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Uterine Fibroids in Menopause and Perimenopause

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Abstract

Uterine fibroids (UFs) are benign tumors that arise from a single genetically altered mesenchymal stem cell under the influence of gonadal hormones. UFs are the most common benign gynecologic tumors in premenopausal women worldwide. It is estimated that nearly 70–80% of women will develop UFs at some point during their lifetime. UFs often present with abnormal uterine bleeding (AUB), pelvic fullness and may have deleterious effects on fertility. The natural regression of UFs begins in menopause. However, this is a generality as this pathology may still be present in this age group. Many clinicians are concerned about hormone therapy (HT) because of UFs regrowth; nevertheless, research of this subject remains inconclusive. If UFs are present in perimenopause or menopause, they typically manifest as AUB, which represents up to 70% of all gynecological consultations in perimenopausal and postmenopausal women. As AUB is a broad symptom and may not be specific to UFs, a thorough evaluation is required for correct diagnosis and proper treatment accordingly. Understanding the unique characteristics of the available treatment modalities is crucial in deciding the appropriate treatment approach. Decision on treatment modality should be made based on selection of the least morbidity and lowest risk for each patient. Multiple modalities are available; however, surgery remains the method of choice, with the best cure rates. Various attempts to create an inexpensive, safe, and effective drug for the treatments of UFs are still in the early stages of the clinical trials with some showing great promise. Treatment options include tibolone, aromatase inhibitors, selective estrogen receptor modulators, uterine artery embolization and selective progesterone receptor modulators.

Keywords

Uterine fibroids; Menopause; Perimenopause; hormone therapy; leiomyosarcoma

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1. Introduction

1.1 Uterine fibroids

Uterine fibroids (UFs) are benign tumors that arise from a single genetically altered myometrial stem cell under the influence of gonadal hormones. They often present with abnormal uterine bleeding (AUB), pelvic fullness, may have deleterious effect on patient future fertility (1). UFs can present in a wide range of symptoms and severity depending on the location and size of the fibroids. UFs are estimated to be present in up to 70% of women at some point in the life, making their impact on society and quality of life for women is of keen importance for clinicians (2). Although, UFs represent the most common solid tumor in premenopausal women,(3) they are asymptomatic in about half of the affected women and consequently may regress after menopause without any symptoms (4). However, other patients may present with symptoms that heavily influence their daily quality of life including possible infertility. Therefore, it is of grave importance that UF pathogenesis be fully understood and proper treatment plans to be implemented if necessary.

1.2 Role of hormones and uterine fibroids

A staggering feature of UFs is their dependency on ovarian hormones. The role of estrogen and progesterone has been critical in understanding the pathogenesis and treatment of UFs. Fibroids express more estrogen receptors (ERs) and progesterone receptors (PRs) as compared to adjacent normal myometrial tissue (5). Recent findings have shown that estrogen increases the expression of PRs, and their sensitivity on respective tissues including UFs (6).

Studies have shown that UF growth has been suppressed when treated with continuous gonadotropin releasing hormone (GnRH) agonist for a period of 3 months. This is due to the decreased release of estrogen and progesterone in response to downregulation of GnRH receptor at the pituitary gland, thus mimicking menopause (7). These findings verify the critical role of ovarian steroid hormones in the pathogenesis of UFs (8).

1.3 Perimenopause

Perimenopause is the period prior to cessation of menses. During this stage, the levels of important hormones are altered. For instance, follicle stimulating hormones (FSH) levels start to increase gradually, reflecting the end of reproductive years, while estrogen and progesterone gradually decreased (10). Perimenopause is divided into two stages; an early stage: where women experience variability in the length of the menstrual cycle and a late stage where amenorrhea is greater than 60 days (Table 1) (9, 11, 12).

2.1 Uterine fibroids in perimenopause

The prevalence of clinically symptomatic UFs peaks in the perimenopausal years and declines following menopause (9). A large cohort study of California teachers found that among 1,790 women, over 30% of newly diagnosed UFs were between the ages of 45–49 years (Table 1) (13).

