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Original article

Management of obesity in the menopause transition and postmenopausal period

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Abstract

Background: The menopause transition and postmenopausal period represent inevitable life stages characterized by physiologic changes that can pose significant health risks, primarily through the effects of estrogen decline on multiple organ systems. The prevalence of obesity during and after menopause is significant. Symptoms derived from menopause, such as poor sleep, sexual dysfunction, and mood changes are often exacerbated in the setting of obesity. Therefore, treating and managing obesity during menopause is essential.

Objectives: The purpose of this review article is to explain the impact obesity bears on midlife and postmenopausal patients, discuss the treatment options available for weight management in this stage of life, including behavioral, medical, and surgical interventions, and review special considerations for hormone therapy in women with increased adiposity experiencing climacteric symptoms.

Methods: A literature review was conducted from February to April 2025.

Conclusions: Many women who seek treatment for obesity and bariatric surgery are perimenopausal or postmenopausal. Raising awareness of the unique considerations in this population can help optimize patient care. (Surg Obes Relat Dis 2026;22:496–506.)

Keywords: Bariatric surgery; Menopause; Perimenopause; Obesity; GLP-1

The menopause transition is an important time in a woman's life characterized by endocrine, somatic and transient psychologic changes that affect physical well-being, quality of life, and morbidity and mortality [1]. It is associated with a conversion from a gynecoid to an android body shape and increased abdominal and visceral fat, which further potentiates the associated cardiometabolic and cancer risks of obesity [2]. Studies show that a substantial portion of menopausal women experience weight gain, with obesity rates reaching 43% or more [3]. An understanding of the physiologic changes that occur during this period and how they affect disease is imperative to providing comprehensive care to menopausal women.

Natural, or physiologic, menopause is defined by the permanent cessation of menses due to loss of ovarian function in women with an intact uterus and ovaries and can only be determined after 12 consecutive months of amenorrhea in women in the expected age range [4]. The menopause transition represents the timeframe prior to the final menstrual period during which the menstrual cycle begins to vary and/or related symptoms of menopause begin to present due to variable ovarian function [5]. Women transition from a eugonadal state in their reproductive years to a hypogonadal state at menopause, characterized by a significant

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decline in circulating estrogen, progesterone, and androgen levels (ovarian hormones) and cessation of menses. In addition to the endocrinologic changes associated with diminishing ovarian function, some potential somatic and psychologic symptoms include vasomotor symptoms (VMS), characterized by hot flushes and night sweats, as well as sleep disturbances, joint pain, mood lability, and genitourinary syndrome of menopause (GSM), among others [6].

The mean age of menopause in the United States ranges from 50–52 across several studies and can vary widely, with almost all women experiencing their final menstrual period between ages 40 and 58 [6,7]. As of 2022, the mean life expectancy for women in the United States was 80.2 years [8]. Thus, women may spend, on average, 40% of their lifespan in menopause, which underscores the relevance of the postmenopausal period and its sequelae to all medical practitioners.

It is well established that obesity in the United States affects women disproportionately. Specifically, severe obesity with a body mass index (BMI) $\geq$ 40 kg/m^2 is nearly double in women (12.1%) compared to men (6.7%), peaking at 14.7% in women aged 40 to 59 years [9]. Obesity rates are calculated at 65% among women aged between 40 and 65 years, and almost 74% among women aged more than 65 years in the United States [10]. Changes in body composition from a gynecoid to an android habitus are common during the menopause transition, which leads to decreased lean muscle mass, increased central and visceral adiposity, and increased epicardial, paracardial, aortic perivascular, and total heart adipose tissue in older women [11–15]. Although ovarian hormone levels diminish, there is a relative increase in bioavailable testosterone due to declining sex-hormone binding globulin levels, which is postulated to be a driving factor in the increase of visceral fat accumulation in the menopausal transition given the presence of androgen receptors on visceral adipocytes [16]. Additionally, intentional weight loss leads to less visceral adipose loss in postmenopausal compared to premenopausal women [17], and the effects of hormone replacement therapy (HRT) on these changes in weight and adipose distribution are conflicting [18,19].

