ORIGINAL ARTICLE

Comparison of Bupivacaine Moistened Dressing and Conventional Dressing for Pain Relief on Skin Graft Donor Sites

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ABSTRACT

Objective: To compare the effectiveness of bupivacaine moistened dressing and conventional dressing in patients requiring split thickness skin graft for reconstruction of various defects.

Study Design: Randomized controlled trial.

Place and Duration of Study: Department of Plastic Surgery and Burns Unit, Mayo Hospital, King Edward Medical University, Lahore, from January 2011 to January 2013.

Methodology: One hundred and fifty patients requiring split thickness skin grafting for various soft tissue defects were divided into two groups A and B, with 75 patients in each group. In Group A, skin graft donor site dressing was kept moist with 12 mL/100 cm^2 of 0.25% bupivacaine solution and in Group B, dressing was moistened with same amount of normal saline. Outcome was measured by calculating rescue analgesia requirements in the two groups after 24 hours. Significance was determined by comparing analgesia sparing effect of each dressing using chi-square test.

Results: In Group A, 5 out of 75 (6.7%) patients required rescue analgesia. In Group B, 72 out of 75 (96%) patients required rescue analgesia ($p < 0.0001$). There was 93.3% effectiveness of bupivacaine soaked dressing while only 4% effectiveness of conventional dressing.

Conclusion: Bupivacaine soaked dressing is much more effective in pain relief and in reducing the requirement of rescue analgesia, in early postoperative period, at split thickness skin graft donor site compared to the conventional dressing.

Key Words: *Bupivacaine. Split thickness skin graft. Donor site. Postoperative pain. Rescue analgesia.*

INTRODUCTION

Skin grafting is the most commonly done surgical procedure for soft tissue defects. Its wide range of applications make it valuable not only to plastic and reconstructive surgeons but also to other surgical specialties.[1,2] Split thickness skin grafts are used in most burns, reconstructive procedures and extensive wound management.[2] They are used to resurface large wounds, line cavities, re-surface mucosal deficits, close donor sites of flaps, re-surface muscle flaps and to cover tissue loss across joints in areas where contraction will cause deformity.[3] They are also used to achieve temporary closure of wounds created by the removal of lesions that require pathologic examination prior to definitive reconstruction.[4,5] The grafting can reduce the course of treatment needed (and time in the hospital) as well as improve the function and appearance of the area of the body which receives the skin graft.[6,7] While any part of the body can be used as a donor site of split-thickness skin grafts, the posterolateral thigh is most commonly used.[8]

The aim of donor site management is to maintain an environment that promotes optimal healing and prevents morbidity that may include pain, infection and delayed healing. Pain at the split thickness skin graft donor site can be a real problem for most patients especially in first five postoperative days.[9-11] Donor-site pain is probably the most disturbing complication in the early post-operative period.[12] If split thickness skin graft donor site is more painful postoperatively than the recipient site then good graft take is likely (Moriarity Sign).[13] Alleviation of this pain can achieve considerable reduction in postoperative morbidity and fast recovery of the donor site.[14,15] These methods include ice application at the donor site, *Fascia Iliaca* compartment block, and a number of dressings.[16,17]

Bupivacaine is an anesthetic agent that blocks the nerve impulses that transmit pain sensation to brain. It is most commonly used for spinal blocks but can also be used for local infiltration anesthesia and peripheral nerve blocks.[18] So bupivacaine soaked dressing is an applicable option for split thickness skin graft donor site for early postoperative analgesia.

The aim of this study was to compare the effectiveness of bupivacaine-moistened dressing and conventional dressing in patients requiring split thickness skin graft for reconstruction of various defects.

METHODOLOGY

This study was conducted at Department of Plastic Surgery and Burn Unit, Mayo Hospital, King Edward Medical University, Lahore, from January 2011 to

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January 2013. This study was carried out on cases requiring skin grafting that were randomly divided into two groups with 75 cases in each group. Random number table was used for this purpose. The two groups were named as Group A and Group B. Inclusion criteria was adult patients of both genders aged 16 - 60 years who required split thickness skin grafting for reconstruction of various defects in whom only thigh was used as split thickness skin graft donor site. Exclusion criteria were unwillingness to participate in trial and patients with previous history of allergy to local anesthetics.

Each patient was informed in detail about the study, the procedure and both dressings and written consent was taken from each patient. In both groups, split thickness skin grafts were harvested with pressure driven dermatome. Once the desired amount of the graft was harvested the donor site wound was first covered with bactigras, which was covered by a thin layer of sterilized gauze, a catheter was longitudinally placed on this layer of gauze on the wound which was in turn covered with abundant amount of sterilized gauzes and finally crepe bandage was applied to prevent external contamination.

