Multiple Z-plasty for Suture Marks

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ABSTRACT

When performing a scar revision surgery for conspicuous scars with wide suture marks, all scars, including the suture marks, need to be excised. However, when the distance between the suture marks is wide, a high tension is needed to close the wound, which leads to complications such as wound dehiscence or hypertrophic scarring.

We performed multiple Z-plasty for the treatment of such scars, utilizing the suture marks as the end of the lateral limbs of the Z-plasties. This technique allows more normal skin to be preserved between the suture marks; moreover, tensile force needed to close the wound becomes less. We report good outcomes in the two cases treated using our original technique.

Key words: multiple Z-plasty, suture marks

Introduction

Suture mark is a component of noticeable scars; however, with appropriate surgical techniques, the formation of suture marks can be avoided. Nevertheless, especially in cases of urgent or critical operations, less time is allowed for skin closure, resulting in conspicuous scars, with or without suture marks. Many studies have reported on the causes and prevention of suture marks; however, only a few studies have been published on the treatment of resultant scars with large suture marks. For hypertrophic suture mark scars, scar revision surgery is usually considered after conservative management, such as pressure or steroid injection. For non-hypertrophic suture marks, surgery becomes an option when punctate scars are noticeable.

The ideal scar revision is total excision of the scar, with all the suture marks, and skin closure without undue tension. However, when the distances between each pair of suture marks are wide, the fusiform resection of the scar and suture marks altogether leaves a large skin defect, which cannot be closed without excessive tensile force. In this study, we report a new scar revision technique for scars with wide punctate suture marks, which applied multiple Z-plasty utilizing the punctate suture marks themselves.

Materials and methods (Fig. 1)

A marginal excision line was designed for the central long scar between the suture marks. Further, the design of the multiple Z-plasty was achieved by obliquely drawing the lateral limbs of the Z-plasties from the suture marks. The angle size of the Zs should not be too small to avoid compromising the circulation of the tip of the triangular flaps. After the administration of local anesthetics mixed with epinephrine solution, the incision was made using a no. 15 scalpel, which had a small, curved edge, and the median scar was resected. If the diameter of each suture mark was large, the circular scar was excised using the no. 11 scalpel, which had a small, curved edge, and the median scar was resected. If the diameter of each suture mark was large, the circular scar was excised using the no. 11 scalpel, which had a small, curved edge, and the median scar was resected. Appropriately undermining and subcutaneous suture to relieve undue tension were necessary. The placement of the drain was optional. After incising the lateral limbs of the multiple Z-plasty and transposing the flaps, excess skin should be trimmed. The incision was closed using intradermal and epidermal sutures. Taping is also a good option for skin closure, especially if the patient has a predisposition to poor scarring and the formation of other suture marks was anticipated.

Case 1 (Fig. 2)

A 21-year-old woman was referred to our department for treatment of a scar with noticeable punctate suture marks on her left anterior neck.
She had a cervical spine injury during an exercise four years prior to consultation, and had undergone some operations in another hospital. We performed scar revision surgery with the multiple Z-plasty technique using the suture marks. After suture removal, the scar was reinforced with paper tape for 5 months.

Case 2 (Fig. 3)

A 39-year-old woman underwent a cardiac surgery for congenital valve disease when she was a toddler. Her scar was also revised by the multiple Z-plasty technique, followed by the application of paper tape for three months.

Results

Neither patient experienced any complications. One year and three months after the operation, the resultant scar of the patient in case 1 was inconspicuous, following the relaxed skin tension lines (RSTLs). In the case 2 patient, minor hypertrophic scarring and minimal dog ear formation in the caudal area were observed three years after the operation; however, she was satisfied with the result.

Discussion

Reports on surgical treatments for scars with visible suture marks are rare. In addition to simple excision, W-plasty and the "wavy-line" closure, which is a modification of the W-plasty,
are reported\(^3\). The main advantages of W-plasty and wavy-line closure are requiring less amount of skin to be discarded, and forming a zig-zag or wavy scar, which is more resistant to tension than straight ones, leading to less propensity for wound dehiscence or hypertrophic scarring.

These benefits were also provided with our multiple Z-plastic scar revision technique. Moreover, our method resected only scar tissues, preserving much more normal skin. Therefore, compared with other techniques, the distance needed for the approximation of the wound was less in our method. In simple fusiform excision, the distance of the advancement of the skin edge for the closure is the same as the width of the suture marks. In W-plasty and wavy-line closure, which saves normal skin to some extent, the skin edges need to move the distance no less than the width between the suture mark and the median scar. When the height of the flaps of the methods or wave is too large, the blood supply to the tips is compromised. In a previous study, the authors reported that the reduction of the interval between the wound edges was at a rate of only 18% to 27%\(^3\).

On the other hand, in our method, the transposition of the triangular flaps makes it easier to close the wound, reducing the distance of the movement of the wound edge, which is at the same point as the base of the triangular flaps, to as short as less than half of the width of the suture marks. Therefore, our technique can be utilized even in cases in which less skin is preserved around the scar. As for the blood supply to the tips of the flaps, the angles of which can be adjusted by the surgeon's preference, the distances between suture marks and the central linear scar are less important. Rather, if the distances between each suture mark along the linear scar are insufficient, the width of the base of each triangular flap becomes narrow, which may cause concern about circulation.

More importantly, the final zig-zag scar might be conspicuous with the large segments of the Zs, especially when they are oriented against the RSTLs. In addition, transposition of the triangular flaps might cause dog ear deformity, especially when the angles of the Zs are large; therefore, cases without such concerns are a good indication for our method. If the result is unsatisfactory, total fusiform excision of the zig-zag scar may become an option for serial excision when sufficient time has passed after the first revision surgery because the spindle shape is smaller than before, and the surrounding skin is expanded to some extent. Therefore, less force will be needed to close the defect.

There is another limitation. Our method can be used only for punctate suture marks, and cannot be applied for severe suture marks fused with the median scar. For such cases, W-plasty or wavy-line closure are good options.

In summary, the chief advantage of our method is that it preserves more normal skin than W-plasty or wavy-line closure, and it requires less tension to close the wound. On the other hand, the disadvantage is that careful design is required to avoid three-dimensional deformation of the skin.

**Conclusions**

Our scar revision technique with multiple Z-plasty is useful for scars with wide visible punctate suture marks.

In our techniques, more skin can be preserved than the conventional scar revision techniques, such as elliptical

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excision or W-plasty, and the mechanical strain working on the scar is reduced.

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Conflicts of interest

None.

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