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Literature Review

Seroma Formation and Breast Cancer Surgery: A Review of Literature

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Abstract

Breast cancer is the second leading cause of death among women worldwide. Surgical treatment of breast cancer is breast conservative surgery (BCS) or modified radical mastectomy (MRM) with axillary lymph node dissection (ALND). The most frequent postoperative complication of MRM and ALND is seroma formation. The seroma formation especially its duration affects the postoperative adjuvant therapy as well as renders the patient prone for nosocomial infections. Many efforts have been put worldwide to reduce the chances and duration of seroma formation. The body mass index, use of electrocautery for dissection, early drain removal, low vacuum drains, obliteration of dead space, and delayed shoulder physiotherapy are most of the hypothesized method but consensus is still lacking and seroma continues to remain a risk to both the surgeon and patients.

Keywords: Carcinoma; Breast; Morbidity; Axillary Dissection; Breast Conservative Therapy

Introduction

Seroma formation is the most recurrent postoperative difficulty perceived after MRM and ALND with an incidence of 3% to 85% [1]. It is the collection of fluid under in the axillary space or under the skin flaps. It has been hypothesized that surgical trauma to the soft tissue results in the exudates formation [2]. There is some role of increased fibrinolytic activity in serum and lymph too [3]. A breast cancer is a major burden for surgical departments and postoperative seroma formation being the commonest complication of breast surgery, results in associated morbidity, delayed drainage and adjuvant therapy [4]. In addition to infection, surgical intervention is a further cause of morbidity for cases of seroma [1,5]. The review of literature was done to analyze numerous factors resulting in seroma formation as well as affecting its duration.

Review of Literature

The technique of dissection of the tissue in breast cancer surgery is a foremost aspect that influences the incidence and volume of seroma formation. A prospective analysis of 385 patients was done by Gong Y (2010) and fellow and it was believed that techniques applied to minimize the leakage from dissected blood vessels and lymphatics along with obliteration of dead space may reduce the incidence of seroma formation [6]. A retrospective analysis of the records of 359 consecutive patients done by Gonzalez EA., et al. showed that the patients undergoing MRM have a significant increased occurrence of seroma formation whereas who have undergone breast conservation surgery (BCS) have shown lesser chances (p=0.01). However, MRM and radical mastectomy showed inconclusive results [7]. In another trial done by Dalberg K., *et al.* (2004) including 247 patients of MRM had shown that removal or conservation of the pectoral fascia has no effect on the incidence of seroma [8]. A prospectively analyzed two cohorts by Kontos M., *et al.* (2008) were matched for postsurgical seroma volumes, complications and pain scores revealed that although the use of electrocautery for breast surgery reduces the blood loss but seen associated with increased wound complications. Porter KA., *et al*. (1998) also emphasized that use of electrocautery developed seroma (p=0.01) [9]. In another retrospective review of 252 breast cancer operations done by Woodworth PA and associates (2000), it was analyzed that postoperative seromas were more commonly seen in carcinoma breast cases with neoadjuvant chemotherapy. However immediate breast reconstruction following MRM was observed to decreases seroma formation when compared to a delayed procedure. Sentinal node biopsy was seen associated with less seroma formation but number of removed lymph nodes in ALND probably does not influence the formation of seroma in

analysis done by Purushotham AD., *et al.* (2005) on 298 patients of carcinoma breast [10]. An analysis of 60 patients with locally advanced breast cancer (T2 or T3) admitted for MRM with ALND was done by Manouras A and fellows (2008), and improved results were reported with use of a vessel sealing system in the form of decreased drainage duration and hospital stay but not the cost of surgery [11,12].

In olden times, Halstead suggested obliteration of the dead space to facilitate wound healing by creating a short superior flap and suturing it with interrupted silk to the fascia below the first rib and skin grafting the remaining part of the defect. Almond LM and fellows (2010) also emphasized the anchroching of flap after surgery helps in early discharge [13]. A significant decrease was reported in the occurrence of post mastectomy seromas when flap tacking was carried out by Chilson and associates (1992). Whereas Coveney and fellows (1993) sutured the skin flaps to underlying muscle and experienced a lower incidence of seroma formation [14,15]. In another effort to reduce seroma formation, mechanical pressure with a pressure garment was applied but does not reduce postoperative drainage [16,17]. Axillary aponeurosis used by Classe JM., *et al.* (2002) as substitute to closed suction drain was also seen associated with early discharge of the patient [18].

The fibrinolytic inhibitor was also used based on the hypothesis that serum and lymph fibrionlytic activity have role in fluid accumulation of seroma. However, no significant difference in the incidence of seroma formation was noticed with the use of fibrin glue. On the otherhand Vaxmanand and fellows demonstrated that seroma formation was increased with the use of fibrin [19]. The tetracycline sclerotherapy was also used in the prevention of seroma formation after mastectomy and a significant reduction in the volume of seroma formation was noted within 48 hrs of its application. But results of randomized clinical trials showed that tetracycline sclerotherapy was associated with severe postoperative pain and no significant reduction in seroma formation was seen [20]. The erythromycin was also used but no significant benefit was observed [21]. Somatostatin receptor octreotide also showed no advantage over other methods in axillary lymph node dissection [22].