In Group A, the donor site dressing was kept soaked by instilling an aqueous solution of bupivacaine hydrochloride in a concentration of 0.25% through the catheter placed in dressing gauzes. The amount instilled depended on the size of the graft taken. For every 100 cm^2 of the donor site wound, 12 mL of the bupivacaine solution was instilled once immediately after the surgery and then repeated after 12 hours of the first instillation. In Group B, the donor site dressing was kept soaked by instilling normal saline through the catheter placed in dressing gauzes. Just like Group A, in Group B for every 100 cm^2 of the donor site wound 12 mL of the normal saline was instilled once immediately after the surgery and then repeated after 12 hours of the first instillation.

For the assessment of pain, patients were interviewed for pain using Visual Analogue Scale every 6 hours. Patients who were complaining of pain or in whom pain score was more than 4 (i.e. need for analgesia), were given intravenous (IV) analgesia in the form of 10 mg Pethidine injection. Final conclusion of analgesia sparing effect of dressings was made at 24 hours post-operatively. All the information was collected through a proforma.

Statistical Package for Social Sciences (SPSS) version 11.0 was used for analysis purpose. Variables of interest such as rescue analgesic requirement in the two groups was compared using chi-square test taking p-value < 0.05 as significant. Qualitative variables like age are presented by calculating mean and standard deviations. Quantitative variables like gender and rescue analgesic requirement are presented by calculating frequency and percentages.

RESULTS

In total, 154 patients were chosen randomly who were to undergo split thickness skin grafting for various soft tissue defects. In 2 patients, the instillation for soakage of dressing was missed at the 12-hour mark. In one patient, peroperatively, it was decided to harvest graft from abdomen as well since thighs were not sufficient as donor site. In another patient, there was early staining and soakage of outer dressing so the dressing had to be changed at 6 hours so continuously soaked dressing could not be achieved. All those patients were excluded from the study. The final data was obtained from and analyzed for 150 patients.

The two groups were similar demographically with respect to age and gender. In Group A, the mean age of patients was 32.79 ± 13.34 years while in Group B, the mean age of patients was 31.83 ± 13.05 years. In Group A, there were 40 males and 35 females while in Group B, there were 44 males and 31 females.

There was a remarkable difference in the requirement of rescue analgesia between two groups. In Group A, only 5 out of 75 patients required rescue analgesia which makes around 6.7%. In Group B, 72 out of 75 (96%) patients required rescue analgesia ($p < 0.001$). Since reduction in the need for rescue analgesia was equivalent to effectiveness, 70 out of 75 patients in Group A, did not require rescue analgesia which gave around 93.3% effectiveness of bupivacaine soaked dressing in reduction of postoperative pain at split thickness skin graft donor site and thus analgesia sparing. In Group B, only 3 out of 75 patients did not require rescue analgesia which gives only around 4% effectiveness of conventional dressing in reduction of postoperative pain at split thickness skin graft donor site and thus analgesia sparing. So bupivacaine soaked dressing was found far more effective in postoperative pain reduction at split thickness skin graft donor site than conventional dressing with a $p < 0.001$.

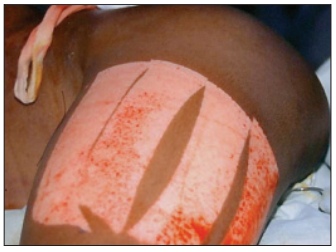

Figure 1: Split thickness skin graft donor site.

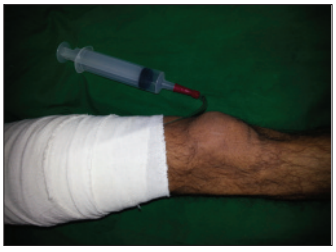

Figure 2: Dressing with perfusion catheter.

DISCUSSION

There can be a number of complications of the donor site of split thickness skin graft. These complications may be peroperative, early postoperative and late postoperative. Peroperative complications include bleeding. Early postoperative complications include pain

and infection. Late postoperative complications include repeated wound breakdown, delayed healing, blistering, poor quality skin, abnormal pigmentation and hypertrophic scarring.

Pain at the split thickness skin graft donor site can be a real problem for most patients especially in first five postoperative days. Donor-site pain is probably the most disturbing complication in the early postoperative period.

This study compared the use of bupivacaine soaked dressing with conventional dressing for pain relief in split thickness skin graft donor site. The basis of this study was that with use of a local anesthetic agent locally at the split thickness skin graft donor site there should be considerable pain relief in early postoperative period due to blockage of nerve endings, which transmit pain signals to the nervous system. This study demonstrated that when the split thickness skin graft donor site dressing was kept moist through the instillation of 0.25% aqueous solution of bupivacaine hydrochloride with the help of a catheter placed in it, it produced considerably more pain relief. This considerably reduced the need for rescue analgesia compared to conventional dressing.

Controversy exists at present as to the efficacy of bupivacaine wound perfusion in the relief of postoperative pain. There is available evidence though that this local instillation of bupivacaine on wounds can be applied to achieve pain relief in early postoperative pain.

