



Menstrual Cycle-Related Hemostatic Variability: A Potentially Modifiable Risk Factor in Plastic Surgery

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ABSTRACT

Background: Menstrual-cycle hormonal variation has been proposed as a modifier of perioperative hemostasis, but plastic-surgery evidence remains limited and heterogeneous.

Methods: We conducted an exploratory retrospective review of 25 records of female patients undergoing elective plastic surgery and integrated the findings with a narrative literature review. Cycle timing was assigned from recorded temporal proximity to menstruation without hormonal confirmation. Bleeding, edema, and pain were extracted as clinician-recorded outcomes; measurement was not standardized.

Results: Fourteen procedures occurred 48-72 hours before menstruation, six during menstruation, and five after menstruation. Perioperative bleeding was documented in 18/25 patients (72%), postoperative edema in 7/25 (28%), and pain in 6/24 (25%). Phase-specific outcome counts and complete inferential outputs were not available in the retained summary dataset; therefore, no reliable between-group effect estimate is presented.

Conclusions: This small, heterogeneous case series is hypothesis-generating and cannot establish that menstrual phase alters surgical bleeding. Prospective studies with hormonal validation, procedure stratification, and standardized outcomes are required.

Keywords:

Menstrual cycle, Blood, Fibrinolytic activity, Luteal phase, Follicular phase.

Introduction

In plastic surgery the surgical scheduling is often influenced by the menstrual phase where the patient may be because menstruation could be a potential risk factor for increased perioperative bleeding. Although this approach is largely empirical, clinical studies in plastic surgery have reported associations between menstrual cycle phases and bleeding-related outcomes, including increased intraoperative blood loss, greater postoperative drainage, and more pronounced early ecchymosis. Differences in bleeding patterns have been described in breast, nasal, and abdominal contouring procedures, suggesting that menstrual cycle-related physiological changes may influence surgical hemostasis even in tissues not traditionally considered hormonally dependent. These observations highlight a mismatch between routine surgical practice and the underlying hormonal and hemostatic physiology, underscoring the need for a clearer integrative framework [1-3].

The menstrual cycle is a physiological process characterized by cyclical hormonal fluctuations that modulate multiple biological systems, including coagulation, fibrinolysis, platelet function, and vascular tone. Menstruation involves shedding the functional endometrium following withdrawal of estrogen and progesterone, and is regulated by tightly controlled local hemostatic mechanisms that limit blood loss. These

mechanisms include platelet aggregation, fibrin deposition, thrombin generation, and clot stabilization, followed by a physiologically increased fibrinolytic activity mediated by plasmin and plasminogen activators. This process represents a transient state of physiological hyperfibrinolysis and vascular vulnerability rather than a pathological condition [4-6].

Evidence from studies evaluating hemostatic parameters throughout the menstrual cycle has demonstrated heterogeneous results. Most investigations report no consistent cyclic variation in global coagulation markers; however, when variations are identified, lower levels of von Willebrand factor and factor VIII are more frequently observed during menstruation or the early follicular phase. Similarly, platelet function testing has shown reduced platelet activity during the follicular phase, followed by an increase during the luteal phase, potentially related to progesterone-mediated modulation of hemostatic proteins [4,6]. In parallel, menstrual bleeding has been associated with increased local fibrinolysis driven by elevated endometrium-derived plasmin and plasminogen activators [4,5].

Studies assessing fibrinolytic activity across the menstrual cycle suggest that systemic coagulation and fibrinolytic variables generally remain within normal ranges, with limited phase-dependent variation. A relative reduction in fibrinolytic activity has been reported at mid-cycle, supporting the concept that hormonal influences on hemostasis are predominantly localized to the endometrial environment rather than systemic [7]. Nevertheless, interindividual variability in fibrinolytic responses has been documented, indicating that subtle systemic effects

may occur in selected patients [8].

During menstruation, endometrial shedding is accompanied by local fibrinolytic activity and vascular changes. Whether these localized mechanisms produce clinically important systemic effects at distant operative sites remains uncertain. Reports of small changes in laboratory markers across the cycle are inconsistent and generally remain within reference ranges; therefore, these mechanisms should be regarded as biological hypotheses rather than findings demonstrated by the present study [4-8].

Taken together, menstrual-cycle physiology provides a rationale for investigation but does not establish a clinically meaningful systemic bleeding effect. This study combines a retrospective exploratory record review with a narrative synthesis to describe the available observations and define requirements for future prospective research.

Materials and Methods

A retrospective, exploratory observational study was conducted by reviewing an existing clinical database of elective plastic-surgery cases. Records were screened for the eligibility criteria described below; no prospective intervention or menstrual-cycle assignment was performed.

Author Confirmation Required Before Submission: Insert the institution(s), exact study dates, source of the records, and whether eligible cases were consecutive or a convenience sample.

The retained convenience sample comprised 25 records of female patients who underwent elective plastic surgery during the study period. Eligibility criteria were female sex, elective surgery, documentation of the temporal relationship between surgery and menstruation, and availability of at least one perioperative outcome. Records missing a specific outcome were excluded only from the analysis of that outcome.

