masses, and myofascial trigger points.[10] The pelvic examination should consist of the external inspection to evaluate for signs of infection, dermatologic conditions, vulvar malignancy, and neurologic changes, as well as the internal examination, which should include bimanual palpation to assess for uterine or adnexal tenderness, masses, and cervical motion pain.[10] Palpation of the pelvic floor muscles may reveal hypertonicity, tenderness, or trigger points, which may suggest underlying myofascial dysfunction. A focused osteopathic structural exam should include assessment of the abdomen, lumbar spine, sacrum, and sacroiliac joints to evaluate postural abnormalities, gait disturbances, or other somatic dysfunctions potentially contributing to CPP, while being aware that somatic dysfunction anywhere in the body system can influence CPP. Carnett's test may be used to differentiate between visceral pain and abdominal wall pain.[8,10] Additionally, the cotton swab test, applied to the abdominal skin, can help identify cutaneous allodynia.[8,10]

Laboratory testing has limited diagnostic utility in the setting of CPP. When indicated, laboratory tests typically include a complete blood count, urinalysis, pregnancy test, and screening for sexually transmitted infections.[10,28] Transvaginal ultrasound is the first-line imaging modality for visualizing gynecologic structures, and can detect uterine fibroids, ovarian cysts, and characteristics of endometriosis or pelvic inflammatory disease.[8,28] When pelvic ultrasound findings are inconclusive, pelvic magnetic resonance imaging (MRI) may offer better diagnostic insights. If endometriosis or adhesions are suspected and a noninvasive workup is inconclusive, laparoscopy may be indicated to allow visualization and potential therapeutic intervention. If laparoscopy is unremarkable, CPP may be suggestive of chronic regional pain syndrome.[28] Diagnostic nerve blocks may also be helpful to identify peripheral nerve dysfunction as a contributor to CPP, when neuropathic etiology is suspected.[28]

PELVIS ANATOMIC CONSIDERATIONS

To address somatic dysfunctions of the pelvic region, the osteopathic physician must have an understanding of the pelvic anatomy and biomechanics. The pelvic region itself encompasses the bony pelvis, pelvic cavity, pelvic floor, and perineum.[30,31] The pelvic bowel consists of the sacrum, coccyx, and two innominate bones, each comprised of the ilium, ischium, and pubis, which connect at the sacroiliac joints, pubic symphysis, and sacrococcygeal joint, with the spine at the lumbo-sacral joint, the lower extremities at the acetabulum of the hip, and the pelvic floor musculature.[30] This osteoligamentous ring-like structure is divided into the false and true pelvis, supporting trunk stability and pelvic organ function.[31] The pelvic floor is made of the levator ani muscle group (pubococcygeus, iliococcygeus, puborectalis) and coccygeus, along with surrounding muscles such as the piriformis and obturator internus, which regulate continence, support viscera, and stabilize the pelvis and lumbar spine.[32] The pelvic musculature, with its fascial connections, mediates pelvic balance and transmits biomechanical forces during locomotion.

Somatic dysfunction in these musculoskeletal or fascial aspects of the pelvis can lead to altered pelvic mechanics, visceral dysfunction, and pain.

INFORMED CONSENT

Due to the intimate nature of the pelvic region, informed consent must be obtained before initiating diagnosis or OMT.[33] Physicians should facilitate a discussion with the patient that includes:

- A description of the proposed examination and potential treatment, and how they could help address the patient's symptoms
- An explanation of where physical contact is required and anatomic regions involved
- Potential benefits of treatment responses and post-OMT effects
- Contraindications associated with treatment, especially those pertinent to the patient's history and presentation

When patients are not well informed, they may experience psychological distress or muscle tension during treatment, which can interfere with therapeutic benefits and potentially exacerbate their symptoms.[34] Patients retain the right to decline any medical diagnosis or intervention, including OMT, at any point during their treatment.

THE FIVE OSTEOPATHIC MODELS AND OMT FOR CHRONIC PELVIC PAIN

An osteopathic approach emphasizes the integration of body, mind, and spirit to provide holistic care. Utilizing the five osteopathic models, the physician can systematically evaluate how somatic dysfunction may contribute to CPP. An osteopathic treatment plan can be based on a thorough understanding of the patient's risk factors, comorbid conditions, and individualized goals of care. Treatment should be directed at both the underlying etiology of CPP and its associated somatic dysfunctions. OMT has been demonstrated to be effective in the management of CPP by addressing musculoskeletal imbalances, pelvic floor dysfunction, and central sensitization associated with pelvic conditions, including endometriosis.[5,6] Clinical studies have consistently reported that patients receiving OMT experience significant reductions in pelvic pain symptoms, dyspareunia, and improved quality of life outcomes.[3,4] Importantly, OMT is often used as part of a multimodal treatment strategy. It can be integrated with other evidence-based modalities, including, but not limited to, pharmacologic management, surgical interventions, and physical therapy. This integrative approach aims to optimize therapeutic outcomes and enhance overall patient well-being. The overall goal of integrating osteopathic treatment is to restore normal physiologic motion, optimizing healing and function. Potential OMT that can be applied to address CPP is listed in Table 3.[30,31,35,36]

TABLE 3: Potential OMTs for CPP by osteopathic model.

Technique	Basic Steps	Contraindications
BIOMECHANICAL MODEL		
Soft tissue – prone traction (lumbosacral method)	Patient is placed in a prone position. Using both hands, exert a gentle ventral force and create a separation and distraction effect. A gentle, rhythmic, and kneading fashion, or sustained pressure may be applied	Acute lumbar/sacral fracture, severe hip arthritis, acute sprain, joint hypermobility, deep vein thrombosis
Lumbar soft tissue – prone pressure with counterleverage	Patient is placed in a prone position. Apply a ventral and lateral pressure perpendicular to the paraspinal musculature with the cephalad hand and apply a posterior force to lift ASIS with caudad hand in a gentle, rhythmic, and kneading fashion, or with sustained pressure	Acute lumbar/sacral fracture, severe hip arthritis, acute sprain, joint hypermobility, deep vein thrombosis
Lumbar soft tissue – supine extension	Patient is placed in a supine position. Use both hands to contact lumbar paraspinal musculature and apply a ventral and lateral force. A gentle, rhythmic, and kneading fashion, or sustained pressure may be applied	Acute lumbar/sacral fracture, severe hip arthritis, acute sprain, joint hypermobility, deep vein thrombosis
Innominate MET: • Anteriorly rotated innominate • Posteriorly rotated innominate	Anteriorly rotated innominate: Patient is in a supine position. Flex the hip and knee on the affected side to the restrictive barrier. Patient is instructed to gently push against the physician's resistance by trying to extend the hip Posteriorly rotated innominate: Patient is in a supine position. Extend the hip to the restrictive barrier, then the patient is instructed to gently lift the leg against resistance For all MET, patient is instructed to gently contract a specific muscle group against the physician's resistance. After holding the contraction for 3–5 seconds, the patient relaxes, and the physician repositions the body part to a new restrictive barrier. This process is repeated several times	Acute pelvic fracture, sacroiliac joint inflammation or hypermobility, rheumatoid arthritis, severe hip/knee arthritis

