Dermatology Practical & Conceptual

# "Ellipticam" and the Philosophy of Dermatological Surgery of the Head

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## ABSTRACT

**Introduction:** Dermatological surgery pursues two primary goals: complete tumor excision and optimal functional and aesthetic outcomes. The standard elliptical excision minimizes dog-ears by aligning sutures with Langer's lines, but in anatomically and aesthetically sensitive areas (e.g., eyelids, lips, nose), alternative reconstructions are needed.

**Objectives:** To present a Tangram-inspired framework ("Ellipticam") for the reconstruction of elliptical excisions in challenging anatomical areas, aiming to optimize both closure and aesthetic outcomes.

**Methods:** The Ellipticam method decomposes an elliptical excision into geometric components (triangles and rectangles) and reassembles them as flaps. This approach underlies multiple surgical designs, including single tangent advancement, opposing triangles, east-to-west, cuneiform wedge, split-advancement, rotation flaps, and multiple double-tangent designs.

**Results:** Each flap reuses all subunits of the ellipse and aligns incisions along low-tension lines to facilitate closure. This method allows precise adaptation to the defect while minimizing tissue waste and visible scarring.

**Conclusions:** Understanding the indications, geometric principles, and elastic behavior of these flaps empowers dermatologic surgeons to manage defects in complex head and neck areas with greater confidence and better aesthetic results.

## Introduction

Dermatological surgery aims to achieve two primary objectives: complete tumor excision and achieving optimal functional and aesthetic results [1-3].

Both objectives must be considered whenever a surgical procedure involving the skin is planned. Various factors, such as tumor size, location, and involvement of deeper structures, influence the choice of reconstructive procedure after skin tumor excision [4]. The most commonly used excision technique is elliptical as it allows for the prevention of redundant peripheral tissue (dog ears) by maintaining an ideal length-to-width ratio of 1:3 [5]. Elliptical excision results in a defect that can be closed by approximating the wound edges with single or continuous skin sutures, preferably preceded by subcutaneous stitches for ease of closure [6]. Larger elliptical defects may require undermining to separate adjacent tissue from subcutaneous connections, facilitating movement during healing and minimizing stretching [7]. Suture placement plays a crucial role in managing tensions caused by retraction forces, muscle traction, and gravity. Aligning the major axis of the ellipse with Langer's lines or skin wrinkles and creases reduces scar tension as these areas experience lower force loads naturally [8]. However, in regions such as the lips, eyes, ears, nose, and facial aesthetic subunits where the elliptical design may intersect with structural, functional, or aesthetic lines, alternative closure methods such as flaps are often necessary. Understanding flap fundamentals, including design, geometry, and tissue movement dynamics, is essential [9].

Dermatologic surgery aims to completely remove skin tumors while preserving form and function [1-3]. After excision, the choice of closure depends on defect size and location [4]. An elliptical excision with a 1:3 length-to-width ratio is commonly used to prevent dog-ears and allows linear closure along relaxed skin lines [5,6]. Undermining adjacent tissue and aligning the major axis with Langer's lines further reduce tension [7,8]. However, on the lip, eyelid, nose, ear, and other aesthetic subunits, a simple ellipse may transect anatomical or aesthetic borders. In these cases, flap reconstruction is preferred [9]. To aid flap design, we introduce the Tangram analogy (Figure 1A-C): a traditional puzzle (five triangles, a square, a rhomboid) whose pieces can form various shapes. Similarly, an elliptical excision can be split into four triangular and two rectangular subunits. By conceptually "rearranging" these pieces, one can design flaps that relocate skin laxity away from the defect. This insight – termed "Ellipticam" (from ellipse + tangram) – informs a family of flap designs. For example, one can create single or bilateral advancement flaps, rotation flaps, and wedge excisions by combining the ellipse's subunits in different ways. Each design uses all pieces of the ellipse and orients incisions along low-tension skin lines. [10].