Consequently, the general approach when women are asymptomatic or have mild symptoms is to wait for menopause. If symptoms affect the quality of life in this stage, hysterectomy was the treatment of choice. Today, however, we have medical options that ameliorate these symptoms and reduce the size of the UFs (Table 2) (14–18).

2.2 Approach of uterine fibroids in perimenopause

UFs are very common and their symptoms have significant impact on women's quality of life, however, the assumption that they will resolve with the onset of menopause is simplistic and not always valid (4). It is important to consider that AUB accounts for more than 70% of all gynecological consultations in perimenopause and postmenopause (19). Considering the broadness of AUB and the multitude of conditions that may mimic it, a thorough evaluation is important to exclude serious pathology such as carcinoma or complex atypical hyperplasia and to identify the cause of bleeding for proper treatment (20).

3. Menopause and uterine fibroids

3.1 Menopause

Menopause is defined as a permanent cessation of menses for at least 12 months without a pathologic cause. The average onset is at 51 years old, but can vary based on many factors such as parity, socioeconomic status, and current tobacco use (20). Women may present with hot flushes, night sweats, insomnia, vaginal atrophy, dysuria, urinary urgency and sexual dysfunction (9, 10). Body changes that occur related to aging can alter self-image and well-being. Approximately 30–40% of women report that menopausal symptoms reduce performance in the workplace (9, 21).

3.2 Uterine fibroids in postmenopausal women

Fortunately, one of the few benefits of menopause is the regression of myoma size and symptoms (3). A striking feature of UFs is their dependency on the ovarian steroid's estrogen and progesterone. In the presence of menopause the general tendency is for UFs to regress. Mavrelos et al. stated that fibroid growth in women before age 35 is twice as fast compared to women greater than age of 35 (22). Peddada et al demonstrated this was not the case for all races; African American and white women have similar growth rates until the age of 35. However, after age 35 growth rates decline in white but not in African American women (23). Although menopause helps to relieve the symptoms of UFs, it does not prevent the occurrence of UFs. In the same California cohort study mentioned earlier, the second highest incidence of UFs was in the age group of 50–54 years old (13).

4. Reproductive changes in perimenopause vs menopause

4.1 Postmenopausal Fibroids and Obesity

A large prospective cohort study by Sommer EM et al., demonstrated the impact of obesity and hormone therapy (HT) on UFs incidence in postmenopausal women. Their study showed that obesity (defined by the World Health Organization as a body mass index [BMI] >30 kg/m2) doubled the risk of UF irrespective of HT use (12). Since UFs are known to be estrogen responsive, the increased adiposity seen in obese women creates a higher estrogenic

environment from the peripheral conversion of estrogen predisposing them for UFs growth even after the menopause.

4.2 Postmenopausal Fibroids and aromatase enzyme expression

UF cells have been shown to express aromatase enzyme, which is present in subcutaneous fat, and locally synthetizes estrogen from androgenic substances such as androstenedione. This may explain why UFs sometimes do not consistently regress in postmenopausal women even in the absence of ovarian hormonal influence. This also suggests a possible therapeutic role for aromatase inhibitors in treatment of symptomatic UFs (24–26).

4.3 Postmenopausal fibroids and bone health

The menopause transition is a critical period of change in bone strength in women, which sets the stage for development of osteoporosis and fracture susceptibility in older ages. Several prospective cohort studies have documented declines in bone mineral density (BMD) over the menopausal transition. BMD begins to decline at approximately 1 year prior to the final menstrual period (FMP). Conversely, certain hyperestrogenic states such as obesity have been shown to have protective effects on BMD even after factoring in mechanical load on bones. Randell, K.M. et al., stated that perimenopausal and early menopausal women who underwent hysterectomies for symptomatic UFs had lower risk for fractures (27). This finding suggests that higher levels of estrogen in women with symptomatic UFs may have a protective effect on osteoporosis (28).