TABLE 3: Potential OMTs for CPP by osteopathic model. *cont.*

Technique	Basic Steps	Contraindications
BIOMECHANICAL MODEL		
Still technique innominate: • Anteriorly rotated innominate • Posteriorly rotated innominate	Anteriorly rotated innominate: Patient is in a supine position. Monitor the PSIS and flex the hip and knee on the dysfunctional side. The leg is abducted and externally rotated until motion is felt, then slight compression is applied while the leg is moved into adduction and extension. The extremity is then returned to the neutral position Posteriorly rotated innominate: Patient is in a supine position. Monitor the PSIS and fully flex the hip and knee on the affected side. The leg is then abducted and externally rotated to the point of ease, with slight compression applied through the femur. While maintaining compression, the leg is returned to the neutral position	Pelvic fracture or instability, sacroiliac or hip inflammation, osteoporosis, hypermobility
Soft tissue – gluteus minimus trigger point	With the patient lying on their side, apply firm pressure between the iliac crest and greater trochanter over the gluteus minimus. Pressure is held until the trigger point softens, and a release is felt	Acute hip fracture or infection
Soft tissue – elbow pressure to piriformis	While the patient lies on their side with hips and knees bent to 90 degrees, apply elbow pressure over the piriformis muscle until a release is felt	Acute hip fracture or infection
Suboccipital release	Patient is in a supine position. Contact the occipital sulcus bilaterally and medially with the index and middle fingers, then apply and maintain a linear traction by rolling fingers out laterally	Acute cervical fracture or instability, rheumatoid arthritis, Down syndrome, Chiari malformation
NEUROLOGIC MODEL		
Anterior lumbar counterstrain AL1: Medial to the anterior superior iliac spine AL2: Medial to the anterior inferior iliac spine AL3: Lateral to the anterior inferior iliac spine AL4: Inferior to the anterior inferior iliac spine AL5: Anterior, superior aspect of the pubic ramus just lateral to the symphysis	Patient is in a supine position. AL1: Flex to L1, side bend toward, knees toward the side of dysfunction to rotate L1 away AL2-4: Flex to spinal level, side bend away, knees away, which rotates the lumbar segment toward AL5: Flex, side bend away, and knees toward which rotates the lumbar segment away All treatments should be positioned correctly and maintained for 90 seconds, or until the physician palpates improvement in at least two to three TART findings	Acute lumbar fracture or strain, severe osteoporosis, hip dislocation, herniated disc
NEUROLOGIC MODEL		
Posterior lumbar counterstrain PL1-5 spinous process: inferolateral aspect/tip of the deviated spinous process of the dysfunctional segment PL1-5 transverse process: posterolateral aspect of the transverse process of the dysfunctional segment	Patient is in a prone position. Extend to the affected spinal level by lifting the extremity or ASIS on the side of the tender point, which rotates the pelvis toward and upper segment away from the side of dysfunction, also adduct the lower extremity. All treatments should be positioned correctly and maintained for 90 seconds, or until the physician palpates improvement in at least two to three TART findings	Acute lumbar fracture or strain, severe osteoporosis, hip dislocation, herniated disc, acute radiculopathy
Anterior pelvic counterstrain Psoas: 2/3 distance from ASIS to midline Iliacus: 1/3 distance from ASIS to midline Low ilium: Superior surface of iliopectineal eminence Inguinal: Lateral aspect of pubic tubercle	Psoas: Significant bilateral hip flexion with lumbar sidebending toward the affected side, may involve some hip external rotation Iliacus: Pronounced bilateral hip flexion and external rotation, knees flexed Low ilium: Notable hip flexion on the affected side Inguinal: Thighs flexed with the opposite thigh crossed over the affected thigh, the lower leg All treatments should be positioned correctly and maintained for 90 seconds, or until the physician palpates improvement in at least two to three TART findings	Pelvic or sacral fractures, sacroiliac joint inflammation/ hypermobility, osteoporosis
Posterior pelvic counterstrain Upper pole L5: Superior medial surface of PSIS High ilium sacroiliac: 2-3 cm lateral to posterior superioriliac spine pressing medially toward PSIS Lower pole L5: on ilium, inferior to PSIS pressing superiorly High ilium flare out: Lateral aspect of ILA and/or coccyx PL3 lateral: 2/3 lateral from PSIS to the tensor fasciae latae PL4 lateral: posterior margin of tensor fasciae latae Piriformis: Midpoint between the lower half of the lateral aspect of the sacrum, ILA, and the greater trochanter	Upper pole L5: Hip extension with fine-tuning through adduction and either internal or external rotation High ilium sacroiliac: Hip extension with adduction and fine-tuning through external rotation Lower pole L5: Hip flexed to 90 degrees, slight internal rotation and adduction High ilium flare out: Hip extension with adduction PL3 and PL4 lateral: Hip extension with abduction and external rotation; adjust positioning as needed for tenderness reduction Piriformis: Marked hip flexion and abduction with fine-tuning using internal or external rotation All treatments should be positioned correctly and maintained for 90 seconds, or until the physician palpates improvement in at least two to three TART findings	Pelvic or sacral fractures, sacroiliac joint inflammation/ hypermobility, osteoporosis