Increased central and visceral adiposity is associated with more severe metabolic diseases including increased aortic plaque and other cardiovascular disease, hypertension, type 2 diabetes, decreased high-density lipoprotein, increased low-density lipoprotein, breast cancer, and osteoarthritis [20]. A Body Shape Index, which is a number derived from a formula based on waist circumference, height, and weight that is used to more accurately assess central obesity than BMI, has been associated with higher mortality rates in postmenopausal women [21]. Joint pain is frequently reported in menopausal women due to decreased joint lubrication and increased cartilage degradation caused by lower circulating estrogen levels, and obesity can compound this given the increased risk of osteoarthritis in this population [20]. In women, weight loss of 5% to 10% has been associated with reduced glucose and triglyceride levels, improvements in high-density lipoprotein and low-density lipoprotein, lower blood pressure, improved chronic pain, and a decreased need for medical therapy to treat diabetes, hyperlipidemia, and hypertension [22]. Additionally, women with obesity are significantly more likely to report VMS during the menopausal transition and immediate postmenopausal period compared to those with normal or overweight BMI [23]. Weight loss has been associated with improved VMS in postmenopausal women [24].

Given the prevalence of severe obesity and increased central adiposity in menopausal women, and its associated negative impact on their health, the prevention and treatment of obesity should be considered an essential component in improving the health and quality of life in this population. The purpose of this article is to review behavioral, pharmacologic, and surgical methods of weight loss in the context of menopause. Finally, as VMS are reported in up to 80% of women undergoing the menopausal transition and HRT is the most effective treatment, we will discuss special considerations of HRT in menopausal women with obesity and VMS [25,26].

Methods

From February to April 2025, a literature review was conducted using the PubMed database with the following keywords: “menopause,” “perimenopause,” “bariatric surgery,” “GLP-1,” and “obesity.” The goal was to identify studies focused on menopausal patients undergoing medical and surgical treatment for obesity. Additionally, publications addressing micronutrient requirements and hormone therapy in menopausal patients with obesity were reviewed. Although not a systematic review, the literature searches were carried out by multiple authors (J.A., M.D., M.S.C.P.; C.Z., M.D., M.S.C.P.; and M.L., M.D.) and the identified articles were reviewed collaboratively. The analysis included observational and retrospective studies, as well as review articles with referenced source manuscripts, covering literature published from 1997 to 2025. Guidelines were developed jointly by authors with key expertise in menopause, women’s health, and bariatric and obesity medicine. Relevant considerations and recommendations are presented in this special issue report.

Discussion

What are the nutritional requirements for postmenopausal women?

During menopause, women experience numerous physiological changes primarily driven by a decline in estrogen and a relative increase in bioavailable testosterone levels

due to a decline in sex hormone-binding globulin despite stable or modestly declining total testosterone [16]. These hormonal shifts impact metabolism, fat distribution, bone density, cardiovascular health, and insulin sensitivity, all of which increase the risk of chronic diseases such as obesity, type 2 diabetes, cardiovascular disease, osteoporosis, and hormone-sensitive cancers [27]. Consequently, nutritional care becomes a cornerstone of both prevention and management during this stage of life. As basal metabolic rate decreases by approximately 250–300 kcal per day, overall energy needs are reduced [28]. Although weight gain in menopause has multiple potential biologic factors, without adjusting caloric intake, weight gain may be further compounded by decreased basal metabolic rate in this population. Women may experience an annual weight gain of up to 2 kg, primarily in the form of visceral fat [28].

Macronutrient balance is essential. Protein intake should be maintained at 1 to 1.2 g per kilogram of body weight daily to prevent the loss of lean body mass and support muscle function [28]. Fat intake should be focused on unsaturated sources, especially omega-3 fatty acids found in fatty fish, nuts, and seeds, while saturated fats should be limited to less than 10% of total energy intake [28]. Carbohydrates should come primarily from complex, fiber-rich sources such as whole grains, legumes, fruits, and vegetables. Daily fiber intake should range between 30 and 45 g, while added sugars should be kept to less than 5% to 10% of total energy intake [28]. Adequate fluid intake, estimated at 33 mL per kilogram of body weight per day, is also essential for supporting metabolic processes, hydration, and thermoregulation [28].

Micronutrient needs also shift after menopause. Postmenopausal women are at an increased risk of vitamin D deficiency, calcium deficiency, and osteoporosis. Calcium becomes critical for maintaining bone health, with a recommended intake of 1000 to 1200 mg per day [27,28]. Vitamin D is equally important for calcium absorption and bone mineralization. Due to limited sun exposure and reduced skin synthesis in older adults, supplementation with 800–2000 IU of vitamin D per day is advised, with higher dosing being of benefit during winter months or in regions with low ultraviolet-B exposure [27,28]. Studies have found that vitamin D ($\geq$ 600 IU/d for age 1–70 years and 800 IU/d for age $>$ 70 years) with supplemental calcium can reduce the rate of postmenopausal bone loss, especially in older women [29]. Results from the Women's Health Initiative (WHI) found that participants taking calcium (1000 mg/d) plus vitamin D (400 IU/d) had a small but significant 1% improvement in hip bone mineral density (BMD) [30]. Meta-analyses of randomized, controlled trials in postmenopausal women (mean age: 71–85 years) revealed that vitamin D doses of 700 IU/d to 800 IU/d were associated with significant reductions in the risk of hip and nonvertebral fractures [31].

