Journal of Plastic, Reconstructive & Aesthetic Surgery (2009) 62, 200–205

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

Influence of controlled hypotension versus normotension on amount of blood loss during breast reduction☆,☆☆

E.C. Kop [b,*], P.H.M. Spauwen [a], P.P.G.M. Kouwenberg [b], F.J.M. Heymans [b], H.B.H. van Beem [a]

[a] *University Medical Centre, Nijmegen, Netherlands*
[b] *Slingeland Hospital, Doetinchem, Netherlands*

Received 14 February 2007; accepted 11 October 2007

KEYWORDS
Controlled hypotension;
Breast reduction;
Blood loss

Summary Controlled hypotension employed during surgical procedures results in a beneficial reduction in blood loss during the operation. Breast reduction is a common cosmetic surgical procedure. Yet, in the Netherlands, controlled hypotension is not standard during breast reduction procedures, and in fact is only occasionally employed. Our research aimed to establish a set of guidelines which would outline the application of controlled hypotension during breast reduction surgery.

The set up of the study was prospective. The patients were randomised into two groups. In the test group, controlled hypotension with an average of 30% reduction in systolic tension was established during the first operative phase. For the control group, normotension was maintained during the entire procedure.

The blood loss in the test group ($n = 23$; mean 318 cc) was reduced by 54.1% compared to control ($n = 28$; mean 598 cc), and this difference was significant. A significant positive correlation was also found between blood loss and total incision time. An overall complication rate of 5.1% was observed; however, there was no significant difference between the two groups. A trend in favour of hypotension does suggest it may also help reduce postoperative complications.

Our data indicate that a reduction in blood loss of more than 50% can be achieved by employing controlled hypotension in the first operative phase of breast reduction. A reduction in systolic pressure of 20–25% with the use of nitroprusside is sufficient to achieve this reduced blood loss.

☆ **Financial Disclosure and Products page**
☆☆ This article was not supported by any funds. There are no financial interests or financial conflicts.
* Corresponding author. University Medical Centre, Padmoes 27, 2645 GA Delfgauw, The Netherlands. Tel.: +31 06 47424619.
E-mail address: e.c.kop@zonnet.nl (E.C. Kop).

1748-6815/$ - see front matter
doi:10.1016/j.bjps.2007.10.033

The beneficial influence of controlled hypotension on the amount of blood loss during surgery has been described for general surgery, neurosurgery and orthopaedics.[2–6] In the Netherlands, hypotension is not used on a routine basis during breast reduction surgery, even though this is a common procedure. The average blood loss during breast reduction is 700–800 cc. We have estimated that as much as a 50% reduction in blood loss could be achieved through controlled hypotension during the actual operation.[1] There has been a previous report on the effects of hypotension on blood loss during breast reduction[1]; however, this was a rather small study. Still, there was significantly less blood loss when comparing hypotension through preoperative use of nitroprusside ($n = 13$) to normotension ($n = 13$).[1] There are trade offs: hypotension during the entire procedure, especially during the haemostatic period, results in an increased risk of postoperative bleeding.[7]

Indications to perform a breast reduction include functional complaints (back, shoulder or neck pain, cutting brassiere straps), difficulty with sports, hygiene problems (stains), as well as various social difficulties associated with unwanted or inappropriate attention. The general physical criteria are a cup size larger than D and a body mass index (weight divided by height squared) equal to or smaller than 27. Contraindications to performing a breast reduction include smoking, body mass index greater than 27, pregnancy planning, the desire to breastfeed, and the use of blood thinners and/or prednisone. Another relative contraindication is psoriasis because of scarring problems and an increased chance of wound infections.[9] An overall complication ratio of 10–30% has been reported.[8] General complications that can occur after a breast reduction procedure are bleeding, fat necrosis, infection, haematomas, skin necrosis, wound dehiscence, scar hypertrophy, nipple and areola problems (sensitivity loss, shape change, retraction, protrusion, malposition, necrosis, loss of erectility).

The aim of our research was to set up a guideline for plastic surgery, as well as for anaesthesia, for the application of controlled hypotension during breast reduction. We hypothesised that hypotension employed during the first period of the procedure will result in less blood loss and postoperative bleeding, as well as a shorter procedure time when compared to surgery where normotension is maintained throughout. In addition, the reduction in blood loss and procedure time will lead to fewer postoperative complications.

Patients and methods

This research was approved by the medical ethical commission of the University Medical Centre Nijmegen in The Netherlands. The set up was prospective. The patients were split at random into two groups. The randomisation was double blind, and only the anaesthetist knew to which group the patient belonged. For the patients of the test group, controlled hypotension, i.e. a reduction in systolic tension by 30% on average, was established only during the first operative phase (Table 1). Normotension for the patients in group 2 was maintained during the entire operation.

In the initial screening, patients were selected according to the inclusion and exclusion criteria (Table 2). The selected patients were then approached by their own doctor. If the patient requested more information, the researcher approached the patient during the preoperative consultation (max. 2 months preoperative). Patients were briefed by the first author, both verbally and in writing. On the day of operation, the patient was asked to sign an informed consent form that was included in the policlinic status. The details of the patients were combined anonymously when used with our postoperative data. The postoperative controls were essentially unaltered procedures, both in the department as well as during the policlinic controls. Patients were not required to do anything additional in order to participate. The primary concern was to determine the amount of blood lost during hypotensive surgery compared to normotensive surgery. Postoperative complications were also recorded for all patients.

Table 1 Surgical periods of breast reduction

Period 1	Incision (de-epithelialisation of the skin around the nipple and nipple cap, development of the steel with nipple and nipple cap, breast reduction)
Period 2	Haemostasis
Period 3	Wound closure, correction of dog-ears, creation of the new nipple and areolis complex

Preoperative screening

The preoperative screening was done within 2 months of surgery. Apart from the anamnesis and a physical examination, haemoglobin (Hb), haematocrit (Ht), urea, creatinine and gamma-glutamyl transpeptidase values were determined and recorded (Table 3). The informed consent form and the research set up were discussed with and given to the patients, so that they had adequate time to fully consider their participation. The patients decided whether or not to participate in the study on the day of admission to hospital.

Randomisation procedure

The randomisation took place immediately prior to surgery. The anaesthesiologist drew a lot from an envelope at random which assigned the patient to either group 1 or 2. The lot was only read by the anaesthetist, whereafter it was replaced in a sealed envelope in a sealed box, until the end of the study. The patients in group 1 received controlled hypotension, and normotension was maintained for the patients of group 2 (control) during the entire procedure.

Anaesthesia technique

The patients were given 20 mg per os temapezam preoperatively for sedation. The patients were given complete anaesthesia and were intubated and respirated. Oxygen with outside air was used in combination with 40% FiO_2, with propofol (2–2.5 mg/kg) as the induction dose and rocuronium (0.3 mg/kg) as a muscle relaxant. As a primary analgesic, either sufentanyl (0.3 mg/kg) or fentanyl (3 mg/kg) was given.

Normoventilation was maintained with an end tidal pCO_2 between 3.5 and 4.5 kPa. Patients were kept under narcosis