BG Pulse Journal USA
ISSN:1947-2536 http://www.bgpulseusa.com/index.php/bg
BG PULSE JOURNAL

UDC 618.14-005.1-02-036.1-07-08

ETIOPATHOGENESIS, MODERN DIAGNOSTICS, AND TREATMENT METHODS OF ABNORMAL UTERINE BLEEDING

Karimova Sabrina Abdujabbor qizi
Murodova Dilnavoz Ilhom qizi
Axtamova Nilufar Akbarjanovna
Samarkand State Medical University, Samarkand, Uzbekistan
https://doi.org/10.5281/zenodo.20390977

Annotation

Background: Abnormal Uterine Bleeding (AUB) is one of the most frequent and debilitating gynecological pathologies, heavily impacting the physical health, psychological well-being, and social functioning of women. The transition from outdated terminology to the modern FIGO (International Federation of Gynecology and Obstetrics) PALM-COEIN classification system has revolutionized the etiological understanding of this condition.

Aim: This study aims to extensively evaluate the etiopathogenesis of AUB and compare the clinical efficacy of modern, targeted hysteroscopic and medical interventions against conventional diagnostic and therapeutic protocols.

Materials and Methods: A prospective clinical investigation was conducted involving 80 female patients presenting with chronic abnormal uterine bleeding. The 80 patients were strictly divided into two groups: a modern method group (n=40) utilizing advanced 3D transvaginal sonography, diagnostic hysteroscopy, and personalized therapies (such as the Levonorgestrel-releasing intrauterine system [LNG-IUS] and targeted resections), and a control group (n=40) managed through traditional blind dilation and curettage (D&C) alongside systemic oral hemostatics.

Results: The modern diagnostic protocol allowed for precise etiological stratification according to the PALM-COEIN system, identifying structural anomalies (polyps, leiomyomas) in over 50% of the cohort. Post-treatment evaluation demonstrated that the modern targeted approach yielded a statistically significant reduction in menstrual blood volume (reducing the PBAC score from 285 to 68) and a rapid restoration of hemoglobin levels (from 8.2 g/dL to 12.4 g/dL) compared to the control group.

Conclusion: Implementing modern diagnostic modalities—specifically hysteroscopy paired with precise etiological classification—eliminates the need for blind, traumatic interventions. Personalized targeted therapy ensures superior hemostatic control, rapid hematological recovery, and the prevention of disease recurrence.

Keywords: abnormal Uterine Bleeding (AUB), PALM-COEIN classification, hysteroscopy, etiopathogenesis, Levonorgestrel-IUS, endometrial hyperplasia, targeted therapy.

Introduction

Defining the Pathology and the Shift in Terminology

Abnormal Uterine Bleeding (AUB) encompasses any deviation from the normal menstrual cycle in terms of frequency, regularity, duration, or volume of blood flow in non-pregnant women [1]. For decades, the medical community relied on confusing, poorly defined Latin and Greek terms

such as "menorrhagia," "metrorrhagia," and "dysfunctional uterine bleeding." Recognizing the severe clinical limitations of these terms, the International Federation of Gynecology and Obstetrics (FIGO) introduced the comprehensive PALM-COEIN classification system, which fundamentally shifted the global paradigm toward an etiology-based understanding of the disorder [2].

Etiopathogenesis: The PALM-COEIN Framework

The etiopathogenesis of AUB is profoundly complex and is now systematically categorized into structural (PALM) and non-structural (COEIN) causes.

- **Structural Causes (PALM):** This category includes Polyps (AUB-P), Adenomyosis (AUB-A), Leiomyoma (AUB-L), and Malignancy/hyperplasia (AUB-M). The pathogenesis here is primarily driven by anatomical distortions of the uterine cavity, increased endometrial surface area, and aberrant local angiogenesis that prevents the normal vasoconstriction of spiral arteries during menstruation [3].
- **Non-Structural Causes (COEIN):** This encompasses Coagulopathy (AUB-C), Ovulatory dysfunction (AUB-O), Endometrial primary dysfunction (AUB-E), Iatrogenic causes (AUB-I), and Not otherwise classified (AUB-N). At the molecular level, AUB-E, for instance, is characterized by a localized deficiency in endometrial vasoconstrictors (like endothelin-1 and prostaglandin F2α) and an overexpression of vasodilators (such as prostaglandin E2) and plasminogen activators, leading to profound local fibrinolysis and uninhibited bleeding [4].