Vitamin C, with a recommended intake of at least 100 mg per day, supports collagen production necessary for bone and skin health [28]. B vitamins, particularly B6, B12, and folate, play a vital role in energy metabolism, cognitive function, and reducing homocysteine levels, which are associated with increased cardiovascular and bone fracture risks [27,28]. Iron needs decrease after menopause due to the cessation of menstruation, and excessive iron may contribute to cardiovascular disease, breast cancer, and bone loss [27].

What is the role of behavioral modifications to treat obesity and optimize health in menopause?

Guidelines for treatment of patients with elevated BMI recommend lifestyle changes for all persons with increased weight (BMI $\geq$ 25 kg/m^2) and obesity (BMI $\geq$ 30 kg/m^2). Interventions include dietary changes with a 500–750 kcal/d energy deficit and daily physical exercise of at least 30 minutes of intense walking [32]. These guidelines are dually applicable to postmenopausal women. Multiple studies have shown that walking interventions specifically in perimenopausal and postmenopausal women significantly improve BMI, body weight, and body fat percentage [33,34]. Resistance training should also be included, ideally 2 to 3 times weekly, to improve bone density in postmenopausal women [35]. Importantly, studies have shown that dietary interventions lead to greater reductions in body weight and body composition parameters among perimenopausal and postmenopausal women compared to exercise alone [36]. When combined with exercise, the impact of dietary interventions on weight and body composition is further enhanced [36].

Several large, randomized control trials have specifically assessed behavioral interventions for weight loss in postmenopausal women. The Women on the Move Through Activity and Nutrition (WOMAN) study demonstrated that a behavioral lifestyle intervention incorporating dietary changes, increased physical activity, and behavioral counseling led to significant weight loss and improvements in insulin sensitivity and cardiovascular risk markers over 5 years [37]. The WHI Dietary Modification Trial showed that a low-fat dietary intervention combined with lifestyle counseling produced modest but meaningful weight loss and improvements in some cardiovascular risk factors [38]. Behavioral components such as self-monitoring, goal setting, cognitive-behavioral strategies, and group support were integral to successful and sustainable weight management in both of the above. For those who fail initial behavioral interventions, medical management is advised; however, lifestyle modifications should continually be maintained.

What are the key counseling points and available medical treatment options for managing obesity during menopause?

For patients with BMI $\geq$ 30 kg/m^2 or BMI $\geq$ 27 kg/m^2 with weight-related comorbidities, the addition of medical

management is recommended. Six medical treatment options currently approved by the Food and Drug Administration (FDA) for chronic weight management are presented in Table 1 [39,40]. These include orlistat, combination phentermine and topiramate, combination naltrexone and bupropion, and the glucose-dependent insulinotropic polypeptide/glucagon-like peptide 1 (GLP-1) receptor agonists—liraglutide, semaglutide, and tirzepatide. When selecting between medications, consideration should be given to drug efficacy, side effect profile, insurance coverage, availability, and patient preference and medical comorbidities.

GLP-1 receptor agonists are generally considered the most effective medication class for weight loss management. The mechanism of action of these medications is primarily based on their ability to mimic the effects of the natural hormone GLP-1. They are designed to promote weight loss by influencing several physiological processes, including appetite regulation, insulin secretion, and gastric emptying. Semaglutide is more efficacious than liraglutide [41]. Semaglutide is also more efficacious in women than in men, as evidenced by studies showing that reduction in fat mass and weight in women is significantly increased compared to men [42,43]. Tirzepatide is a dual GLP-1 and glucose-dependent insulinotropic polypeptide receptor agonist and is more efficacious than "traditional" GLP-1 receptor agonists, such as liraglutide, for achieving weight loss [44]. Tirzepatide has also been shown to be more effective for weight reduction in women than in men, with female sex being a significant predictor of greater weight loss [45]. In the SURPASS phase 3 clinical trial program, female sex was independently associated with a higher likelihood of achieving $\geq$ 15% body weight reduction, even after adjusting