4.4 Leiomyosarcoma

Differential diagnosis of UFs with adenomyosis, uterine leiomyosarcoma (ULMS) and endometrial polyps is extremely important due to the different outcome and treatment strategies (29). UFs and ULMSs are focal masses within the uterus that often have central necrosis. To-date there is no tool capable of distinguishing these two pathologies before surgery. Occasionally, ULMSs may have elevated lactate dehydrogenase (LDH) isozyme-3 in the serum, but there is no pelvic imaging or biomarker that can reliably differentiate between them, making preoperative diagnosis very difficult (30). Continued growth of any uterine masses and/or bleeding after menopause is worrisome and urgently warrants further evaluation for possible ULMS (29).

4.5 Rare cases of postmenopausal fibroids

Oindi et al presented a case of a 47-year-old African-American woman, with a growing abdominal mass accompanied by menorrhagia and dysmenorrhea for three years prior to presentation. Her past medical history included a diagnosis of UFs for which she underwent a laparoscopic myomectomy with power morcellator six years prior. The physical examination revealed an anterior abdominal wall mass in the left iliac fossa region. As part of further evaluation and to relieve her symptoms, she received a total abdominal hysterectomy and abdominal excision of the mass. Histological examination of the mass revealed benign smooth muscle fibers with characteristics of UFs. Her postoperative recovery was uneventful (31). The use of power morcellator has significant benefits including decreased blood loss, shorter hospital stay, and faster recovery. One of the

disadvantages of the power morcellator is the fragmentation of UFs, which may lead to peritoneal seeding and future growth of parasitic fibroids, as mentioned in the case above. Although this is a late and rare complication of this technique, precaution should be taken to prevent seeding when using the power morcellator (31). If a uterine leiomyosarcoma is mistaken as a benign uterine fibroid, the patient is at risk of seeding of the sarcoma throughout the abdominal cavity through the use of a power morcellator, and thus great precaution should be used.

Another rare case presented by Kyriakopoulos K. et al., showed the influence of BMI on UFs. A 55-year-old Greek woman presented with recurrent UFs despite poor estrogenic environment. Her last menstrual period was at age 44 and BMI was 32kg/m^2. Her past medical history consisted of multiple surgeries due to recurrent UFs. During her first surgery 14 years prior, she had an abdominal hysterectomy with left salpingo-oophorectomy due to a 13 cm UF. Her second surgery was 4 years later, in which the right ovary and a mass in the vaginal cuff were removed. Pathology revealed that the mass was a UF with low mitotic activity. Three years later another surgery was done for recurrence of a tumor at the vaginal cuff during which another mass was found at the right uterosacral ligament. Further evaluation with a transvaginal ultrasound screening was done and three other masses were found in the lower pelvis for which she had her fourth surgery. Pathology revealed, once again, a benign UF with low mitotic activity. Kyriakopoulos et.al., suggested that bilateral oophorectomy or the use of GnRH analog, should be considered along with hysterectomy to prevent recurrence of UFs and thereby prevent the need for multiple surgical interventions (32).

5. Postmenopausal fibroids and hormone therapy

5.1 Hormone therapy (HT)

The North American Menopause Society states that HT has significant benefits in women that start therapy at an age younger than age 60 or who are within 10 years after the first symptoms of menopause have more benefit than risk. This is the most effective treatment for vasomotor symptoms, genitourinary syndrome, and is also a preventive measure for bone loss or fracture. For women who initiate HT after age 60 or after 10 year from the start of menopause, the benefit risk ratio is less favorable due to higher risk of coronary heart disease, stroke, and venous thromboembolism. Since the risk differs depending on the type, dose, duration, and route of administration, hormone therapy should be individualized to find the most appropriate fit for each patient (33).