Table 1: Characteristics of the study population.

Characteristics	Value
Number of patients	25
Age, mean range	28.4
Sex	Female (100%)
Surgical procedures	
Lipoabdominoplasty+Breast augmentation	6 (24%)
Breast augmentation	5 (20%)
Primary rhinoplasty	5 (20%)
Bichectomy	3 (12%)
Liposuction	2 (8%)
Mastopexy	2 (8%)
Other procedures	2 (8%)

The exposure was calendar-based timing of surgery relative to the recorded onset of menstruation. It was classified from the interval documented in the database as follows:

- 48–72 hours prior to menstruation, corresponding to the late luteal phase
- Day of menstruation at the time of surgery

- Post-menstrual period, defined as the period after the onset of menstruation

This pragmatic classification was based on temporal proximity recorded in the clinical database. It was not confirmed by serum progesterone, estradiol, luteinizing hormone, ovulation testing, or cycle-length standardization; accordingly, the labels are timing categories rather than hormonally confirmed phases.

The primary outcomes were:

1. Perioperative bleeding was a binary, clinician-recorded composite outcome indicating that the operative record described increased intraoperative bleeding and/or the postoperative record described elevated drain output. The source summary did not preserve a uniform milliliter threshold or a standardized measurement method (e.g., suction volume corrected for irrigation plus gauze weight); the outcome must therefore be interpreted as a non-validated record-based measure rather than objectively quantified blood loss.
2. Postoperative edema was a binary clinician-recorded finding of clinically relevant swelling during immediate follow-up; no validated edema scale was used.
3. Postoperative pain was a binary clinician-recorded finding during immediate follow-up. A standardized validated scale and fixed assessment timepoint were not available; one record lacked pain information.

Statistical analysis

Cycle-timing category, procedure type, bleeding, edema, and pain were treated as categorical variables and summarized as counts and percentages. Age was treated as continuous and is reported as mean and range.

Comparative analysis

Because the retained analysis file contained aggregate totals but not complete phase-by-outcome cell counts, reproducible phase-specific Fisher exact tests, odds ratios, confidence intervals, and effect sizes could not be reconstructed for this revision. Inferential claims have therefore been removed, and the case series is reported descriptively.

No post hoc power calculation was used to justify the fixed sample. With only 25 observations, sparse outcome cells, and heterogeneous procedures, the study has low precision and a high risk of type II error; it is not adequate to establish equivalence, absence of association, or a clinically meaningful trend.

Any future inferential analysis should report exact two-sided p-values together with phase-specific counts, effect sizes, and 95% confidence intervals and should account for procedure type.

Results

A total of 25 female patients undergoing elective plastic surgery were included in the analysis. The mean age was 28.4 years (range 15–41 years). Surgical procedures included combined body contouring surgeries and isolated procedures, with the most frequent being lipoabdominoplasty with breast augmentation, breast augmentation, and primary rhinoplasty.

Patients were classified according to the timing of surgery

relative to the onset of menstruation. Surgeries were performed during the late luteal phase (48–72 hours prior to menstruation), on the day of menstruation, or after the onset of menstruation. The late luteal phase represented the largest proportion of cases.

Table 2: Distribution of menstrual cycle timing at the time of surgery.

Timing of the menstrual cycle	n (%)
48–72 h before menstruation	14 (56%)
Menstruation	6 (24%)
Post-menstrual period	5 (20%)

Perioperative bleeding

The non-standardized record-based bleeding outcome was documented in 18/25 patients (72%).

The retained summary did not contain complete bleeding counts for each timing category; consequently, the direction or

magnitude of a phase-specific association cannot be estimated reproducibly from the available information.

No standardized quantitative blood-loss series was available for reanalysis. Statements describing a non-significant trend have been removed because a non-significant result does not demonstrate a trend or absence of effect.

Postoperative edema

Clinician-recorded postoperative edema was documented in 7/25 patients (28%). Phase-specific counts were not available in the retained summary, so no between-category association is claimed.

Postoperative pain

Clinician-recorded postoperative pain was present in 6/24 patients (25%); one record lacked pain data. Phase-specific counts were not available, and no between-category association is claimed.

Table 3: Perioperative outcomes according to the menstrual cycle phase.

Outcome	48-72 h before menstruation	Menstruation	Post-menstrual	Overall
Records in timing category	14	6	5	25
Clinician-recorded perioperative bleeding	NR	NR	NR	18/25 (72%)
Clinician-recorded postoperative edema	NR	NR	NR	7/25 (28%)
Clinician-recorded postoperative pain	NR	NR	NR	6/24 (25%)*

Values are counts and percentages calculated from the retained summary. NR indicates that the phase-specific cell count was not reported in the available analysis file. Inferential statistics are intentionally omitted because they cannot be reproduced from aggregate totals. *Denominator 24 because one pain record was missing.

