

PB-PG-0211-24033 – NIHR Research for Patient Benefit Programme – Final report

Project title: Is intra- operative passive movement therapy (IPM) effective in reducing post-operative morphine consumption, and improving the quality of recovery and functional ability of patients following breast reconstruction surgery? A randomised controlled trial.

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Plain language summary

After long operations patients can suffer severe pain and stiffness in areas well away from where the surgeons cut. We call this non-surgical site pain (NSSP). Lying still can cause damage to nerves, muscle and the skin.

We set out to investigate if passively moving patients whilst they are asleep during a long operation can improve recovery postoperatively.

We studied women undergoing breast reconstructions after breast cancer surgery. We devised a series of passive movements that could easily be administered to patients twice during an operation. These passive movements or stretching exercises were given by a member of the theatre team. We called this treatment intra-operative passive movement therapy (IPM).

We asked the public and patients what they were most concerned about during the recovery after a long operation. They told us that the amount of pain felt, and reducing the time taken to become mobile, self caring and independent were particularly important.

The primary aim of the study was to see if the amount of pain experienced in the 24 hours after the operation was reduced by passive movements in theatre during the operation. We measured the pain experienced by looking at the amount of morphine (a powerful painkiller) patients used. Patients were given a patient controlled analgesia (PCA) pump and encouraged to give themselves enough morphine to make themselves comfortable. We also looked at how long patients took to be mobile and self-caring and employed a questionnaire that accurately measures the quality of recovery.

After obtaining all the necessary ethical approvals 212 women were screened and 142 eligible women recruited to join the study. They were allocated by chance to receive either standard care without IPM or standard care plus IPM. Neither the patients nor the clinical care team knew which group any participant was allocated to.

The intervention was well tolerated and the protocol worked. All the patients received the treatment they were allocated. 10 patients were lost to follow up as they returned to theatre for a second operation. 15 other patients were lost to follow up. Patients receiving IPM used less than half the amount of morphine in the first 24 hours after the operation compared with

those who did not receive IPM. Generally patients receiving IPM experienced less NSSP than those who did not. There was no difference in the quality of recovery scores and time to become fully mobile and self caring between the groups.

Keywords

Analgesia, Pain, Physiotherapy, Post-operative, Recovery

Summary of research findings

Background

Patients undergoing prolonged surgical procedures often complain of severe pain and stiffness in areas distant from the surgical site. We describe this as non-surgical site pain (NSSP). NSSP causes considerable distress to patients and can delay recovery and the restoration of independent living. A local audit of 21 women undergoing breast reconstruction revealed that most operations take between 7 and 12 h, and that 62% suffered from non-surgical site pain. The pain was most severe in the immediate postoperative period. These women experienced pain mostly in the forearm and shoulders. In the audit, patients consistently said that one of the worst aspects of the recovery period was the pain and general aching feeling they experienced after surgery. Having identified this as a particular concern to our patients and in the absence of any established treatment we set out to examine whether a simple intervention could reduce the pain suffered by our patients and improve the quality of recovery. We postulated that NSSP was the result of prolonged immobility whilst lying on an operating table. With the help of our patients and the physiotherapists, the team developed a series of passive stretching exercises that could be delivered during breast reconstructive surgery. Prior to embarking on the main study, we conducted a feasibility study. This confirmed the intervention was practicable and deliverable. This pilot study helped to identify a primary outcome measure and ensure this randomized controlled study was adequately powered to detect a clinically significant difference between our study groups.

Methods

Having received research ethics committee approval, consecutive patients undergoing delayed, unilateral, Deep Inferior Epigastric Perforator (DIEP) or muscle sparing Transverse Rectus Abdominis Myocutaneous (TRAM) free-flap microvascular reconstructive breast surgery were invited to take part in this study, between October 2012 and December 2015. The study took place at the Queen Victoria Hospital NHS Foundation Trust. Women aged 18 years or over, with an ASA score of 1-2 were eligible. Patients with a history of chronic pain (defined as requiring regular analgesia), limb weakness or immobility, and allergies, intolerances or contraindications to drugs within the standardized treatment protocol were excluded. Written consent was obtained from participants prior to enrolment. The study intervention consisted of a sequence of safe, simple and reproducible movements designed by the hospital's physiotherapist (IPM). These passive movement techniques have been well described in the pilot study conducted at the authors' host institution. The movements targeted the sites most commonly affected by non-surgical site pain, namely

elbows, shoulders, knees and the lower back. Theatre staff were trained to deliver IPM using a validated instructional video. The treatment was performed twice during the peri-operative period: after the flap had been raised and again at the end of surgery. The sequence and number of passive movements was standardized. Each set of movements took approximately 5 minutes to perform.

Patients were randomised to receive either passive movement therapy (IPM) or standard care. The anaesthetist, surgeon, researcher and patient were all blinded to the intervention. This was achieved by the clinicians leaving the operating theatre whilst the trial intervention was occurring. At this time the attending anaesthetist could maintain sight of the monitoring equipment but not the patient.

A large sterile drape was placed over the surgical field to maintain the sterility of the operative site, whilst the treatment was/was not administered by the ODP.

Anaesthesia and intraoperative analgesia were standardized. One hour prior to the end of the operation intravenous diclofenac (75mg), paracetamol (1g) and morphine 0.2 mg.kg⁻¹ were administered. At the end of surgery 20 mls of 0.25% levobupivacaine was injected through each of the two abdominal drains. Participants were placed in a standardised supine position.