Modern Diagnostic and Therapeutic Paradigms

The traditional diagnostic standard of blind dilation and curettage (D&C) is now considered archaic and frequently misses focal lesions such as small submucous myomas or polyps [5]. Modern diagnostics mandate the use of transvaginal 3D ultrasound, saline infusion sonohysterography, and office hysteroscopy. Hysteroscopy allows for direct visualization and targeted biopsy of the endometrium, minimizing trauma [6]. Concurrently, modern therapeutic principles have shifted away from high-dose systemic estrogens toward targeted organ-level therapies, such as hysteroscopic polypectomy, endometrial ablation, and the localized continuous delivery of progestins via the LNG-IUS, which induces profound endometrial atrophy and effectively halts abnormal bleeding at the molecular level [7].

Material and Methods

Study Design and Clinical Cohort

A prospective, randomized clinical trial was designed to evaluate the efficacy of modern diagnostic and therapeutic protocols. The study cohort was strictly limited to 80 female patients (ages ranging from 25 to 48 years) experiencing persistent AUB for a minimum of three months.

Inclusion Criteria: Negative pregnancy test, documented hemoglobin drop (anemia secondary to blood loss), and a Pictorial Blood Loss Assessment Chart (PBAC) score exceeding 100 points per cycle.

The 80 patients were divided into two parallel therapeutic cohorts:

1. **Modern Method Group (n=40):** Diagnosed primarily via high-resolution 3D transvaginal Doppler ultrasound and diagnostic office hysteroscopy. Interventions were etiology-specific: structural lesions (PALM) were treated with targeted hysteroscopic resection (myomectomy/polypectomy), while non-structural pathologies (COEIN) were treated with the insertion of a Levonorgestrel-IUS (Mirena) or specific systemic antifibrinolytics (Tranexamic acid).
2. **Control Group (n=40):** Diagnosed using conventional 2D pelvic ultrasound. Hemostasis and diagnosis were achieved via traditional blind fractional dilation and curettage (D&C) under general anesthesia, followed by standard oral progestin therapy (Norethisterone) administered from days 15 to 26 of the cycle.

BG Pulse Journal USA
ISSN:1947-2536 http://www.bgpulseusa.com/index.php/bg
BG PULSE JOURNAL

Outcome Measures and Statistical Analysis

Clinical efficacy was measured using the PBAC scoring system to objectively quantify menstrual blood loss, alongside hematological parameters (Hemoglobin and Ferritin levels) measured at baseline, 3 months, and 6 months post-intervention. Statistical comparisons were executed using Python data analysis libraries, with significance defined at a p-value of <0.05.

Result and Discussion

Etiological Stratification via PALM-COEIN

Accurate clinical outcomes rely entirely on identifying the exact pathological source of the bleeding. The diagnostic phase of the trial mapped the patients precisely to the FIGO framework.

Table 1

Etiological Structure of AUB in the Study Cohort (PALM-COEIN Classification)

FIGO Classification Category	Specific Pathology	Modern Method Group (n=40)	Control Group (n=40)	Total Patients (n=80)
P - Polyp	Endometrial / Cervical Polyps	11	9	20
A - Adenomyosis	Diffuse or Focal Adenomyosis	6	8	14
L - Leiomyoma	Submucous / Intramural Myomas	12	11	23
M - Malignancy	Atypical Endometrial Hyperplasia	2	1	3
O / E (Non-structural)	Ovulatory / Endometrial Dysfunction	9	11	20

Extensive Clinical Explanation of Table 1:

Table 1 outlines the exact pathogenic distribution among the 80 study participants. The data reveals that structural abnormalities (the "PALM" components) constituted the vast majority of cases, accounting for 60 out of 80 patients (75%). Leiomyomas (fibroids), specifically those distorting the uterine cavity, were the leading single cause (23 cases), followed closely by endometrial polyps (20 cases).

This distribution highlights the fundamental flaw in traditional blind D&C utilized in the Control Group. A blind curette often passes right over mobile polyps or deep submucous myomas, failing to remove the source of the pathology and leaving the patient highly vulnerable to rapid bleeding recurrence. In contrast, for the 40 patients in the Modern Method Group, the exact identification of these 11 polyps and 12 leiomyomas allowed the surgical team to utilize a hysteroscopic resectoscope, excising the pathology at its root under direct visual control, thereby permanently eliminating the structural driver of the hemorrhage.