Technique	Basic Steps	Contraindications
NEUROLOGIC MODEL		
Occipitoatlantal decompression	Patient is in a supine position. Support the occiput with both hands, placing the middle fingers on the posterior arch of the atlas. Gentle caudad traction is applied as the patient tucks their chin to their chest and holds deep inspirations to enhance articular release	Acute cervical instability, rheumatoid arthritis, vertebrobasilar insufficiency
CV4 technique	Patient is in a supine position. Cup the occiput, placing the thenar eminences on either side of the squama. Gentle medial compression is applied to resist cranial flexion and encourage extension, held until a still point is reached	Coagulopathy, intracranial mass, vertebrobasilar insufficiency
Ganglia release Celiac ganglion: below xiphoid Inferior mesenteric ganglion: above the umbilicus Superior mesenteric ganglion: halfway between the celiac and inferior mesenteric ganglion	Patient is in a supine position. Apply a gentle, sustained pressure with fingertips over the midline abdomen at the level of the targeted ganglion. Pressure is maintained until a softening or release is palpated in the underlying tissues	Abdominal aneurysm, coagulopathy, active intra-abdominal infection
Paraspinal inhibition	Patient is in a supine position. Contact the paraspinal muscles and apply steady pressure lateral to the spinous processes. This pressure is held for 2–5 minutes to reduce hypertonicity and facilitate muscle relaxation	Acute spinal fracture or tumor, infection, osteoporosis
Sacral inhibition	Patient is in a prone position. Place one or both hands over the sacrum, applying gentle, sustained pressure until a release is felt	Sacral fracture, local infection or abscess, coagulopathy, osteoporosis
Abdominal pump	Patient is in a prone position. Place their hands over the thoracolumbar fascia, applying gentle pressure to engage the tissues. The hands are then twisted in opposite directions while maintaining compression and traction to create a myofascial stretch until a release is felt	Recent abdominal surgery or infection, malignancy, deep vein thrombosis, cardiac/pulmonary compromise, pregnancy
RESPIRATORY-CIRCULATORY MODEL		
Thoracolumbar release	Patient is in a prone position. Place their hands over the thoracolumbar fascia, applying gentle pressure to engage the tissues. The hands are then twisted in opposite directions while maintaining compression and traction to create a myofascial stretch until a release is felt	Acute fracture, open wounds, osteoporosis
RESPIRATORY-CIRCULATORY MODEL		
Thoracolumbar release	Patient is in a prone position. Place their hands over the thoracolumbar fascia, applying gentle pressure to engage the tissues. The hands are then twisted in opposite directions while maintaining compression and traction to create a myofascial stretch until a release is felt	Acute fracture, open wounds, osteoporosis,
Lumbosacral compression/ decompression	Patient is in a prone position. Place one hand on the sacrum and the other on the lumbar spine, then gently compress and decompress the fascia by moving the hands together and apart. The fascia is either followed (indirect) or c hallenged (direct) until tissue release is felt	Acute fracture, open wounds, osteoporosis, hypermobility, acute radiculopathy
Thoracolumbar MFR (diaphragm, thoracic outlet)	Patient is in a supine position. Place one hand on the lower ribs and the other on the thoracolumbar spinous processes and gently compress. The fascia is treated either indirectly or directly until a release is felt	Fracture, soft-tissue infection or abscess, aortic aneurysm, coagulopathy, malignancy
Lumbosacral MFR (pelvic diaphragm)	Patient is in a supine position. Place hands on the lumbosacral junction. The fascia is treated either indirectly or directly until the tissue releases	Fracture, soft-tissue infection or abscess, aortic aneurysm, coagulopathy, malignancy
Pelvic MFR	Patient is in a supine position. Place thumbs on either side of the pubic symphysis and apply gentle forces to indirectly or directly facilitate tissue release	Pelvic fracture, deep vein thrombosis, infection, open wound, osteoporosis
Doming of diaphragm	Patient sits up and leans forward while the physician stands behind and places their fingertips beneath the costal margins. Gentle upward pressure is applied during the patient's inhalation to release tension in the diaphragm	Rib fractures, diaphragmatic hernia, recent thoracic/ abdominal surgery
Pelvic diaphragm release (side-lying)	While the patient lies on their side, place fingers in the ischiorectal fossa to engage the pelvic diaphragm. As the patient breathes, the physician applies gentle upward pressure during exhalation to release fascial tension	Pelvic surgery, infection, hemorrhoids, deep vein thrombosis
Sacral rocking	Patient is in a prone position. Place one hand on the sacral base and the other reinforcing it, applying light pressure. A gentle rocking motion is synchronized with the patient's breathing to encourage extension during inhalation and flexion during exhalation	Sacral or pelvic fracture, open sacral wound, osteoporosis, coagulopathy, sacroiliac joint inflammation

Abbreviations: ASIS, anterior superior iliac spine; MET, muscle energy technique; MFR, myofascial release; PSIS, posterior superior iliac spine; TART, tissue texture changes, asymmetry, restriction of motion; tenderness

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OMT is generally safe when performed mindfully and cautiously; however, physicians must be aware of certain contraindications. Absolute contraindications include compromised or friable tissue susceptible to injury.[30] Relative contraindications include dermatologic conditions (contagious skin diseases, acute burns, painful rashes, abscesses, cellulitis, skin cancers); acute inflammatory or traumatic soft tissue injuries (fasciitis, fascial tears, muscle strains, myositis, ligament sprains); infections and neoplasms affecting muscle, ligament, bone (osteomyelitis, bone tumors, osteoporosis), or joints (septic arthritis, joint instability, joint neoplasms); and visceral pathology (organ infections or neoplasms, organomegaly, gastrointestinal obstruction, acute abdominal or pelvic pain).[30] Vascular concerns such as hematomas, deep venous thrombosis, and coagulopathies also necessitate careful consideration.[30]

Biomechanical Model

Biomechanically, OMT can restore structural integrity, alignment, and functional mobility to correct functional alterations in posture and movement related to CPP. Examples include MET, which targets pelvic musculoskeletal restrictions, correcting somatic dysfunctions at the sacroiliac joints and pubic symphysis, thus reducing pelvic discomfort and biomechanical strain.[37] Soft tissue and MFR techniques can address the pelvic fascia, effectively reducing muscular tension, fascial restrictions, and enhancing local tissue mobility and healing.[35,38]

Respiratory Circulatory Model

The respiratory-circulatory model aims to maximize vascular and lymphatic function. Diaphragmatic release techniques applied to the abdominal diaphragm and pelvic diaphragm help enhance respiratory excursion, leading to better fluid and circulatory movement, contributing to overall pelvic homeostasis.[30,31,34,35] Techniques such as thoracic, abdominal, and pedal pumps, pelvic and mesenteric lift, and sacral rocking open pelvic lymphatic channels and vascular structures, improving venous return and lymphatic drainage. Enhanced venous and lymphatic circulation can reduce local and distal swelling and edema, boost immune responses, improve local tissue nutrition and oxygenation, and facilitate metabolic waste removal, thereby alleviating pelvic congestion and inflammation.[39]

Metabolic Nutritional Model

Metabolic-energy model techniques address inflammatory and metabolic components of pelvic pain. Balanced ligamentous tension (BLT) techniques can be utilized to balance pelvic ligamentous strains. This can promote energy efficiency and reduce strain-induced inflammation.[35] Furthermore, dietary and nutritional counseling complements these approaches by targeting systemic inflammation, optimizing metabolic processes, and facilitating tissue repair and healing. Recent studies highlight dietary interventions such as a low-FODMAP (fermentable oligosaccharides, disaccharides, monosaccharides, and polyols) diet, demonstrating efficacy in reducing endometriosis-related pelvic pain and gastrointestinal symptoms.[40,41] Additionally, supplementation with antioxidants such as vitamins C and E has been shown to significantly reduce pain scores in individuals with endometriosis.[42,43] Personalized healthy diet plans have been increasingly recognized for their potential to reduce inflammation, alleviate gastrointestinal symptoms, and improve quality of life in patients with CPP.[44] These interventions may help mitigate oxidative stress and inflammation contributing to pelvic pain.[43]

Neurologic Model

The neurologic model incorporates viscerosomatic and somatovisceral reflexes, facilitated spinal cord segments, Chapman's reflex points, and autonomic imbalance. Segmental facilitation at spinal levels corresponding to pelvic organs (T12–L2 for sympathetic, craniocervical junction, S2–S4 for parasympathetics) leads to heightened nociceptive input and altered autonomic tone, which can contribute to CPP. On physical exam, findings such as tissue texture changes and tenderness can contribute to pain, pelvic floor hypertonicity, and suggest altered visceral function. Chapman's points may reflect ongoing viscerosomatic activity associated with reproductive, urinary, or gastrointestinal dysfunctions.[39] The following are examples of osteopathic techniques that can help normalize neural input: counterstrain, occipitoatlantal decompression, MFR, paraspinal inhibition, sacral inhibition, sacral rocking, and suboccipital release.[34,45]

