

The Basic Z-Plasty

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Z-plasty is a plastic surgery technique that is used to improve the functional and cosmetic appearance of scars. With this technique, it is possible to redirect a scar into better alignment with a natural skin fold or the lines of least skin tension. Contracted scars may be lengthened with this technique. Z-plasty involves the creation of two triangular flaps of equal dimension that are then transposed. Basic z-plasty flaps are created using an angle of 60 degrees on each side, which can lengthen a scar by 50 to 70 percent and reorient the direction of the central wound by 90 degrees. Keeping the length and angle of each flap precisely the same is key to avoiding mismatched flaps that may be difficult to close. Some possible complications of z-plasty include flap necrosis, hematoma formation under the flaps, wound infection, trapdoor effect, and sloughing of the flap caused by high wound tension. (Am Fam Physician 2003;67:2329-32. Copyright© 2003 American Academy of Family Physicians.)

This article is one in a series of "Office Procedures" articles coordinated by Thomas J. Zuber, M.D., Atlanta Medical Center, Atlanta, Georgia.

Z-plasty is a plastic surgery technique used to improve the functional and cosmetic appearance of scars. It involves the creation of two triangular flaps of equal dimension that are then transposed.¹

For a basic z-plasty, the triangular flaps are created using an angle of 60 degrees (Figures 1a through 1e). Theoretically, this angle can lengthen a contracted scar by about 75 percent and reorient the direction of the central wound by 90 degrees. In practice, the lengthening and reorientation will be less, owing to increased wound tension.

Angles smaller than 60 degrees are easier to transpose but result in less lengthening and realignment of the scar to less than 90 degrees. Angles larger than 60 degrees should be avoided because the force required to transpose the flaps increases markedly, making closure of the wound difficult. The length of each of the lateral limbs of the z-plasty must be precisely equal to the central incision over the original scar, or puckering at the corners will result, and additional undermining and trimming of the flaps will be necessary to obtain proper closure. The multiple variations of the basic z-plasty are beyond the scope of this article.²

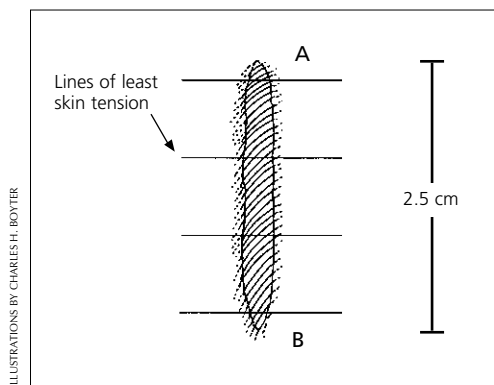


FIGURE 1A. The basic 60-degree z-plasty technique. The original defect is 90 degrees perpendicular to the lines of least skin tension. Tension on the healing wound eventually widens and thickens the scar. The scar length (AB) is 2.5 cm.

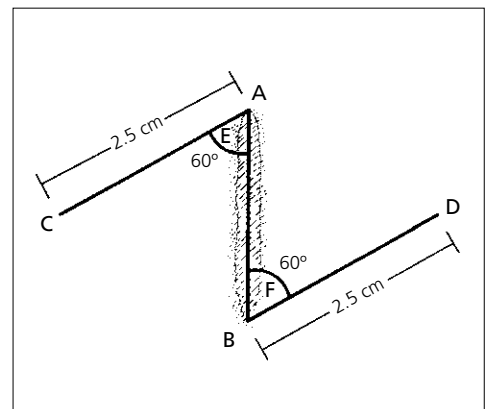


FIGURE 1B. Diagonal lines (AC and BD) are drawn at a 60-degree angle to the scar (AB). The diagonal lines should be the same length as the scar (2.5 cm). The new flap tips are E and F.

Precisely equal lengths and angles of the lateral arms are key to obtaining proper flap closure after transposition in z-plasty.

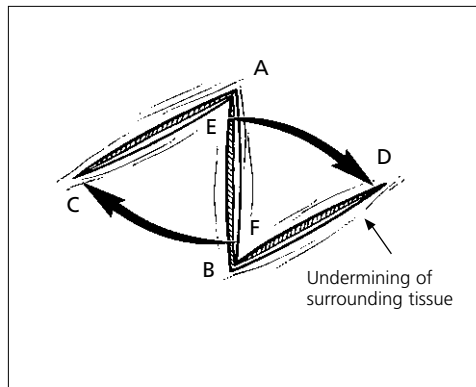


FIGURE 1C. Incisions are made vertically through the skin using a no. 15 scalpel blade. The triangular flaps and the surrounding skin are undermined. When tip F is pulled toward C, and tip E toward D, the flaps E and F are transposed.