The work was done by Browse DJ., *et al.* (1996) on sixty-seven patients undergoing level three axillary node clearances for the benefit of collar and cuff shoulder immobilization in reducing the incidence of axillary seroma formation. The results showed daily drainage volume was decreased insignificantly more rapidly in patients with immobilized shoulders (31% vs 43%, P>0.05) [23]. It was considered that early shoulder mobilization led to increased seroma formation and a systematic review of 12 randomized controlled trials (RCTs) of which six were included in a meta-analysis had supported this hypothesis [24]. Another study done also showed that, late shoulder movement reduces seroma formation (p=0.00001) but without any affect on drainage volume or hospital stay. Conversely, a number of RCTs have demonstrated no difference in seroma formation between early (within 1-2 days postoperatively) or late (by 5-7 days postoperatively) shoulder movement [25]. Rodier., *et al.* and van der Horst., *et al*. also found no significant difference in seroma formation following early or delayed physiotherapy. Thus seroma formation may be reduced by delayed physiotherapy at the cost of mild shoulder dysfunction but without long term limitation of movement [26,27].

The suction drains are used very commonly after ALND. The skin flap opposition to the chest wall and facilitation of wound healing can be achieved by negative pressure of the suction drain [28,29]. The closed suction drainage in postmastectomy patients also decreased the incidence of wound infection and necrosis. However, there was no significant difference observed between suction and closed drainage on the formation of seroma [30]. A prospective randomized study of 227 axillary dissections with the use of closed suction drainage to prevent seroma formation after lumpectomy was conducted by R G Somers., *et al.* (1992). It was found advantageous in decreasing the incidence and degree of seroma formation [31]. The use of multiple drains also have not shown any significant benefit on the amount or duration of seroma formation [32]. Early discharge from the hospital with the drain in situ as well does not appear to be linked with any inconvenient events and the patient acceptance of early discharge with drains in situ remains excellent. However, some reports have expressed mixed results and no convincing evidence to reduction in seroma rate but discharge within a day of surgery has been laden with a higher rate of seroma formation [33]. It is frequent practice to take away drains when drainage reduces to a minimal volume (20-50 mL) in the preceding 24 hours to avoid or decrease the chances of seroma formation. After 48 hours of surgery, as much as 74% of the total volume of seroma is supposed to be drained, drains may be securely removed if the total drainage during the first 3 days is less than 250 mL [34]. Somers., *et al.* studied 108 patients and found that drains were removed on first postoperative day not considering the volume of the drainage, no significant difference was observed with respect to drainage volume at the time of drain removal, subsequent mean number of aspirations, and time to

resolution of seromas. Parikh., *et al.* randomized 100 patients who underwent mastectomy with ALND to drain removal at either 3 or 6 days postoperatively. More seroma fluid was seen collected in the patients with drain left for longer time [31,35]. Inwang., *et al.* carried out studied on 84 patients comparing drain removal on day 5 to drain removal when drainage was less than 20 mL over 2 consecutive days. No significant difference was found in the mean number of aspirations required and wound complications. Yii., *et al.* also found no significant difference in drainage at 48 hours and no significant difference in seroma frequency were observed. Liu and McFadden removed drains at 23 hours postoperatively, only a 2% seroma rate was observed [36-38]. On comparing drainage versus no drainage, short duration closed suction drainage appeared advantageous for decreasing the incidence and degree of seroma formation [31]. Zavotsky., *et al.* mentioned that axillary node dissection can be managed with or without a drain but with need of multiple aspirations (50%) compared to that in the drain group (8.3%) [39]. Furthermore Bonnema., *et al.* compared high versus low vacuum drainage, in 141 patients and found that high vacuum drains had a higher incidence of vacuum loss but a lower incidence of leakage around the drain. Thus, no strong evidence is available to recommend high or low pressure suction to reduce seroma formation [40]. In contrast, van Heurn and fellow and Chintamani., *et al.* found that the mean volume of fluid drained was significantly lower from a low vacuum system, which lead to early drain removal [41-43].

Association of patient and tumor characteristics to postoperative seroma formation was attempted to analyze in number of studies. Body weight and body mass index were found to be associated with increased seroma formation, whereas no definitive connection has been found between seroma formation and hormone receptor status, axillary nodal status, lymph node positivity or disease stage and grade [1,44-46]. Likewise no association of seroma formation was seen associated with tumor size and location, histological type, site of the disease and specimen weight as well [46,47].

Conclusion

Seroma formation is the most often seen early complication of breast surgery with axillary lymph node dissection, can delay patient recovery and cause discomfort. Except body weight and body mass index, patient and other factors associated with tumors have no significant effect on seroma formation. The closure of the dead space may reduce seroma rate. Sclerotherapy and mechanical pressure do not reduce seroma drainage and use of fibrin glue remains controversial. Delaying shoulder physiotherapy also reduces drainage. Literature favors the use of drains, but the number of drain tubes does not reduce the formation of seroma. On the other hand, low vacuum drains in the axilla reduce the seroma formation resulting in earlier drain removal and earlier discharge. Seroma formation can be safely measured on an outpatient basis by multiple percutaneous aspirations.

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