THIRD REFINEMENT IN RHOMBOID RELEASE OF CONTRACTURES BY ADDING FOUR-FLAP Z-PLASTIES

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SUMMARY. Rhomboid release has been utilized in the reconstruction of flexion contractures. In this study a new refinement of the rhomboid subcutaneous flap with a combination of adjacent four-flap Z-plasties on both sides is presented. Satisfying functional results were obtained, keeping the rhomboid flap and the structures on the rhomboid flap in their original position. The new design of the previous rhomboid release - the “rhomboid flap and adjacent four-flap Z-plasties” - makes it possible to preserve important anatomical landmarks, such as hairy skin in the axilla, the nipple/areola complex, and the pubic area in the contracture, and is considered a good method of releasing burn or congenital contractures.

Introduction

Since 1992, rhomboid release has been utilized in the reconstruction of flexion contractures. The flap was planned in the centre of the contracture. Defects arising after the release were closed in V-Y fashion (Fig. 1). This prototype was modified by adding Z-plasties on both edges of the flap to close the defects and prevent linear scar formation (Fig. 2). Rhomboid release was observed to be refined by Ertaş et al., with various experimental and clinical modifications.9

The combinations of rhomboid release and Z-plasties have been utilized in the release of contractures involving the axilla, groin, and popliteus, and found to be especially useful in first web-space contractures of the hand.

In this study, a new refinement is presented. The rhomboid subcutaneous flap was combined with adjacent four-flap Z-plasties on both sides. The results are presented photographically together with a review of the literature.

Material and method

Between 2001-2005, four patients with ten various post-burn contractures and one patient with a congenital pubic web were treated utilizing rhomboid flaps and adjacent four-flap Z-plasties on each side of the flaps according to the axis of the contracture band. The length of time from injury to reconstruction ranged between 2 and 20 years. The age of the patients and the locations of the contractures are shown in Table 1.

![Fig. 1 - Original rhomboid release, with defects closed in V-Y fashion.](image1)

![Fig. 2 - Rhomboid release and Z-plasties.](image2)

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<th>Table 1 - Data of patients with contractures</th>
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Surgical technique

The rhomboid subcutaneous flap with 60° and 120° was planned at the centre of the contracture band. The parts of the flap with 60° followed flexion creases. The four-flap Z-plasties were planned on both edges of the flap (Fig. 3). After release (Fig. 4), the triangular flaps were transposed and sutured in their new locations (Fig. 5). Pre-operative and post-operative views of the technique applied to different regions are presented (Figs. 6-9).
Fig. 8a - Patient with left axillary contracture.

Fig. 8b - Pre-operative drawing of rhomboid flap and Z-plasties on contracture bands.

Fig. 8c - Post-operative view of patient after one month.

Fig. 9a - Patient with congenital pubic web.

Fig. 9b - Pre-operative drawing of rhomboid flap and Z-plasties on contracture band.

Fig. 9c - Immediate post-operative view after contracture release.

Fig. 9d - Post-operative view of patient after two months.
Results

All the rhomboid flap and adjacent Z-plasties were effective in the treatment of the linear contracture bands. Adequate contracture release and gain in range of motion were achieved in all cases post-operatively. All the rhomboid flaps and adjacent Z-plasties healed well. The patients received physiotherapy. After a one-year follow-up, none of them had developed any contracture recurrence.

Discussion and conclusion

Post-burn contractures, especially those involving areas adjacent to major joints, have always been a challenging problem. They may be due to the severity of the initial burn injury, but ineffective precautions may make the deformities even severer. Post-burn digital flexion contractures are seen in the majority of cases.

In the treatment of burn contractures, various methods have been described. The reconstruction alternatives after release of the contracture range from simple grafting to long-term flaps and adjacent Z-plasties. Adequate contracture release and gain in range of motion were achieved in all cases post-operatively. All the rhomboid flaps and adjacent Z-plasties healed well. The patients received physiotherapy. After a one-year follow-up, none of them had developed any contracture recurrence.

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In the treatment of burn contractures, various methods have been described. The reconstruction alternatives after release of the contracture range from simple grafting to local or distant flap utilizations. Z-plasty - the plastic surgeon’s best friend - is of paramount importance and is a frequently used method in both single and multiple forms. Its various modifications have been reported.

The use of subcutaneous pedicle flaps in the treatment of burn contractures was first described by Suzuki in 1987. Subcutaneous pedicle flaps have turned into the perforator flaps in which the perforators have been identified - this has the advantage of primary closure of the donor area. The versatility of subcutaneous flaps has led plastic surgeons to use them in geometric shapes, and one of these is the rhomboid flap.

Rhomboid release has many advantages, especially in the reconstruction of contractures involving important anatomical landmarks such as the axilla, elbow, pubic area, nipple/areola complex, and digital flexor surfaces. It is well known that when the contracture involves an anatomical landmark, it is important to try not to change its position if we wish to achieve a more aesthetic result. By designing the rhomboid flap on the hairy axilla, the axillary hair will be preserved in its original position and will continue to grow. In a burn contracture involving the nipple/areola complex, the nipple/areola can be included in the rhomboid flap, keeping it undisturbed. These important areas may be transposed to their original positions when needed.

Undermining Z-plasties or any kind of flaps may cause problems of flap viability. The rhomboid flap is safer because it is not undermined, and important anatomical landmarks can thus be preserved. This is especially important in burn contractures in areas with underlying important vessels and nerves, such as the popliteal area or the inguinal region. Excision of the contracture over these areas may expose these important anatomical structures. Leaving the present contractured tissue in rhomboid fashion over these areas prevents them from being damaged. After release, subsequent defects can be closed in V-Y, Z-plasty, or four-flap Z-plasty fashion, depending on the severity of the contracture.

Finally, the design of the rhomboid flap and the adjacent four flap Z-plasties makes it possible to preserve important anatomical landmarks, such as hairy skin in the axilla, the nipple/areola complex, and the pubic area in the contracture, and is considered a good method of releasing burn or congenital contractures. The closure of defects, without the need of skin grafting or colour and texture matching, and the prevention of linear scar formation are also considered to be advantageous. The only disadvantage seems to be that it causes more operative scars. However, this is comparable to multiple Z-plasty or other post-operative scars. This new refinement can be added to the plastic surgeon’s armamentarium in the release and reconstruction of post-burn contractures involving various areas of the body.

BIBLIOGRAPHY

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Acknowledgements. The Authors would like to thank Dr Emin Elbüken for his drawings.

This paper was received on 1 August 2006.

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