Table 1
FDA-approved medications for chronic weight management

Generic name	Mechanism [36,37]	Dosing [37]	Adverse effects [36,37]
Semaglutide	GLP-1 receptor agonist that promotes satiety and weight loss through appetite regulation and slowing gastric emptying	*Injectable* Initial dose .25 mg once weekly Titrated to maintenance dose of 2.4 mg once weekly	Nausea, vomiting, diarrhea, abdominal pain, constipation, increased heart rate, hypoglycemia, and potential increased risk of thyroid cancer
Tirzepatide	Dual GLP-1 and GIP receptor agonist that increases insulin secretion, suppresses appetite, and slows gastric emptying	*Injectable* Initial dose 2.5 mg once weekly Titrated to maintenance dose of 5–15 mg once weekly	Nausea, vomiting, diarrhea, abdominal pain, constipation, increased heart rate, hypoglycemia, and potential increased risk of thyroid cancer
Liraglutide	GLP-1 receptor agonist that increases satiety, slows gastric emptying, and decreases appetite	*Injectable* Initial dose 0.6 mg once daily Titrated to maintenance dose of 3 mg once daily	Nausea, vomiting, diarrhea, abdominal pain, constipation, increased heart rate, hypoglycemia, and potential increased risk of thyroid cancer
Phentermine-topiramate	Phentermine suppresses appetite via norepinephrine release; topiramate affects appetite regulation through GABA receptors modulation	*Oral* Initial dose phentermine/topiramate 3.75 mg/23 mg daily (can titrate up to 15 mg/92 mg daily)	Paresthesias, dizziness, insomnia, dry mouth, constipation, increased heart rate, and potential for memory and cognitive issues
Naltrexone-bupropion	Naltrexone is an opioid antagonist; bupropion is a dopamine and norepinephrine reuptake inhibitor; together they affect the hypothalamus to reduce appetite	*Oral* Week 1: 1 tablet once daily (naltrexone/bupropion 8 mg/90 mg) Week 2: 1 tablet twice daily Week 3: 2 tablets in the morning and 1 tablet in the evening Week 4: 2 tablets twice daily Maximum daily dose: 4 tablets (32 mg/360 mg)	Nausea, headache, constipation, dizziness, insomnia, risk of seizures (especially in individuals with eating disorders), and increased blood pressure
Orlistat	Inhibits pancreatic and gastric lipases, reducing fat absorption in the intestine	*Oral* 120 mg 3 times daily with meals containing fat	Gastrointestinal side effects (e.g., diarrhea, flatulence, oily stool), liver injury, and reduced absorption of fat-soluble vitamins (A, D, E, and K)

FDA = Food and Drug Administration; GLP-1 = glucagon-like peptide-1; GIP = gastric inhibitory polypeptide; GABA = gamma-aminobutyric acid. Mechanisms of action, dosing, and adverse effects are described for the 6 US FDA-approved weight loss medications [39,40].

for other baseline characteristics such as age, race, baseline weight, and glycemic status [46].

The selection of medical management should consider coexisting medical conditions, such as cardiovascular disease and type 2 diabetes. GLP-1 receptor agonists offer specific benefits for patients with these comorbidities. An important consideration for postmenopausal women is that GLP-1s have a neutral or even positive effect on bone metabolism [47] and an improvement in cardiometabolic risk factors [43]. Notably, a recent study found that postmenopausal women with a BMI $\geq$ 25 kg/m^2 taking HRT had an improved weight loss response to semaglutide than those not taking HRT [48]. In this retrospective cohort study evaluating postmenopausal women on semaglutide, 16 were taking HRT and 90 without HRT. Women using HRT had a significantly higher total body weight loss percent at 3, 6, 9, and 12 months, and a greater percentage of women on HRT achieved $\geq$ 5% and $\geq$ 10% total body weight loss at 12 months [48]. As previously noted, research on the role of HRT to assist with weight loss in menopausal women has shown conflicting results. More studies on concomitant HRT and GLP-1 use may be helpful to determine if these medications consistently demonstrate a synergistic effect on weight loss.

What are the relevant discussion points and counseling for surgical management of obesity in menopause?

Efficacy of bariatric surgery in menopausal women

In 2022, the American Society of Metabolic and Bariatric Surgery and the International Federation for the Surgery of Obesity and Metabolic Disorders updated the indications for bariatric surgery to include eligibility for patients without comorbidities above a BMI of 35 kg/m^2 as well as for individuals with metabolic disease and a BMI of 30–34.9 kg/m^2 [49]. These recommendations apply to menopausal women as well. After bariatric surgery, menopausal women experience lower total weight loss, percentage of total weight loss, and change in BMI compared to premenopausal women [49,50]. Ochner et al. [51] demonstrated that women aged 20–45 years lost on average 7 kg more than women aged 55–65 years after gastric banding but did not demonstrate the same age-related effect in men. Waledziak et al. [50] also showed that premenopausal women lost on average 7 kg more than postmenopausal women with a history of gastric band or Roux-en-Y Gastric Bypass (RYGB). Nonetheless, postmenopausal women have lower fat mass and visceral adipose tissue, preserved lean mass, and better lipid profile long-term after bariatric surgery compared to age-matched nonsurgical controls [52]. Interestingly, Asarian et al. [53] demonstrated that in rats that underwent oophorectomy prior to RYGB, postoperative estradiol replacement led to significantly more weight loss compared to rats that did not receive hormone replacement. The previously mentioned studies suggest that the hypothalamic-pituitary-ovarian axis plays a role in the efficacy of bariatric surgery in women; however, further research is needed to further delineate this relationship. Still, bariatric surgery remains the most effective method for weight loss in postmenopausal women with class II obesity and beyond.

