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Short Commentary

Uterine Fibroids: Patterns of Occurrence Pathophysiology and Advances in Treatment

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Introduction

Uterine fibroids, also known as leiomyomas, are the most common benign tumours affecting females of reproductive age [1]. Although they can occur in women of all races, research consistently shows that their prevalence, severity, and clinical impact are disproportionately higher among Black women [2]. This disparity is striking, with Black women developing fibroids two to three times more frequently than their Caucasian counterparts, often at a younger age and with a larger tumour burden [3]. In many cases, the condition presents not only as a medical challenge but also as a public health concern, given its impact on quality of life, fertility, and overall reproductive health outcomes [2].

Factors Contributing To The Development Of Fibroids

Genetics likely plays a significant role, with specific gene mutations, such as MED12, being more commonly identified in fibroid tissue [4]. Vitamin D deficiency, more prevalent in individuals with darker skin due to reduced synthesis from sunlight, has been associated with fibroid development [5]. Environmental exposures, including certain dietary patterns and contact with endocrine-disrupting chemicals, may also contribute to pathology [6,7]. Together, these factors create a complex landscape in which Black women experience a heavier and more symptomatic fibroid burden.

The Role of the Uterus Across the Lifespan

In premenopausal women, the uterus is essential for menstruation, implantation, and the nourishment of a developing fetus [8]. Fibroids can distort the uterine cavity, leading to heavy menstrual bleeding, pelvic pain, and in many cases, infertility or recurrent pregnancy loss [9]. In postmenopausal women, the uterus generally becomes less hormonally active, and fibroids often regress due to declining estrogen and progesterone levels. However, persistent or enlarging uterine masses after menopause should be investigated promptly, given the small but real risk of malignancy [7].

Pathophysiology and Complications

The pathophysiology of fibroids reflects a complex interplay of hormonal, genetic, and molecular factors. Estrogen and progesterone drive fibroid growth by stimulating smooth muscle proliferation and extracellular matrix deposition [1]. Growth factors such as transforming growth factor-beta contribute to the dense fibrous structure characteristic of fibroids, while inflammatory mediators further promote vascularization and tumour persistence.

Although fibroids have a low potential for malignant transformation into leiomyosarcoma, which occurs rarely in the population, they can cause significant morbidity [10]. Heavy and prolonged menstrual bleeding often leads to anemia of chronic disease, while distortion of the uterine architecture can interfere with conception and pregnancy [7].

Medical Management: Strengths and Limitations

Treatment approaches for fibroids depend on the patient's symptoms, age, fertility goals, and overall health [11,12]. Medical management is typically the first-line approach for symptom control. Nonsteroidal anti-inflammatory drugs can reduce menstrual discomfort but do not address bleeding volume or tumour size. Hormonal contraceptives, such as combined oral pills or hormonal intrauterine devices, may reduce bleeding but have minimal effect on fibroid regression.

Gonadotropin-releasing hormone agonists can shrink fibroids and control bleeding temporarily, but their use is limited by menopausal side effects and rapid regrowth once therapy is stopped. Selective progesterone receptor modulators, such as ulipristal acetate, have demonstrated efficacy in controlling symptoms and reducing tumour size. However, safety concerns—particularly related to liver toxicity—have restricted their use in some regions [11,13]. While medical therapy can be effective, recurrence after discontinuation is common, and some patients eventually require procedural intervention.

Surgical Options

Surgical options remain a cornerstone of fibroid management [14]. Myomectomy, which involves surgical removal of fibroids while preserving the uterus, is preferred in women who wish to maintain fertility. The procedure can be performed hysteroscopically, laparoscopically, or via open abdominal surgery, depending on fibroid size, number, and location. Although myomectomy has high success rates in symptom relief and improving fertility, new fibroids may develop over time [11]. Hysterectomy, the complete removal of the uterus, provides a definitive cure and eliminates recurrence risk, making it a suitable choice for women who have completed childbearing and

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seek a permanent solution. Less invasive options, such as endometrial ablation, can address heavy bleeding in selected cases but are ineffective for large or deeply embedded fibroids and are not appropriate for women desiring future pregnancies [11].

Minimally Invasive and Newer Techniques

In recent years, minimally invasive and uterus preserving procedures have expanded treatment possibilities [15]. Uterine Artery Embolization (UAE) involves blocking the blood supply to fibroids, leading to their shrinkage [16]. It offers a shorter recovery time compared to surgery. UAE preserves the uterus, although it may affect fertility and is associated with post-embolization syndrome—characterized by pain, fever, and malaise in the days following the procedure [17]. MRI-Guided Focused Ultrasound Surgery (MRgFUS) is another emerging option, utilizing high-intensity ultrasound waves to thermally ablate fibroid tissue without the need for incisions [16]. While promising, MRgFUS is currently limited to specific types and locations of fibroids and is not yet widely available [18].

The Role of Education and Shared Decision-Making

Given the variety of available interventions, patient education remains essential. Many women are not fully informed of all treatment options, leading to unnecessary delays in care or overly aggressive interventions when more conservative measures could be effective. Health professionals should ensure that patients understand the risks and benefits of each approach, including the impact on fertility and overall quality of life [7].

For younger women, fertility preservation often becomes the primary concern, making options such as myomectomy or selective medical therapy more appropriate. In contrast, older women, particularly those with completed childbearing or those at higher risk for uterine cancer, may find definitive procedures such as hysterectomy more appealing. Importantly, counselling should be culturally sensitive, as fibroid-related morbidity disproportionately affects Black women, many of whom experience additional barriers in accessing comprehensive gynecological care [2].

Conclusion

Uterine fibroids represent a significant burden on women's health globally, but the disparities seen among Black women underscore the need for targeted research, prevention, and management strategies. While medical management offers symptom control, recurrence is common, necessitating procedural or surgical approaches for many patients. The rise of minimally invasive and uterus-preserving technologies such as uterine artery embolization and MRI-guided focused ultrasound highlights the progress being made, yet these options remain underutilized due to availability, cost, and awareness barriers.

Ultimately, empowering women with accurate knowledge and a comprehensive range of treatment options is critical. Individualized, patient-centered decision-making—considering fertility goals, age, comorbidities, and personal preferences—remains the cornerstone of effective fibroid management. Addressing systemic inequities and improving access to innovative treatments will help ensure better outcomes, especially for those populations most heavily affected.

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