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Bupivacaine and kaltostat reduces post-operative donor site pain

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SUMMARY. **A prospective double blind controlled trial was carried out to examine the differences in post-operative split skin graft donor site pain between sites dressed with three differently treated types of dressing; a dry calcium alginate dressing (Kaltostat® Britcair), a saline moistened Kaltostat dressing and a bupivacaine hydrochloride (0.5%) moistened Kaltostat dressing. There was a significant reduction in post-operative pain in the Kaltostat and bupivacaine group (group 3) at 24 and 48 h when compared to the other two groups ($p < 0.04$). There was no difference in ease of removal of dressings or the quality of wound healing on day 10 between the three groups. This study demonstrates a significant reduction in post-operative pain in bupivacaine soaked Kaltostat without reducing the beneficial effects of Kaltostat on donor site healing and we recommend its use in clinical practice.**

Following the harvesting of a split skin graft the donor site is inevitably painful and can even be more painful than the recipient site.[1] Parenteral and enteral analgesic agents may be required but these agents are not without unwanted side effects. A topical agent such as bupivacaine could supplement or replace these agents by providing effective post-operative analgesia. Kaltostat® (Britcair, UK) is a calcium alginate dressing that has been shown to hasten donor site wound healing.[2] It is an absorbent inert dressing and as such provides an ideal conduit for application of bupivacaine to the donor site. This study assesses the efficacy of Kaltostat and bupivacaine in providing pain relief at the donor site while demonstrating that wound healing is not compromised.

Materials and methods

Forty five patients undergoing split thickness skin grafts for a variety of surgical conditions were prospectively studied (Table 1). Adult patients above 70 kg in weight, with no previous hypersensitivity to local anaesthesia and with a single thigh donor site only were included in the study. After harvesting the skin graft each patient was assigned to one of three different treatment groups of donor site dressing in a randomised manner; group 1, dry Kaltostat (dry control); group 2, Kaltostat moistened with 20 ml of normal saline (wet control); and group 3, Kaltostat moistened with 20 ml of bupivacaine 0.5%. The dressing was secured with an outer wound pad and adhesive dressing. Post-operative donor site pain was assessed by a "blinded" medical observer, who was unaware of the type of dressing used, at 24, 48 and 72 h in all patients using a linear analogue pain scale (0–10 scale). The dressing was removed (or removed after soaking if required) on the 10th post-operative day and epithelial healing was assessed by a similar observer. Ease of removal and the presence of infection were also documented. If healing was not complete a Jelonet® dressing was applied to the unhealed area and dressed daily until healing was complete. Results were tested for statistical significance using the student test.

Table 1 Indications for split thickness skin grafting. * One patient excluded from study (see text).

Indication	*Group 1*	*Group 2*	*Group 3*
Skin malignancy	4	5	3
Burn contracture	5	4	4*
Trauma	4	3	4
Burn	2	2	1
Varicose leg ulcer	0	1	2

Results

There was no significant difference between groups when comparing ages and sex (Table 2). Values for pain as measured on the linear analogue pain scale were elevated for groups 1 and 2 at 24 h (3.7 and 3.9 respectively) and at 48 h (3.2 and 3.0 respectively). There was no statistical difference between these groups at 24 and 48 h. Pain scale values for group 3 were significantly lower at 24 and 48 h (1 and 0.7 respectively) when compared with groups 1 and 2 ($p < 0.04$) (Fig. 1). The values for all three groups at 72 h were not significantly different (1, 1.4 and 1.2 for groups 1, 2 and 3 respectively).

One graft site in each group was unhealed at 10 days. There was no difference in ease of removal between all three groups. One patient in the bupi-

Table 2 Age (mean ± standard deviation) and sex (male to female ratio) of study population.

