

ESSENTIAL CONSIDERATIONS OF THE NASAL TISSUES

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The purpose of this paper is to consider the nature of the tissues of the nose and their reaction to injury. The frequency of trauma, the resulting deformity, and the unpredictable results from surgical repair suggest that there is a need for a better understanding of these structures.

A study of hundreds of injuries and surgical procedures of the nose has stimulated my interest as to why healing and tissue reactions vary from patient to patient.

Healing of nasal injuries depends upon the extent and severity of the trauma. Injuries with lacerations of the skin and tears of the mucosa associated with fractures, complicate healing by scarring and progressive deformity. Why does the mild injury of childhood becomes the major deformity of the adult? Why does corrective surgery of these deformities frequently leave much to be desired?

Basically, there is a different problem between nasal injuries and rhinologic surgery. In nasal fractures, except in the very severe cases, there is very little malalignment of tissues, the periosteum and periochondrium are still attached holding the fragments in good position and blood and nerve supply is disturbed very little. The main problem created is the collection and extravasation of blood into the tissues. These hematoma's of varying size may cause damage by pressure plus the added load of removal of the products of inflammation. Scar tissue is the likely result causing a progressive change in the relationship of the septum to the nasal pyramid. Increasing abnormal function will result.

Rhinologic surgery involving the septum pyramid compound presents a different problem. Tissue planes are opened, bony and cartilaginous tissues are freed and their relationship to each other is changed resulting in a disturbance of blood and nerve supply, but in a potentially infected area, places a very severe strain on the area's ability to handle such trauma. Collections of blood in these tissue planes invite a varying degree of post-operative scarring and progressive deformity.

With this thought in mind, a review of the histology of the tissues of the nose, and the pathology of tissue injury and its effect on the ultimate result is indicated.

Histologically, the nose is made up of fifteen different kinds of tissues each with a different healing potential. These tissues are:

1. Skin
2. Subcutaneous tissues

3. Fat
4. Muscle
5. Connective tissues with its cells and fibrillar components and ground substance
6. Nerves
7. Blood vessels — arteries and veins
8. Cartilage
9. Perichondrium
10. Submucosal tissues
11. Bone
12. Periosteum
13. Mucous membranes, glands and ciliated epithelium (definitely damaged by nasal packing)
14. Muco-cutaneous junction of vestibule (subject to concentric contraction with stenosis)
15. Joint fascia of the chondro-osseous joint of the septum.

Thus, many different tissues, each with a different healing potential is the key to our problem. The fast healing tissues such as skin, subcutaneous and connective tissues, muscle and mucosal tissues will heal by scar tissue. This creates an uneven but constant pull which distorts the slow healing tissues such as cartilage and bone.

Repair of any specific tissue depends on the ability of the cells of that tissue to regenerate. However, scar tissue is the common result of repair of many of these tissues thus complicating healing in corrective procedures of the nose.

All wounds follow the same general progression of events following injury and surgery. Bleeding into the wound results in some clot formation. Retraction of the clot provides stability in the wound area in which vasodilatation now occurs, possibly as a release of an histamine-like substance. Vasodilatation permits circulating cells, antibodies, oxygen, and nutrients to be carried to the wound area. Necrotic debris is removed by phagocytic activity and by enzymatic digestion. Endothelial, capillary buds appear in the clot by the second day. Fibrin trabaculae in the clot provides a framework for cellular and fibrillar retention. Fibroblasts which multiply in the wound and migrate in from the periphery, combine with endothelial cells and young blood vessels to compose granulation tissue.

The stimulus to fibroplasia is not known, but it is clearly related to a specific degree of inflammation. Too little is followed by delayed repair. Excessive inflammation can lead to "stormy healing" and excessive scarring. Good circulation is of great importance in wound healing, but infection is the greatest detriment.

In order to outline a plan of post-operative care, the local changes in the wound may be classified into three phases:

Phase 1 lasts from one to four days. The new connective tissue must start with new blood vessels and mesenchymal cells. The ground substance is created around the blood vessels. If excessive, it may choke off the blood supply and delay healing. At this phase the tensile strength of the wound

diminishes despite metabolic activity and one must depend on sutures and proper splinting.