Biopsychosocial Model

The biopsychosocial model acknowledges behavioral, emotional, and psychosocial components that influence the perception of pain. In CPP, patients frequently present with comorbid anxiety, depression, trauma histories, and social stressors that exacerbate pain intensity and functional impairment.[46] OMT, integrated with mindfulness-based interventions, can increase patient awareness of tension patterns and stress responses, reducing pain perception and emotional distress. This approach is complemented by patient education, stress management techniques, and collaboration with behavioral health specialists to address psychological comorbidities, improving overall quality of life.[46] Cognitive behavioral therapy, mindfulness-based stress reduction, and trauma-informed care have also been demonstrated to reduce CPP severity and improve quality of life.[10,47] OMT can also modulate autonomic tone and reduce somatic manifestations of stress. Techniques such as compression of the fourth ventricle

(CV4), suboccipital release, rib raising, and thoracic inlet MFR may help rebalance the autonomic nervous system, reduce sympathetic overdrive, and support relaxation responses.[30,37]

ALLOPATHIC AND ADJUNCTIVE THERAPIES FOR CPP

Pharmacologic interventions for CPP commonly include analgesics such as nonsteroidal anti-inflammatory drugs (NSAIDs), acetaminophen, and opioids for acute flareups. Neuromodulatory treatments, including tricyclic antidepressants, serotonin norepinephrine reuptake inhibitors, selective serotonin reuptake inhibitors, and anticonvulsants (gabapentin, pregabalin), are increasingly being prescribed for neuropathic components of CPP.[10,27] Hormonal therapies, including oral contraceptives or gonadotropin-releasing hormone agonists, may be effective, especially when conditions such as endometriosis or dysmenorrhea contribute to CPP.[10,48]

Nonpharmacologic interventions include pelvic floor physical therapy, which focuses on muscular strengthening, relaxation, biofeedback, and manual therapy to alleviate myofascial pain and dysfunction.[10,49] Cognitive behavioral therapy is beneficial for managing associated psychological distress, anxiety, and depression commonly comorbid in CPP.[27,47] Acupuncture and yoga also demonstrate promise in reducing pain severity and improving quality of life.[50-52] Additionally, physical activity and exercise have been associated with improved quality of life and reduced pain symptoms in endometriosis, as well as enhanced mental health outcomes in individuals with CPP disorders.[53,54]

CONCLUSION

CPP remains a complex multifactorial condition that benefits from a personalized, multimodal treatment approach. By utilizing the five osteopathic models, clinicians can identify and treat structural, neurologic, circulatory, metabolic, and biopsychosocial contributors to CPP. While these models and the accompanying table of OMT offer a useful guide, it is not a substitute for thorough osteopathic evaluation and personalized treatment based on each patient's unique findings. OMT integrated with nonosteopathic therapies can maximize the efficacy of treatment for CPP.

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REVIEW ARTICLE

Relationship Between Vitamin K Refusal and Refusal of Other Newborn Interventions

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KEYWORDS

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Parental refusal

Vaccine hesitancy

Vitamin K refusal

ABSTRACT

Infants are born with low levels of vitamin K, placing them at risk for vitamin K deficiency bleeding (VKDB). To prevent this, the American Academy of Pediatrics recommends intramuscular (IM) vitamin K for all newborns. However, parental refusal of this and other standard newborn interventions is increasing. While vitamin K refusal has been studied individually, this review explores its association with broader refusals of newborn medical care. A literature search using keywords including newborn, parental refusal, vaccine hesitancy, and vitamin K refusal was conducted across PubMed, Scopus, and PsycINFO databases, covering publications from 2000 to 2025. Fifteen studies were included that examined IM vitamin K refusal and its relationship to other intervention refusals at birth. Findings reveal that parents who refuse vitamin K are significantly more likely to decline other preventative interventions such as hepatitis B vaccine and erythromycin eye ointment. These refusals increase the risk of preventable conditions, including hepatitis B transmission, neonatal conjunctivitis, and VKDB. Trends are more prominent among non-Hispanic white families and those giving birth outside of hospital settings. Often-mentioned reasons for refusal include misinformation, distrust in the medical system, and a preference for "natural" approaches. Continued increases in newborn intervention refusal may contribute to lower vaccination rates and greater public health burdens. This review draws a strong association between refusal of IM vitamin K and refusal of other newborn interventions, emphasizing a need for targeted education and trust-building between families and healthcare providers.

INTRODUCTION

After Minnesota clinicians noticed an increase in refusal of prophylactic vitamin K in infants, a study was performed on a cohort of Minnesota hospital-born infants, showing that incidence of vitamin K refusal had increased between 2015 and 2019.[1] Vitamin K, a crucial assistant to vitamin K–dependent clotting factors, is present in newborns, however, in low levels, which is why the American Academy of Pediatrics (AAP) has been recommending the prophylactic use of additional vitamin K since 1961 to prevent vitamin K deficiency bleeding (VKDB).[2] AAP recommends a vitamin K dose intramuscularly (IM) within 6 hours of birth, with newborns weighing >1500 g receiving 1 mg and newborns weighing ≤1500 g receiving 0.3 mg/kg to 0.5 mg/kg.[3] Refusal of vitamin K alone is not an isolated event, as a study from *Maternal and Child Health Journal* showed that of all parents who refused vitamin K prophylaxis in Nashville-area hospitals, 66% also refused erythromycin eyedrops and neonatal hepatitis B vaccine.[4] While refusal rates, causes, and consequences of vitamin K prophylaxis have been thoroughly studied, the predictive relationship with broader newborn medical intervention refusals has not been deeply reviewed. This literature review aims to explore the relationship between refusal of vitamin K prophylaxis and broader newborn medical intervention, along with beliefs, motivations, and implications that exist within this trend.

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METHODS

Search Strategy

A systematic literature search was conducted in PubMed, Scopus, and PsycINFO covering the period January 1, 2000, to April 30, 2025. Full search terms with Boolean operators included: ("vitamin K" OR "vitamin K prophylaxis" OR "IM vitamin K") AND ("parental refusal" OR "vaccine hesitancy" OR "decline" OR "refusal:) AND ("newborn" OR "infant") AND ("hepatitis B vaccine" OR "erythromycin" OR "newborn interventions").

The search returned 412 articles in PubMed, 298 in Scopus, and 126 in PsycINFO (total = 836). After removing 214 duplicates, 622 unique articles remained for screening.