Several medical conditions become more prevalent after menopause including but not limited to hypertension, diabetes, hyperlipidemia, osteoarthritis, and coronary artery disease. Bariatric surgery can help treat, eradicate, and/or slow the progression of many of these conditions. For several female-related pathologies, such as endometrial cancer and breast cancer, the risk of these conditions increases with age and is mostly identified in postmenopausal women. Endometrial cancer is the cancer most strongly associated with obesity and for every 10% increase in the waist-to-hip ratio, the risk of endometrial cancer increases by 21% [54]. Decreased incidence of endometrial (odds ratio: .25) and breast cancer (odds ratio: .21) has been associated with RYGB, gastric banding, and vertical sleeve gastrectomy, with gastric bypass associated with the largest cancer risk reduction in hormone-related cancers. Bariatric surgery has also been associated with a 53% decrease in ovarian cancer risk in women with obesity [54].

Perioperative considerations of metabolic and bariatric surgery in menopausal women

Menopausal patients typically fall into an age group that has increased perioperative risk due to medical comorbidities. Overall, however, morbidity and mortality rates for bariatric surgery in elderly patients remain low, and the procedure offers significant benefits in weight loss and improvement of obesity-related comorbidities. Optimizing medical conditions prior to bariatric surgery as well as assessing and minimizing venous thromboembolism (VTE) risk are important aspects of perioperative care for these patients. Medical optimization of common conditions such as diabetes and hypertension and cardiovascular risk assessment and stratification must be addressed, and may require coordination with primary care, endocrinology, cardiology, and/or other specialties. Furthermore, many menopausal women may be taking HRT such as estrogen, progesterone, or androgens, or treatment for hormone-sensitive cancer such as aromatase inhibitors or selective estrogen receptor modulators (SERMs). These medications may carry perioperative risk for VTE or poor wound healing.

In 2021, the Society for Perioperative Assessment and Quality Improvement published a consensus statement regarding the preoperative management of endocrine, hormonal, and urologic medications [55]. Topical HRT and aromatase inhibitors can be continued perioperatively as these medications do not increase VTE risk, although aromatase

inhibitors were associated with poor wound healing in one retrospective cohort study. Similarly, transdermal estrogen and oral progesterone can be continued perioperatively due to the negligible risk of VTE. SERMs used for breast cancer treatment or prevention, oral estrogen therapy, and androgen therapy can be continued leading up to and on the day of surgery. SERMs used for other indications should be discontinued 7 days prior to surgery. Postoperatively, a conversation surrounding risks and benefits must be had with patients regarding the continuation of SERMs and oral estrogen and testosterone replacement given the increased risk for VTE. In some cases, coordination with a patient's medical oncologist may be useful to further counsel on the risks versus benefits of pausing antineoplastic therapy [55,56].

Although there is a paucity of literature specifically addressing mortality and complication rates after bariatric surgery in menopausal women, current data suggest that age, rather than menopausal status, is the primary demographic risk factor for increased complications [51,57–59]. Pooled analyses of large data cohorts reveal higher rates of serious complications, anastomotic leak, and hemorrhage. There are several studies that demonstrated increased risk in elderly patients undergoing surgery. Four of 5 patients undergoing MBS are female, and thus, these studies are likely applicable to the menopausal patient population.

Edwards et al. [60] analyzed the Metabolic and Bariatric Surgery Accreditation and Quality Improvement Program database from 2015–2017 and found that 5%–6% of MBS is performed in elderly patients (aged $\geq$ 65 years) of which all the women were almost certainly menopausal. Mortality from surgery was 3-fold higher in this population and comorbid conditions were the greatest driver of complications. However, mortality and morbidity were significantly less for sleeve gastrectomy compared to other methods in this population [60]. Meta-analyses and large registry studies report 30-day major morbidity rates of 4%–9% and mortality rates of .2%–.7% in those with age more than 65–70 years. These rates are higher than younger cohorts, but still relatively low [61–64]. Counseling elderly menopausal patients on the differences in efficacy and increased risk of morbidity and mortality of MBS can help in indi vidualizing care. Most published studies do not stratify by menopausal status, highlighting the need for future research to report outcomes in this manner for more precise risk assessment [65,66].