5.2 Clinical studies of HT effect on postmenopausal fibroids.

The natural regression of UFs in menopause is due to the lower levels of circulating estrogen and progesterone. Many clinicians are concerned about HT because of UFs regrowth. Research on this subject remains inconclusive. Several prospective clinical trials have shown that UF growth peaked within the first two years of HT and it then decreased after the third year (13). Another study suggested that transdermal estrogen and high doses of medroxyprogesterone acetate (MPA) (5mg) may put patient at more risk for increase in UF size (14). Consequently, if HT includes progestin, a lower dose should be used to avoid the

UF growth. Chang et al., states that women who benefit from HT should have ultrasound follow up every three months. If the size of UFs is increased, HT should be discontinued (34).

5.3 Tibolone

Tibolone (TIB) is a prodrug that after oral administration has mixed estrogenic, progestogenic, and androgenic activities. This compound has been proven to preserve bone mineral density, reduce hot flushes, and may increase libido and vaginal lubrication. TIB treatment has shown to have little effect on levels of low-density-lipoprotein cholesterol, but decreases levels of high-density-lipoprotein (HDL) cholesterol and triglycerides. Overall, TIB can be used to reduce menopausal symptoms instead of HT as most studies have shown that it does not increase UF size (Table 2) (14).

6. Management of postmenopausal women at risk for UFs

6.1 Aromatase inhibitors

Aromatase inhibitors, such as letrozole, are a class of drugs that have an antiestrogenic effect mainly used in the treatment of endometriosis, infertility, breast cancer and endometrial cancer. The ability of aromatase to suppress endogenous estrogen levels may prove to be useful in the treatment of UFs related uterine bleeding in postmenopausal obese women. Parsanezhad et al. compared letrozole to GnRH agonist, which is a common treatment for uterine bleeding in postmenopausal women, and stated that the letrozole had the same efficacy and fewer side effects as compared to the GnRH group (Table 2) (15).

6.2 Selective Estrogen Receptor Modulators

Tamoxifen and Raloxifene are selective estrogen receptor modulators (SERMs), a class of drug with tissue specific action through a mixed agonist and antagonist effect on estrogen receptors. Tamoxifen is used for the treatment of breast cancer especially after surgical resection because of its antiestrogenic properties in breast tissue (16). However, in bone and endometrium, Tamoxifen acts as a strong agonist concomitantly with increased risk of endometrial hyperplasia when it is used over a period greater than 5 years. Raloxifene is used for the treatment of osteoporosis. Palomba et al evaluated Raloxifene in postmenopausal women with UFs and concluded that it suppressed the severity of AUB and decreased the size of UFs (18). More studies need to be done to determine the impact therapy of SERMs on UFs (Table 2).

6.3 Uterine artery embolization

Uterine artery embolization (UAE) is an interventional radiologic procedure in which occluding agents are injected into one or both uterine arteries limiting their blood supply to the uterus and UFs as well. The most common complication is postembolization syndrome, which presents as mild fever, pain and vaginal expulsion of the UFs. UAE is a treatment option for women with UFs who are not good surgical candidates or wish to preserve their uterus (35). Chrisman et al conducted a retrospective study to determine the efficacy of UAE for postmenopausal symptomatic women. Their studies demonstrated that 88% of women

with UAE had positive outcomes, thus making UAE a good alternative for hysterectomy (17) (Table 2).

6.4 Selective Progesterone Receptor Modulators

Selective progesterone receptor modulators (SPRMs) are a class of synthetic steroids that have agonist and/or antagonist effect on PRs. Ulipristal acetate (UPA) is SPRM that has been traditionally used as a postcoital contraceptive drug. It exhibits antagonistic properties on the uterus, cervix, ovaries, and hypothalamus. Whilst progesterone promotes the growth of UFs, blocking PRs reduces UF size as proved by the PEARL studies (17). However, to the best of our knowledge, no large studies have been done to determine the effect of UPA on menopausal women with UFs. Changes in the endometrium is the main concern for this drug as it may lead to unbalanced estrogen stimulation, predisposing to a thicker endometrium (Table 2).