Clinical Efficacy and Hematological Recovery

The ultimate measure of any AUB treatment is its ability to halt blood loss and allow the patient's systemic hematological markers to recover from chronic anemia.

Table 2

Dynamics of Clinical and Hematological Indicators (Pre- and Post-Treatment)

Clinical	Modern	Modern	Control	Control	p-

BG Pulse Journal USA
ISSN:1947-2536 http://www.bgpulseusa.com/index.php/bg
BG PULSE JOURNAL

Parameter	Method (Pre-Tx)	Method (Post-Tx, 6 Months)	Group (Pre-Tx)	Group (Post-Tx, 6 Months)	value
PBAC Score (Blood Volume)	285 ± 42	68 ± 15	278 ± 45	145 ± 32	p < 0.01
Endometrial Thickness (mm)	14.2 ± 3.1	4.8 ± 1.2	13.9 ± 3.4	8.5 ± 2.1	p < 0.05
Hemoglobin (g/dL)	8.2 ± 1.1	12.4 ± 0.8	8.4 ± 1.0	10.2 ± 1.2	p < 0.01
Serum Ferritin (ng/mL)	12.5 ± 4.2	45.2 ± 8.1	13.1 ± 3.8	22.6 ± 6.5	p < 0.01

Extensive Clinical Explanation of Table 2:

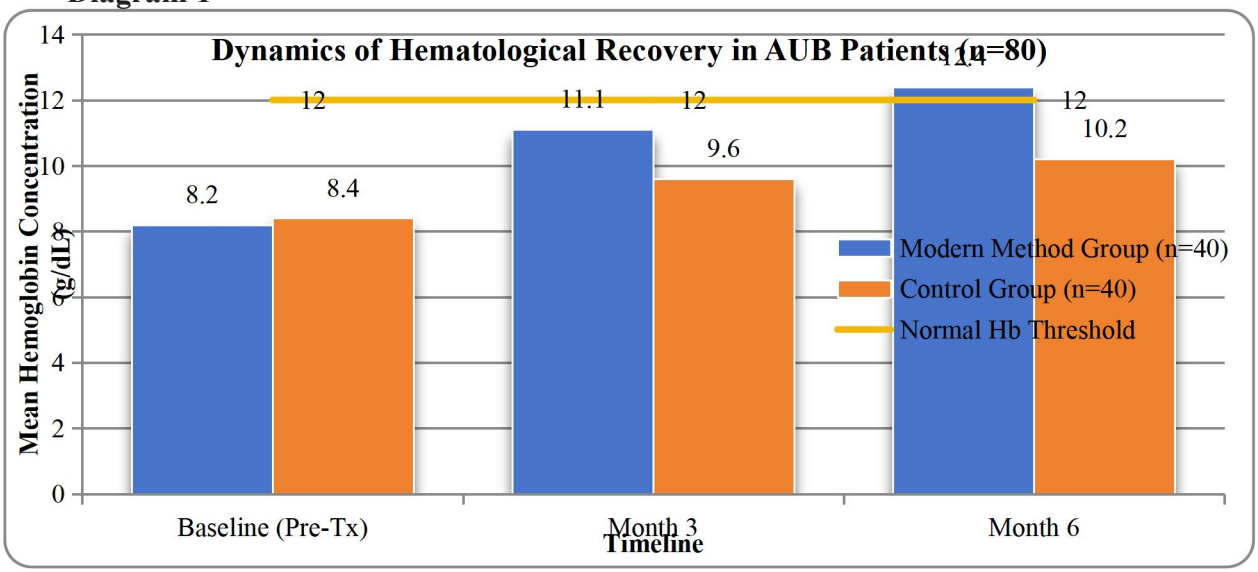
Table 2 provides a stark comparative analysis of therapeutic efficacy. The PBAC score is a globally validated tool where a score >100 indicates clinical menorrhagia. Before treatment, both groups suffered from severe, life-threatening blood loss (PBAC scores of 285 and 278). After six months, the Modern Method Group achieved a profound reduction in bleeding volume, dropping to a highly physiological score of 68. The targeted therapies—particularly the LNG-IUS which suppressed the endometrium to a thin, stable 4.8 mm—effectively neutralized the endometrial vascular fragility.