In summary, bariatric surgery is safe and effective in well-selected menopausal patients, and menopausal women benefit from significant and sustained weight loss, improved lipid profiles, and reduced visceral adiposity, which can positively impact cardiometabolic risk. Bariatric surgery in elderly women carries a higher short-term risk profile and requires careful preoperative evaluation and procedure selection. Advanced age alone should not preclude surgery; rather, a multidisciplinary approach to patient risk assessment is essential and shared decision-making with the patient is best practice [67].

Impact of micronutrient deficiencies on women in menopause following metabolic and bariatric surgery

There are more than 45 vitamins and minerals required to maintain the health of the human body, all of which can be obtained by a balanced diet rich in fruits and vegetables [6]. Achieving adequate daily intake of micronutrient requirements can be a challenge after MBS, due to increased satiety and malabsorption. Specific nutrients like iron, vitamin D, calcium, vitamin B12, and folate are frequently affected. Additionally, postmenopausal women may be at a higher risk for certain deficiencies, such as vitamin D and calcium, due to reduced absorption and increased bone turnover [68].

Micronutrient surveillance after bariatric surgery is crucial due to the increased risk of deficiencies. Guidelines typically recommend monitoring at 1, 3–6, and 12 months postoperatively, with adjustments based on the specific surgery type and individual needs. While there is not a direct age-based distinction in the surveillance schedule, certain age groups may warrant more frequent or intensive monitoring for specific deficiencies [69]. Specifically, this includes routine monitoring of iron, folate, B12, vitamin D, and monitoring of zinc and copper for malabsorptive procedures or in cases of otherwise unexplained or unresponsive clinical phenomena for other procedures [70,71]. Additionally, screening for vitamin A in all MBS patients at 6 and 12 months in the first postoperative year [72] and review of serum thiamine levels in cases of otherwise unexplained or unresponsive clinical phenomena in all bariatric surgery patients is advised [70].

A daily multivitamin and multimineral supplementation with calcium, vitamin D, vitamin B12, and iron is specifically recommended for all procedures [70,71]. The Clinical Practice Guidelines 2013 update specifies that these recommendations cover the initial postoperative phase (3 to 6 months) and that supplementation should be provided in chewable forms to maximize absorption [70].

What are principal considerations for patients with obesity requesting hormone replacement therapy?

The net effect on endocrine systems following bariatric surgery likely varies on an individual basis and depends on factors such as comorbidities, stage of menopause transition, amount of weight loss, and likelihood to adhere to vitamin supplementation after surgery [73]. Hormone therapy is the most effective treatment for menopause-related symptoms. Current clinical guidelines recommend the use of menopausal HRT for women aged less than 60 years or who are within 10 years of menopause onset

and have a favorable benefit-risk ratio. The FDA-approved indications for HRT include VMS, prevention of osteoporosis, premature hypoestrogenism (due to hypogonadism, bilateral oophorectomy, or primary ovarian insufficiency), and genitourinary symptoms—vulvovaginal atrophy and dyspareunia [74]. Decision-making regarding HRT in patients with a chronic medical condition, such as obesity, can be challenging; however, this clinical conundrum is more the norm than an aberration [75]. Approximately 8 in 10 midlife and 9 in 10 older US adults report 1 or more chronic medical conditions [76]. As previously mentioned, obesity confers an increased risk of metabolic complications, coronary artery disease, VTE, and certain hormone-sensitive cancers, including breast and endometrial cancer. HRT also increases the risk of VTE and breast cancer depending on the formulation prescribed; thus, HRT in patients with obesity may compound these risks. Therefore, it is recommended that any symptomatic menopausal patient whose symptoms could be treated with HRT have a comprehensive cardiovascular risk assessment. No matter a patient's BMI, if the patient's overall 10-year risk for a significant cardiovascular event is low, HRT should not be stopped or withheld, unless the patient desires cessation of treatment. Patients presenting to a bariatric clinic with any of these symptoms should be evaluated and considered for appropriate treatment. Consultation with a menopause or primary care professional is recommended to discuss the best approach for symptomatic treatment, which may include estrogen therapy, lifestyle changes, or other medications.

Vasomotor symptoms

Approximately 80% of women report VMS (hot flashes and night sweats) during the menopause transition. Longitudinal and cross-sectional studies have indicated links between higher body fat and higher BMI to VMS [77]. Perimenopausal and recently postmenopausal women with obesity are more likely to report more severe or frequent VMS [77]. Thus, effective therapies, including HRT, are needed for this population of women. HRT is considered the gold standard treatment for VMS of menopause.

