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Original Article

Origin and countermeasure for common skin flap complications after radical operation for breast cancer

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Abstract
Objective: To discuss the various factors which cause the common skin flap complications after radical operation for breast cancer
Methods: Two hundred sixteen patients with T1-3N0-1M0 breast cancer underwent radical surgery at The Cancer Hospital of Xingtai City, China during 1995-2003. Patey mastectomy was performed in majority of patients. Skin flaps were dissected using scalpel after injecting adrenaline containing saline into subcutaneous tissue. Diathermy was used only to stop bleeding vessels. A subset of patients who developed abnormal vascularity of skin flaps, seroma collection and flap necrosis was analyzed. Pressure garment and suction drains were used routinely. Flap necrosis < $3cm^2$ was allowed to heal with secondary intention whereas larger defects were skin grafted.
Results: In 56 patients, flap associated complications were noted. Abnormal vascularity, flap necrosis and seroma collection were absorbed in 34 (15.7%), 13 (6%) and 9 (4.2%) patients, respectively. Eight patients (3.7%) required skin grafting. All patients were discharged with full recovery.
Conclusion: To minimize the skin flap complications after radical surgery for breast cancer, lesser use of cautery, injection of adrenaline containing solution into subcutaneous tissue, routine use of suction drains and application of pressure garment may be recommended.

Key Words: Modified radical mastectomy; seroma

The breast cancer is the most common malignancy in female and surgical treatment still remains a common procedure for its treatment. Despite trends toward breast-conserving treatment of breast cancer, as many as 70% of women who are diagnosed with breast cancer undergo mastectomy as their primary surgical therapy.[1] However, the skin flap complications can increase the morbidity, unnecessary hospital stay and cost. Common complications associated with the skin flap include flap necrosis and seroma collection. Review of the literature shows that above problems are not addressed adequately. The purpose of this paper is to analyze the origin and discuss how to prevent and control these complications.

Materials and methods

At The Cancer Hospital of Xingtai City, we operated on 216 patients with invasive breast carcinoma during the period of 1995-2003. All the patients had T1-3, N0-1, and M0 disease. None of them underwent neoadjuvant chemotherapy. Patey modified radical mastectomy was performed in the majority of patients except in few patients with invasion of pectoral muscles. The later group was subjected to Halsted radical mastectomy (in earlier years of the study). The flaps were dissected out with the help of scalpel after injecting into the subcutaneous tissue a solution made of 200 ml of normal saline with 0.5 ml of adrenaline, except in the hypertensive patients. In the later group, adrenaline containing solution was not used. Axillary dissection was carried out mostly by scissors. A routine level I-II nodal dissection was carried out. If intraoperative findings suggested of involvement of level III nodes, they were as well dissected out. Diathermy was used only to stop the bleeding vessels. Two suction drains were inserted, one in axilla and the second beneath the flap.

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A subgroup of patients who developed complications associated with skin flaps was analyzed. The following complications were recorded:

1. Abnormal vascularity of skin flap. It was identified by dark red colour of flap, which faded on pressure, and restored slowly after the pressure was removed.
2. Fluid accumulation under skin flap (seroma collection)
3. The skin flap necrosis

In the case of abnormal vascularity, the patients were treated expectantly with proper care of the wound, continued drainage and loose wrapping around the chest wall with elastic bandage (pressure garment). Seroma collection was treated with needle aspiration and proper wrapping as mentioned above. If the flap necrosis developed either as sequelae to continued abnormal vascularity or developed primarily, debridement was carried out. If the resulting defect size was < $3cm^2$, it was allowed to heal with secondary intention. But any greater defect was grafted (split thickness skin graft). Drains were removed if the last 24 hour drainage was < 30 ml.

Results

Out of 216 patients, who underwent radical surgery, 56 patients (25.9%) developed complications related to flap. There were two male and 54 female patients. Age varied from 27 to 66. Forty seven patients underwent Patey mastectomy and eight - Halsted mastectomy. An average (mean) of 23 nodes per patient was dissected out.

Abnormal vascularity, flap necrosis and seroma collection were absorbed in 34 (15.7%), 13 (6%) and 9 (4.2%) patients, respectively. Out of 34 patients with abnormal vascularity, 9 patients eventually developed flap necrosis. Therefore, there were total 43 (19.9%) cases with flap necrosis. Eight patients (3.7%) had a defect size > $3cm^2$ and required skin grafting. A single tapping was required in 8 patients and three tapings in 1 patient with seroma collection. All patients were discharged with full recovery.

Discussion

Post mastectomy flap complications directly affect patient's further treatment, especially delays the adjuvant chemotherapy or radiotherapy to carry on. The later may further affect prognosis. Therefore, it appears especially important to seek the reason, and improve the processing method.