## Objectives

To present the Tangram-inspired "Ellipticam" framework for analyzing elliptical excisions and guiding flap design. To describe specific flap techniques (e.g. single tangent advancement, opposing triangles, east-to-west, cuneiform wedge, split-advancement, rotation flaps, H-plasty, T-plasty, and O-Z (double opposing rotation)) for head and neck reconstruction. To discuss how these flap designs optimize tension distribution and aesthetic outcomes by leveraging skin elasticity and geometry.

## Methods

We conceptually decomposed the standard elliptical excision into geometric subunits (triangles and rectangles) analogous to a tangram puzzle. Using this framework, we designed various flaps such that all subunits of the ellipse are reused to close the defect. In each case, incisions are planned to follow relaxed skin tension lines or aesthetic boundaries. Burow's triangles (triangle excisions) are displaced away from the defect, and excess skin is shifted into less visible or more elastic areas. Our approach emphasizes the skin's intrinsic elasticity: each flap is advanced or rotated into the defect by mobilizing surrounding tissue, rather than by stretching beyond its natural laxity. In summary, the methods involve flap geometry design guided by elasticity principles: raising triangular and rectangular flaps, undermining widely, and advancing/rotating tissue to achieve closure with minimal distortion.

## Flap Techniques

### Single Tangent Advancement Flap (Figure 2)

The Single Tangent Advancement Flap is indicated when side-to-side closure on taut skin would generate high tension, particularly near delicate landmarks (e.g. eyelid margin, lip vermilion, nasal ala). It recruits tissue from one side only, avoiding distortion of the other. Two adjacent triangular segments (Burow's triangles) are incised next to the defect; these triangles are then advanced together in a straight line away from the defect. The connecting incision is placed within a relaxed skin tension line (e.g. a wrinkle) to minimize visible scarring.

*Advantages:* By moving redundant skin away from the defect, this flap reduces closure tension and avoids pulling on nearby structures. Only one side advances, so the flap maintains robust blood supply. The resulting scar can be camouflaged along natural creases. In practice, this flap provides a reliable one-sided closure on the face with minimal functional compromise [11].

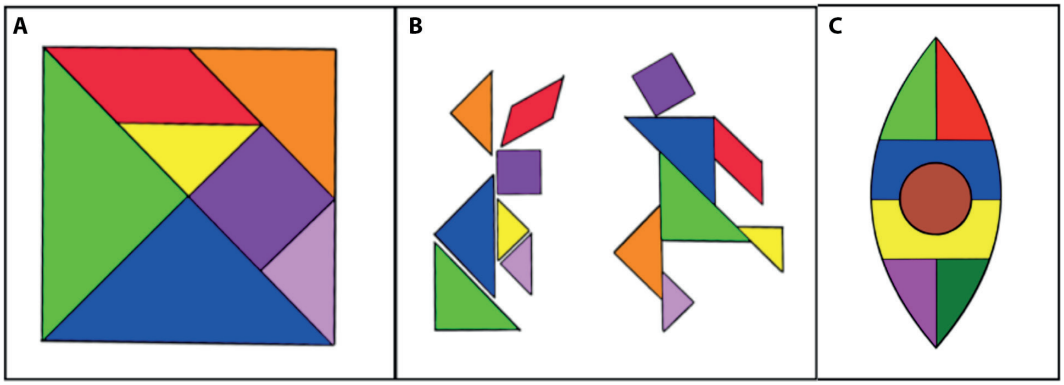


**Figure 1.** Tangram in its original square configuration (A) and in some of its possible compositions (B) (C) Graphical representation of an ellipsis divided into multiple subunits, resembling the pieces of a tangram.

### Opposing Triangles Flap (Figure 3 A)

The Opposing Triangles Flap is used for two adjacent or bilateral lesions flanking a central axis. It creates mirrored flaps on each side of the axis, allowing simultaneous reconstruction of both defects.