Although studies examining the association between HRT and overall weight loss are conflicting, HRT does result in favorable effects on body composition and fat distribution, preserving lean body mass and reducing visceral adiposity [75]. These effects were demonstrated in the Estrogen/Progestin Interventions trial, in which women in the conjugated equine estrogen (CEE) group (with or without progestogen) weighed 1 kg less than women randomized to placebo after a 3-year follow-up. Women in the CEE only group had a smaller waist circumference compared to those on placebo [78]. Similar findings regarding body fat distribution were observed in the WHI trials over a 6-year period [79]. Although HRT is not recommended in the treatment of central adiposity, patients taking CEE may note favorable body composition changes with use.

Finally, a 2016 longitudinal study analyzed the data of 69 women (aged 35–72 years) undergoing bariatric surgery at preoperative and 6-month postoperative visits. The reported degree of bothersome hot flushes in these midlife women decreased from prebariatric to postbariatric surgery ($P < .01$) [80]. Despite the potential for weight loss and less bothersome VMS after surgery, many women will continue to experience signs and symptoms of menopause that require medical management, including HRT.

It is important to note that obesity is not a standalone contraindication to HRT. However, compounded cardiometabolic risks in patients with obesity and coexisting conditions should be thoroughly assessed and carefully weighed against the potential risks of HRT to determine eligibility for initiation or continued treatment. If there is any uncertainty regarding the appropriateness regarding continuation of HRT, referral to a menopause specialist is recommended.

For patients who are not suitable candidates for HRT, lifestyle modifications—such as weight loss, avoidance of spicy foods, wearing light clothing and pajamas, and use of cooling mechanisms like fans and specialized pillows, sheets, and blankets—can help manage VMS. In addition, several nonhormonal therapies are available, including selective serotonin reuptake inhibitors, with Brisdelle being the only FDA-approved medication in this class; others are used off-label. Others include the alpha-antagonist clonidine, gabapentin, and oxybutynin. A newer treatment for women with contraindications to HRT, fezolinetant, is an FDA-approved selective neurokinin-3 receptor antagonist shown to reduce bothersome hot flashes by 50%–55% [81]. However, unlike estrogen therapy, nonhormonal treatments do not offer protective benefits on bone density and do not address GSM.

Osteoporosis

The relationship between obesity and osteoporosis is complex and not fully understood. Some studies suggest a protective effect of obesity on bone density, while others indicate a link between obesity and increased fracture risk. Although total adiposity has positively correlated with BMD, obesity contributes to bone and muscle fragility, which affects physical function and mobility, leading to decreased activity, decreased BMD, and increased risk of vertebral fractures [82,83]. While obesity may have some protective effects on bone, maintaining a healthy weight is still important for overall health and can help manage osteoporosis risk.

Estrogen is a key hormone that helps maintain bone mass and density by promoting osteoblast activity (bone-building cells) and inhibiting osteoclast activity (bone-resorbing cells). During menopause, estrogen levels decline, leading to increased bone loss and an increased risk of osteoporosis.

Estrogen replacement therapy, often part of HRT, can help reduce bone loss and prevent osteoporosis in postmenopausal women, particularly if started shortly after menopause. Estrogen replacement therapy is not considered treatment for an established osteoporosis diagnosis, and women with osteoporosis should be referred to the appropriate specialist for medical management of this condition.

Genitourinary syndrome of menopause

GSM, formerly known as vulvovaginal atrophy, is a condition characterized by vaginal and urinary symptoms due to declining estrogen levels after menopause. Common symptoms include vaginal dryness, itching, burning, painful intercourse (dyspareunia), urinary urgency, frequent urination, and recurrent urinary tract infections [84]. For bothersome GSM symptoms not relieved with over-the-counter therapies in women without indications for the use of systemic hormone therapy, low-dose vaginal estrogen therapy (cream, tablet, suppository, and ring), vaginal dehydroepiandrosterone, or oral ospemifene are recommended [50]. For selected survivors of breast and endometrial cancer, observational data show that the use of low-dose vaginal estrogen therapy for those who fail nonhormone therapy, such as vaginal moisturizers, for the treatment of GSM appears safe and greatly improves quality of life. These therapies can be used at any age and for extended duration, if needed [50].

Stress urinary incontinence (SUI) and GSM are closely linked through the common effects of estrogen deficiency on urogenital tissues [85]. SUI affects up to 50% of postmenopausal women, with low estrogen levels contributing to pelvic floor muscle weakness, urethral thinning, and decreased tissue elasticity [85]. In addition to vaginal estrogen therapy, pelvic floor physical therapy can be highly effective in relieving SUI symptoms.