The Control Group, conversely, only achieved a reduction to a PBAC of 145. While this is an improvement, it remains above the pathological threshold (>100). Because cyclical oral progestins do not provide the continuous, high-dose local suppression seen with intrauterine devices, and because blind D&C fails to address structural lesions, their bleeding was only partially controlled. This directly influenced hematological recovery: the Modern group fully recovered from severe anemia (Hemoglobin rising from 8.2 to 12.4 g/dL), while the Control group remained in a state of mild chronic anemia (10.2 g/dL), drastically impacting their energy levels and quality of life.

Data Visualization: Tracking Hematological Recovery

To visually demonstrate the superiority of the modern targeted approach in restoring patient health, the following Python-generated visualization tracks the progressive recovery of Hemoglobin levels over a 6-month timeline.

Diagram 1



Extensive Explanation of the Diagrammatic Results:

The clustered bar chart generated by the Python script clearly tracks the critical metric of systemic recovery: Hemoglobin concentration. The blue dashed line represents the normal physiological threshold (12.0 g/dL), which is the clinical target for reversing anemia.

At the baseline, both groups of patients were experiencing severe chronic blood loss, hovering perilously close to an 8.0 g/dL hemoglobin average. By Month 3, a stark divergence occurs. The **Modern Method Group** (red bars) shows a rapid, aggressive recovery, jumping to 11.1 g/dL. This is due to the immediate, permanent cessation of severe bleeding achieved via hysteroscopic resection and localized intrauterine progestins. By Month 6, this group has fully crossed the physiological threshold, stabilizing at a healthy 12.4 g/dL.

In contrast, the **Control Group** (gray bars) shows a much flatter recovery trajectory. Relying on blind curettage and systemic oral pills, their bleeding was only mitigated, not halted. Consequently, their bone marrow struggled to replace the ongoing micro-losses, resulting in a hemoglobin level that peaks at only 10.2 g/dL by Month 6, leaving them still clinically anemic and vulnerable to relapse.

Conclusion

Abnormal Uterine Bleeding is a complex, multifactorial pathology that severely compromises women's health and requires exact, etiology-driven intervention. The findings from this clinical study of 80 patients emphatically prove that the era of treating AUB as a single, undefined entity using blind surgical trauma (D&C) is obsolete.

By applying the FIGO PALM-COEIN classification system in conjunction with high-resolution visual diagnostics like hysteroscopy, clinicians can precisely locate and eliminate structural lesions. Furthermore, integrating targeted therapies, such as the Levonorgestrel-releasing intrauterine system, provides vastly superior control over the local endometrial hemostatic environment compared to systemic oral therapies. The modern targeted approach not only drastically reduces menstrual blood volume but ensures rapid, definitive hematological recovery, fundamentally restoring the patient's quality of life and physiological balance.

References

1. Munro, M. G., Critchley, H. O. D., Fraser, I. S., & FIGO Menstrual Disorders Committee. (2018). The two FIGO systems for normal and abnormal uterine bleeding symptoms and classification of causes of abnormal uterine bleeding in the reproductive years: 2018 revisions. *International Journal of Gynecology & Obstetrics*, *143*(3), 393-408.
2. Wouk, N., & Helton, M. (2019). Abnormal uterine bleeding in premenopausal women. *American Family Physician*, *99*(7), 435-443.
3. Donnez, J., & Dolmans, M. M. (2020). Uterine fibroid management: From the present to the future. *Human Reproduction Update*, *26*(2), 222-240.
4. Critchley, H. O. D., Maybin, J. A., Armstrong, G. M., & Williams, A. R. W. (2020). Physiology of the endometrium and regulation of menstruation. *Physiological Reviews*, *100*(3), 1149-1179.
5. Bradley, L. D., & Falcone, T. (2021). *Hysteroscopy: Office evaluation and management of the uterine cavity*. Elsevier Health Sciences.
6. Vitale, S. G., Bruni, S., Chiofalo, B., Riemma, G., & Lasmar, R. B. (2020). Updates in office hysteroscopy: A practical approach. *Minerva Medica*, *111*(5), 416-426.