*Design:* each lesion's defect is extended into a rectangular advancement flap with a triangular extension (Burow's triangle) on each side. The bases of the paired triangles face opposite directions, forming two half-elliptical flaps centered on each lesion. Linear incisions connect the nearest rectangle bases. When advanced, the two flaps move toward each other to close both defects symmetrically.

*Advantages:* The bilateral advancement shares tension between the two sides, equalizing forces and preserving a smooth contour. Parallel scars are concealed along aesthetic unit borders, and each flap compensates for the other for an even closure [11].

### East-to-West Flap (Figure 3 B)

The East-to-West Flap addresses defects of one nasal tip ala while preserving tip symmetry. It is indicated for lateral nasal tip lesions that approach midline where asymmetric tissue loss would distort tip contour. Two matched triangular advancement flaps are designed on either side of the tip defect. These triangles slide horizontally toward each other until their apices meet at the nose center. Each triangle's base aligns with the rim of the central defect, ensuring equal tissue is recruited from both sides.

*Advantages:* By advancing equal triangular flaps from right and left, the flap maintains nasal tip symmetry and avoids twisting the tip. The nostril and columellar contours are preserved by distributing movement evenly. Final scars lie along natural subunit borders (e.g. alar-tip junction) for camouflage [11].

### Cuneiform Excision/Wedge Flap (Figure 3)

The Cuneiform Excision is used for lesions on circumferential orifices (lip vermilion border, eyelid margin, nostril rim) where an ellipse would disrupt the circular anatomy. Instead of an elliptical removal, a full-thickness wedge (cuneiform) is excised through the orifice depth. When the wedge is closed, it folds on its axis, preserving the orifice's circular continuity. Typically up to one-third of the orifice circumference can be removed without undue tension. Wedge edges are planned along stable landmarks (e.g. vermilion border, eyelid margin) to optimize alignment.

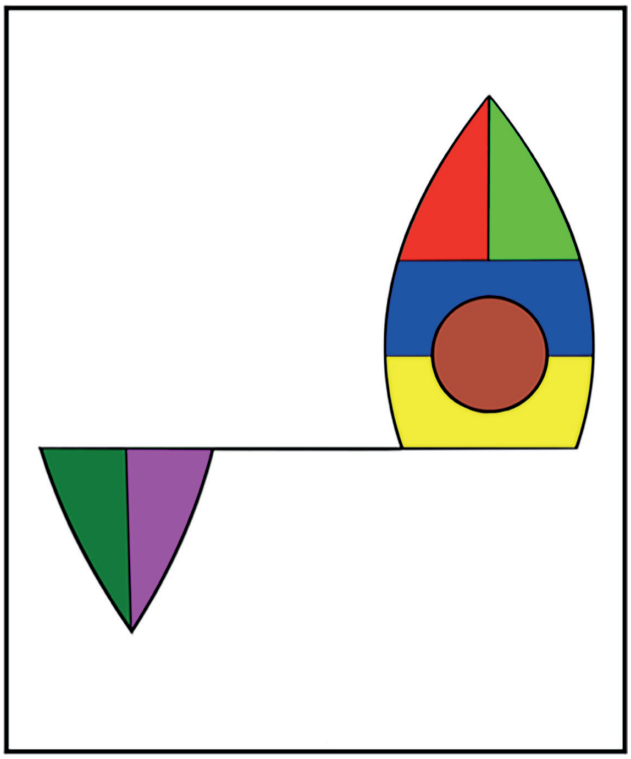

**Figure 2.** Single tangent advancement flap.

*Advantages:* This flap preserves at least two-thirds of the orifice rim, maintaining continuity of key landmarks. Aligning the excision with anatomical borders yields excellent functional and cosmetic results. The closure is full-thickness and tension-free, preventing puckers and keeping the orifice shape intact [12].

