REGIONAL ANAESTHESIA

Postoperative shoulder surgery initiative (POSSI): an interim report of major shoulder surgery as a day case procedure†

K. Russon1 *, A. M. Sardesai1, S. Ridgway2, J. Whitear3, D. Sildown4, S. Boswell5, A. Chakrabarti5 and N. M. Denny6

1Department of Anaesthesia, Addenbrooke’s Hospital, Cambridge CB2 2QQ, UK. 2Department of Anaesthesia, Royal Gwent Hospital, Newport, UK. 3Discharge Liaison, West Norfolk Primary Care Trust, Norfolk, UK. 4Clinical Effectiveness Department, 5Department of Orthopaedics and 6Department of Anaesthesia, Queen Elizabeth Hospital, Kings Lynn, UK

*Corresponding author. E-mail: russonkim@doctors.org.uk

Background. There are logistical and financial advantages to undertaking shoulder surgery in a day case setting. However, this approach is limited by postoperative pain being inadequately controlled by oral medication alone. We describe a pilot study investigating the feasibility and acceptability of community based continuous interscalene brachial plexus blockade (CIBPB) to provide effective analgesia for day case shoulder surgery.

Methods. Phase 1 consisted of five patients who received CIBPB for shoulder surgery. Following an overnight hospital stay they were assessed for discharge home with the interscalene catheter in situ. Once the safety and feasibility of the approach was documented, five more patients were recruited to Phase 2. These patients had the adequacy of analgesia assessed in the postoperative period and were discharged home on the same day as surgery. A district nurse visited twice daily and removed the catheter on the third day. Patient satisfaction was assessed using a discovery interview.

Results. Nine of the 10 patients experienced good analgesia. One patient was re-admitted because the catheter fell out. No patient experienced complications and the discovery interviews showed that the patients were satisfied with their management and pleased to be treated as a day case.

Conclusions. POSSI proved that it was feasible to manage these patients in the community with support and training of the district nurses. Although extra community nursing hours are required, this technique has the potential for significant cost benefits with at least three bed days saved per patient.

Keywords: anaesthetic technique, day-case; anaesthetic technique, regional brachial plexus; analgesic technique, infusion; surgery, orthopaedic

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It is well documented that certain shoulder operations are extremely painful¹ and that interscalene brachial plexus blockade (ISBPB) can provide analgesia that is superior to morphine.² However, single-shot blocks only provide analgesia for up to 18 h, and when the block wears off patients can experience severe pain that requires treatment with parenteral opiates.³ The administration of parenteral opiates in the postoperative setting usually requires that the patient remains in hospital. Over the past few years, continuous regional analgesia (CRA) with an indwelling interscalene catheter has been used successfully to manage pain after shoulder surgery.³ Using this technique, it is possible for patients to undergo major shoulder surgery without either pain or the need for morphine. It is then no longer

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necessary for patients to remain in hospital and they can be managed on a day-stay basis. A few centres around the world have recognized the advantages in doing this and have reported successful results.\textsuperscript{4–8} The purpose of this pilot study was to see if we could do this in the UK state-supported healthcare setting.

\section*{Methods}

Local Research Ethics Committee approval was gained for this study, and all subjects provided written, informed consent. The project was jointly supported by the Queen Elizabeth Hospital Trust, Kings Lynn (QEH) and the West Norfolk Primary Care Trust. A multidisciplinary team was formed from hospital staff and primary health care staff. In addition to a consultant anaesthetist and a consultant surgeon, the team included orthopaedic preoperative assessment nurses, the Clinical Fellow in Regional Anaesthesia, the Discharge Liaison Sister (who liaised with the district nurses) and the Clinical Effectiveness Manager (who interviewed the patients in their homes after completion of their treatment).