In a recent study, performed in Thailand by Jenwitheesuk *et al*.,[11] 0.5% bupivacaine hydrochloride solution was used to keep the dressing at split thickness skin graft donor site moist for first five postoperative days in one group (G1) and similar amount of normal saline was used to keep donor site dressing moist in second group (G2). In this study, bupivacaine soaked dressing was found to be significantly more effective in pain relief at donor site in early postoperative period with $p < 0.001$ in first four postoperative days and $p < 0.05$ on the fifth day. In another study performed in Nigeria,[13] Oluwatosin and colleagues also used 0.5% aqueous solution of bupivacaine hydrochloride to treat the split thickness skin graft donor site. In this study, it was found that the patients in whom donor site was treated with bupivacaine solution had significantly less pain compared to those in whom donor site was not treated with any solution, with $p < 0.00001$ on the first and second postoperative days, $p < 0.0005$ on the third and fourth day and $p < 0.0013$ on the fifth day. This study is comparable to those studies except that 0.25% solution of bupivacaine was used rather than 0.5%. The reason for using 0.25% bupivacaine was that larger amounts of this solution could be used with little fear of toxicity even if absorption occurs. So this method can be safely used for larger donor site areas. Results of this study are still in agreement with these studies.

It has been almost universally accepted that moist dressing at split thickness skin graft donor site has an advantage over dry dressing both in terms of healing and pain management. This has also been proven in a recent study by Wiechula who studied these dressings in detail.[19] In accordance with this, in this study moist dressing was used in both groups so as to rule out that pain relieving effect was due to moist nature of the dressing and not due to the local anesthetic effect.

Other local anesthetic agents both short acting as well as long acting have also been tried topically to reduce pain at split thickness skin graft donor sites by plastic surgeons mostly with good results. Cenetoglu *et al*. used topical lignocaine gel at split thickness skin graft donor site and found very encouraging results as far as the pain relief was concerned. The effect was of shorter duration since lignocaine is a short acting anesthetic agent though its onset of action is early.[20] This explains the purpose of choosing bupivacaine over lignocaine in this study because bupivacaine has a longer duration of action. To overcome the late onset of action of bupivacaine the first instillation for soaking the dressing was done while patient was still under the effect of general anesthesia so local anesthetic took effect till the patient was awake postoperatively.

Bupivacaine has also been used topically for purpose of analgesia postoperatively in past in a number of conditions and in a number of locations. Recently, Scimeca *et al*. published a case report of a 55-year-old gentleman with a complex past medical history, 2-year history of opioid dependency and a 2-week history of intractable pain associated with the combination of debilitating painful diabetic neuropathy and painful lower extremity wounds.[21] After surgical debridement of the lower extremity wounds, substantial analgesia was achieved postoperatively through the implantation of a portable direct infusion pump device. The device supplied 2 ml/hour of 0.25% bupivacaine and resulted in a reduction in pain within the first hour of implantation. In another study, Kadar and Obaid studied, the topical effects of bupivacaine post-tonsillectomy in tonsillar fossa in 70 cases.[22] The mean postoperative pain scores for the subject fossae after 4 hours, before bed, before breakfast, before lunch and before discharge were less than control fossae scores, showing better pain relief with bupivacaine.

Zohar *et al*. from Tel Aviv University studied the role of bupivacaine for pain relief in 36 patients after total abdominal hysterectomy and bilateral salpingo-oophorectomy.[23] They divided patients in two groups. In one group (G1), they instilled 0.25% bupivacaine solution and in second group (G2), they instilled sterile water. When compared G1 required significantly less rescue analgesia ($p < 0.001$) than G2. In another study, Andrei *et al*. from Paris studied the role of local anesthetics in preventing postoperative pain after laparoscopic gynecologic surgery. In each patient, the operating surgeon instilled 20 ml of either 0.5% bupivacaine solution, 0.75% ropivacaine solution or

normal saline depending upon the group. It was found that analgesia (morphine) requirement was considerably less in bupivacaine group than normal saline group ($p < 0.05$).

Grief *et al*. concluded in their study on 37 patients that 20 mL of pleural bupivacaine 0.25% every 6 hours provided a substantial opioid-sparing effect during recovery from nephrectomy and extended the time until opioids were needed for pain relief.[24] In older literature as well there is documented role of perfusion of wounds with local anesthetics in postoperative pain relief. In 1989, Chester *et al*.[25] published their study. Thirty consecutive patients undergoing elective cholecystectomy were studied. Patients undergoing wound perfusion with normal saline consistently suffered more severe pain than those perfused with bupivacaine. All these studies have proven that bupivacaine solutions are effective when used topically as instillation or as soakage of dressing on wounds, as in this study, to provide analgesia. This also disproves the older concept that bupivacaine has no topical analgesic effect.

A number of methods and different types of dressings have been employed in the past to address this postoperative split thickness skin graft donor site pain especially in early postoperative period. These methods include ice application at the donor site,[12] fascia iliaca compartment block for early postoperative pain relief,[16] and a number of dressings have been used for this pain relief at donor site.

CONCLUSION

Bupivacaine-soaked dressing was much more effective in pain relief and in reducing the requirement of rescue analgesia in the early postoperative period, at split thickness skin graft donor site, compared to the conventional dressing.

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