Lymphatic drainage and seroma formation following axillary lymphadenectomy in breast cancer remains a significant clinical problem that increases morbidity and the length of hospital stays. [2, 3, 4] The frequency of this complication ranges from 18% to 59% following operations for breast carcinoma, with an average reported rate of 26%[2, 5, 6].

The natural history of the accumulation of fluid after lymphadenectomy is poorly understood, as are factors that lead to the development of prolonged seroma formation[7,8]. Old age, obesity, early postoperative arm use and more radical lymphadenectomy are possible risk factors for prolonged drainage, but the published data vary. [9, 10] Wrapping the wound with a pressure garment is a very old practice in order to decrease the chances of seroma formation. Though it is not routinely performed these days [11], we followed the practice of application of pressure garment in our hospital. Theoretically, it appears to help, especially if the drain gets blocked. But, wrapping may promote fluid accumulation if applied inappropriately. If it has been performed with uneven pressure, fluid starts to accumulate in specific locations, such as axilla and parasternal area. Loam et al evaluated the effects of pressure garment on early removal of drains, shortening of hospital stay and reducing the incidence of seroma formation in a randomized trial. They found that pressure garment did not prevent seroma formation but reduced the volume of drainage and facilitated early removal of drains resulting in a significant reduction in the length of hospital stay. [12]

Use of diathermy has been as well blamed for flap necrosis and increased rate of seroma collection. In the 1970s, the use of electrocautery to raise flaps and excise the breast and pectoral fascia was advocated by Kakos and James as a means to decrease blood loss during radical mastectomy. [13] Use of electrocautery did lead to decreased blood loss and lower transfusion requirements. Wound healing was felt to be similar to healing in wounds from dissection by scalpel, but evaluation of the seroma rate was not part of this study. [14] Following Kakos and James' study, dissection of flaps by electrocautery became a widespread practice. Subsequent evidence suggests that such complications of wound healing as cellulitis, infections, flap necrosis, and seroma formation are increased following the use of cautery.[15, 16] Hoefer et al reported wound complications of all types increased 44% over those for scalpel. [15] The incidence of seroma was 30% in the cautery group and 9% in the scalpel group. Wound infection and cellulitis were similarly higher in the cautery group. The authors postulated that increased thrombosis of subdermal vessels caused by cautery might lead to

relative ischemia of the flaps, and that inadequately sealed lymphatics might predispose the wound to seroma. Similarly, Keogh et al showed that there was higher incidence of seroma collection in diathermy group in comparison to the scalpel dissection group (38% vs. 10%, p = 0.03). [16]

Insertion of suction drains in order to drain the lymphatic collection is a well accepted practice. A few innovative surgeons have performed axillary dissection without drains and discharging patients after surgery. [7] In a prospective randomized trial of 225 patients, Somers et al noted an overall incidence of seromas in 92% patients studied. [17] When comparing the drained and undrained groups, a significantly increased number of aspirations, volume aspirated, and time to resolution of seromas in undrained group was reported. They concluded that use of drains should remain an integral part of the procedure. Surgeons who promote the idea of not putting the drain as it does not decrease the seroma formation and does not decrease number of aspirations, basically have shown their reports from the series of breast conserving surgery and not from modified mastectomy. They as well believe that in the later group drain is needed to be kept for a shorter period of time.

To avoid above complications, several preventive measures can be recommended. Firstly, skin incision of 3-5 cm away from the tumour should be enough, and in cases of bigger defect a skin graft or some pedicled myocutaneous flap at the same setting would be a better option than just suturing the flaps under tension. Secondly, very thin flaps tend to develop necrosis; therefore, one should try to raise a flap with approximately 0.5 cm thick layer of subcutaneous tissue. Thirdly, we recommend using cautery less often. The later inevitably leads to some degree of burn, which in turn increases the chances of flap necrosis, and increases the rate of seroma formation. In nonhypertensive patients, we always injected adrenaline containing normal saline solution into subcutaneous plane and thereafter raised the flaps with scalpel rather than with cautery. This minimizes bleeding and requires less use of cauetry.

If wrapping has been considered, it should be loose enough to insert two fingers beneath it. Fourthly, suction drains should be routinely inserted. Besides all the above mentioned things, we should as well pay attention towards correction of plasma protein, albumin, anaemia and proper antibiotics for wound infection.

In our study, we had a low incidence of seroma collection (4.2% in comparison to an average reported rate of 26%) despite mastectomy and axillary dissection. We believe that scalpel dissection of flaps and sharp scissor dissection of axillary nodes after injecting adrenaline containing solution in subcutaneous space, and a proper application of pressure garment could have minimized the seroma formation.

Conclusion

To minimize the complications, namely seroma collection and flap necrosis after radical surgery for breast cancer, lesser use of cautery, injection of adrenaline containing solution into subcutaneous tissue, routine use of suction drains and application of pressure garment may be recommended. Once the flap necrosis develops early debridement with or without skin grafting should be considered.

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