SOME PRACTICAL PLASTIES TO RELIEVE WOUND TENSION

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A veterinarian has at his/her disposal several plasty techniques that can be used to relieve wound tension or correct problems caused by tension. These are V to Y plasty, Z-plasty, W-plasty, and circle plasties (bow tie University, AL

V to Y PLASTY

A V to Y is a form of relaxing incision which will give a small amount of relaxation to allow wound closure. After it has been determined that undermining will not provide sufficient relaxation for wound closure, V to Y plasty may be considered. A V-shaped incision is made in skin adjacent to a wound, with the point of the V going away from the wound. The wound is closed. This is followed by closure of the V incision in the shape of a Y. Suturing begins at the ends of the Y with alternate placement of sutures on each side. When tension begins to develop, the remaining portion of the incision is closed side-to-side to provide the stem of the Y.

Z-PLASTY

Z-plasty can be used in several ways to relieve tension. The principles of Z-plasty must first be understood. It is composed of a central limb and 2 arms. These must always be equal in length. The angles at which the arms join the central limb can be any size between 30 and 90 degrees, with 60 degrees being the most workable angle in skin. However, the angles of a Z-plasty can be any combination of angles within the range of 30-90 degrees. After a Z-plasty has been designed, the Z is incised, the 2 flaps of the Z-plasty are undermined, and the flaps are transposed into their new positions. The result is still a Z-plasty; however, the central limb is now going in the opposite direction.

Relaxing incision: The principle of Z-plasty relaxation is that relaxation is gained in the direction of the original alignment of the central limb of the Z. Thus, if a Z-plasty is to be used as a relaxing incision, the Z-plasty is designed adjacent to the wound with central limb of the Z going in the direction that relaxation is needed.

Theoretically, two factors will govern the amount of gain in length (relaxation) that is attained with a Z-plasty, the size of the angles of the Z-plasty and the length of the arms and central limb of a Z-plasty. As these become larger, the amount of relaxation increases. As an example, with a 60 degree angle Z-plasty, if the length of the central limb is 2 cm (designed in the direction relaxation is needed), after flap transposition, the length of relaxation will be 3.5 cm. In other words, there is a gain of 75% in the direction of needed relaxation. It should be remembered that the gain in relaxation in one direction is at the expense of skin perpendicular to the direction. Thus, when a Z-plasty is being considered for relaxation, the skin in the area should be manipulated to be sure it is present to be used for relaxing purposes.

Release of a circumferential scar: Multiple Z-plasties can be used to increase the length/diameter of a constricting circumferential scar. Such scars can result on the limbs from the contraction of second intention healing of a circumferential wound or from some constricting object around the limb (e.g. rubber band).

The principle of the procedure is the same as with a Z-plasty relaxing incision - gaining length in the direction of the central limbs of the Z’s when the Z-plasty flaps are transposed. Multiple plasties are used for the procedure since their effect is additional.

A line is drawn in the base of the circumferential scar. This will be the central limb of many Z-plasties. A piece of radiographic film is cut in the shape of an equilateral triangles with each side the length of the desired limbs of the Z-plasties. Because the angles are 60 degrees, the triangle is placed sequentially around the central arm and limbs are drawn off of it using the triangle as a pattern. This results in multiple small Z-plasties around the limb with their central arms along the constricting scar.

Each small Z-plasty is incised, underlying scar tissue is removed and the flaps are transposed and sutured in their new positions. It is important that the complete procedure be done on one Z-plasty before proceeding to the next Z-plasty. Otherwise, it will be too confusing to figure out the proper flap transposition. The end result is an increase in length in the direction of the central limb of the Z’s, i.e. increased circumference at the area of the constricting scar. Multiple Z-plasties can also be used along the length of a restricting bowstring scar to increase length and relieve restriction.

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Relocation of a deviated structure: If contraction from second intention healing or tension from wound closure has resulted in deviation of a structure from its normal position, i.e. lateral canthus of an eye, Z-plasty can be used to relocate/realign the structure.

The Z-plasty is designed with the deviated structure located in one of the flaps of the Z-plasty. Thus, when the flaps are transposed into their new position, the deviated structure is taken with the flap and moved into its proper position.

Changing the direction of a linear wound: Z-plasty can be used to change the direction of a linear wound when the orientation of the wound results in tension disruption of the wound, e.g. a horizontal wound over the extension surface of the carpus which breaks open with carpal flexion.

The principles of Z-plasty are used to design a 60 degree angle Z-plasty with the central limb being the linear wound. As the Z-plasty flaps are transposed, the direction of the original wound is rotated 90 degrees to go with, rather than against the tension lines.

W-PLASTY

A linear scar that is at right angles to skin tension lines can result in a widened scar over time. Usually such scars are covered by hair in animals. However, if the scar is on a short haired animal and the owner...
wishes to have it less noticeable, the scar can be made to go more along skin tension lines and be less noticeable.

The scar is included in a W-Plasty design - i.e. the sides of the incisions to remove the scar are drawn with a saw tooth design, i.e. multiple W’s with each angle being about 60 degrees. A no. 15 or 11 scalpel blade is used to incise the W’s starting with the ventral-most line first so blood does not wash off the drawn lines as would happen if the dorsal line were incised first. After removing the scar tissue, a continuous subcuticular suture of 3-0 to 4-0 nonabsorbable suture (nylon or polypropylene) is placed such that bites are alternately placed on each side of the wound half way between the tip and base of each small flap/saw tooth. Final closure is with simple interrupted sutures of the same material at the tip of each flap. Thus, the scar is changed from one long scar that runs against tension lines to many small scars that run with tension lines and are less noticeable since they do not tend to widen as much.

**CIRCLE PLASTIES**

The veterinarian is often called upon to close small circular wounds in areas of limited tissue availability, e.g. on the limbs, where management of “dog ears” and tension may present a challenge. The bow-tie or combined V technique are plasty techniques that may provide a smooth closure.

**Bow-tie Technique:** This can be considered for smaller circular wounds where edge-to-edge closure results in relatively large “dog ears” and skin in the area is sufficient to allow removal of some of it for a smooth closure. Two equilateral triangles of skin are removed from opposite sides of the defect. The central axis of the triangles is 30 degrees from the long axis of skin tension lines. The apex of each triangle points toward the center of the circle with each triangle as high as the circle radius. Following removal of the triangles, the resulting flaps are undermined, moved, and sutured into their new positions. These maneuvers divide the circle into a series of smaller fusiform defects that can be easily closed. In essence, removal of the triangles of skin and transposition of the resulting flaps prevents “dog ears” before they occur.

**Combined-V Technique:** Two V-shaped flaps are created on opposite sides of a circular defect. The technique is indicated when there is sparsity of skin around the defect and all skin must be used to close the defect, with none being removed as “dog ears”, e.g. on the limbs. Two V-shaped flaps are designed on opposite sides of the defect as two equilateral triangles as with the bow-tie technique. However, the central axis of the triangles is 45 degrees from the long axis of the skin tension lines. To make the V-shaped flaps, only 2 sides of the triangles are incised such that the vertex of the V pointing toward the long axis of the defect. After the flaps are incised and undermined, they are moved and sutured into their new positions. When the tip of the V-shaped flap is sutured into the side of the circular defect, it should be done so that a small fusiform defect is formed with sides of equal length. This converts the original defect into smaller, irregular fusiform defects. The skin of each flap is used to close half of the larger central fusiform defects. For smooth closure, a “fudging” technique can be used to suture the shorter edge of the flap to the longer edge of the defect. Thus, simple interrupted sutures are placed so bites are closer together on the flap and further apart on the concave edge of the defect.

**References**