Screening and Study Selection

Two independent reviewers screened titles and abstracts for relevance. Disagreements regarding inclusion were resolved through consensus; a third reviewer was available but not required. After a full-text review, 15 studies met all inclusion criteria. Reasons for exclusion included:

- Not examining vitamin K refusal (n = 376)
- No assessment of other newborn interventions (n = 144)
- Non–peer-reviewed or review articles (n = 87)

The PRISMA flowchart (shown in Figure 1) details the selection process.

FIGURE 1: PRISMA flowchart.

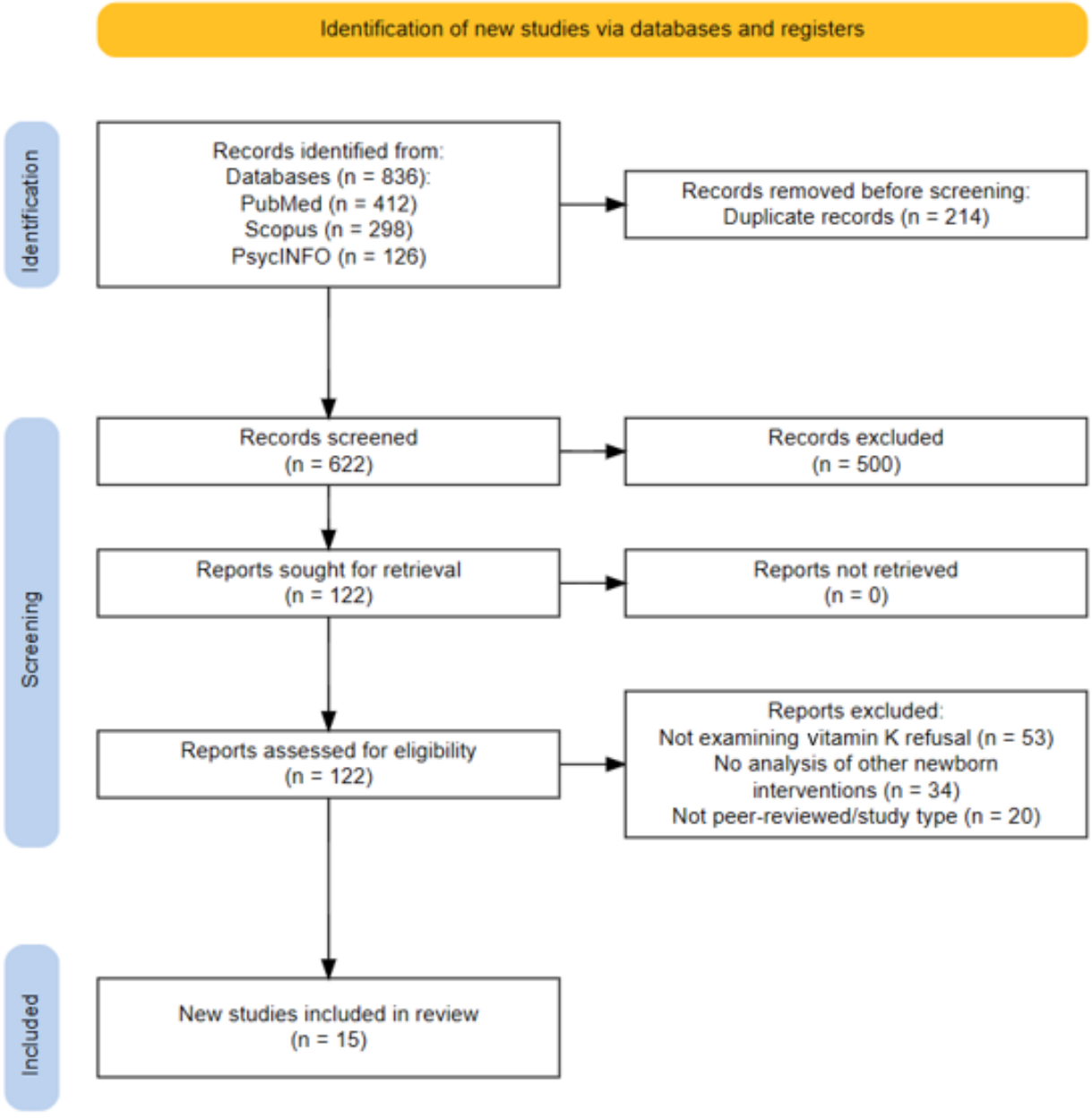

TABLE 1: Study quality based on Newcastle-Ottawa Scale or CASP.

Author(s)	Design	Newcastle-Ottawa (Quantitative)	CASP (Qualitative)	Strengths	Weaknesses
Sahni et al. (2014)	Retrospective cohort	8	NA: quantitative study	Large sample; population-based	Retrospective design
Vereen et al. (2022)	Cohort study (military)	7	NA: quantitative study	Unique population	Limited generalizability
Bernhardt et al. (2015)	Retrospective cohort	7	NA: quantitative study	Clear association w/ immunization rates	Small sample size
Loyal et al. (2018)	Survey study	6	NA: quantitative study	Multicenter data	Self-reported bias
Loyal et al. (2019)	Qualitative interviews	NA: qualitative study	High	Rich parental perspectives	Single-center, small cohort
Hamrick et al. (2016)	Survey study	7	NA: quantitative study	Diverse population sample	Response bias possible
Danziger et al. (2020)	Review of refusal trends	6	NA: quantitative study	Longitudinal trend analysis	Limited to hospital births
Aragona et al. (2021)	Retrospective chart review	6	NA: quantitative study	Documentation trends	Missing demographic data
Marcewicz et al. (2017)	Retrospective cohort	7	NA: quantitative study	Birth-setting comparisons	Retrospective nature
George et al. (2025)	Retrospective cohort	8	NA: quantitative study	Population-based data	Missing variables on refusals
George et al. (2025)	Retrospective cohort	8	NA: quantitative study	Large database	Some missing refusal reasons
Loyal et al. (2017)	Survey study	6	NA: quantitative study	Multicenter network	Self-reporting issues
Loyal et al. (2018b)	Qualitative focus groups	NA: qualitative Study	Moderate	Parent attitudes explored in depth	Small single-center
Hamrick et al. (2015)	Survey study	6	NA: quantitative study	Early refusal data	Limited longitudinal follow-up
Blauvelt et al. (2025)	Retrospective cohort (hospital births)	7	NA: quantitative study	Contemporary data; linked refusal of vitamin K, hepatitis B vaccine, and erythromycin to missed nirsevimab	Refusal rate not isolated for vitamin K; limited to one health system

Inclusion and Exclusion Criteria

Studies were included if they:

1. Investigated parental refusal of IM vitamin K in newborns
2. Explored associations with refusal of other newborn interventions
3. Were original research articles in peer-reviewed journals

Studies were excluded if they:

- Focused solely on vitamin K administration without refusal data
- Lacked analysis of other newborn interventions
- Were nonoriginal studies (eg, reviews, editorials)

Data Extraction

From each study, the following information was extracted:

- Author(s), year, country, and study design
- Population demographics and sample size
- IM vitamin K refusal rates
- Associations with refusal of other newborn interventions
- Key findings and conclusions

QUALITY ASSESSMENT

Study quality was evaluated using the Newcastle-Ottawa Scale for quantitative studies and the Critical Appraisal Skills Programme (CASP) checklist for qualitative studies (see Table 1).

