ORIGINAL ARTICLES

The Effect of Intra-Neural Local Anaesthetic Infusion on Pain Following Major Lower Limb Amputation.

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Abstract

Background

Critical lower limb ischaemia has an annual incidence of 500 – 1000 per million and around a quarter will undergo a major lower limb amputation. Post operative pain and phantom pain are recognised complications.

Aim

The aim of this study was to assess the role of postoperative intraneural infusion of local anaesthetic in patients under-going major lower limb amputation.

Methods

Between May 1998 and July 2001, following amputation patients either had standard post-operative analgesia or had an intra-neural infusion of 0.5% bupivicaine via an infant feeding catheter connected to a standard syringe pump (Alaris®). This was a retrospective review and clinical notes of these patients were analysed to assess their post operative course, analgesic requirements and to ascertain phantom limb pain/sensation rates. All the data collected was from standard drug charts, case note entries and out-patient letters.

Results

During this time period 64 patients had a major lower limb amputation (31 patients treated routinely and 33 patients had an intra-neural anaesthetic (INA) catheter placed). In the INA group median post-operative opioid analgesia requirement was 10mg versus 74mg ($p=0.0002$, Mann-Whitney U) and post-operative prescription of amitriptyline for phantom pain was less common (4 patients versus 11 patients; $p=0.0281$, Mann-Whitney U). There was no obvious increase in complications or significant adverse events.

Conclusions

Postoperative intra-neural local anaesthetic infusion is a safe and effective technique. It reduces post-operative opioid analgesia requirement and seems to reduce phantom pain development.

Introduction

Critical lower limb ischaemia has an annual incidence of 500 - 1000 per million, around a quarter will undergo a major lower limb amputation.[1] The aim of any major lower limb amputation is to alleviate pain and to allow rehabilitation. These operations are usually carried out in patients of advanced years with morbidity and mortality rates in some series as high as 37% and 4% respectively.[2] Of the long-term complications, stump pain and phantom pain are common.[3] Up to 85% of patients develop some degree of phantom pain and the pathophysiology behind this seems to involve central, peripheral and psychological elements.[4,5] To date numerous possible treatment options have been suggested including pre-operative[6,7,8], peri-operative[9,10,11] and post-operative[3,12,13,14,15] measures. However, the best way in which to treat post operative pain and phantom pain is still unclear. The aim of this study was to assess the efficacy of post-operative intraneural infusion of local anaesthetic in the relief of amputation related pain and neuralgia.

Methods

This study was carried out from May 1998 until July 2001 at the University Hospital of Hartlepool, where the intraneural local anaesthetic technique had recently been implemented. A control group comprising patients having amputation before the date of implementation and also patients having amputations by other surgeons were included. Patients were identified from the theatre log and their clinical notes were requested. Patients who underwent amputation for reasons other than peripheral vascular disease were excluded. After amputation the patients either had standard post-operative analgesia or had an intra-neural infusion of 0.5% bupivicaine which was placed per-operatively. This was a previously published technique whereby the sciatic nerve, in above knee amputations, and the posterior tibial nerve, in below knee amputations, was dissected and an infant feeding catheter passed under the perineurium and secured in place. The catheter was then used to infuse 0.5% bupivicaine at 3-4ml/hr for 5 days using a standard syringe pump (Alaris®). Post operative analgesic requirements, complications and phantom limb pain/sensation rates were assessed retrospectively.

Statistical analysis

All statistical analysis was carried out using Co-Stat v6.303 using a T-test and Mann-Whitney U test. Significance was reached at $p = 0.05$.

Results

During this period there were 64 major lower limb amputations carried out (33 received intraneural anaesthetic (INA) and 31 had standard treatment only). The two groups were well matched for age, sex and American Society of Anesthesiologists' grade (Table I). However, the above knee:below knee rate (AKA:BKA) differed significantly between the two groups. Incidence of complications was noted for early death (within 30 days), deep vein thrombosis/pulmonary embolism, chest infection and wound infection (any patient started on antibiotic for a suspected infection) (Figure 1). Complication rates were not statistically different between the 2 groups.

