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Research Article

The Partial Tissue Expansions

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Abstract

Background: Tissue expanders are usually inflated with saline. We attempted to mitigate the side effects of the weight of the tissue expanders by replacing some of the saline with air.

Methods: Of the 23 patients who were implanted with tissue expanders at our hospital, 7 complained of discomfort resulting from awareness of implant expansion and consciousness of implant weight, and 3 showed marked malposition. For these 10 patients, we replaced some of the saline with air to alleviate their symptoms.Studies published in English were selected for inclusion in this review as were additional articles identified from bibliographies.

Results: Symptoms improved in all 10 patients without complications, and their tissue expanders were eventually replaced with permanent implants.

Conclusion: No difference was observed between the 10 patients with tissue expanders inflated partially with air and the 13 for whom, only saline was used. Inflating tissue expanders with a mixture of air and saline is a good way to prevent side effects related to expander weight.

Introduction

The tissue expanders used in breast reconstruction surgery are typically inflated with normal saline solution. However, the weight of normal saline may cause discomfort, misalignment, or even skin necrosis resulting from blood circulation insufficiency due to excessive pressure. Herein, we report our experience with reducing such discomfort and malpositioning by partially replacing the saline with air.

Methods

From March 2012 to July 2013, we implanted tissue expanders in 23 patients at our hospital after mastectomy and inflated the expanders with saline. Of these 23, 7 complained of discomfort resulting from expansion or consciousness of implant weight, and 3 showed marked malposition due to overweight of saline. For these 10 patients, we removed saline from the expander reservoir until the patient's discomfort was relieved, which was about 40% of the expander volume on average, and used a syringe to add an equal amount of air to the expander. In all 23 patients, we were able to maintain symmetry in the reconstructive breast volume without full expansions. It would be better to state that patients received incomplete expansion, replaced about 40% of the saline with air, and checked the patient frequently (1-2 times per week), replacing air as needed to maintain volume. Results: It is still not clear what "malpositioning feelings" refers to. Essential of our method.

1. No full expansion
2. Saline is less than 40% (the patient feel comfortable)
3. Replacing air partially and checked frequently (1-2 /week)

Results

The 7 patients who experienced discomfort and the 3 who showed malpositioning feelings all showed improvement; none developed any complications. Tissue expanders were replaced with permanent implants 6-12 months from the first operation. Two of the 10 patients were able to travel by air without problems. No differences from the 13 patients using only saline were observed.

Discussion

The saline-inflated breast expanders in general use today are silicone bags that dilate the subcutaneous soft tissue and were developed by Radovan [1] in the 1980s. However, it was Neumann [2] in the 1950s who was the first to attempt skin expansion using air; he used an air-inflated rubber balloon for auricular reconstruction.

Air is 854 times less dense than water, so it is light and has relatively little expansion power. The main purpose of breast expansion after total resection is maintaining form and space. A less skin need to be removed, large expansion forces should not be required. Therefore, minimal pressure is needed to maintain the inflation in the expanders. Symptoms improved markedly in the 10 cases where air was used for of partial tissue expansion. All patients showed improvement in their symptoms. The use of air does not affect the use of postoperative radiation therapy; radiation penetrates liquid and air in similar ways. We believe that our method can be used in reconstruction of relatively small breasts and it is a simple and safe expansion method.

In 2009 in the USA and Australia, a new carbon dioxide-based tissue expander was introduced in the market, designed to allow gradual controlled expansion and eliminate the need for percutaneous injections. After intraoperative filling by the surgeon and wound healing, small doses of carbon dioxide are administered on a daily basis by the patient with a hand-held dosage controller leading to gradual, incremental expansion. During trials, rapid expansion during the active dosing phase and flexibility to meet individual patient needs during expansion were demonstrated, and patients achieved full expansion in an average of 15 days [3,4]. However, air travel is contraindicated in patients using the CO_2 product because CO2 expands significantly at altitude. In comparison, air expands much less, and as long as full expansion does not occur, patients with partial air-inflated expanders should be able to travel safely by air. Asian women, including Japanese women, have relatively small breasts, so symmetric reconstruction of the breasts can easily be archived without full expansion. We believe our method is effective for reconstruction of relatively small breasts.

Impaired vascular perfusion in tissue expander breast reconstruction leads to mastectomy skin necrosis [5].

Their study found hypertension and/or BMIs >30 to be associated with mastectomy skin necrosis. In addition, patients receiving intraoperative tissue expansion fill volumes >300 cm2and patients with mastectomy specimens weighting >500 g have significantly higher odds of developing necrosis. We believe our method is effective heavy and large breast reconstruction, too.

Summary

We attempted to mitigate side effects due to the weight of tissue expanders by replacing some of the saline with air. This was performed successfully without complications in 10 patients undergoing breast reconstruction after mastectomy, with no differences observed compared to the 13 patients whose implants were inflated using only saline. We conclude that inflating tissue expanders with a mixture of air and saline is a good way to prevent side effects related to expander weight.

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