Phase 2 lasts from four to fourteen days and is marked by proliferation of fibroblasts and other cells and by the development of collagen fibers to strengthen the wound.

Phase 3 or that of scar contraction, begins from the tenth to twelfth day and proceeds rapidly until epithelization is complete and then slows down and continues for many months. This is when the scar tissue activity may create an uneven pull on the slow healing tissues causing the post-operative deformity one wants to avoid.

Although there are no accepted ways of speeding up wound healing, certain factors may impede recovery such as:

1. Hematoma-need not be large but will interfere with fibrogenesis.
2. Infection-may occur following blood in closed space in a potentially infected area.
3. Foreign bodyreaction-wound must be clean. The presence of blood clots, bone fragments, suture materials, buried mucous membranes, necrotic tissue from excessive fibroplasia choking off blood vessels, or necrosis from too tight suturing.
4. Inadequate use of dressing. Firm splinting, both internal and external is important.
5. Nutritional status of the patient:
Low blood sodium and potassium
Low serum protein interferes with fibroplasia
Anemia-primary or secondary
Dehydration-more frequent than realized
Low Vitamin C - a requisite for forming collagen.
6. Endocrine disturbances-hypometabolism or hypothyroidism
7. Allergic rhinitis with mucosal changes as shown by high circulating eosinophil count may indicate a poor adreno-cortical response.

The nutritional, the endocrine or allergic status of the patient should be investigated before surgery. However, the surgery may activate a latent condition and not be noted clinically until the post-operative phase.

If the active phase, from the fourth to fourteenth days is delayed, stimulation to healing may be helped by:

1. Heat: all forms, short wave, infra red, hot applications which stimulate formation of nests of endothelial cells.
2. Non-specific. Foreign protein therapy in form of milk derivatives stimulates reticulo-endothelial system.
3. Use of an occasional dose of ACTH to activate the adrenocortical response-useful in high post-operative eosinophil counts where excessive swelling occurs.
4. Supplementary ascorbic acid therapy-continued for at least several weeks post-operatively.
5. Low serum protein may delay healing. Adequate supply in diet and fluids by mouth. Use of high protein dietary adjuvants.

6. Sodium heparin in small divided doses helps to control inflammation through its action as a local detoxifying agent of histamine.
7. Stimulation of healing by local use of cartilage. Prudden and Associates (cartilage extracts) Dingwall (Squibb) Boplant-lyophilized fetal calf septal cartilage. (These are not used as implants or for tissue supports, but for stimulation to fibroplasia and prevention of excessive scar tissue.)
8. Post-operative dressings are very important. All mobilized structures must be held in place firmly by an internal splint supplemented by an external splint of adhesive and dental compound. This prevents collection of blood in the tissue planes and encourage normal healing.
9. The post-operative phase lasts for a period of one year or more. These patients must be followed in order to evaluate if the physiology of the nose has been restored.

RÉSUMÉ

La fréquence d'un trauma au nez, la déformation résultante et la remise en état chirurgienne avec des résultats imprévisibles, suggère qu'il y a un besoin pour une meilleure compréhension des types de tissu en question. Ces nombreuses espèces de tissu présentes dans le nez, chacun ayant un potentiel différent de guérison, explique la guérison inégale qui suit le trauma ou la chirurgie.

Les tissus qui guérissent rapidement s'ils ont la chance de cicatrifier, déforment les tissus qui guérissent plus lentement. La déformation progressive stimulée par des facteurs de croissance, par l'allergie par l'infection et par le métabolisme dérangé, cause des changements dans la relation de la pyramide-et le-cloison.

Il n'y a pas de manière spécifique pour accélérer la guérison du tissu, mais on discute des facteurs qui retardent la guérison. On discute les phases de la guérison normale par des méthodes qui découragent la formation excessive de tissu de cicatrice.

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