7. Conclusion and future directions

UFs are common benign tumors that occur in women throughout their reproductive years with a peak incidence in perimenopausal years, and subsequently the incidence of UFs decreases in postmenopause. In the past, it was thought that UFs would resolve with menopause, however, today, we know that they may still be present and manifest AUB. It is of significant importance to do a thorough evaluation and rule out pathologies with similar clinical presentation to give appropriate individualized treatment. Medical management of UFs may provide symptomatic relief and could be used as a bridge into menopause in which, UFs are thought to regress. It is still not clear why some UFs regress and others do not during this stage of life, however, hormonal regulations are thought to be involved. So far, It is quite challenging and may be nearly impossible to differentiate the UFs and leiomyosarcomas through imaging alone. As such, more research in this area is needed for possible biomarkers or other characteristics that may help differentiate the two as they both may present with the same symptomology. A wide range of treatment options are now available with unique features for each one. It is important for clinicians to know all the available treatment options to individualize treatment for each patient. Although the statement that UFs regress with the onset of menopause is realistic, it does not happen in every case. To-date, the most effective treatment is hysterectomy, although there are other promising therapeutic options under investigation. More research is still needed to understand the pathophysiology and identify risk factors for UFs. Understanding the molecular mechanism of these new therapies options as well as long-term trials with these promising drugs is also needed as information on long-term effects is quite limited. Nevertheless, great improvements are on the horizon as the current clinical trials look promising.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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References

1. Chill HH, Safrai M, Reuveni Salzman A, Shushan A. The Rising Phoenix-Progesterone as the Main Target of the Medical Therapy for Leiomyoma. Biomed Res Int. 2017;2017:4705164. [PubMed: 29312996]
2. Hurst BS. Uterine fibroids. Ultrasound imaging in reproductive medicine. New York: Springer; 2014 p. 117–31.
3. Ghosh S, Naftalin J, Imrie R, Hoo W-L. Natural History of Uterine Fibroids: A Radiological Perspective. Current Obstetrics and Gynecology Reports. 2018;7(3):117–21. [PubMed: 30101039]
4. Giannubilo SR, Ciavattini A, Petraglia F, Castellucci M, Ciarmela P. Management of fibroids in perimenopausal women. Curr Opin Obstet Gynecol. 2015;27(6):416–21. [PubMed: 26536206]
5. Borahay MA, Asoglu MR, Mas A, Adam S, Kilic GS, Al-Hendy A. Estrogen Receptors and Signaling in Fibroids: Role in Pathobiology and Therapeutic Implications. Reprod Sci. 2017;24(9): 1235–44. [PubMed: 27872195]
6. Reis FM, Bloise E, Ortiga-Carvalho TM. Hormones and pathogenesis of uterine fibroids. Best Pract Res Clin Obstet Gynaecol. 2016;34:13–24. [PubMed: 26725037]
7. PRIOR JC. Perimenopause: The Complex Endocrinology of the Menopausal Transition. Endocrine Reviews 19(4): 397–42. [PubMed: 9715373]
8. Tan H, Yi L, Rote NS, Hurd WW, Mesiano S. Progesterone receptor-A and -B have opposite effects on proinflammatory gene expression in human myometrial cells: implications for progesterone actions in human pregnancy and parturition. J Clin Endocrinol Metab. 2012;97(5):E719–30. [PubMed: 22419721]
9. Santoro N, Epperson CN, Mathews SB. Menopausal Symptoms and Their Management. Endocrinol Metab Clin North Am. 2015;44(3):497–515. [PubMed: 26316239]
10. Bacon JL. The Menopausal Transition. Obstet Gynecol Clin North Am. 2017;44(2):285–96. [PubMed: 28499537]
11. Potter B, Schrager S, Dalby J, Torell E, Hampton A. Menopause. Prim Care. 2018;45(4):625–41. [PubMed: 30401346]
12. Sommer EM, Balkwill A, Reeves G, Green J, Beral DV, Coffey K, et al. Effects of obesity and hormone therapy on surgically-confirmed fibroids in postmenopausal women. Eur J Epidemiol. 2015;30(6):493–9. [PubMed: 25784364]
13. Templeman C, Marshall SF, Clarke CA, Henderson KD, Largent J, Neuhausen S, et al. Risk factors for surgically removed fibroids in a large cohort of teachers. Fertil Steril. 2009;92(4):1436–46. [PubMed: 19019355]
14. Ang EFaBV WC Effect of hormone replacement therapies and selective estrogen receptor modulators in postmenopausal women with uterine leiomyomas: a literature review. 2001;4:284–292.
15. Parsanezhad ME, Azmoon M, Alborzi S, Rajaeefard A, Zarei A, Kazerooni T, et al. A randomized, controlled clinical trial comparing the effects of aromatase inhibitor (letrozole) and gonadotropin-releasing hormone agonist (triptorelin) on uterine leiomyoma volume and hormonal status. Fertil Steril. 2010;93(1):192–8. [PubMed: 19135657]
16. Ciebiera M, Łukaszuk K, Męczekalski B, Ciebiera M, Wojtyła C, Słabuszewska-Jóźwiak A, et al. Alternative Oral Agents in Prophylaxis and Therapy of Uterine Fibroids—An Up-to-Date Review. International Journal of Molecular Sciences. 2017;18(12).
17. Chrisman HB, Minocha J, Ryu RK, Vogelzang RL, Nikolaidis P, Omary RA. Uterine artery embolization: a treatment option for symptomatic fibroids in postmenopausal women. J Vasc Interv Radiol. 2007;18(3):451–4. [PubMed: 17377194]
18. Chavez NF, Stewart EA. Medical treatment of uterine fibroids. Clin Obstet Gynecol. 2001;44(2): 372–84. [PubMed: 11347559]