Discussion

Published studies have reported mixed results regarding menstrual timing and surgical outcomes. Small, procedure-specific studies in breast surgery, rhinoplasty, and

abdominoplasty have described differences in blood loss, drainage, or wound outcomes, whereas broader reviews have not established a consistent systemic hemostatic effect. These external findings provide context but do not validate the outcomes of the present 25-record series [4-8].

Table 4: Selected published studies on menstrual timing and plastic-surgery outcomes.

Study	Year	Journal	n	Procedure	Phase with greater bleeding or complication	Measurement used	Limitations
López MM et al.	2016	Plastic and Reconstructive Surgery	92	Breast reduction	Early luteal/ perimenstrual: increased dehiscence and poorer healing	Dehiscence, healing time, early complications	No direct blood loss measurement; moderate sample; young population
Sarigüney Y et al.	2004	Annals of Plastic Surgery	52	Breast reduction	Perimenstrual: increased intraoperative bleeding and postoperative drainage	Intraoperative bleeding and drainage volume	Small series; retrospective design
Findikçioğlu K et al.	2009	European Journal of Plastic Surgery	58	Rhinoplasty	Menstrual phase: increased intraoperative bleeding	Suction volume + gauze weight	Small sample; variable techniques
Findikcioglu K et al.	2012	Journal of Plastic, Reconstructive & Aesthetic Surgery	72	Abdominoplasty	Menstrual/perimenstrual: increased intraoperative bleeding and drainage	Blood loss + 24–48h drainage volume	Moderate sample; retrospective; no hormonal control
Lin Z (Review)	2017	Systematic review (PMC)	-	Multidisciplinary	Higher bleeding/ complications in perimenstrual phase (days -3 to +3)	-	Heterogeneous data

In the present dataset, 18/25 records contained a clinician-documented bleeding outcome; however, the absence of standardized blood-loss measurement and recoverable phase-specific cells prevents estimation of an association with

menstrual timing. Local endometrial fibrinolysis, hormonal vascular effects, and platelet variation are plausible hypotheses, but none was measured in these patients. They should not be interpreted as mechanisms demonstrated by this study.

Table 5: Reported hemostatic patterns across menstrual-cycle phases in the cited literature.

Parameter	Follicular Phase	Ovulatory Phase	Luteal Phase	Menstrual Phase
PT	Normal	Normal	Normal	Normal
aPTT	Slightly ↓ or normal	Normal	Normal or slightly ↓	Slightly ↑ (due to fibrinolysis)
INR	Normal	Normal	Normal	Normal
D-dimer	Slightly ↑	Slight ↑	↑	↑↑
Fibrinogen	Normal or slightly ↓	Slight ↑	↑	↓
Platelets	Normal or slightly ↑	Normal	↑ up to 20–30k	Mild ↓

Clinical interpretation

The current case series does not justify routinely avoiding elective surgery during menstruation. Menstrual history may be documented as part of individualized preoperative assessment, particularly when patients report heavy menstrual bleeding or a personal bleeding history, but scheduling decisions should follow the overall clinical risk assessment and patient preference.

The reviewed literature is heterogeneous and does not establish a causal or clinically actionable increase in bleeding risk for a specific menstrual phase.

Limitations

This exploratory study has major limitations: a fixed sample of 25 records without an a priori sample-size calculation; retrospective, non-random record selection; calendar-based exposure classification without hormonal confirmation; heterogeneous procedures with different baseline bleeding profiles; no procedure-adjusted or subgroup analysis; non-standardized clinician-recorded bleeding, edema, and pain outcomes; one missing pain observation; absence of validated pain scoring and fixed assessment timepoints; and incomplete phase-specific analytic outputs. These limitations create misclassification, measurement, confounding, and type II error risks. The data cannot support equivalence, causal inference, or a recommendation to alter surgical scheduling.

Future prospective studies should use consecutive recruitment, prespecified sample-size calculations, hormonal validation (e.g., serum progesterone with cycle tracking), procedure stratification, standardized blood-loss measurement (suction volume corrected for irrigation plus gauze weight), drain output at fixed timepoints, validated pain scales, and reporting of exact p-values, effect sizes, and 95% confidence intervals.

Conclusion

This exploratory retrospective case series documents frequent clinician-recorded perioperative bleeding but does not establish that menstrual timing modifies hemostasis in plastic surgery. The small sample, procedural heterogeneity, calendar-only exposure classification, and non-standardized outcomes prevent a reliable phase-specific effect estimate.

The narrative literature review identifies biological hypotheses and mixed procedure-specific observations, not proof of causality or a basis for routine postponement of surgery.

Menstrual and bleeding history may remain part of individualized preoperative assessment, while decisions about timing should be based on the full clinical context rather than menstrual phase alone.

Prospective, adequately powered studies with hormonal confirmation, procedure-specific analyses, objective blood-loss measurement, and validated postoperative outcomes are needed before a scheduling recommendation can be made.

Conflict of Interests

The authors have no conflict of interest.

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