

Management of Deep Bed Sore with Closed Irrigation in Cardiac Surgery: Experience with the Use of Normal Saline Solution

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Abstract: Bed sore after cardiac surgery is a serious complication with high morbidity and mortality rates. We performed normal saline closed irrigation as an alternative to open aggressive debridement and muscle flap operations. A total of 38 patients with bed sore after cardiac surgery were studied 22 patients were in class 1 and 2 were excluded from this study and 16 patients with class 3 deep seated bed sore underwent this study with closed normal saline irrigation solution. Most of the bed sores with infections were associated with several predisposing risk factors such as: advanced age, disorders of skin integrity, organ system failure and cardiac cachexia in the preoperative state. One of these patients died of adult respiratory distress syndrome in the postoperative course, one patient died of pneumonia and sepsis but the remaining 14 patients were discharged with their wounds well healed. Acute and deep bed sore infection occurred in these patients from the fifth day after cardiac surgery up to 14 days after the operation. The infection was successfully treated with gross necrotic material debridement and continuous closed irrigation with normal saline. We conclude that early debridement of bed sore and continuous closed wound irrigation with normal saline are effective in the management of deep seated bed sore after cardiac surgery.

Key words: Deep bed sore, cardiac surgery, management, irrigation, normal saline, patients

INTRODUCTION

Bed sore is an important complication after the open heart surgery that many preventive and therapeutic approaches have been tried and new trials are evolving to cure these infected bed sore. As the length of surgery increased, so did the percentage of patients with pressure ulcers (Makhsous *et al.*, 2007). In one study, most patients had at least 1 comorbid condition (78%). These data suggest that extra body fat reduces the risk of PU in elderly hospitalized patients (Compher *et al.*, 2007). Bed sore is more common in men. Low cardiac output with consumption of cardiac inotropes like adrenaline decreases tissue perfusion in the pressure sore areas. Respiratory failure after the operation, unconsciousness and immobility increase the rate of bed sore (Fogerty *et al.*, 2008). Total 16 patients with deep seated bed sore (6 female/10 male), were studied for bed sore, defined as deep infected wound with subcutaneous and facial necrosis and positive culture. Mean age was 68 years (53-79 years). Attention has been focused on aggressive open debridement of the wound with muscle flap operations and needs intravenous antibiotic for about 6-8 weeks to control the infection. Aggressive

debridement destroys the blood supply to the skin and the adjacent tissue, so area of skin necrosis over the bed sore increases. These techniques we have to do a major operation for controlling the bed sore but in our technique we only do a minor surgery without aggressive debridement or muscle flap release. In our technique with only the gross necrotic debridement we preserve the blood supply to the wound and continuous normal saline irrigation itself debrides the wound and removes the necrotic materials, eliminates the infection and improved the patient's symptoms in about 2 days. In 87.5% of the patients the bed sore recovered. As this procedure is not done routinely, we decided to evaluate the efficacy of this procedure in patients with deep seated infected bed sore after cardiac operation in behsat heart center in Tehran.

MATERIALS AND METHODS

Between September 2003 and October 2007, 38 patients with bed sore were studied. Twenty two patients were in class 1 and 2 superficial bed sore and were excluded from the study. Sixteen patients with deep seated bed sore were treated with gross debridement and closed normal saline irrigation. All patients had bed sore

within the 2 weeks after the operation. Fifteen of these patients underwent coronary artery bypass graft and 1 patient had mitral valve replacement operation. These patients underwent a closed continuous normal saline irrigation about 1 L h⁻¹ after the initial gross debridement. During the treatment course patients underwent reexploration to see the degree of improvement. The patients were 10 men (62.5%) and 6 women (37.5%), whose age ranged from 53-79 years with mean age of 68 years. Three of the patients (18.75%) developed bed sore after 7 days post operation. Most of these patients had associated predisposing factors such as: Cardiac cachexia in the preoperative state, prolonged perfusion time and respiratory insufficiency in the postoperative period and severe uncontrolled diabetes. The most common organism was Methicillin-resistant *Staphylococcus aureus*. *Staphylococcus epidermidis*, *Pseudomonas aeruginosa* and Gram-negative rods were also the leading cause of the bed sore in a less frequent order. The mean irrigation period was 10-14 days, after which a hemovac drain was connected to the irrigation tube to continuously evacuate any fluid collection. After 1 week this drain was extracted. According to culture, suitable antibiotics were given to all patients. Patients with superficial bed sore and negative culture were excluded from this study. Cultures were taken during the irrigation period from the fluid extracted from the wound. After discharging the patients were followed every 1 month to see the recurrence or sinus tract formation.

