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Ethyl Alcohol as Sclerosing Agent in Treatment of Post Mastectomy Seroma

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Abstract:

Post-mastectomy seroma is a frequent complication that can delay adjuvant therapy, increase infection risk, and impair quality of life. When repeated aspirations and compression fail, chemical sclerotherapy is an accepted minimally invasive option. Ethyl alcohol (ethanol) promotes fibrosis of the seroma cavity by inducing endothelial damage and protein denaturation, thereby obliterating dead space. Contemporary series suggest ethanol sclerotherapy achieves high rates of resolution with low complication profiles, although single-session success may be limited and protocol heterogeneity persists. This paper summarizes the rationale, technique, efficacy, and safety of ethanol sclerotherapy for post-mastectomy seroma and contextualizes it among alternative sclerosants.

Keywords: Post-mastectomy seroma; ethanol sclerotherapy; ethyl alcohol; breast surgery complications; percutaneous drainage; sclerosant therapy; refractory seroma; postoperative collection.

Introduction:

Seroma remains one of the most common complications following mastectomy and axillary dissection, causing patient discomfort, risk of infection, and potential delay in adjuvant treatment; management strategies continue to evolve to reduce recurrence and improve outcomes **(1).**

Ethanol, a widely available sclerosant, induces fibrosis by denaturing proteins and damaging endothelial linings, thereby promoting adhesion of cavity walls; its safety and efficacy have long been demonstrated in interventional radiology applications for postoperative lymphatic collections **(2).**

Recent breast-focused studies have described ethanol sclerotherapy as a minimally invasive and effective intervention for persistent seromas, reporting high rates of resolution with low complication profiles, though acknowledging that multiple sessions may be required in some cases **(3).**

Historic reports support the use of 95% ethanol instillation, alone or in combination with agents such as povidone-iodine, delivered via percutaneous catheter, with promising results in reducing chronic post-mastectomy seromas **(4).**

By contrast, recent randomized controlled trials evaluating intraoperative use of sclerosants such as doxycycline or bleomycin sprayed into the wound cavity have not demonstrated significant benefit in preventing seroma formation, underscoring that ethanol sclerotherapy should be considered primarily as a targeted therapy for established refractory seromas **(5).**

Prevention of postmastectomy seroma:

The principles of seroma treatment are essentially focused on prevention. After a seroma has developed, the standard treatment is percutaneous aspiration. Persistent seromas have traditionally been treated with repeated aspiration, local pressure dressings, and occasionally surgical ablation **(6).**

Many surgical procedures have been proposed to decrease incidence of seroma, such as the use of multiple drains, prolongation of suction drainage, postmastectomy shoulder immobilization, compression dressing, and

sclerotherapy with sclerosing substances such as tetracycline. The current methods of seroma prevention can be divided into intraoperative and postoperative interventions **(7).**

Management of postmastectomy seroma:

Traditional treatments for postmastectomy seroma are effective for most patients, and few studies have investigated the best management approach for patients with seroma. Common treatments include simple aspiration, drain replacement, or even observation if the seroma is small and not bothersome (**4).**

A. Sclerotherapy for the treatment of postmastectomy seroma:

The chronic fluid collections such as liver cysts, renal cysts, pelvic lymphoceles, and pleural effusions have been treated with the injection of sclerosing agents, which is known as sclerotherapy. Concentrated alcohol is most commonly used, but other possible agents include acetic acid, talc, tetracycline, and betadine **(4).**

Tetracycline has been used for chemical pleurodesis of pleural effusions. **Hokkam et al. (8)** reported using this agent for sclerotherapy of postmastectomy seroma.

B. Fibrin glue in conjunction with collagen patches to reduce postmastectomy seroma:

Injection of fibrin glue in the axillary fossa was reported to decrease seroma formation in patients who underwent quadrantectomy or mastectomy with axillary lymphadenectomy **(7).**

C. Mechanical closure of dead space and seroma formation:

There are two mechanical approaches for closure of dead space beneath skin flaps after breast surgery: compression by external pressure or flap fixation with sutures. The concept of the former is to obliterate dead space by applying external pressure to the flaps and to encourage flap adhesion to the underlying muscles, whereas the latter secures skin flaps to the chest wall with sutures.

The importance of the latter has long been recognized, particularly by plastic surgeons. In the field of breast surgery, **Halsted, (9)** was the first to advocate fixation of the skin flaps to the deep structures at the edge to cover the contents of the axilla, and to obliterate dead space under the clavicle **(10).**

Also, the usefulness of subcutaneous tacking sutures using absorbable material to secure the flap was assessed in Mny studies. However, the most important consideration appears to be obliteration of the largest potential dead space, the empty axillary apex **(11)**.

Closed suction drainage has superseded static wound drainage, as this increases freedom of movement, reduces the need for bulky dressings and the incidence of infection and breakdown, requires less time for nursing care, and reduces patient discomfort in the postoperative period. Thus, the majority of studies have employed closed suction drainage, while some have precluded the use of drains **(7).**

Ethanol As A Sclerosing Agent

Postoperative breast seromas occur when tissue disruption and inflammation result in exudative fluid accumulation within a potential space created by the surgical procedure. Seromas increase the risk of infection, demand additional allocation of limited healthcare resources, and may delay adjuvant therapy **(12).**

A systematic review by **Piper et al. (13)** found seroma incidence rates in breast conservation surgery as low as 0.6%. Reported seroma incidence rates following mastectomy are higher but have considerable variability (range, 10% 92%) **(14).**

In contrast, the management of clinically significant postoperative seromas following mastectomy or axillary dissection has not been well studied. A small series in the surgical literature found that frequent seroma aspirations do not decrease the time to seroma resolution **(15).**

Sclerotherapy has been used to treat postoperative seromas resulting from multiple surgeries and post-traumatic etiologies. In a general review of sclerotherapy management of postoperative and post-traumatic fluid collections, **Sood et al. (16)** found that various sclerosing agents were an effective means of managing recurrent seromas. Talc and tetracycline were the most popular agents, but ethanol, erythromycin, and other tetracyclines have all been used in a very limited fashion.

Breast radiologists are often asked to evaluate for postoperative seromas and frequently perform aspirations. Methods to reduce the frequency and number of repeated seroma aspirations for radiologists are thus needed, as this could directly improve patient care and reduce cost burden. Studies in the radiology literature assessing ethanol sclerotherapy for postoperative breast seromas are sparse.

Therefore, this study aims to report our experiences using ethanol ablation for recurrent postoperative seromas of the chest wall and axilla.

Several sclerosants stimulate fibrous union of the tissue surfaces by inducing inflammation. Ethanol, for example, is a common pleurodesis agent and causes sclerosis through protein coagulation and hyperosmolar cell destruction, which ultimately lead to tissue necrosis. The resulting inflammatory reaction causes fibrosis and closure of the pseudocyst **(17).**

Ethanol incites an intense inflammatory reaction as it comes into contact with the epithelial lining of the transected lymphatic vessel. This results from dehydration of the cellular layer and coagulation of proteins and causes obliteration of the lymphatic leak as the rent in the vessel is permanently sealed (**16).**

The safety of absolute ethanol for the sclerosis of fluid cavities has been demonstrated by Bean, who used it to treat renal cysts. Absolute ethanol is slow to penetrate the fibrous capsule, and if it ever were to extravasate outside the cyst, it would be quickly diluted and inactivated by the adjacent tissue and fluid **(18).**

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