Other staff who were not part of the immediate team but who needed to be kept informed, included ward managers, ward staff, the Directorate Manager, the Chief Pharmacist, the Medical Devices Officer and operating theatre staff and District Nurses. Throughout the project there were monthly multidisciplinary team meetings. Initially, a process map of the patient journey was made to identify the changes necessary to the established practice and to format the changes that would be needed to develop an appropriate patient care plan. Documentation was developed before the project was started. This included a list of requirements (Appendix 1), detailed patient information leaflets and a list of telephone numbers that would allow patients to access 24 h support.

The study comprised two phases. Phase 1 consisted of trialing the proposed care plan on in-patients, who stayed in hospital for one night and were discharged on the day after surgery. If formal assessment of the results of Phase 1 indicated that the process had been safe and successful, then Phase 2 could proceed, with patients being discharged home with an interscalene catheter in situ on the day of surgery.

\section*{Phase 1}

Five subjects were studied in Phase 1. Inclusion criteria for the study comprised all patients undergoing major shoulder surgery for which the surgeon and anaesthetist agreed that postoperative CRA would be appropriate. In addition, the patients had to fulfil all of our current day surgery criteria, which included: ASA I–III, BMI $<38 \text{ kg m}^{-2}$, living within 20 miles of the hospital, having a means of transport, an accompanying adult at home and access to a telephone.

Potential patients for the study were identified from an inpatient waiting list. A brief telephone assessment of these patients was undertaken by the orthopaedic preoperative assessment nurse to ensure that patients met the day case criteria before they were approached about taking part in the trial. These patients were then formally pre-assessed 2 weeks before surgery. The patients and their carers were given clear instructions about the care of the interscalene catheter, local anaesthetic infusion pump and their numb arm.

In the anaesthetic room, the patients were monitored with an ECG, pulse oximeter and automated non-invasive blood pressure. An i.v. cannula was inserted. An interscalene brachial plexus catheter was inserted under sedation with a target-controlled infusion of propofol. A ‘catheter-through-needle’ technique was used to place the interscalene catheters as described previously.\textsuperscript{9} The equipment used was a Contiplex Tuohy kit (B. Braun, Melsungen, Germany). When contractions in the target muscle (biceps/brachialis) were evoked at a stimulus duration of 0.1 ms and a current of $<0.5 \text{ mA}$, ropivacaine 0.75% 30–40 ml was injected. The 20G end-hole catheter was then placed, and a test dose of lidocaine 1% with 1:200,000 epinephrine 5 ml was injected down the catheter to exclude intravascular placement. The catheter was tunneled subcutaneously medially towards the sternal notch and secured with an epidural catheter clamp (Lokin, Smiths Medical, Hythe, UK). The surgical procedures were performed under sedation or general anaesthesia according to the patients’ preference.

Patient-controlled CRA was started after surgery. Plain ropivacaine 0.2% was infused at a background rate of 9 ml h$^{-1}$ via an Abbott Gemstar pump (Abbott Laboratories Ltd, Queenborough, UK). Patients had an option of receiving a bolus of 5 ml for breakthrough pain with a lockout period of 30 min. All patients took regular oral diclofenac (slow release 75 mg twice a day) and codamol (30/500 mg four times a day) after surgery. Pain control, catheter and infusion pump function and patient suitability for discharge was assessed on the morning after surgery (Appendix 2). If patients were judged suitable for discharge, they were given written instructions on the management of the pump, the contact numbers of the District Nurses and a letter for their General Practitioner.

A District Nurse visited each patient in the evening after discharge (about 30 min), and twice daily thereafter (60 min in the morning and a few minutes in the evening) to check on them, assess pain, redress the wound, assist with the exercises and change the infusion bag if necessary. The District Nurse removed the catheter on the third day after surgery.

\section*{Phase 2}

Five subjects were studied in Phase 2. Patient assessment and enrolment were as for Phase 1. The ISBPB was induced with prilocaine 1% 30–40 ml rather than ropivacaine. At the end of the operation, a bolus injection of ropivacaine 0.2% was injected down the catheter, followed by its attachment to a disposable patient-controlled CRA pump (Baxter disposable pump, Compton, UK). The fixed pump settings used in Phase 2 were: ropivacaine 0.2%, background infusion of 7 ml h$^{-1}$; bolus of 5 ml; lockout period of 30 min. Patients
were assessed 4 h after surgery and were discharged if they met the discharge criteria. Other elements of their postoperative management were as for Phase 1.