Table I Patient Demographics

	No INA (n=31)	INA (n=33)	P value (T-test)
Mean age	71	73	0.4425
Sex M:F	17:14	20:13	0.644
Mean ASA	3.1	3.0	0.6383
Elective/Emergency	6:25	12:21	0.1331
AKA:BKA	11:20	23:10	0.0062

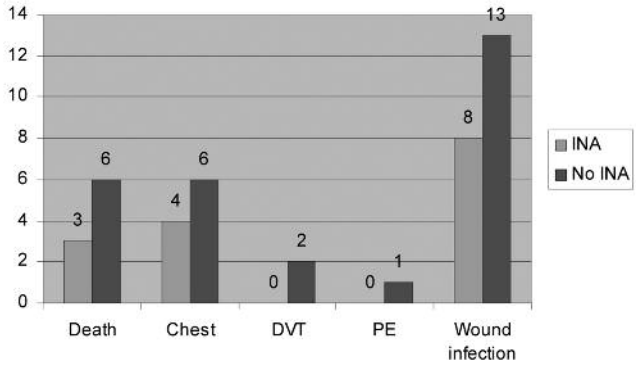

Figure 1. Complication rate. (Death – early death within 30 days/ same hospital stay, Chest – Chest infection, DVT – Duplex proven deep venous thrombosis, PE – V/Q or CT proven Pulmonary embolism)

Complications specific to the intraneural catheter included 3 blocked catheters, 8 pulled out prematurely and one patient had an un-proven but suspected anaphylactic reaction to the local anaesthetic. This was in fact a patient who had a transient post-operative hypotension in whom the infusion was stopped as a precaution but never restarted.

The average duration of treatment of the intraneural anaesthesia was 3.4 days (range 1-8). Analgesic requirements were identified from patients' drug charts for both groups (Figures 2 and 3). In the INA group 12 of 33 patients required no opioid analgesia (4 of 31 in the control group).

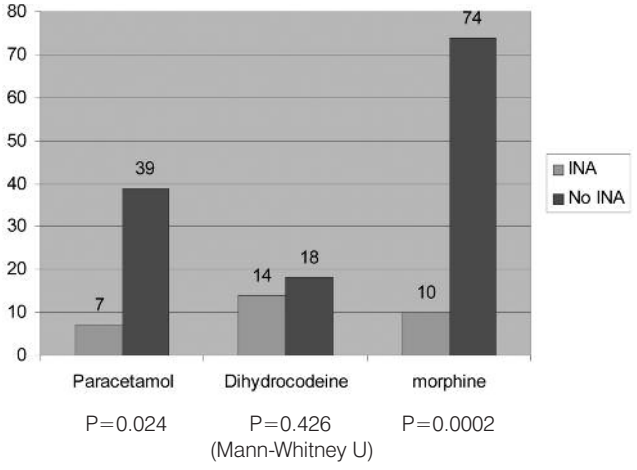

Figure 2. Median analgesia required. Paracetamol (G), Dihydrocodeine and morphine (mg)

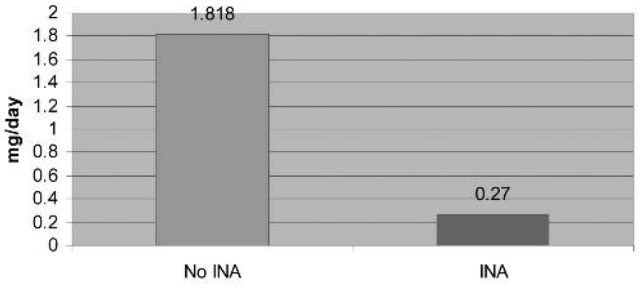

Figure 3. Median morphine requirement mg/day (p=0.0078, Mann-Whitney U)

Phantom pain was documented in 3 patients in the INA group compared to 7 in the control group. In addition the prescription of amitriptyline, which was the drug of choice for treatment of phantom pain during this period, was more common in the control group (Figure 4).

