

Short Communication

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Plastic Surgery: Principles and the Golden Formulas

Badr M I Abdulrauf

Section of Plastic Surgery, King Faisal Specialist Hospital and Research Center Jeddah, Saudi Arabia

ABSTRACT

The entire field of Plastic Reconstructive and Aesthetic surgery is technically based on 3 elements, “Viability” of tissues; “Transfer” of tissues; and the extent of tissue defect or “Tension”. These were expressed in 3 mathematical formulas and rules. An updated “Definition” of the specialty has been suggested.

*Corresponding author

Badr M I Abdulrauf, Head Section of Plastic Surgery, Department of Surgery King Faisal Specialist Hospital and Research Center PO Box 40047 Jeddah 21499, Saudi Arabia.

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The term “Plastic” originates from Latin, means the ability to be molded or reshaped, which requires manipulations and mobilization of structures. When such a feature is applied to biologic tissues then maintenance of perfusion is at least required.

Tissue viability is being challenged during every Plastic reconstructive Surgery (PRS) procedure, hence it goes without saying, we carry out maneuvers and steps to preserve blood supply in every operation. The father of modern Plastic surgery, Sir H. Gillies often mentioned: “Plastic surgery is a constant battle between blood supply and beauty [1]”.

Very often we as Plastic and Reconstructive surgeons are not particularly vocal about the circulatory issue because it is such an integral basic matter in our day to day work. However, occasionally and in small percentage, a routine procedure may end up with the unexpected complication of interruption to blood supply. This could be true for example in local flap’s failure; nasal skin necrosis in Rhinoplasty; digital ischemia in certain hand surgeries; or fat necrosis in lipo-transfers or lipofilling. In fact, even a simple filler injection procedure to the face involves an ischemic element with a rare risk of tissue necrosis. When it comes to specific flaps or free microsurgical tissue transfers then the focus on intactness of blood supply becomes much more obvious. Hence, the concern on tissue viability is always there.

An integral part of all PRS procedures involves recruitment of tissues, this is true in both esthetic operations or functional ones. Such recruitment always results in a secondary deficiency of tissues, this in turn requires freeing more tissues or other means. Therefore, in PRS, some “Tension” at site of closure is a normal

expectation. Nonetheless when it is significant, “Tension” means an invite to problems and wound edge ischemia, which carries the risk of wound dehiscence

[Tension $\propto$ Ischemia].

One generally reverts to undermining and advancement (essentially a local skin flap) or other means of tissue rearrangement. This simply means, wound tension is inversely proportional to the amount of tissue advancement, or undermining **[Tension $\propto$ 1/ Tissue advancement]**

Tissue mobilization in attempt to relief tension could also be detrimental to viability when it is miscalculated, depending on the physical factors (like width to length ratio of a random skin flap) or upon reestablishing the microcirculation in case of free flaps [2-4]. **[Tissue advancement $\propto$ Ischemia].**

Nevertheless, free micro-vascular muscle flap for instance is often indicated to improve blood supply of a certain region such as in chronic wounds, osteomyelitis or in irradiated fields. However, when such a free flap fails (does not survive) then one is back to square one, besides the loss of a donor distant muscle. The primary issue to be treated therefore often remains like a “debt to be paid”.

The concept we are conveying here is the fact, any tissue repositioning or a flap procedure does involve a risk to tissue’s vitality.

The three formulas (Figure 1) are somewhat contradicting to each other mathematically, but this is a reality in PRS. In other words, this is what differentiates between Plasticity in general compared to Plastic surgery. We believe it is essential for students of surgery particularly PRS to be acquainted with these, and how they correlate.

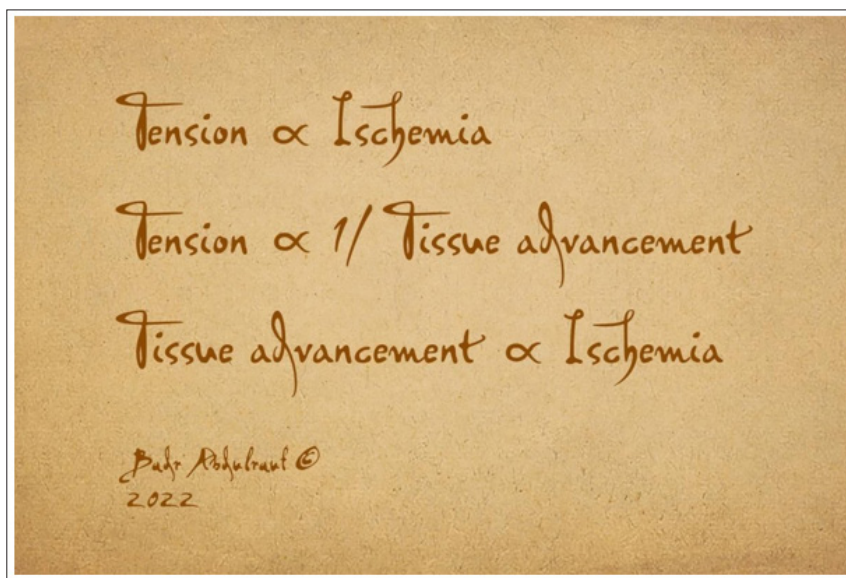


Figure 1: The three golden rules/ formulas that govern the field of Plastic and Reconstructive surgery, technically speaking 1. The degree of Tension at site of closure is directly proportional to extent of wound edge ischemia. 2. The degree of Tension at site of wound closure is inversely proportional to the amount of tissues being mobilized or recruited. 3. More the maneuvers used for reducing tension or reconstructing a defect, the element of ischemia is also associated and relatively increased. The author felt these deserved to be portrayed in Leonardo da Vinci's style.