	Group 1	*Group 2*	*Group 3*
Age in years	41.4 (13)	52.4 (10)	47.3 (11)
Sex (M:F ratio)	7:8	6:9	7:6

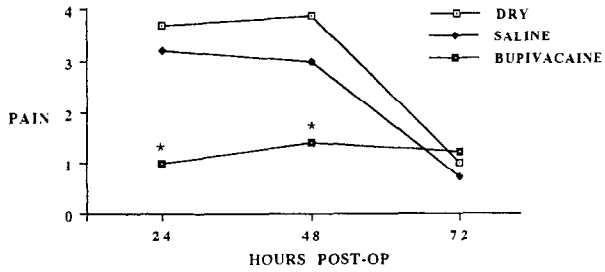

Fig. 1

Figure 1—Linear analogue pain scores for dry, saline and bupivacaine groups. Vertical axis: pain score. Horizontal axis: time in hours. * $p < 0.04$ versus dry and saline groups.

vacaine group was excluded from the study because the dressing had slipped down the leg post-operatively; it was found that the dressing had not been secured with an outer adhesive bandage initially.

Discussion

An ideal donor site dressing should promote healing, reduce donor site pain and cause little, if any, donor site morbidity. Jelonet is the standard dressing of comparison and is still used as the dressing of choice in some units.[3] It has been applied with modifications both to enhance the healing rate beneath it and to decrease donor site pain.[1] Kaltostat, a calcium alginate dressing, has been shown to be a superior dressing in rate of donor site healing and post-operative donor site patient comfort when compared to a Jelonet dressing.[2] It has the advantage of being a dry absorbent dressing and yet forms a moist gel layer at the wound dressing interface.

A recent report suggests that relief of post-operative pain is still unsatisfactory and a number of studies have demonstrated that most patients expect to experience pain post-operatively.[4] A significant factor in inadequate post-operative pain relief is poor nursing and medical education. One of the factors that contributes to this is overestimation of the risk of opiate addiction and respiratory complications on the part of nursing and medical staff.[2] Schulze *et al.*[5] have shown that a combination of analgesic agents of different drug classes (opiate, NSAID and bupivacaine) has an additive effect and can reduce post-operative pain scores to zero. An effective topical analgesic agent, as in this study, could be used in conjunction with systemic agents to provide more effective relief of donor site pain.

The agent used in this study was bupivacaine hydrochloride 0.5% which is a long acting local anaesthetic agent used commonly in regional anaesthesia. Bupivacaine can, however, have systemic toxicity. Its maximum recommended dose varies from 2 mg/kg to 3 mg/kg.[6] For a standard 70 kg man using bupivacaine 0.5% the safe dose varies between 30 and 40 ml. This study used only 20 ml in any one dressing and only adults over 70 kg with a single thigh donor site were studied, so it was well within the safe therapeutic range of bupivacaine. If the dressing were to be used to dress more than one site or the dressing were to be used in a child, this would have to be taken into account.

The period of post-operative pain relief in the bupivacaine group is far greater than its stated half life. This phenomenon of prolonged activity of a local anaesthetic has been described before in the relief of post-operative pain after herniorrhaphy, where a difference was found as late as 10 days post-operatively in patients blocked peri-operatively with bupivacaine.[7]

References

1. Stanley D, Emerson DJ, Daley JC. Whitehead's varnish and Jelonet—a better dressing for skin graft donor sites than Jelonet alone. Ann R Coll Surg Engl 1988; 70: 369–71.
2. Attwood AI. Calcium alginate dressing accelerates split skin graft donor site healing. Br J Plast Surg 1989; 42: 373–9.
3. Foyatier JL, Hezez G, Masson CL, Latarjet J. Use of a neutral paraffin dressing (Jelonet) at a Burn Care Center at the Saint Luc Hospital in Lyon. Ann Chir 1990; 35: 327–30.
4. Kuhn S, Cooke K, Collins M, Jones JM, Mucklow JC. Perceptions of pain relief after surgery. B M J 1990; 300: 1687–90.
5. Schulze S, Roikjaer O, Hasselstrom L, Jensen NH, Kehlet H. Epidural bupivacaine and morphine plus systemic indomethacin eliminates pain but not systemic response and convalescence after cholecystectomy. Surgery 1988; 103: 321–7.
6. Shearer AJ. The principles of anaesthesia. In: Cusheri A, Giles GR, Moosa AR, eds. Essential Surgical Practice. London: Butterworth Scientific Publications, 1988: 203–24.
7. Tverskoy M, Cozacov C, Ayache M, Bradley EL, Kissin I. Postoperative pain after inguinal herniorrhaphy with different types of anaesthesia. Anesth Analg 1990; 70: 29–35.

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