Results

Phase 1

Patient characteristics and the procedures they underwent are presented in Table 1. All the ISBPBs were successful, all interscalene catheters worked well, in that they provided good analgesia. The electronic pumps malfunctioned in three cases (battery failure and air alarms for small amounts of air). These problems necessitated additional District Nurse visits. Postoperative semi-structured discovery interviews by the Clinical Effectiveness Team at the patient’s home showed that all the patients were satisfied with their management. However, the patients presumed that they would be pain-free after the catheter had been removed. Unfortunately, this was not the case.

Phase 2

Patient characteristics and the procedures they underwent are presented in Table 2. All the ISBPBs were successful, all interscalene catheters worked well in that they provided good analgesia. One catheter dislodged shortly after the patient had been discharged home. The patient was re-admitted to hospital for pain management. The Clinical Effectiveness Manager visited the patients at home after operation and conducted semi-structured discovery interviews that showed that all the patients were satisfied with their management. One patient felt that his recovery was quicker when compared with his previous identical shoulder operation as an in-patient.

Discussion

A few centres outside the UK have described the use of postoperative interscalene CRA at home.4–8 The aim of this pilot study was to see whether it was feasible in the UK state-funded health setting. The challenges facing us were complex; including patient selection, achieving adequate analgesia, the selection of suitable pumps, the creation of patient care pathways and providing adequate nursing backup for the patient at home, as well as working across primary and secondary care Trusts and forming a liaison with the community nurses.

We chose to perform the study in two phases because by keeping patients in hospital for one night in Phase 1, we were able to assess the quality of the analgesia and the reliability of the infusion equipment before proceeding to Phase 2. The electronic pumps used in Phase 1 proved not to be reliable, so elastomeric disposable pumps were used for Phase 2. These functioned very well.

Although previous reports of CRA at home did not include visits by trained nurses,4–6 we felt that this was an important part of guaranteeing the safety and efficacy of the system while ensuring that backup facilities were available if there were problems with analgesia. It was essential that the nurses had clear guidelines, including a readmission policy, and had appropriate support available. Although previous reports of interscalene catheters describe the patient removing their own catheter,4,5 we chose to have District Nurses do this. They could then either return the electronic pump to the hospital (Phase 1) or dispose of the elastomeric pumps appropriately (Phase 2), and forward any assessment documentation to the POSSI Team.

We based our dose regimen on the studies that have shown ropivacaine infusions to be safe and effective in this setting.9,11 However, during Phase 1 we became aware of an analgesic gap that occurred as the initial injection of ropivacaine 0.75% wore off at about 16 h after block insertion, often in the early hours of the morning. This phenomenon has been reported before.5 If patients were to be sent home on the day of surgery, the analgesic gap would occur at home when there was no healthcare professional immediately to hand to help. Hence, we
changed the local anaesthetic we used to establish the surgical block from ropivacaine 0.75% to prilocaine 1%. The short duration of this drug meant that if the catheter infusion did not provide adequate analgesia, then this would have become apparent before the patient was discharged. This strategy appeared to work well: there were no analgesic gaps recorded.

Catheter failure or dislodgement is a common complication of CRA. Although our catheters are securely fixed as described above, one patient experienced catheter failure and required readmission for pain control. This event demonstrated the need for a readmission policy and proved it worked effectively.

Sending patients home with medical devices attached to them raises the issue of patient safety. The pump infusion rates we chose were based on published data that indicated that the doses administered were very unlikely to be associated with systemic local anaesthetic toxicity. An important safety feature of elastomeric pumps is that they include a high flow resistance that prevents ‘dumping’ of large amounts of local anaesthetic into the patient, which might produce systemic toxicity. In addition, these pumps have an easily activated clamp that the patient can use to stop the infusion if signs or symptoms of local anaesthetic toxicity develop. We were also reassured by the twice-daily visits of trained nursing staff and the presence of a 24 h on call service.

