PERINEURAL CATHETER TECHNIQUE FOR PREVENTION OF POST-AMPUTATION STUMP PAIN

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ABSTRACT

BACKGROUND
Post-operative stump pain can be a cause of significant morbidity in high risk amputees. The underlying medical conditions may deter the use of systemic analgesics.

AIMS
Our study aimed to study the analgesic efficacy of an introperatively placed perineural catheter as compared to Epidural analgesia for major lower limb amputation.

MATERIALS AND METHODS
In this prospective study, a total of 38 patients undergoing major lower limb surgeries were randomised to receive an Epidural infusion of 5ml/hr. of 0.125% Bupivacaine or a perineural infusion of 10ml/hr. of 0.125% Bupivacaine for 72 hours postoperatively. VAS scores and the number of doses of rescue analgesia received were recorded at regular intervals for 72 hours.

STATISTICAL ANALYSIS
Data analysis was carried out using student t-test and ANOVA.

RESULTS
There was no statistical significance in the VAS scores or the requirement of rescue analgesic between both the groups. No significant side effects were noted in either of the groups.

CONCLUSION
The results suggest that perineural infusion of local anaesthetics following lower limb amputations provides excellent analgesia for acute stump pain.

KEYWORDS
Amputation, Analgesics, Epidural, Perineural Catheter.

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INTRODUCTION

Acute stump pain and phantom limb pain after amputation is a significant problem among amputees with a reported incidence of 13%-71%.[1] The transection of the nerve causes barrage of afferent impulses causing spinal cord hyperexcitability resulting in neuroplastic changes. This further leads to the development of persistent post-surgical pain and chronic pain syndrome including phantom limb pain.[2,3,4] These conditions might require the use of systemic analgesics including long-term opioids.[5]

It has been suggested that patients receiving peripheral local anesthetic nerve blocks experience reversal of cortical reorganization.[6]

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Continuous regional analgesia may be a safer alternative to epidural analgesia/systemic opioids in geriatric patients avoiding known side effects such as sedation, respiratory depression, hypotension, motor block and urinary retention.[7] Malawer et al first described the use of peripheral nerve sheath catheters for analgesia.[8] The purpose of our study was to evaluate the analgesic efficacy of an infusion of local anaesthetics through a perineural catheter placed intraoperatively as compared to Epidural analgesia for lower limb amputations.

MATERIAL AND METHODS

Following institutional protocol, informed consent was obtained from all the patients enrolled for the study. 38 patients of either sex in the age group of 18-75 years belonging to American society of Anaesthesiologists physical status I-III scheduled for elective/emergency above/ below knee amputation between Jan 2010 and Nov 2011 were included.

After a detailed pre-anaesthetic evaluation all patients were familiarised with the linear Visual analogue scale (VAS) {0 – no pain and 10–worst imaginable pain}.

A blinded observer other than the anaesthesiologist was involved with each patient. The patients were randomly allocated using a computer generated randomisation table into Epidural (E) group and Perineural Group (N) group. On the day of the surgery after ensuring that all standard monitors like Electrocardiogram, Non-invasive Blood pressure and Pulseoximetry were in place patients of Group E had a lumbar Epidural catheter placed. Patients of both groups received a Sub-Arachnoid block with hyperbaric Bupivacaine (12.5mg). Intraoperatively patients of Group N had a mulitiorifice 20 G Epidural catheter placed into the nerve sheath of either the Sciatic nerve or the Posterior Tibial nerve.

The catheter was sutured in place and was exteriorised using a 16 gauge venous Cannula. Both the groups received a bolus of 8cc of 0.125% Inj. Bupivacaine through the epidural/perineural cathter before the closure of the wound. Intravenous infusion of Inj. Paracetamol 1gm eight hourly was the standard protocol. Post-operatively Group E received an infusion of 5cc of 0.125% Inj. Bupivacaine while group N received an infusion of 10 cc of 0.125% Inj. Bupivacaine for 72 hours. All the patients were assessed for pain using VAS. Patients with a score >3 received rescue analgesia of intravenous Tramazac 1mg/kg. Time to rescue analgesia, side effects such as Hypotension, Bradycardia, urinary retention, motor Blockade, were also noted. Adverse events like catheter dislodgement were recorded.

Sample size was determined by a cross over pilot study of 6 patients in both the groups to detect a projected difference of 35% between the two groups for duration of analgesia for Type 1 error (α) of 0.05. The results were averaged (Mean ±SD) for continuous numerical data. The student 't' test was used to determine whether there was a statistical difference in the demographic data and level of amputation between groups. Statistical difference between groups with respect to the pain scores (VAS) was analysed using repeated–measures analysis of variance (ANOVA). 'P' <0.05 was accepted as statistically significant. The data analysis Toolpak of Microsoft excel (Microsoft Inc, WA, USA) was applied.