Strengths and Weaknesses of Included Studies

Overall, included studies were of moderate to high quality based on the Newcastle-Ottawa Scale for quantitative research and the CASP checklist for qualitative research. Strengths included adequate sample sizes, population-based or multicenter designs, and strong statistical or qualitative methods, improving generalizability and insights. However, most studies were observational, limiting causal inference. Some qualitative studies had small single-center samples, reducing external validity. Several relied on self-reported parental attitudes, posing response bias risk. Heterogeneity in settings and definitions challenged direct comparison.

TABLE 2: Study characteristics of included primary research articles.

Author(s)	Year	Setting	Sample Size	Refusal Rate (%)	Associated Refusals
George et al.	2025	Minnesota, USA (hospital births)	2015–2019 birth cohort (102,451)	1.30%	More likely to refuse hepatitis B vaccine and eye ointment
Schulte et al.	2014	USA (multistate, case series of VKDB)	7 infants with vitamin K deficiency, 5 with VKDB	100%	Parents who refused vitamin K often also delayed/refused vaccines
Marcewicz et al.	2017	US – Nashville hospitals and Tennessee birthing centers	>3.8 million births	3% in hospitals, 31% in birthing centers	Associated with hepatitis B vaccine refusal and erythromycin
Sahni et al.	2014	Alberta, Canada (population-based)	~282,000 infants	0.3% refused IM vitamin K	Strongly associated with nonimmunization at 2 years
Vereen et al.	2022	US Military Health System	7140 infants	0.07%	Refusal linked with later under-immunization
Bernhardt et al.	2015	New Zealand (retrospective cohort)	3575 babies	3%	Vitamin K refusal predicted later vaccine refusal
Loyal et al.	2018	US hospitals (multisite)	102,878 infants	0.60%	Associated with refusal of erythromycin eye ointment and hepatitis B vaccine
Hamrick et al.	2016	US, 5 community hospitals, 1 academic medical center, 2 birthing centers (Southeast states)	45 parents interviewed	89%	Associated with refusal of erythromycin eye ointment and hepatitis B vaccine
Loyal et al.	2019	Qualitative interviews, US	17 newborns	82% refused; 18% delayed	Not Applicable
Loyal et al.	2017	BORN Network survey (US hospitals)	85 hospitals	Rates varied; refusal up 52% by region	Associated with refusal of other prophylaxis (hepatitis B vaccine + erythromycin)
Loyal and Aragona	2021	US (hospital electronic medical records [EMR] data)	67,750 infants	0.40%	Co-refusal of hepatitis B vaccine and erythromycin
Ye et al.	2024	US academic hospital, New Jersey	2038 infants	0.88%	28% refused all prophylaxis; explored parent decision-making
Blauvelt et al.	2025	US health system (hospital births)	~6000 infants	Not specified for vitamin K alone; refusal linked to missed prophylaxis bundle	Infants who missed vitamin K, hepatitis B vaccine, and erythromycin were also far less likely to receive nirsevimab (0% uptake when vitamin K refused)

TABLE 3: Reported reasons for parental refusal of IM vitamin K.

Category	Example From Studies	Frequency/Studies Reporting
Safety concerns	Fear of preservatives; "too much dose for a newborn"; risk of leukemia (myth); pain; potential side effects	Reported in Hamrick et al. 2016; Loyal et al. 2019; George et al. 2025; Marcewicz et al. 2017; Loyal et al. 2017
Preference for "natural" approach	Belief that baby should stay "pure" and avoid "unnecessary chemicals"; preference for oral vitamin K	Hamrick et al. 2016; Loyal et al. 2019; Loyal et al. 2017; Bernhardt et al. 2015; Marcewicz et al. 2017; Ye et al. 2024
Distrust of medical system	Mistrust of pharmaceutical companies, vaccines, or government mandates; preference for advice from social circle or internet	Hamrick et al. 2016; Sahni et al. 2014; Bernhardt et al. 2015; Marcewicz et al. 2017; Loyal et al. 2019; Ye et al. 2024
Lack of knowledge	Belief that vitamin K is unnecessary or unaware of interventions	Loyal et al. 2017; Bernhardt et al. 2015; Ye et al. 2024
Misunderstanding vitamin K as a vaccine	Parents confused vitamin K injection with hepatitis B vaccine; vaccine hesitancy	Hamrick et al. 2016; Marcewicz et al. 2017; Loyal et al. 2018; Loyal et al. 2017; Ye et al. 2024
Sociodemographic/ Other	Religious objections; prior negative medical experiences; desire for "delayed" interventions	Hamrick et al. 2016; Loyal et al. 2019

RESULTS

Review of several studies shows a strong link between parents who decline IM vitamin K for their newborns and a broader pattern of hesitancy toward routine childhood vaccinations and other early preventive care (Table 2). This connection raises public health concerns, as it may lead to lower immunization rates and increased vulnerability to preventable illnesses.

In a population-based study, Sahni et al. discovered that parents who declined IM vitamin K for their newborns were significantly more likely to have unvaccinated children.[5] This finding was supported by research conducted by Vereen et al., which focused on military families, and revealed that refusing vitamin K at birth often predicted incomplete immunization by the time the child reached 15 months.[6] Bernhardt et al. reported similar findings, noting that infants whose parents declined vitamin K were more likely to be unvaccinated by 6 months.[7] Together, these findings establish vitamin K refusal as an early marker of ongoing vaccine hesitancy (settings, sample sizes, and associated outcomes summarized in Table 2).

Research also demonstrates co-refusal of interventions within birth hospitalization. Loyal et al. observed that

parents declining IM vitamin K frequently refused hepatitis B vaccine birth dose and erythromycin eye ointment.[8] Hamrick et al. reinforced this, finding that 90% of parents who refused vitamin K also declined hepatitis B vaccine, and 77% declined erythromycin, often citing online information about preservatives, dosage, and side effects.[9] Loyal and Aragona (2021) used EMR data to show consistent trends in refusal of vitamin K alongside hepatitis B vaccination and erythromycin eye ointment, demonstrating how these refusals often occur together across hospital settings.[10] Recent evidence adds to these findings. Blauvelt et al. (2025) observed that infants who did not receive standard newborn prophylaxis, such as vitamin K, erythromycin, and hepatitis B vaccine, were much less likely to receive nirsevimab for respiratory syncytial virus (RSV) prophylaxis before discharge. Uptake was 0% among those whose families refused vitamin K.[11] This highlights how refusal of one prophylaxis often predicts cascading refusal of others, even beyond the immediate newborn period (see "Associated Refusals" column in Table 2).