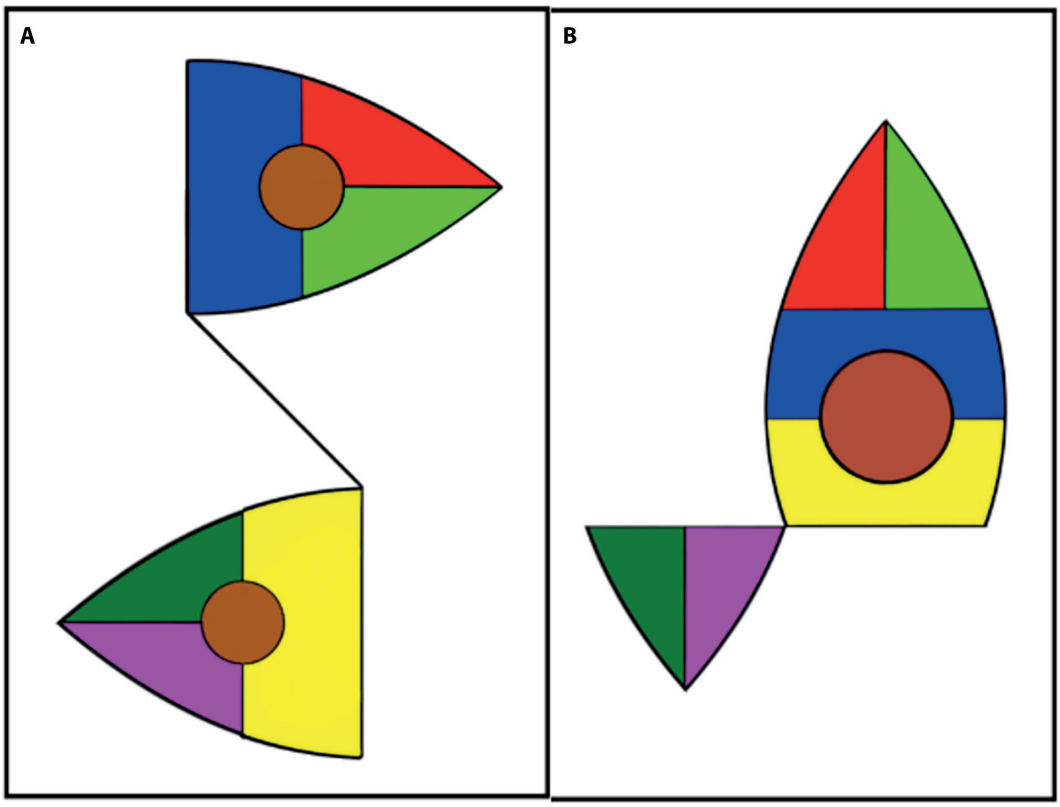


**Figure 3.** (A) Opposing triangles flap. (B) East-to-west flap.

### Split Advancement Flap/Helical Rim (Figure 4)

The Split Advancement Flap is a modification of the classic helical rim flap, indicated for helical rim defects extending into adjacent skin or lobe. Two triangular extensions are created at the rim's margin and advanced into the defect. Their bases sit at the rim margin and apices extend into the lobule or posterior ear. This design uses the ear's 3D anatomy: the triangular flaps fold under the ear with wide undermining, hiding scars on the soft, cartilage-free postauricular skin.

*Advantages:* The split advancement flap reconstructs rim defects and soft-tissue loss simultaneously without sacrificing cartilage. It recruits extra skin from behind the ear, preserving the rim curvature. Scars are concealed on the ear's posterior surface, yielding excellent aesthetic results. Overall, it maintains ear contour while closing complex helical defects [12].

### Single Rotation Flap (Figure 5)

The Single Rotation Flap closes circular or oval defects on convex surfaces (scalp, cheek, forehead) where linear closure would deform tissue. A curved incision is drawn to form a triangular flap adjacent to the defect. The flap's apex is oriented away from the defect and its base along the defect edge. After wide undermining, the flap pivots on its base and is rotated into the defect. Surrounding skin is advanced as needed, and any standing tissue (dog-ears) is excised. The incision's curvature is planned to lie along relaxed lines.