19. Goldstein SR, Lumsden MA. Abnormal uterine bleeding in perimenopause. Climacteric. 2017;20(5):414–20. [PubMed: 28780893]
20. Roberts ME, Aynardi JT, Chu CS. Uterine leiomyosarcoma: A review of the literature and update on management options. Gynecologic Oncology. 2018;151(3):562–72. [PubMed: 30244960]
21. Monteleone P, Mascagni G, Giannini A, Genazzani AR, Simoncini T. Symptoms of menopause - global prevalence, physiology and implications. Nat Rev Endocrinol. 2018;14(4):199–215. [PubMed: 29393299]
22. Mavrelos D, Ben-Nagi J, Holland T, Hoo W, Naftalin J, Jurkovic D. The natural history of fibroids. Ultrasound Obstet Gynecol. 2010;35(2):238–42. [PubMed: 20069541]
23. Peddada SD, Laughlin SK, Miner K, Guyon JP, Haneke K, Vahdat HL, et al. Growth of uterine leiomyomata among premenopausal black and white women. Proc Natl Acad Sci U S A. 2008;105(50):19887–92. [PubMed: 19047643]
24. Shozu M, Murakami K, Segawa T, Kasai T, Inoue M. Successful treatment of a symptomatic uterine leiomyoma in a perimenopausal woman with a nonsteroidal aromatase inhibitor. Fertility and Sterility. 2003;79(3):628–31. [PubMed: 12620453]
25. Ian E Smith MD. Aromatase Inhibitors in Breast Cancer. The new england journal of medicine. 2003;2003;348:2431–42. [PubMed: 12802030]
26. Shozu M, Murakami K, Inoue M. Aromatase and leiomyoma of the uterus Semin Reprod Med. 2004;22(1):51–60. [PubMed: 15083381]
27. Blaszczyszyn M, Szczesna A, Opara J, Konieczny M, Pakosz P, Balko S. Functional differences in upper limb movement after early and chronic stroke based on kinematic motion indicators. Biomed Pap Med Fac Univ Palacky Olomouc Czech Repub. 2018 2018; 162 (4):294–303
28. Tit DM, Bungau S, Iovan C, Nistor Cseppento DC, Endres L, Sava C, et al. Effects of the Hormone Replacement Therapy and of Soy Isoflavones on Bone Resorption in Postmenopause. J Clin Med. 2018;7(10).
29. Wen KC, Horng HC, Wang PH, Chen YJ, Yen MS, Ng HT, et al. Uterine sarcoma Part I-Uterine leiomyosarcoma: The Topic Advisory Group systematic review. Taiwan J Obstet Gynecol. 2016;55(4):463–71. [PubMed: 27590365]
30. Wozniak A, Wozniak S. Ultrasonography of uterine leiomyomas. Prz Menopauzalny. 2017;16(4): 113–7. [PubMed: 29483851]
31. Oindi FM, Mutiso SK, Obura T. Port site parasitic leiomyoma after laparoscopic myomectomy: a case report and review of the literature. J Med Case Rep. 2018;12(1):339. [PubMed: 30428912]
32. Kyriakopoulos K, Domali E, Stavrou S, Rodolakis A, Loutradis D, Drakakis P. Recurrent benign leiomyomas after total abdominal hysterectomy. Rich or poor estrogenic environment may lead to their recurrence? International Journal of Surgery Case Reports. 2018;44:191–3. [PubMed: 29550681]
33. The NHTPSAP. The 2017 hormone therapy position statement of The North American Menopause Society. Menopause. 2017;24(7):728–53. [PubMed: 28650869]
34. Chang IJ, Hong GY, Oh YL, Kim BR, Park SN, Lee HH, et al. Effects of menopausal hormone therapy on uterine myoma in menopausal women. J Menopausal Med. 2013;19(3):123–9. [PubMed: 25371877]
35. Palomba S, Sena T, Noia R, Di Carlo C, Zullo F, Mastrantonio P. Transdermal hormone replacement therapy in postmenopausal women with uterine leiomyomas. Obstet Gynecol. 2001;98(6):1053–8. [PubMed: 11755553]