The POSSI project proved successful, albeit with small numbers of patients. Its safe implementation involved a lot of planning and hard work by a large multidisciplinary team. However, we were sufficiently encouraged by our results to turn this pilot study into a properly funded service. Efficiency savings proved popular with hospital managers. Most importantly it was deemed to be successful by patients and by community nurses who found it easy and satisfying to care for these patients in their own homes.

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Appendix 1

Setting up service—requirements

1. An anaesthetic team that performs blocks on a regular basis.
2. The ability to provide 24 h care for patients with an interscalene catheter—either based in primary or secondary care. This team must be prepared for their role.
3. A pre-assessment programme in place.
4. Identify the team members:
   - Consultant Anaesthetists and support
   - Consultant Orthopaedic Surgeon
   - Orthopaedic Preoperative Assessment staff
   - Community Liaison Nurse (who should identify the District Nurses who will be involved in the care of the patients)
   - Ward Manager and Ward Staff
   - Directorate Manager
   - Pharmacy
   - Medical Devices Officer
   - Operating Theatre Staff
   - Audit Department—both in Primary and Secondary care
   - Pump manufacturer with technical and educational support
5. Process map the patient journey to identify what action is required.
6. Division of labour:
   - The Consultant Anaesthetist gains approval for the initiative from the Local Research Ethics Committee.
   - Orthopaedic Preoperative Admission Clinic Staff Nurse and Community Liaison Staff Nurse work together to produce the necessary documentation. This includes:
     - Patient information leaflets
     - Readmission policy
     - District Nurse policies
     - Discharge checklist
     - Patient diary sheets including the Visual Analogue Scale pain scores (VAS)
     - Equipment loan sheets
     - Contact numbers for community nursing staff
     - Pump training policy
     - General Practitioner letters
     - Exercise sheets
     - Local anaesthetic toxicity checklist
     - Checklist for District Nurses and patients
     - Formulation of patient and District Nurse support folders.
7. All documentation produced must be sent to the Trust’s reading panels, Clinical Governance panels and the relevant managers for approval—numerous changes may have to be made for this to occur.
8. Identification of key trainers for pump training for primary care (District Nurses), secondary care (ward staff, theatre staff) and the patients.
9. Issues with regard to funding should be discussed—patients are moving from secondary care to primary care.
10. A business plan to address these issues.
11. Regular team meetings to discuss issues and update each other on the current situation.
12. Once the final decision is made to start a project, the identification of patients suitable for the trial.
13. After the trial has started, continuous audit of processes and outcome. Patients and staff should be asked for input about system changes that would increase safety and effectiveness.
Appendix 2

**POSSI DISCHARGE CHECK LIST**

- GP LETTER FOR THE PATIENT.
- TTOs—Patient medication and one elastomeric infusion pump and system.
- CHECK THAT THE INFUSION PUMP IS PRIMED AND CHECK THE FLOW RATE.
- COPY OF THE PRESCRIPTION FOR THE DISTRICT NURSE.
- EXERCISE INFORMATION SHEET. Ensure physiotherapist signed off.
- DISTRICT NURSE REFERRAL.
- DISTRICT NURSE MOBILE NUMBER FOR THE PATIENT.
- INFORM PATIENT OF THE INFORMATION PACKAGE HE/SHE HAS TO TAKE HOME contact numbers, visual analogue scales etc.
- INFORM PATIENT OF THE APPROXIMATE TIME THAT THE DISTRICT NURSE WILL VISIT THAT EVENING.
- PATIENT TO DEMONSTRATE WHAT ACTION TO BE TAKEN. In case of signs of anaesthetic toxicity.
- SUPPLY BAG.

References


4 Ilfeld BM, Enneking F. A portable mechanical pump providing over four days of patient-controlled analgesia by perineural infusion at home. *Reg Anesth Pain Med* 2002; 27: 100–4


