Menstruation is a physiological phenomenon of cyclic endometrial exfoliation caused by changes in the level of sex hormones (estrogens and progesterone), under the system of mutual feedback between the gonads, the anterior pituitary gland, and the hypothalamus. Amongst surgeons, there is belief that menstruation is a contraindication to elective surgery. This is attributed to the functional impairment of the coagulation system and accompanying pain during the postoperative period, which may interfere with the general picture, and thus, possibly delay the diagnosis of postoperative complications.

In view of the contraindications the aim of the study was to review literature data for evidence confirming or negating this thesis, according to evidence-based medicine.

The PubMed, Ovid Medline, Science Direct and Springer databases were browsed through using a combination of the following words: “menstrual cycle”, “intraoperative bleeding”, “contraindication to elective surgery”, and “blood loss”. Considering the above-mentioned, 452 studies were found. After abstract analysis, 421 were discarded. Thirty-one studies were qualified for full-text analysis, off which 12 were rejected. Finally, 19 studies were included in the methodology of the mentioned problem.

Amongst the many complications concerning the functioning of the coagulation system during the menstrual cycle, one should initially quote the systematic review undertaken by Konol et al. in 2012. The authors gathered 30 of the best publications concerning the issue. Analysis considered studies assessing platelet function, von Willebrand’s factor (VWF), factors VIII, IX, X, XI, XIII, D-dimers, plasminogen activator inhibitor (PAI-I), tissue plasminogen activator (tPA), alpha₂-antiphasmin, and the fibrinogen level. In most studies cyclic changes of the above-mentioned were not observed. In isolated cases where such changes were observed the lowest level of these factors (especially VWF, FVIII, and platelet factor activity) was diagnosed during menstruation. It should be noted, however, that the above-mentioned reduction did not exceed 10% of initial values, not having any clinical implications. The main conclusion following the systematic review of the above-mentioned is that diagnosis of coagulation factor disturbances should be performed during the menstruation cycle (1).

Hormonally dependent organs

It has been shown that the menstrual cycle causes periodic changes in hormonally-sensitive female tissues, such as the uterus, vagina, mammary glands, oral mucosa, conjunctiva, and the Eustachian tube. Thus, most studies concerned the above-mentioned organs (2-7).

Findikcioğlu et al. determined the influence of the phase of the menstrual cycle on intraoperative blood loss during nose plasty. There was a statistically significant greater blood loss during the peri-ovulatory phase. However, it had no influence on the course and final result of the operation (8).

Hrushesky et al. published their study in 1989, evaluating the correlation between the length of survival in case of breast cancer surgery and the phase of the menstrual cycle. The retrospective analysis of 44 female patients with breast cancer after surgery showed that recurrence and mortality were higher in case of patients subjected to surgery during the initial phase of the menstrual cycle, as compared to those patients operated later on (9).
Subsequent studies showed contradictory results concerning the optimal time when to perform breast cancer surgery. In 2009, a prospective study was published comprising data analysis of a group of 834 female patients. The observation period was 6.6 years. Both the disease-free time and survival duration showed statistically insignificant differences, considering women operated during the luteal and follicular phases (82.7 vs. 82.1% and 91.9% vs. 92.2%). The advantage of this study consists in the determination of the phase of the menstrual cycle, based on hormone levels, and not as is the case in many studies, on the basis of the last menstrual period (10). Another study concerning the mammary gland is the prospective analysis of 35 patients subjected to breast reduction surgery. Both peri- and postoperative blood loss was statistically significantly greater in patients operated during the peri-menstrual phase. The authors of the study recommend that patients be qualified for the above-mentioned procedure between the 8-th and 20-th day of the cycle (11). Endoscopy of the mammary ducts should also be avoided during the luteal phase, due to statistically significant greater pain, as compared to the procedure performed during a different phase (average pain level was evaluated on the basis of the VAS scale: 6.86±1.07 vs. 5.17±1.40; p<0.05) (12).

In case of a retrospective analysis of 24 female patients (12 in the luteal and 12 in the follicular phase) subjected to hysterectomy, their was no statistically significant difference between both groups, considering the pre- and postoperative hemoglobin level, duration of surgery, intraoperative blood loss, recovery time, and hospitalization period (13). In case of laparoscopic resection of peritoneal endometriosis, the procedure should not be performed during the luteal phase, during which the authors observed twice as many recurrences, as compared to other phases of the menstrual cycle (14).

### Hormonally-independent organs

In case of organs independent or slightly dependent of sex hormones only one study was published. The study comprised 41 patients subjected to abdominoplasty during the periods between 0-7 and 21-28 days (group A), between the 8 and 20 day of the cycle (group B), and after menopause (group C). The authors of the study showed no statistically significant differences between the groups, considering intra- and postoperative blood loss. However, there was a significant correlation between the BMI and amount of removed tissue, and the time of drain removal and intra- and postoperative blood loss (15).

### Other investigations

In case of nausea and vomiting occurring during the postoperative period, study results are contradictory. In case of middle ear surgery the above-mentioned were observed less frequently during menstruation, as compared to the periovulatory phase (16). In case of a prospective study comprising 60 female patients subjected to general anesthesia surgery nausea and vomiting were observed more often during the initial 14 days of the menstrual cycle (76.8% (1-14 days) vs. 32.35% (15–28 days). (17). In a group of 159 patients, those with menstrual cycle irregularity were at increased risk of nausea and vomiting during the postoperative period (20.5% vs. 40.5%) (19).

There was no statistically significant difference concerning pain perception during 13 different time intervals in the first postoperative day, regardless whether they were operated during the luteal or follicular phase. Additionally, there was no statistically significant difference between analgesic (tramadol and morphine) requirement, between both groups (18).

Another study analysed the hemodynamic response of 62 female patients depending on the phase of the menstrual cycle (31-follicular and 31-luteal). Propofol and rocuronium were used during intubation. During the luteal phase one observed a statistically significant higher blood pressure during the first minute after intubation. In case of the remaining parameters no statistically significant differences were observed (20).

### Conclusion

Based on available literature data, there is no evidence that menstruation can be a contraindication to elective surgery. Currently however, there are no studies directly devoted to the issue of the menstrual cycle in general surgery.
REFERENCES