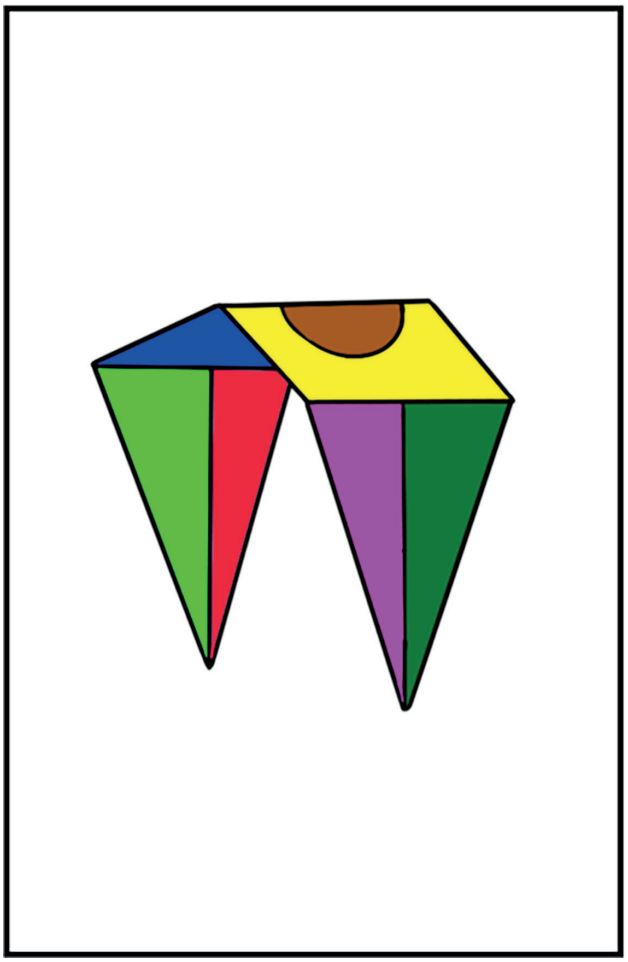

**Figure 4.** Cuneiform excision.

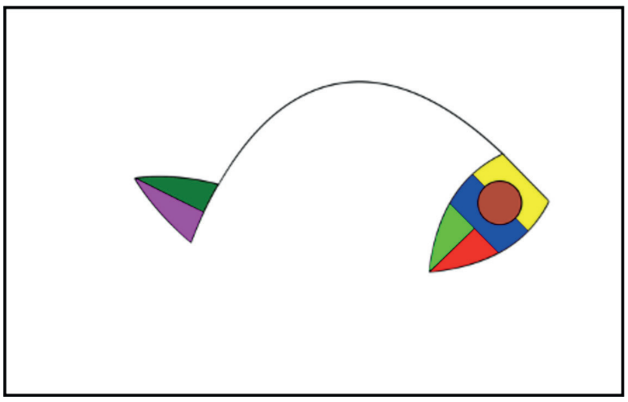

**Figure 5.** Single rotation flap.

*Advantages:* Rotation flaps allow closure of circular defects without distant tissue transfer. They carry a broad base for reliable perfusion, and when incisions follow natural skin lines the scar is well hidden. On convex areas like the forehead or scalp, the rotation flap preserves contour. However, if lines cannot be perfectly followed, the curvilinear scar may be more noticeable than a linear closure [13].

## Unipedicle Double Tangent Flap (Figure 6)

The Unipedicle Double Tangent Flap is for moderate-sized defects on one side of the face or scalp (e.g., forehead, cheek) with available lateral laxity. Two parallel incisions are made on one side of the defect, raising a broad flap (including the lesion) with triangular (Burow's) extensions at its edges. This entire flap, with its triangular wings, is then advanced directly into the defect. As it advances, the triangular extensions fold inward like gathered skin, aided by wide undermining. Incisions are placed along relaxed lines or unit borders (e.g. hairline) to hide scars.

