Effect of infiltration with ropivacaine on blood loss during reduction mammoplasty

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Summary
Ropivacaine is a new aminocamide local anaesthetic agent. Unlike other agents in its class, such as bupivacaine, it has been found to be vasoconstrictive. We have sought to investigate if this property is clinically useful and may reduce surgical blood loss. Reduction mammoplasty is a procedure in which considerable blood loss may occur. We have compared preincision infiltration of ropivacaine 75 mg in 0.9% saline 60 ml with the current practice of infiltration with bupivacaine 75 mg in 0.9% saline 60 ml and epinephrine (adrenaline) 5 μg ml\(^{-1}\). We studied five subjects; each received both solutions by infiltration, one to each breast, in random order and both the operating surgeon and anaesthetist were blind to the solution given. For data analysis, blood loss was expressed in ml/kg of tissue excised. There was no significant difference between the two regimens for duration of surgery or amount of tissue excised; however, ropivacaine was associated with markedly greater intraoperative blood loss than bupivacaine (median 696 (range 305–1366) ml kg\(^{-1}\) vs 300 (169–608) ml kg\(^{-1}\); \(P=0.04\), Wilcoxon rank sum test). Postoperative blood loss was not significantly different between groups (116 (14–173) ml kg\(^{-1}\) vs 98 (13–332) ml kg\(^{-1}\); \(P=0.69\), Wilcoxon rank sum test). We conclude that the vasoconstrictive properties of ropivacaine were not sufficiently great to merit its use as a sole agent for infiltration before reduction mammoplasty. (Br. J. Anaesth. 1998; 81: 974–975).

Keywords: anaesthetics local, bupivacaine; anaesthetics local, ropivacaine; anaesthetic techniques, i.v. regional; surgery, plastic

Reduction mammoplasty is a relatively common procedure in which significant blood loss may occur. During the 1970s, blood loss during this type of surgery often required replacement by transfusion.\(^1\) However, significant reduction in blood loss and therefore transfusion requirements occur when epinephrine (adrenaline) is infiltrated before surgical incision.\(^2\) It is now common practice to infiltrate breast tissue with a combination of bupivacaine and epinephrine 1:200,000 before dissection. This provides a combination of perioperative local anaesthesia with vasoconstriction.

Ropivacaine is a newly introduced aminoamide local anaesthetic agent which is closely related structurally to mepivacaine and bupivacaine. However, it is less toxic than bupivacaine which has been associated with adverse cardiac effects after rapid systemic absorption or inadvertent intravascular injection.\(^3\) In addition, after subcutaneous infiltration, ropivacaine has a greater duration of action than bupivacaine which has been attributed to the intrinsic vasoconstrictor properties of the drug.\(^3\)

The aim of this study was to investigate if ropivacaine alone, in comparison with a bupivacaine–epinephrine mixture (our current standard regimen), provided any useful vasoconstriction during reduction mammoplasty.

Method and results
After obtaining local Ethics Committee approval and written informed consent, we recruited five patients in a pilot study. Subjects were female, ASA I–II, aged 27–32 yr and undergoing elective reduction mammoplasty. Exclusion criteria included gross breast asymmetry and known sensitivity to local anaesthetic agents.

Patients underwent a standard general anaesthetic without premedication. Anaesthesia was induced with propofol and maintained with isoflurane and 70% nitrous oxide in oxygen. The trachea was intubated and the lungs ventilated to normocapnia after administration of atracurium. Residual neuromuscular block was antagonized with neostigmine and glycopyrrolate. Peri- and postoperative analgesia were supplemented with morphine as required.

The same surgeon operated on all patients. Patients provided their own comparison as each subject received both solutions. The surgeon and anaesthetist were blind to the solution used for infiltration before incision of each breast. The local anaesthetic solutions were: bupivacaine 75 mg in 0.9% saline 60 ml with epinephrine 5 μg ml\(^{-1}\), and ropivacaine 75 mg in 0.9% saline 60 ml without epinephrine.

The skin was incised by scalpel and tissue was dissected using argon-assisted diathermy. Operative blood loss from each breast was measured separately by weighing of swabs and the use of plastic drapes.

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with collection pockets. Postoperative blood loss was measured by surgical wound drains. In addition, the amount of tissue excised and the time from infiltration to completion of each dissection were measured.

Published data suggested that mean blood loss with epinephrine would be approximately 150 ml (sd 90 ml).\(^1\) For a study power of at least 80% we calculated that 20 patients would be required to detect a difference in blood loss of 90 ml. Data were analysed statistically using SPSS for Windows 95–Wilcoxon rank sum test. We did not assume that the data would fit a normal distribution. Level of significance was taken as \(P<0.05\).

Data from all subjects are shown in table 1. There was no significant difference between the two regimens for duration of surgery or amount of tissue excised. For analysis, blood loss was expressed in ml/kg of tissue excised. We found that administration of ropivacaine was associated with markedly greater intraoperative blood loss than the bupivacaine–epinephrine mixture (median 696 (range 305–1366) ml kg\(^{-1}\) vs 300 (169–608) ml kg\(^{-1}\); \(P=0.04\), Wilcoxon rank sum test). Postoperative blood loss did not differ significantly between the two solutions (116 (14–173) ml kg\(^{-1}\) vs 98 (13–332) ml kg\(^{-1}\); \(P=0.69\), Wilcoxon rank sum test).

### Comment

We have found that ropivacaine was associated with significantly greater blood loss than bupivacaine–epinephrine during reduction mammoplasty. It was our original intention to study 20 patients, but after five patients it was apparent that a large difference may exist and therefore the study was halted and treatment codes were broken. We compared ropivacaine with our current practice of using a mixture of bupivacaine with epinephrine 5 \(\mu\)g ml\(^{-1}\); it would not have been acceptable to compare it with bupivacaine alone as this is known to be associated with extensive blood loss and may have resulted in the need for transfusion or possibly asymmetrical wound healing.\(^2\)

Infiltration of ropivacaine has been shown to result in more prolonged analgesia than plain bupivacaine.\(^4\) We did not examine the quality or duration of postoperative analgesia. In \textit{in vitro} experiments, ropivacaine has been shown to produce vasoconstriction in isolated femoral artery preparations,\(^3\) and \textit{in vivo} studies examining capillary blood flow with a laser Doppler technique have shown a significant reduction in blood flow.\(^6\) In addition, ropivacaine may be less toxic than bupivacaine,\(^3\) suggesting that it may be preferable to bupivacaine as a local anaesthetic for reduction mammoplasty.

There may be some advantage in using a mixture of ropivacaine with epinephrine. This may prove more efficacious in terms of both blood loss and duration of postoperative analgesia; further studies are required.

In summary, we have found that in respect of intraoperative blood loss, ropivacaine was not suitable for use as a sole agent for infiltration before reduction mammoplasty. Further studies are required to examine the optimum dose of epinephrine for use with ropivacaine.

### References