Journal of Plastic, Reconstructive & Aesthetic Surgery (2012) 65, e338—e343

JPRAS
An International Journal of Surgical Reconstruction
www.JPRASurg.com

The impact of the menstrual cycle on intra-operative and postoperative bleeding in abdominoplasty patients☆

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Received 30 August 2011; accepted 10 September 2012

KEYWORDS
Menstruation;
Bleeding;
Abdominoplasty;
Sex hormone;
Perioperative;
Drain removal time;
Blood loss

Summary *Background:* Hormonal changes that take place during the menstrual cycle may have an effect on perioperative bleeding. Previous studies have confirmed a relationship between the menstrual cycle and surgical bleeding in rhinoplasty and breast reduction surgery; yet both surgical sites display changes in accordance with sex hormone levels during the menstrual phase.
Aim: The aim of this study was to determine the effect of the menstrual cycle on perioperative bleeding when undergoing surgeries of sites not directly related to menstrual hormonal changes.
Materials and methods: Forty-one patients undergoing abdominoplasty were grouped as group A — perimenstrual (0—7, 21—28 days), group B — periovulatory (8—20 days) and group C — post-menopausal. Intra-operative blood loss was calculated during surgery while postoperative blood loss was determined by measuring the amount of drainage. All menstrual data were recorded. Age, body mass index and weight of the resected tissue were also considered as factors that can affect the amount of bleeding and therefore were also evaluated in terms of significance.
Results: There was no significant difference between groups regarding intra-operative and post-operative blood loss. Body mass index and weight of the resected tissue had a strong influence on the time of drain removal and the amount of intra-operative and postoperative blood loss.

☆ This paper was accepted as an oral presentation for (ESPRAS EUROPEAN appointed) the 33rd National Congress of the Turkish Society of Plastic Reconstructive and Aesthetic Surgery (14—18 September, 2011, Izmir/Turkey).

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http://dx.doi.org/10.1016/j.bjps.2012.09.001

Conclusion: This study strongly suggests that the menstrual period does not affect perioperative blood loss for operations on areas less sensitive to sex hormone levels such as the abdomen. In light of the results, we can conclude that the patient's menstrual date is not of vital importance regarding perioperative blood loss when planning surgery for areas with less sensitivity to menstrual hormonal changes.

Surgical bleeding is one of the main challenges faced by surgeons that directly affects morbidity and mortality rates[1] along with the comfort of the surgeon and the patient. The ability to reduce the amount of intra-operative and postoperative bleeding results with fewer complications and reduced hospitalisation. Therefore, many studies have been undertaken to determine the factors that affect surgical bleeding and some techniques have been introduced to reduce the morbidity of bleeding such as the administration of local vasoconstricting agents[2–7] and hypotensive anaesthesia.[8,9]

Recent studies have confirmed that hormonal changes can also induce perioperative bleeding, especially in the female patient. The effects of the menstrual cycle on bleeding in breast reduction and rhinoplasty surgery have been shown in previous studies.[10,11] However, breast tissue and nasal mucosa are both affected by hormonal changes that occur during the menstrual cycle. Taking the menstruation phase into account while scheduling other operations might be clinically meaningful, if the effects of the menstrual cycle on surgical bleeding can be proven.

The aim of this study was to investigate the effect of the menstrual cycle on surgical bleeding when dealing with surgical fields that are not under the direct influence of acute hormonal changes seen during the menstrual cycle. For this purpose, the effect of the menstrual cycle on the amount of intra-operative and postoperative bleeding was investigated in abdominoplasty patients.

Material and methods

The study was performed with the participation of 41 consecutive female patients who underwent abdominoplasty surgery in our clinic between June 2004 and June 2006. Routine preoperative workup was done, and preoperative haemoglobin–haematocrit levels were recorded. None of the patients had any bleeding disorders nor did they take any type of medication. Patients who had previous abdominal surgery or trauma resulting with a scar were excluded from the study.

All operations were performed under general anaesthesia according to standard and strict Total Intravenous Anesthesia (TIVA) protocol. A combination of propofol (2 mg/kg) and rocuronium (0.6 mg/kg) was used for induction. Maintenance of anaesthesia was achieved with propofol (4–6 mg/kg per hour) and remifentanyl (0.1–0.2 μg/kg per hour). After induction of general anaesthesia, the surgical area was infiltrated with 14 ml lidocaine 2% + 1/80 000 adrenaline, diluted with 28 ml of saline. As lidocaine takes effect in 4–10 min and the tachycardia and increased blood pressure caused by adrenaline return to normal within 5–10 min, the operation was initiated 7 min after infiltration was completed.

Standard abdominoplasty was performed for all patients. After the skin incisions were made, the entire flap elevation process was performed using electrocautery. Dissection was performed up to the level of the xyphoid process and costal arches superiorly and to the end of the rectus sheath laterally. Vertical midline rectus abdominis plication was performed for every patient. No additional procedures, such as liposuction, were undertaken. Blood loss during the operation was evaluated by analysing haematocrit levels from total soiled swabs.[12–14] The swabs were placed in plastic bags with 2000 ml saline immediately after being used in the operative field to prevent drying. They were squeezed at the end of the operation by a circulating nurse, and the fluid in the bag was analysed at the haematocrit counter. Intra-operative blood loss was calculated according to the following formula:

$$\text{Intraoperative blood loss(ml)} = \frac{2000 \times \text{haematocrit of fluid}}{\text{Haematocrit of blood}}$$

Two 10-mm flat silicone suction drains were inserted under the flap. Because the drain removal times of the patients varied, postoperative blood loss was measured as the amount of liquid collected in the drains for the first 48 h. Deep-vein thrombosis (DVT) prophylaxis was achieved with compression stockings and early mobilisation at the postoperative first morning while none of the patients received heparin for this purpose. All patients were dressed with a compression garment right after surgery.

All operations were performed by the same surgical team and none of the team members had information concerning the patient's menstrual history. All menstrual data, including the date of their last menstruation, the usual length of their menstrual cycle and previous use of hormones or hormone-containing medications, were collected after the surgery. Previous childbirth was not an exclusion criteria as all patients had a history of at least one childbirth at the time of their surgery. Concomitant endometrial biopsy would be more precise, but considering the clinical feasibility of our interpretations, this was not attempted. Menstrual dates of these women were normalised to a 28-day cycle with the help of the following formula[15]:

$$\text{Adjusted day of cycle} = \frac{14 \times \text{day of the cycle at the time of surgery}}{\text{Length of the follicular phase}\ (\text{cycle length of the patient} - 14)}$$

In light of this formula, patients were grouped as group A – perimenstrual (0–7, 21–28 days), group B – periovulatory