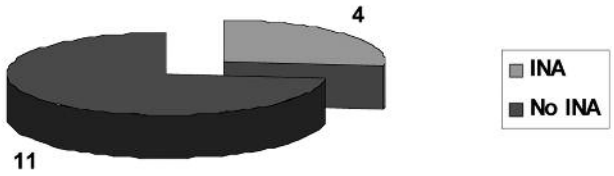

Figure 4. Amitriptyline prescription. (p=0.0281, Mann-Whitney U)

Discussion

Major lower limb amputation is still a relatively common procedure[1] and clearly anything that can improve outcome should be considered. The results of this study show that the use of intraneural local anaesthetic infusion is a safe technique. There was only one suspected case of adverse reaction and the evidence for it was weak. There was concern that the catheter could act as an extra source of infection, which could lead to an increase in wound infection rates and wound breakdown. However, there was no evidence of increase in wound problems in the INA group.

This technique seems to reduce postoperative analgesia requirements, in particular opioid requirements, given median morphine requirement was 10mg in the treatment group compared with 74mg in the control group, which represents a significant reduction (p=0.0002, Mann-Whitney U). Phantom pain incidence also seems to be reduced as amitriptyline, which was the drug of choice for treatment of this complication, was prescribed more frequently patients in the control group compared to the INA group (11 cf. 4; p=0.0281, Mann-Whitney U).

It is recognised that the major confounding factor, in this study, is the differing above knee to below knee amputation rates in the two groups. This was simply because the technique was initially instigated for above knee amputations and only when its success in these patients became apparent it was used for all major lower limb amputations.

Post-operative analgesia given via intraneural infusion of local anaesthetic is a well described technique.[9,10,11,12,13,14] Current literature is divided on its efficacy in reducing post-operative opioid analgesic requirements or phantom pain rates. Elizaga et al, in a retrospective series, found that single nerve intraneural local anaesthetic infusion was ineffective in reducing post-operative opioid analgesic requirement and made no difference to phantom pain development.[11] However, this trial was on a small, heterogeneous group of 19 patients who underwent amputation for a variety of indications including ischaemia, infection, trauma and congenital abnormalities. Therefore, this may not be a true representation of a vascular surgeon's traditional case mix. The authors also acknowledge that the use of patients with pre-operative chronic pain may have influenced results, in particular phantom pain development. Several other studies including a randomised controlled trial by Pinzur et al have reported a dramatic reduction in post-operative opioid requirements but no significant change in phantom pain development.[9,12,13] To date only 2 small series have identified a reduction in phantom pain development following the use of intraneural local anaesthetic infusion. Morey et al found retrospectively, in a group of 39 amputees, that there was a reduction in phantom pain reporting compared with historical data.[10] In addition to this a pilot study by Fisher and Meller remarkably found a complete absence of phantom pain in a series of 12 patients treated by this method of post-operative analgesia after long-term follow-up.[14]

Conclusions

The findings of this study are consistent with previous papers, which found a reduction in post-operative opioid analgesia requirements. A reduction in post-operative pain and analgesic use will lead to early mobilisation thereby reducing hospital stay and possibly reducing post-operative complications. It has been shown that pre-operative pain control is effective at reducing phantom pain development.[16,17] This study suggests that the same is either true for peri-operative pain control or that local anaesthetic in some way reduces predilection for phantom pain development by direct action on the transected major peripheral nerves. It is recognised that the differing above knee to below knee amputation rates in the INA and control groups could influence the results; however, there is enough evidence to suggest that a prospective trial should be under taken to further evaluate the findings of this pilot study.

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