Post-op patients were asked to score their pain using a 0-100 mm visual analogue score (VAS), with 0 being no pain and 100 being the worst pain imaginable. Morphine was titrated in 2 mg increments, intravenously, every 5 minutes until the VAS score was less than 30 or until a maximum of 10 mg of morphine had been administered. A patient controlled analgesia (PCA) pump, programmed to deliver 1 mg boluses every 5 minutes, with a maximum cumulative dose of 40 mg in any four hour period was then attached to a designated cannula. Regular oral paracetamol (1 g 6 hourly) and ibuprofen (400 mg 8 hourly) were prescribed post-operatively. Oral cyclizine (50 mg 8 hourly) and lactulose (15 mls 12 hourly) were administered to patients whilst attached to the PCA. Deviations from the protocol were recorded.

The primary outcome measure was originally planned to be total morphine consumption up to 72 hours after the operation (including both morphine administered in recovery and that administered by PCA). However, this was subsequently changed to total morphine consumption up to 24 hours post-operatively. This was deemed necessary because shortly after the study began routine care at our institution changed. PCAs were discontinued after less than 36 hours, partly because very little morphine was used after 24 hours and also to encourage mobilisation in patients.

The cumulative recovery and PCA morphine consumption at six and 12 hours after the operation was also recorded.

Secondary outcomes including the quality of recovery as measured using the previously validated QoR-40 questionnaire and upper limb function were recorded at day one, three and five post-operatively, or until discharge if this occurred sooner. No validated assessment tool of post-operative arm function exists. Therefore a series of questions, developed in conjunction with the physiotherapists and patient focus group, were used to evaluate upper limb function bilaterally. Patients were asked to rate the worst pain they had experienced at their surgical site and in their shoulders, elbows, wrists, back, hips and lower limbs in

recovery and at each post-operative time point, using a linear numerical scale, with 0 being no pain to 3 severe uncontrollable pain.

Based on the feasibility study, a sample size of 142 patients was required to detect a 30% difference in the primary outcome between treatment groups with a power of 0.8 and α error (two tail) of 0.05, whilst allowing for a 15% attrition rate. This was based on a mean PCA use of 91 milligrams of morphine (S.D = 53.17) in the pilot study.

Findings

212 patients were screened. 70 were excluded as they either did not meet inclusion criteria or did not wish to participate. 142 were randomized. 68 were in the standard care group, of these 59 were included in the final analysis. 74 patients were allocated to the IPM group, of these 53 were included in the final analysis. Some of the reasons for exclusion included return to theatre within 24 hours (n=10), cancellation of the intended operation (n=5), protocol violations (n=6). It was always intended that data collected from patients if they had returned to theatre would not be included in the final analysis. Patients whose flaps failed or who had significant bleeding returned to theatre as emergencies. These immediate surgical complications are painful. The secondary procedures were often prolonged. It was impossible to determine whether they suffered from NSSP as a result of their second theatre episode. It was not possible to re-administer their study intervention during their second theatre trip.

Analysis of the results was conducted using intention to treat. Median morphine use in the standard care group was 24.0 mg (IQR 10.0-41.0) and in the IPM group 11.0 mg (IQR 5.0-23.0). Total morphine use during the 24 hours postoperatively in the IPM group as compared with the control group is reduced by a factor of 0.54 ($\exp(-0.614798) = 0.540750$), 95% CI: 0.37 to 0.80, $P=0.002$. The intervention had a statistically and clinically significant impact on our primary outcome measure.

NSSP was common. All the patients experience pain at some time. In both groups the pain was most frequent in the back and elbows. The intervention appeared to reduce the incidence of NSSP. Those patients receiving the intervention reported a lower incidence of NSSP in all areas of their bodies as compared with the standard care group. The intervention had no effect on either post operative mobility or the quality of recovery as measured by the QoR 40.

Conclusions

1. IPM reduced morphine consumption by a statistically and clinically significant amount in women undergoing breast reconstructive surgery.
2. The intervention was well tolerated and deliverable.

Patient and public involvement

The involvement of breast cancer survivors ensured that the study design and materials were acceptable to recruits and that the study was tailored to addressing negative aspects of the patient experience by guiding outcome measures. Three members of the focus group participants were consulted on a regular, though informal basis, throughout the conduct of the clinical phase of the trial.

Throughout the recruitment phase of the trial, the research team continuously gathered feedback from the patients recruited into the trial. They were uniformly positive about how the study was being conducted. When clinical practise at our institution changed to encourage earlier mobilisation with cessation of the use of a PCA at 24 hours informal discussions were had with patients. All those consulted were opposed to continuing to insist that trial patients used PCA pumps longer than non trial patients.

Of the 142 patients recruited 136 wanted to be informed of the results of the study. In conjunction with patient representatives, a lay summary is being prepared that will be passed onto involved patients. This will be sent to participants.

It has been difficult to continue to engage with the original PPI representatives. Two have moved away and have ceased to be involved. The clinical recruitment and analysis phases have taken considerably longer than originally anticipated.

Data sharing statement

See link

[\[https://www.nihr.ac.uk/documents/nihr-position-on-the-sharing-of-research-data/12253\]](https://www.nihr.ac.uk/documents/nihr-position-on-the-sharing-of-research-data/12253) for the NIHR position of the sharing of research data. The NIHR strongly supports the sharing of data in the most appropriate way, to help deliver research that maximises benefits to patients and the wider public, the health and care system and which contributes to economic growth in the UK. All requests for data should be directed to the award holder and managed by the award holder.

Disclaimer

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This final report has not been peer-reviewed. The report was examined by the Programme Director at the time of submission to assess completeness against the stated aims.

This project was carried out between September 2012 and November 2015.