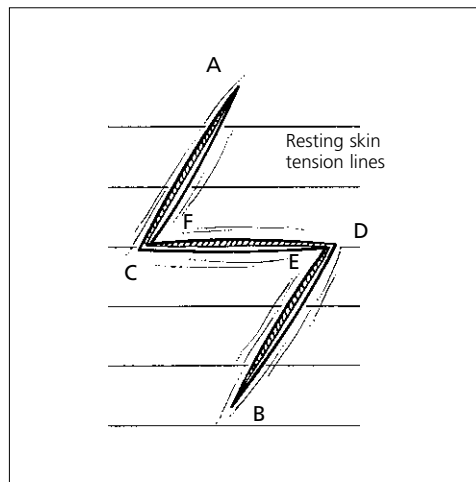


FIGURE 1D. The F flap is pulled above the E flap. The new centerline of the wound (CD) is horizontal and lines up with the resting skin tension lines. The resulting diagonal lines are also better aligned with the resting skin tension lines than the original perpendicular scar line was.

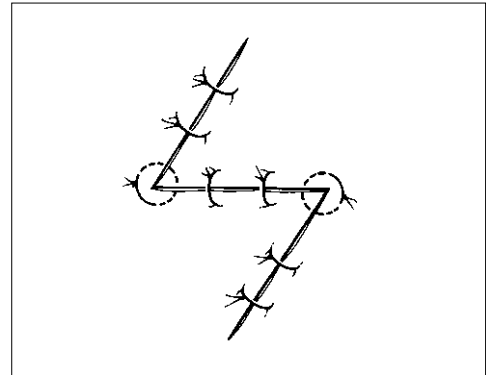


FIGURE 1E. A few anchoring stitches are placed in the new centerline. The two flap tips are then approximated using interrupted tips or corner stitches. Additional simple interrupted sutures are placed to close the diagonal lines.

In a primary care setting, z-plasty is reserved for improvement of linear, thin scars and is not used as a primary closure technique. The most common situation in which a z-plasty would be used is an unfavorable cosmetic or functional scar that has not improved after waiting for a reasonable length of remodeling time (e.g., one year). More complicated scar situations, such as burn scar contractures, wide scar contractures on fingers, and hypertrophic or keloid scars, typically involve plastic surgery techniques other than basic z-plasty.

Indications

Common indications for z-plasty include (1) lengthening of a contracted linear scar across a flexor crease (*Figures 2a and 2b*)—flexion contracture is released, and functionality across the scar is improved; and (2) changing the direction of a cosmetically unfavorable scar (*Figure 3*)—the scar is realigned along a natural skin fold or along the lines of least skin tension, creating less tension on the wound and resulting in a cosmetically superior scar appearance.

Technique

The mechanics of the technique must be clearly understood by the physician before the

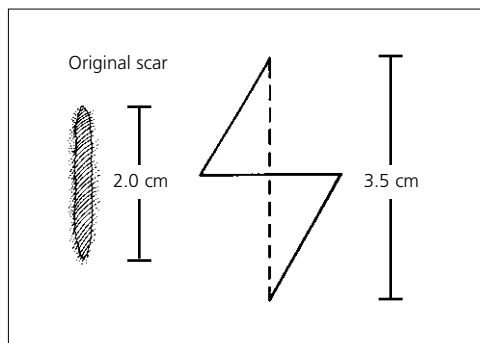


FIGURE 2A. Lengthening of contracted scars. When flaps are transposed, the length of the wound (in the direction of the original scar) is increased by 75 percent to 3.5 cm.

procedure is attempted. The procedure and its risks and benefits are first explained to the patient, and an informed consent is obtained.

A basic z-plasty is performed using the steps illustrated in *Figures 1a through 1e*.

The surgical site is prepped with an antibacterial solution, such as povidone-iodine (Betadine), and sterile drapes are applied.

Two arms are drawn at each end of the linear scar, inscribing an angle of 60 degrees to the scar. The side arms are exactly equal in length to the central scar and have precisely the same angle.

Local or regional anesthesia is administered.

Vertical incisions are made through the skin along the lines, using a no. 15 scalpel blade.