*Advantages:* Using one broad flap spreads closure forces over a large area, reducing tension per unit. The two lateral scars can be concealed in natural creases. This flap can repair medial forehead, cheek, or even ear helical defects by recruiting tissue from the temple or scalp (e.g. rotating the glabellar region to the nasal tip). It is highly versatile for unilateral defects, recruiting tissue widely while preserving contour [11].

## Bilateral Double Tangent Flap/H-Plasty (Figure 7)

The Bilateral Double Tangent Flap (H-Plasty) is used for large or midline facial defects (forehead, chin, lip) with tissue available on both sides. Two mirror-image broad advancement flaps are raised—one on each side of the defect. On each side, parallel incisions form a rectangular flap with Burow's triangles at its ends. Both flaps are advanced medially; the four small triangles may be excised or transposed to facilitate movement. Incisions are usually along horizontal relaxed lines (e.g. forehead rhytids) to camouflage scars.

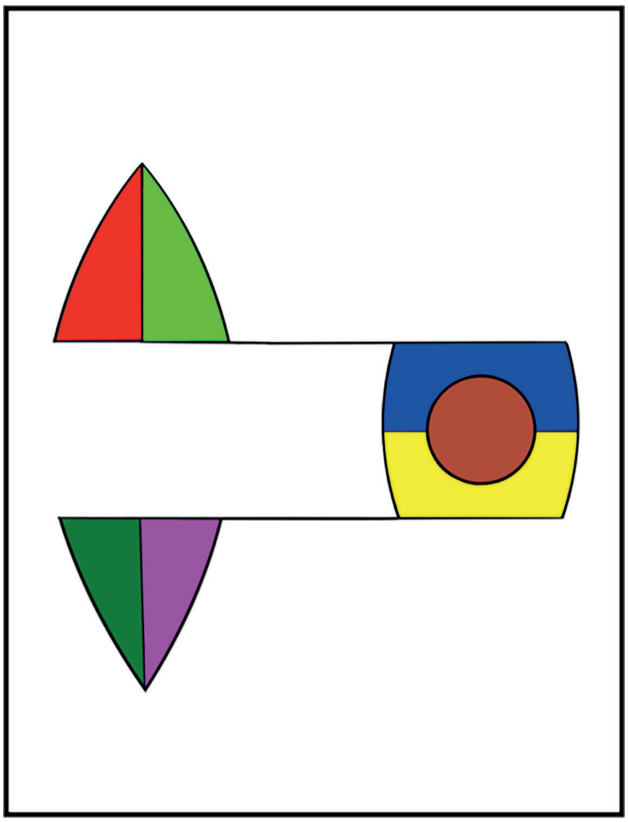

**Figure 6.** Unipedicle double tangent flap.

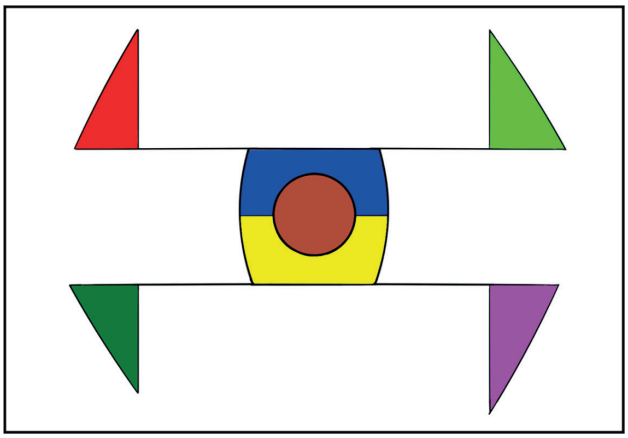

**Figure 7.** Bilateral double tangent flap.

*Advantages:* Bilateral advancement shares tension, minimizing distortion. The repair yields an "H"-shaped scar: a central horizontal scar with two parallel vertical limbs. Horizontal limbs lie in natural creases; vertical limbs are placed near the midline or as curves to hide the junction. This recruits tissue from both sides efficiently and is effective for wide midline defects (forehead, nose, lips) with well-camouflaged scars [11,14].