RESULTS

Total of 38 patients were enrolled in our study. 2 patients of Epidural (E) group were excluded from the study because of catheter displacement. No difference in the demographic profile was detected between the two groups as shown in Table 1.

Mean VAS scores between the groups were comparable as shown in Table 2

The mean requirement of rescue analgesia were 3.16 doses in Group E and 3.58 in Group N. P being 0.40 was stastically insifnificant.

DISCUSSION

Wall has suggested that the rationale of use of regional anaesthesia to prevent bombardment of the central nervous system during surgery lies in avoidance of spinal cord hyper excitability and in reduction of postoperative pain.[9]

Allan Fisher et al suggested that the perineural catheter technique involves administration of the block intra-operatively after amputation of the leg and transection of the nerves, peripheral injury has already occurred by the time the block is instituted. Hence, the situation is not identical to that suggested by Wall. But it is possible that the prolonged block administered intraoperatively soon after the peripheral trauma of amputation and continued into the postoperative period may modify and reduce the hyper excitability response of the spinal cord.[10] Acute Pain Management: Scientific Evidence 2nd edition (APS:SE 2e) recommended that compared with opioid analgesia, continuous peripheral nerve blockade (Regardless of catheter location) provides better postoperative analgesia and leads to reductions in opioid use as well as nausea, vomiting, pruritus and sedation (Level I).[11] O.G.S. Ayling et al. conducted a large retrospective analysis of 198 lower limb amputees and reported that continuous perineural catheter infusions of local anesthetic are a safe and effective method for reducing opioid analgesic medications following lower limb amputations.[12]

Lambert et al. conducted a study of 30 patients scheduled for lower limb amputations; 14 patients received epidural bupivacaine for 24 hours before and during surgery and 3 days postoperatively, and 16 patients had an intraoperatively placed perineural catheter for intra and postoperative administration of bupivacaine. They concluded that the perioperative epidural block is not superior to perineural catheter in preventing phantom pain.[13]

Hence, we tried to compare the analgesic efficacy of a perineural catheter to epidural analgesia, both initiated introperatively continuing into the post-operative period for 72 hours.

Analgesia of the amputated stump is obtained by nerve sheath block of the sciatic nerve in above-knee amputation and posterior tibial nerve despite the fact that sensory innervations of the anterior aspect of the thigh comes from the femoral nerve.[10] and that of the below knee stump from the common peroneal nerve. This could be because of the stump being bathed by the large volume of local anaesthetic being infused.

In previous studies describing the use of continuous perineural infusions of local anesthetics, the infusion rates varied from 1 to 10ml/hr.[7,10,14] Malawer et al. used 4ml/hr. of 0.5% of bupivacaine.,[8] while in other trials bupivacaine 0.25% at 10ml/hr.[10] and bupivacaine 0.1% at 10ml/h (With clonidine) were used. In our study we chose to use a larger volume of 10ml of diluted local anaesthetic, i.e., 0.125% bupivacaine.

The linear Visual Analogue Scale (VAS) being a reliable validated score for assessing acute post-operative pain, was used in our study with 0 representing no pain to 10- the worst possible pain.

Results of our study revealed that mean VAS scores at regular intervals were <3 in both the groups indicating that both the techniques provided excellent analgesia for 72 hours. There was no statistically significant difference (p=0.059) between the pain scores of the Epidural and Perineural group means (Between-Subjects Analysis).

One patient of Group E had urinary retention requiring Bladder catheritisation, while one patient in group N had nausea which did not require any medication. No other side effects were noted in either of the groups.

CONCLUSION

Considering patients presenting for major limb amputations are a high risk group with multiple co-morbidities, it would be prudent to choose a safer technique like continuous perineural infusion thus avoiding systemic analgesics and neuraxial blockade (Epidural). Hence, we conclude that perineural catheter technique is a safe alternative compared to Epidural analgesia.

LIMITATION

The limitations of our study were that long-term follow-up to study the role of perineural/epidural analgesia in preventing phantom limb pain was not done. Considering that we infused a large volume of the local anaesthetic to a surgical wound, the serum levels of Bupivacaine could have been measured. A larger study incorporating both the above can be planned.

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	E Group	N Group	'P' value
No (n)	19	19	
Age (Yrs.)	64.68±9.28	64.89±8.2	
Sex – M/F	17/2	16/3	
Type of lower limb amputation- Below Knee/Above Knee	15/4	16/3	0.674

Table 1: Demographic Data

MEAN SCORES	GROUP E	GROUP N
VAS 1	1.473	1.947
VAS 2	2	2.052
VAS 4	1.631	1.842
VAS 8	2.052	2.157
VAS 12	1.578	1.789
VAS 24	1.157	1.473
VAS36	0.894	0.947
VAS 48	0.894	1
VAS 60	0.789	1
VAS 72	0.421	0.526

Table 2: Mean Vas Scores at Different Time Points between the Two Groups