Statistical analysis was performed with student's t-test and data are expressed as mean±SD.

Surgical technique: After the induction of anesthesia, the bed sores were exposed. At first culture was taken then the necrotic tissue were resected without resection of any bone. Sinus tracts under the skin were connected to each other without disturbing any blood supply to the skin. Blood vessels arising from the deep tissue pass through the subcutaneous tissue to the skin are located in the necrotic subcutaneous tissue and during debridement we preserved these vessels with the necrotic tissue around them. We must be careful not to cut them during debridement. Two catheters were inserted from the skin to the necrotic space and skin is closed one catheter is connected to a continuous suction to drain the normal saline which is inserted from the other catheter. Saline irrigation is continued 1 L h⁻¹ till the evacuated fluid is clear and then irrigation is given in a lower rate. Reexploration was done 2 times during the irrigation period to see the quality of normal saline debridement.

RESULTS

The mean time for bed sore debridement and establishment of closed irrigation was about 20 min. Out of 16 patients undergoing bed sore debridement and closed continuous normal saline irrigation, 1 patient died because of sepsis and respiratory failure, another 1 patient died because of pneumonia and heart failure secondary to the preoperative myocardial infarction. Fifteen patients had bed sore after coronary artery bypass graft and one patient had mitral valve replacement as the initial operation. One patient had postoperative bleeding which was controlled with re-exploration. In 3 patients the catheter, which drained the bed sore space was obstructed with necrotic tissue so the catheter was replaced with a larger one. Patients general condition, fever and pain usually improved 2 days after the continuous irrigation.

At the time of discharge 14 patients (87.5%) recovered the deep seated bed sore, 1 patients (6.25%) had a sinus tract with some drainage from it. In follow up sinus tract drainage recovered 6 months after the operation. In 13 patients (81.25%) there was no complication and patients recovered. There was significant correlation between postoperative pneumonia and respiratory failure with mortality of the patients.

DISCUSSION

Bed sore is a dreaded complication after open heart surgery. Proper and early treatment is an important determinant for survival. Without appropriate treatment patient may develop sepsis and die. Some studies mention Aggressive debridement with plastic surgery as primary treatment for deep seated bed sore (Liu *et al.*, 2007). Many preventive and therapeutic approaches have been tried and new trials are evolving. Reconstructive soft-tissue transfer techniques successfully achieve early wound closure, coverage of exposed hardware and decreased rates of chronic osteomyelitis (Bauer, 2008; Levi and Rees, 2007). Skin graft is not a good option in pressure bearing areas because of doubtful viability and unpredictable outcome. Flap selection for back reconstruction is based on defect size, site, extent, tissue availability, previous surgery. Random pattern skin flaps can be used for small sacral ulcers, are easy to elevate, muscle is not sacrificed and they can be re-elevated but lack bulk with limited rotational arc and doubtful tip vascularity (Lemaire *et al.*, 2008). Tissue expansion is a useful technique providing sensate skin of similar color, texture and thickness.

Myocutaneous/muscle flaps have good vascularity, withstand infections, obliterate dead space and are the best choice in paraplegics. Gluteus maximus is a quadrilateral muscle (Type III flap) with dual blood supply from the superior and inferior gluteal arteries (Seyhan *et al.*, 2008).

Turnover gluteus maximus, sliding, segmental, split, bilateral V-Y myocutaneous advancement flaps are all excellent variants for coverage of sacral defects (Witkowski *et al.*, 2005; Hai *et al.*, 2006; Borman and Maral, 2002). Split-turnover flap based on either of the vascular pedicles preserves most of the muscle in ambulatory patients. Microsurgical free flaps requiring plastic surgery facilitate to cover defects where local tissue is not available (Czternastek *et al.*, 2001). Preoperative planning, single stage procedure, adequate debridement, dead space obliteration, meticulous homeostasis, tension-free wound closure and proper postoperative nursing care lead to good results in these techniques. Complications include seroma, hematoma, wound dehiscence, infection and flap necrosis. All these methods need a major operation in the infected wound in these debilitated patients. In open technique the wound is open and needs frequent surgical debridement and dressing which are painful to the patient. Frequent surgical debridement has the risk of bleeding through the wound and also the risk of superinfection and can cause bactremia or sepsis. After surgical debridement.