### Bilateral Unipedicle Advancement Flap/T-Plasty (Figure 8)

The T-Plasty is indicated for midline defects where tissue is limited or incision count should be minimized. It is especially useful at natural T-junctions (e.g. upper lip vermilion-white roll, central forehead midline). A single horizontal incision is made at the defect base, with two vertical limbs forming a "T" shape. Two adjacent triangular extensions and two central rectangular flaps are raised. The side flaps are advanced and rotated so their bases meet in the middle, creating the horizontal limb of the "T". The remaining triangles slide to the ends of the incision to accommodate excess skin. Vertical limbs are aligned with anatomic landmarks (e.g. white roll, midline); the horizontal limb follows a natural border.

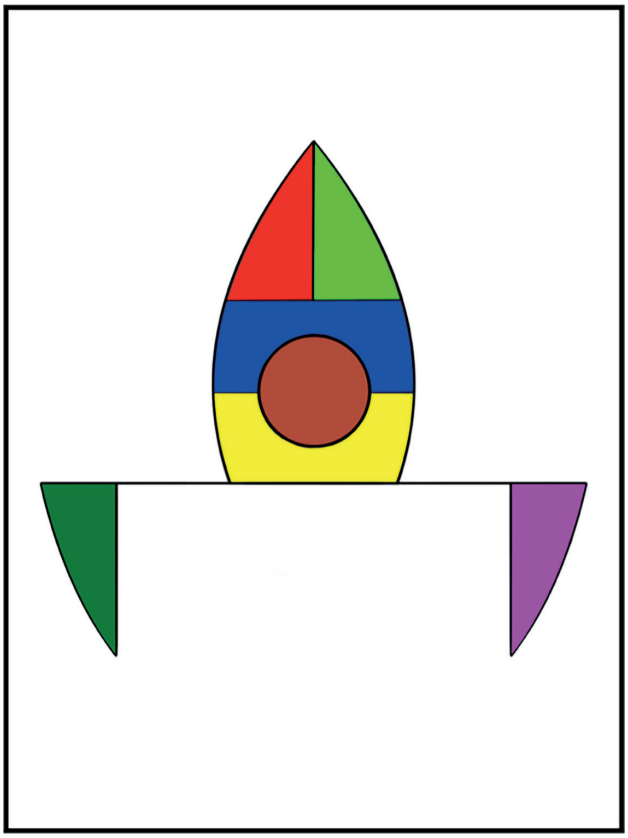

**Figure 8.** Bilateral unipedicle advancement flap.

*Advantages:* The T-Plasty requires only one horizontal incision, minimizing total scar length. By using two flaps, it effectively decreases wound tension with minimal disruption. Placing limbs along unit boundaries (e.g. vermilion border, eyebrow line) hides the T-shaped scar in natural transitions. It is well-suited to the upper lip, glabella, preauricular, and hairline regions where aesthetic unit junctions conceal the scar intersection [11].

### Double Opposing Rotation Flap/O-Z Plasty (Figure 9)

The O-Z Plasty (double opposing rotation) is designed for circular or oval defects on convex areas (scalp, forehead) to avoid puckering. Two rotation flaps are raised on opposite sides of the defect. Each flap's base spans one side of the defect (typically superior and inferior) and arcs outward at about 180°. The flap bases should be roughly 1.5× the defect diameter to allow full rotation. Each flap is then rotated into the defect; the suture line forms a "Z" with small triangular Burow defects at its ends.

*Advantages:* The O-Z flap converts a round defect into a linear closure, distributing tension bilaterally. It is highly useful when scalp or forehead laxity is limited. By closing a round defect with flaps from both sides, it avoids a radiating scar, disperses forces multidirectionally, and yields excellent cosmetic results [13].