Glucagon-like peptide 1 and hormone replacement therapy

For patients who are using GLP-1 agonists or have undergone bariatric surgery, it is important to consider how these methods of weight loss may interact with other medications the patient is taking. As GLP-1 agonists lead to delayed gastric emptying, there is reasonable concern regarding the effect of these medications on oral bioavailability of other medications. Studies have mixed results in premenopausal women with respect to combination hormonal contraception, but there is some evidence that tirzepatide decreases the bioavailability of combined estrogen-progesterone oral contraceptives [86]. Semaglutide does not appear to affect the bioavailability of ethinyl estradiol/levonorgestrel combined oral contraceptives [87], although data on other contraceptive formulations are unavailable. Although this is helpful regarding contraception, combined oral contraceptives almost exclusively contain ethinyl estradiol as the active estrogen ingredient, whereas HRT contains either estradiol or CEEs. GLP-1 agonists may have different effects on the oral bioavailability of these forms of estrogen compared to ethinyl estradiol. Furthermore, the progesterone component of both oral contraceptives and oral HRT can vary greatly, further confounding the ability to make recommendations for management of these medications with concomitant GLP-1 agonist use. It is plausible that if a GLP-1 agonist affects the bioavailability of oral HRT, then a patient's dosage required to treat their symptoms could change. Conversely, as the patient loses weight, their VMS may decrease which could decrease or eliminate the need for HRT. While the systemic levels of hormonal contraceptives are extremely important with regards to preventing pregnancy, the systemic levels of menopausal HRT are not the most important factor in treatment of symptomatic menopausal women. HRT is specifically recommended for symptomatic treatment rather than treating based on serum estrogen, progesterone, or androgen levels. In fact, monitoring of hormone levels in symptomatic menopausal women is not recommended. Of note, transdermal estrogen, which has the lowest risk profile and is the preferred formulation of systemic estrogen therapy, bypasses first pass metabolism and thus should not be affected by GLP-1 agonists. If a menopausal woman on HRT is concomitantly taking a GLP-1 agonist for treatment of their obesity and presents to their provider with worsening or new-onset symptoms of menopause (VMS, vulvovaginal atrophy, dyspareunia, etc.) that can be treated by reviewing and/or adjusting their HRT regimen, they should be referred to a provider with expertise in HRT for medication optimization.

Hormone replacement therapy considerations in menopausal women undergoing bariatric surgery

Further studies examining the effect of HRT on weight loss in menopausal women after bariatric surgery are needed. As both MBS and weight loss affect the metabolism of drugs, adjustments in HRT may be needed based on the patient's symptoms. Furthermore, given the potential for bone loss in menopausal women who have undergone bariatric surgery, HRT can be considered as a method to prevent osteoporosis in this population. The decision to use HRT to improve the weight loss effects of bariatric surgery or to prevent bone loss should be based on the patient's individual medical history and risk factors in consultation with a menopause specialist or primary care physician.

Limitations

The main limitation of this study is that this article is a review article of predominantly observational studies. Randomized controlled trials investigating patients with obesity in the menopause transition and postmenopausal period are limited. Further studies to expand our knowledge surrounding these important topics are necessary to improve the care of menopausal patients with obesity, particularly

with respect to the most effective weight loss therapies and optimal formulations of HRT.

Conclusions

Many women who seek treatment for obesity and bariatric surgery are perimenopausal or postmenopausal. Raising awareness of the unique considerations in this population can help optimize patient care. While obesity is not a contraindication to HRT, cardiometabolic risks should be assessed to individualize care and assure the safest application of therapy. Bariatric surgery can have significant impacts on overall health in aging women. A collaborative, multidisciplinary approach ensures that patients receive comprehensive care, addressing not just weight loss, but also potential nutritional deficiencies, mental health, and other health concerns. Collaborative care helps ensure that patient needs are met, including monitoring for micronutrient deficiencies and appropriate contraceptive and hormone therapy counseling. Specialized care for menopause after bariatric surgery may involve consultations with specialists such as registered dieticians, psychologists, endocrinologists, and menopause certified practitioners. Referral to a menopause specialist is advised if there is any uncertainty about a patient's eligibility for initiation or continuation of hormone treatment.

Finally, inclusion of perimenopausal women in future obesity-related research is essential to better understand the similarities and differences between this population and postmenopausal women. Further investigation into the combined use of HRT and GLP-1 receptor agonists may help determine whether a synergistic effect on weight loss exists. Additional studies are also needed to evaluate the benefits and risks of MBS in menopausal women and the influence of HRT on postsurgical weight loss outcomes.

Disclosures

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