In all these techniques patients received intravenous antibiotics for about 6 weeks. All these procedure involves extensive debridement and needs a prolong time of anesthesia in these debilitated patients. The cosmetic results after muscle flaps are also important after healing the bed sores. Surgical flaps are a major operation with various post operative complication and needs specialized care postoperatively. In our technique, bed sore is not opened at the initial state and at area of skin necrosis, gross debridement is done and skin over the bed sore is closed with 2 catheter inserted into the cavity of bed sore for continuous irrigation. It needs a shorter time of anesthesia only about 20 min. There is no need to reoperate the patients to close the wound with skin flaps. In our technique, the patient symptoms will improve in about 2 days and there is no need to change the dressing as is done in other techniques. In our technique, the blood supply to the skin and muscle is not compromised with debridement so infection is controlled sooner and wound healing take place faster and skin necrosis will not occur. As there is no need to do plastic surgery to close the wound the cosmetic result is better. Complications

that are seen in other methods are not seen in our technique. In our study, only one patient died of respiratory failure and pneumonia and one patient because of pneumonia and heart failure and one patient had sinus tract, which improved spontaneously. In the follow up there was no recurrence of infection. In other method, the recurrence of bed sores were treated with debridement and muscle flaps. but in our technique only 1 patients had sinus tract drainage which improved spontaneously. After about 1 week the patients antibiotics is discontinued and patients is discharged to continue the irrigation at home and could be followed as out patient.

The small number of the patients in the study also was a limitation in our study. As the normal saline solution flows through the bed sore cavity, debrides the necrotic material, which may obstruct the catheter. Our data suggest that continuous close normal saline irrigation technique is an easy, safe with a low hospital stay, lower mortality and morbidity and with no need for reoperation and can be done in every patient with deep seated bed sore.

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REFERENCES

- Bauer, J., 2008. Phillips LGMOC-PSSM CME article: Pressure sores. *Plast Reconstr. Surg.*, 121 (1 Suppl): 1-10.
- Borman, H. and T. Maral, 2002. The gluteal fasciocutaneous rotation-advancement flap with V-Y closure in the management of sacral pressure sores. *Plast Reconstr Surg.*, 109 (7): 2325-2329.
- Compher, C., B.P. Kinosian and S.J. Ratcliffe, 2007. Baumgarten M. Obesity reduces the risk of pressure ulcers in elderly hospitalized patients. *J. Gerontol. A Biol. Sci. Med. Sci.*, 62 (11): 1310-1312.
- Czternastek, M., J. Talar, M. Lukowicz and A. Zurada, 2001. Various surgical techniques in the comprehensive treatment of decubitus ulcers. *Ortop. Traumatol. Rehabil.*, 30, 3 (4): 557-561.
- Fogerty, M.D., N.N. Abumrad, L. Nanney, P.G. Arbogast, B. Poulouse and A. Barbul, 2008. Risk factors for pressure ulcers in acute care hospitals. *Wound Repair Regen*, 16 (1): 11.

- Hai, H., H. Dai and Y. Xu, 2006. Combined treatment of refractory decubitus ulcers. *Zhongguo Xiu Fu Chong Jian Wai Ke Za Zhi.*, 20 (9): 909-911.
- Lemaire, V., K. Boulanger and O. Heymans, 2008. Free flaps for pressure sore coverage. *Ann. Plast Surg.*, 60 (6): 631-634.
- Levi, B. and R. Rees, 2007. Diagnosis and management of pressure ulcers. *Clin. Plast. Surg.*, 34 (4): 735-748.
- Liu, Y., X. Zhang and C. Zhang, 2007. Clinical typing and surgical principle of pressure sore *Zhongguo Xiu Fu Chong Jian Wai Ke Za Zhi.*, 21 (9): 932-936.
- Makhsous, M., M. Priebe, J. Bankard, D. Rowles, M. Zeigler, D. Chen and F. Lin, 2007. Measuring tissue perfusion during pressure relief maneuvers: Insights into preventing pressure ulcers. *J. Spinal Cord Med.*, 30 (5): 497-507.
- Seyhan, T., N.M. Ertas, T. Bahar and H. Borman, 2008. Simplified and versatile use of gluteal perforator flaps for pressure sores. *Ann. Plast Surg.*, 60 (6): 673-678.
- Witkowski, W., M. Baranski, A. Broma and M. Olszowska Golec, 2005. The operative management of sacral pressure sores with a bilateral modified myocutaneous V-Y plasty. *Pol. Merkur Lekarski.*, 18 (104): 192-195.