There is often a thin line that exists between obtaining marvelous results and ending up with complications of tissue necrosis, wound breakdown, dehiscence and for instance possible exposure of an implant. Diverse endless examples exist: Various body lift procedures such as major abdominoplasty or thigh lifts; Breast reconstruction; Ear reconstruction; Replantation of extremities; Microvascular flaps etc [5].

To elaborate, the perfect example of Microtia (congenitally underdeveloped ear) reconstruction can be used. In order to achieve best results, skin flap thickness needs to be as minimum as possible for it to reveal best possible shape of the underlying detailed cartilaginous framework, meanwhile the flap's adequate perfusion is obviously critical. Furthermore, the more skin freed and recruited from surroundings, it would reduce tension and accommodate a higher profile cartilaginous framework with its 3D configuration. Meanwhile, that would also increase the risk of ischemia to the skin flap. A perfect balance needs to be achieved for the reconstruction to succeed (Figure 2) This reflects the “two edge- sword” nature of this procedure and many others in PRS [6].

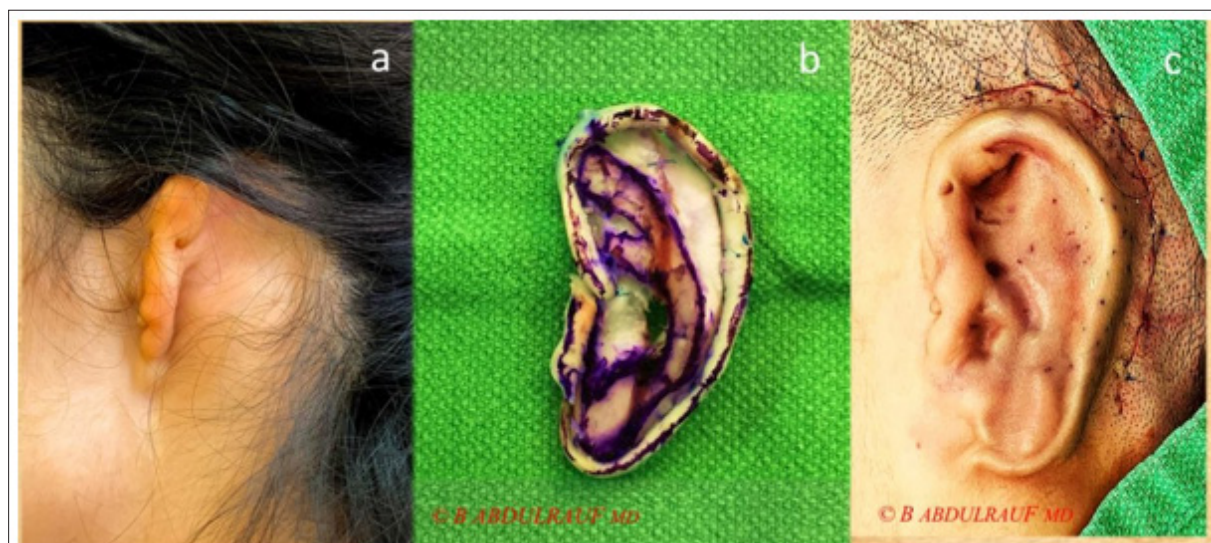


Figure 2: Plastic surgery can be re-Defined as “Shape alteration and enabling to heal”. A case of Microtia in a young lady (a) Autogenous rib cartilages have been used, carved and sculpted in shape of external ear (b) At end of first stage reconstruction where a pocket of skin flap was created and the cartilaginous framework has been implanted (c) The risk of Ischemia to the skin flap is always a concern in the early postoperative period due to the pressure effect of the cartilages underneath a relatively thin skin flap. The 3 formulas in Figure 1 can be perfectly correlated here.

Scars to some extent also represent effect of ischemia to wound edge. Although in PRS, extra efforts are routinely being exercised to produce least conspicuous scars but a widened atrophied scar is often inevitable in many procedures, which is simply due to the effect of excessive “Tension”. This can be evident in many bodycontouring or lifting procedures, where the healing is slowed down due to the marginal blood supply of skin being advanced and closed under tension. The usual result is a widened atrophied scar. This would explain for example when a scar of a tummy tuck is being compared to the one of cesarean section. This would also explain why plastic surgical patients are being discouraged or advised to abstain from smoking in many elective procedures. Minor wound disruption in many body lift procedures also result in hypertrophic scars due to the prolonged inflammatory phase of healing.

The aim of this brief philosophical communication is to educate on the essence of plastic surgery field technically speaking, and to put it in a context of three golden formulas and rules. Finally, Plastic surgery probably could be re Defined as: “Shape alteration and enabling to heal”.

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