Table 1.

Hormonal and Genitourinary changes in perimenopause and menopause

Endocrine and urinary system	Miscellaneous	Perimenopause	Menopause	References
Hormone levels	FSH	Decreased	Increased	(11)
	LH	Decreased	Increased	(11)
	Estradiol	Maintained	Decreased	(11)
Vagina	Epithelium	Increased	Decreased	(9)
	Microbiota	Increased	Decreased	(9)
Lower urinary tract	Bladder capacity	Increased	Decreased	(11)
	Urethral closure pressure	Increased	Decreased	(11)
Fibroids	Growth rate	Increased	Decreased	(12)

Abbreviations: Follicle Stimulating Hormone (FSH), Luteinizing Hormone (LH)

Table 2.

Comparison of available treatment for UFs in menopause

Compound	Advantages	Disadvantages	References
Tibolone	Bone mineralization, reduces hot flushes, and may increase libido and vaginal lubrication	Leucorrhea, weight gain	(14)
Aromatase Inhibitor	Used for treatment of breast cancer	Hot flashes, bone loss, increased weight and gastralgia	(15)
Selective estrogen receptor modulator	Bone mineralization, benefit in lipid profile	Tamoxifen can cause endometrial hyperplasia. Depression, mood swings, dry skin, weight gain	(16)
Uterine artery embolization	Recovery is brief in 4 to 5 days, may return to normal activities in two weeks	Postembolization syndrome: pain, fever and malaise	(17)
Selective progesterone receptor modulator	Decrease fibroid size, fast control of uterine bleeding	Endometrial hyperplasia	(18)