Qualitative studies provide insight into parental motivations (Table 3). Loyal et al. (2019) described parents favoring "natural" methods expressing concerns about preservatives and distrusting conventional medical care.12 Similar themes of safety fears, perceived lack of necessity, and medical mistrust were echoed across multiple surveys and interviews.13 These studies underscore how refusal decisions are shaped by broader belief systems, not just isolated concerns about vitamin K.

Further studies by Marcewicz et al. and George et al. found that vitamin K refusal was more common in out-of-hospital births and among families who also declined other preventive services. George et al. also found that in Minnesota, refusal rates were higher among white non-Hispanic families and those who had midwife-assisted births.[1,4]

However, findings also reveal variation across populations and settings. Marcewicz et al. and George et al. reported higher refusal rates among out-of-hospital births, midwife-attended deliveries, and white non-Hispanic families.[1,4] Danziger et al. (2020) described refusal as occurring along a spectrum, where most parents declined only one intervention and very few rejected all.[14] In contrast, Ye et al. (2024), using a large hospital-based database, found that 28% of families who refused IM vitamin K also declined every form of newborn prophylaxis.[15] These estimates are not contradictory; they reflect different populations and care contexts. Danziger et al. examined in-hospital largely urban cohorts, whereas Ye et al. analyzed a broader dataset that captured settings in which refusal tends to be categorical. This interpretation aligns with settings and populations detailed in Table 2. Taken together, these studies suggest that while many refusals are selective, a significant minority of families, particularly those outside hospital systems, decline all newborn interventions.

In summary, early refusal of IM vitamin K is rarely an isolated decision. It often signals broader parental hesitancy toward preventive care, with patterns varying across populations but consistently carrying implications for both newborn and long-term child health.

DISCUSSION

The reviewed research highlights a consistent association between parental refusal of vitamin K and other newborn interventions, including hepatitis B vaccine and erythromycin eye ointment (Table 2). This pattern suggests that refusal of vitamin K is rarely an isolated health decision but rather part of a broader hesitancy toward conventional newborn care. For many families, these choices reflect deeply held values and beliefs, including a preference for more natural approaches to newborn care and concerns about additives or unexplained ingredients in medical interventions, alongside broader mistrust of healthcare systems and providers (Table 3).

Qualitative studies provide insight into these motivations. For example, in Loyal et al. (2019), one parent explained, "She [the nurse] brought in the actual vial and my husband said that it has 100 mcg of aluminum, and I'm not sure if I want to give our minute-old baby aluminum."[11] This testimonial illustrates how worries about ingredients or preservatives can shape parental decisions.

Refusal of newborn medical interventions poses serious public health challenges. When refusals cluster within certain communities or demographic groups, they create pockets of under-immunized populations who are highly susceptible to preventable illnesses such as VKDB, perinatal hepatitis B, and vaccine-preventable diseases. These clusters compromise herd immunity, increasing the likelihood of localized outbreaks that can spread beyond the initial community, especially impacting immunocompromised individuals and infants too young for routine immunizations. A consistent pattern of multiple newborn intervention refusals shown in this review reflects a broader form of medical hesitancy that can potentially lead to refusal or delay of important routine childhood vaccines.

Importantly, these findings highlight the need to understand parents as partners rather than categorize them as compliant or noncompliant. Many families refusing interventions are motivated by a desire to protect their child, shaped by prior experiences, personal values, and information sources they trust. Recognizing this perspective helps shift conversations from persuasion toward collaboration.

Clinicians can help bridge this gap by initiating conversations early in prenatal care, listening actively to parental concerns, and inviting parents to share the reasoning behind their choices. Practical strategies include using open-ended questions to explore beliefs, clarifying misinformation without judgment, and offering clear evidence-based information in a way that respects parental autonomy. Public health campaigns can further support this effort by providing accessible information and engaging directly with the same online spaces where many parents first encounter vaccine- and vitamin-related content.

Ultimately, early trust-building between parents and providers is essential. By approaching these conversations with empathy, transparency, and respect for parental values, clinicians can prevent cascading refusals, support informed decision-making, and strengthen the physician-patient relationship in ways that benefit both families and communities.

CONCLUSION

This review demonstrates that refusal of IM vitamin K frequently occurs alongside refusal of other newborn prophylaxis, particularly hepatitis B vaccine and erythromycin eye ointment (Table 2). Motivations for refusal are complex and include concerns about preservatives such as aluminum, fears of potential side effects, preferences for "natural" alternatives, misunderstandings that vitamin K is a vaccine, and mistrust of the medical system (Table 3). These perspectives show that refusals are often rooted in a genuine desire to protect the child rather than in simple noncompliance. Although refusal rates remain low in most hospital-based populations, they rise substantially in out-of-hospital births and in settings with midwife-attended deliveries, reflecting differences across populations and care environments. For clinicians, the value of these findings lies not in the observation that refusals cluster, which is already apparent in practice, but in understanding the specific reasons parents provide. This knowledge can support more effective conversations in which providers clarify misconceptions, respect parental values, and build trust to prevent cascading refusals that place newborns and communities at greater risk.

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CLINICAL IMAGE

Newborn Rash: Distinguishing Benign vs Pathological Skin Lesions

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KEYWORDS

Erythema toxicum neonatorum • Neonatal skin lesions • Herpes simplex virus • Transient neonatal pustular melanosis • Neonatal cephalic pustulosis

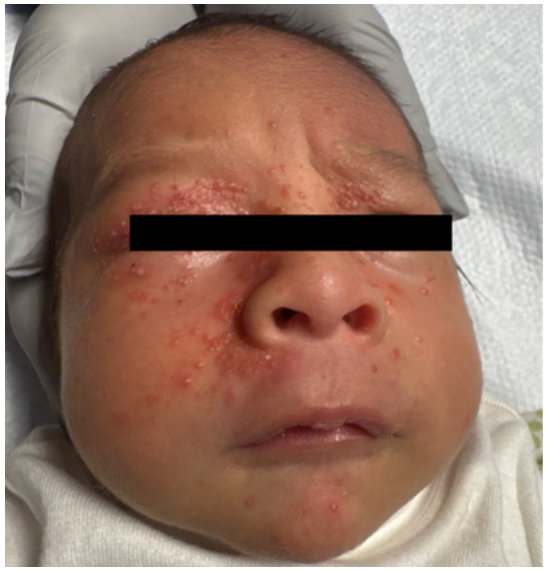
CASE PRESENTATION

A 17-day-old male infant, born at 39 weeks and 3 days' gestation via spontaneous vaginal delivery, was admitted to the pediatric inpatient service for worsening skin rash over the past 5 days. The patient's mother states that the rash started as scattered erythematous papules over the cheeks and nasal bridge. This was consistent with the patient's newborn exam at day 2 of life. He was later seen by his pediatrician for his routine 2-week well-child check, where diffuse erythematous papules were noted over the face (Figure 1A). The rash gradually worsened over the next 2 days, and the patient was subsequently admitted for further evaluation.

On admission, the infant was afebrile, active, and feeding well with no clinical signs of systemic illness. On physical examination, diffuse maculopapular and pustular lesions with erythematous bases were noted over the face (Figure 1B).