Full-thickness skin flaps are undermined at the level of subcutaneous fat, creating two triangular flaps of equal size and shape. Adequate undermining of surrounding subcutaneous tissue is performed to achieve proper mobilization of the flaps.

The two flaps are then transposed around each other, changing the direction of the original scar.

The flaps are held in place with a few anchoring sutures.

The skin is closed using interrupted sutures. Corner stitches may be used for the flap tips.

Topical antibiotics and a pressure dressing are applied over the wound to minimize the

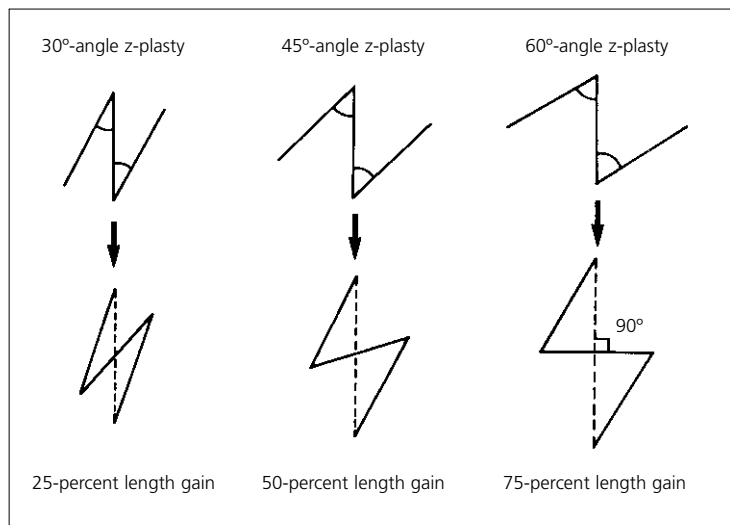


FIGURE 2B. Lengthening of contracted scars. Difference in length gain and realignment of scar with different z-plasty angles.

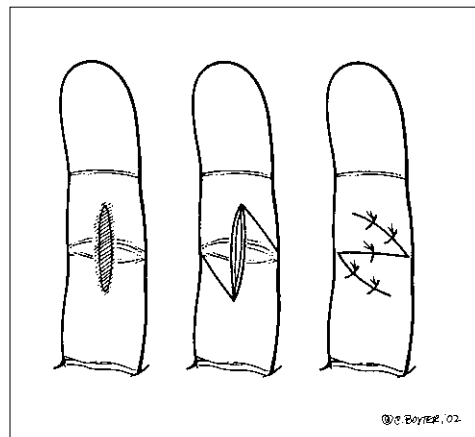


FIGURE 3. Lengthening of a contracted scar across a flexor crease. A scar contracture across the proximal interphalangeal joint crease is superficial and does not involve the deeper tendons. This bowstring scar interferes with full finger extension. The scar is excised, and a z-plasty is created with the lateral arms being the same length as the central wound. The lateral arms are drawn 60 degrees to the original central wound. The flaps are transposed, lengthening the direction of the original central line. The new central arm aligns with the flexor crease. The added length of skin across the crease prevents reformation of a contracted scar.

The necessary undermining in z-plasty carries possible risks of hematoma formation and flap necrosis.

chance of hematoma formation caused by the undermining.

The wound is re-examined in one to two days, and sutures are removed in seven to 14 days.

Complications

Z-plasty may be complicated by flap necrosis, hematoma formation, wound infection, sloughing of the flap caused by high wound

tension, and the trapdoor effect (elevation of central tissue resulting from a downward contraction of a surrounding scar).

Most complications may be prevented by meticulous attention to technique.³ When possible, patients should be advised to stop taking anticoagulants before the surgery, and if a hematoma is thought to be present during the postoperative course, large-bore needle aspiration may be performed. Routine wound care instructions are given to the patient, and prophylactic antibiotics may be considered for use in patients with diabetes and in other immunocompromised patients. The trapdoor effect may be avoided by employing sufficient undermining of tissues surrounding the flap site.

The authors indicate that they do not have any conflicts of interests. Sources of funding: none reported.

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REFERENCES

1. Burke M. Z-plasty. How, when and why. *Aust Fam Physician* 1997;26:1027-9.
2. Zuber TJ. Skin biopsy, excision, and repair techniques (illustrated manuals, videotapes, and CD-ROMs of soft tissue surgery techniques). Kansas City, Mo.: American Academy of Family Physicians, 1998;52-61.
3. Rohrich RJ, Zbar RI. A simplified algorithm for the use of Z-plasty. *Plast Reconstr Surg* 1999;103:1513-7.