## Discussion

The Ellipticam philosophy emphasizes that any flap must use all portions of the original ellipse and slide them cohesively. Conceptually breaking an ellipse into pieces (triangles/

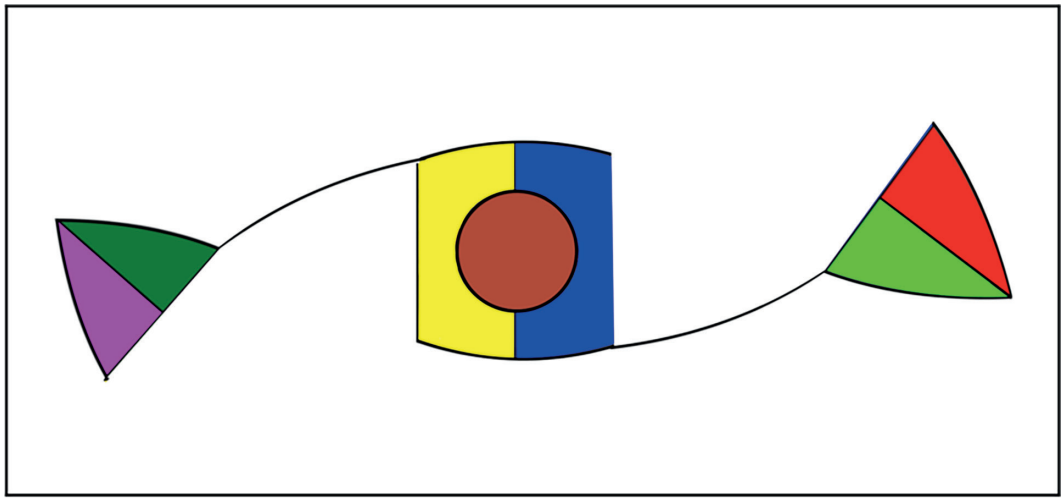

**Figure 9.** Double opposing rotation flap.

rectangles) simplifies the understanding of flap movement. In practice, this ensures that no redundant skin is wasted and closure tensions are balanced. For example, all the flaps above relocate excess tissue to less visible or more elastic areas (e.g. temple, behind ear, along relaxed lines). Importantly, these designs limit tissue reorientation – they mainly advance or rotate skin, preserving native alignments. The movement of each flap relies on the skin's intrinsic elasticity rather than tension (i.e. by sliding tissue). Flap selection is thus guided by the defect's context: single-sided advancement for unilateral defects, bilateral flaps for midline lesions, rotation flaps for convex contours, and wedge excisions for circular orifices. In all cases, aligning incisions along natural creases or aesthetic unit borders reduces scar visibility. Mastery of these principles allows dermatologic surgeons to minimize scarring and distortion when conventional elliptical closure is contraindicated. In essence, the "Tangram" analogy teaches that ingenious rearrangement of simple shapes – using all parts of an ellipse – yields robust reconstructive solutions.

## Conclusion

The Tangram-based Ellipticam approach provides a unified philosophy for flap design in head and neck dermatologic surgery. By decomposing an elliptical excision into its subunits and reassembling them, surgeons can create tailored flaps that distribute tension and respect anatomical boundaries. Key points include:

- Complete use of ellipse subunits: All pieces of the original ellipse are mobilized to close the defect, ensuring efficient tissue use.
- Relocation of redundancy: Flaps move extra skin to distant, inconspicuous, or more elastic sites (away from functional/aesthetic zones).
- Minimal reorientation: These flaps advance or rotate skin without twisting its orientation, preserving natural alignment.
- Dependence on elasticity: Closure relies on skin elasticity; wide undermining and movement along relaxed lines minimize tension.

In cases where a straight elliptical excision would compromise form or function, these flap techniques leverage geometry and elasticity to achieve effective reconstruction. Understanding this philosophy equips dermatologic surgeons to handle complex defects on the face and scalp with optimal aesthetic results.

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