FIGURE 1A

FIGURE 1B



QUESTION

1. What is the most likely diagnosis?

A. Erythema toxicum neonatorum

B. Neonatal herpes simplex virus

C. Impetigo

D. Transient neonatal pustular melanosis

E. Neonatal cephalic pustulosis (neonatal acne)

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Correct Answer: A. Erythema toxicum neonatorum

Erythema toxicum neonatorum (ETN) is a benign newborn rash consisting of macules and papules that can develop into yellow pustules with an erythematous base.[1,2] ETN is a nonpruritic rash that typically presents within the first 72 hours of life, with complete spontaneous resolution within 2 weeks, and most commonly affects term male infants.[2,3] ETN can present differently across different skin tones, and erythematous bases may be more subtle on darker skin tones.[3] The rash is typically located on the face and proximal extremities, sparing the palms and soles.[1] The etiology of ETN is still highly debated and unknown.[3-5] Cytologic examination of an ETN pustule would show eosinophilia.[1,2,9] Differentiating benign neonatal rashes like ETN, neonatal cephalic pustulosis, and transient neonatal pustular melanosis (TNPM) from mucocutaneous herpes simplex virus (HSV) and impetigo is vital in clinical practice.

Distinguishing ETN from mucocutaneous HSV is crucial, as HSV requires prompt treatment to avoid potentially life-threatening sequelae like disseminated infection or central nervous system (CNS) disease like meningoencephalitis.[6,7] Neonatal herpes rashes typically appear as mucocutaneous vesicles with erythematous bases around the mouth and eyes with associated systemic signs like fever, lethargy, poor feeding, or irritability. Diagnostic evaluation for neonatal HSV includes surface specimen swabs from the conjunctiva, mouth, nasopharynx, anus, and any vesicular skin lesions for HSV polymerase chain reaction (PCR) or viral culture.[7] Serum PCR can help detect HSV viremia, but it alone is not a definitive indicator of disseminated disease.[7] The diagnostic method of choice for evaluating suspected CNS involvement in neonatal HSV is PCR of cerebrospinal fluid.[7]

Impetigo usually presents as honey-colored crusts (nonbullous) or flaccid bullae (bullous form). Bullous impetigo is commonly caused by Staphylococcus aureus, whereas the nonbullous form is typically caused by Streptococcus pyogenes. Diagnostic testing for impetigo includes lesion culture and gram staining.[8] Except in the rare case of superimposed infection, ETN alone does not normally stain for bacteria on gram stains.

TNPM is a benign, idiopathic, self-limited neonatal skin lesion like ETN.[9] However, TNPM pustules are usually present at birth.[9] TNPM also has a different progression, starting with flaccid and superficial pustules, which progress to scaling and hyperpigmented macules.[4,9] Cytologic examination of a TNPM pustule would show polymorphonuclear neutrophils, unlike the eosinophils seen in ETN.[4,9]

Neonatal cephalic pustulosis (neonatal acne), typically presents later than ETN, usually developing around 2 weeks of life.[10] Neonatal cephalic pustulosis may be caused by an inflammatory reaction to yeast infection from *Malassezia* species, rather than a true acne.[10] However, the current literature is divided regarding the association.[10] Neonatal cephalic pustulosis is usually self-limited but topical 2% ketoconazole or mild topical corticosteroids could be considered for treatment.[10]

Differentiating benign neonatal rashes like ETN, neonatal cephalic pustulosis, and TNPM from impetigo and mucocutaneous HSV is imperative to avoid overtreatment and potentially life-threatening sequelae.

DISCUSSION

The patient was treated empirically with intravenous acyclovir and nafcillin to target HSV and *Staphylococcus*, respectively, while awaiting confirmatory laboratory results. HSV cultures (from the lesion) and serum PCR testing were both ultimately negative. Bacterial culture from the patient's right periorbital lesion showed heavy growth of *Staphylococcus epidermidis*, likely from skin flora rather than a true pathogen. Based on the clinical course, physical exam, and negative diagnostic testing, the patient's final diagnosis of ETN was concluded, and both antimicrobials were discontinued 3 days after initiation of therapy. No pustules, vesicles, or honey-crusted lesions were noted at his 1-month well-child checkup (19 days after onset). Spontaneous resolution of our patient's lesions took longer than the typical 7- to 14-day course of ETN.[3]

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PATIENT EDUCATION HANDOUT

PEDIATRICS

Vitamin K in Newborns

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WHY IS VITAMIN K IMPORTANT IN NEWBORNS?

Vitamin K is a fat-soluble vitamin essential for blood clotting. Newborns have naturally low levels of vitamin K, increasing their risk for vitamin K deficiency bleeding (VKDB).[1,2] Without supplementation, it can take up to 6 months for newborns to develop sufficient clotting.[3]

To prevent VKDB, the American Academy of Pediatrics (AAP) recommends a single intramuscular dose of vitamin K within 6 hours of birth. Infants who weigh less than 1500 g receive 1 mg, while those weighing more than 1500 g receive 0.3–0.5 mg/kg.[3,4]

Why do newborns lack Vitamin K?

- Minimal vitamin K crosses the placenta during pregnancy.
- Newborns have little gut bacteria to make vitamin K.
- Breastmilk contains low levels of vitamin K.

TYPES OF VKDB

VKDB is categorized by timing of onset

- **Early VKDB:** Occurs within 24 hours of birth, often in infants of mothers taking medications that interfere with vitamin K metabolism.
- **Classic VKDB:** Occurs between days 2–7 with typical symptoms of gastrointestinal, skin, or mucosal bleeding.
- **Late VKDB:** Occurs between 2–12 weeks and is most concerning due to life-threatening bleeding, often in the brain. Late VKBD typically presents without warning signs, and without vitamin K prophylaxis, has a mortality rate of 20%–50%. Infants who do not receive the vitamin K injection are approximately 81 times more likely to develop late VKBD compared to those who do receive it.[5]

COMMON CONCERNS AND MISCONCEPTIONS

Is oral vitamin K as effective as the injection?

- Oral vitamin K may prevent classic VKDB, but it is less effective in preventing late-onset VKDB[3]
- Oral vitamin K requires strict parental adherence and multiple doses over several months
- AAP does not recommend the oral vitamin K formulation due to inconsistent absorption

Is the benzyl alcohol preservative harmful?

- The vitamin K injection contains 9 mg/mL of benzyl alcohol[1]
- A toxic dose of benzyl alcohol typically occurs between 99– 405 mg/kg/day, far exceeding the small 0.5- to 1-mg dose newborns receive[6]
- Preservative-free formulations are also available

Can a maternal diet rich in vitamin K prevent VKDB?

- Increasing maternal vitamin K intake does not prevent early-onset VKDB, though it may increase placental vitamin K concentrations

Vitamin K administration at birth remains the safest and most effective way to prevent life-threatening VKDB. Parents are encouraged to discuss any concerns with their physician. Additional resources are available through the Centers for Disease Control and Preventions (CDC) website and AAP.[1,3]

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