

INFECTION AND ALLERGY IN RHINOLOGIC SURGERY

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New problems concerning rhinologic surgery have been created since the advent of extensive procedures of the nose. Functional corrective surgery has demanded that these procedures be performed even in spite of poor tissue tone, thick oily skin, atrophy, hypertrophy and probable keloid tendency. This type of problem with the need for improved breathing with its beneficial effects on general health has made it impossible to choose only the ideal case. The probability of deleterious effects developing in such a case is in direct proportion to the preoperative pathology.

However, it has been noted that in other than the ideal case, there has been a predisposition to infection. It is difficult to explain whether the source of this infection could be by auto infection from the patients own nasal secretion or skin surface, or from a prevalent hospital infection.

Even in spite of efforts to control postoperative healing and to prevent infections, there is a factor that could and probably does play an important role that alters good postoperative results. We refer to allergy. A review of the literature has shown that most articles deal with the relation of allergy to paranasal sinus disease, but not at all to corrective and functional surgery of the nose itself. Many rhinologists have seen allergic rhinitis develop following nasal operations, and feel that any nasal procedure may be allergenic in nature. However, many patients have improved and it is considered that the shock or stimulation of a procedure is a possible explanation for the procedure.

That trauma predisposes living tissue to infection is universally conceded. The role of allergy here is not so well recognized and accepted. To study these conditions and their tendencies to complicate and delay healing following surgery of the nose and to deduce what can be done to minimize or overcome unwanted postoperative sequelae, a questionnaire was sent to members of the American Rhinologic Society with a list of specific questions pertaining to allergy in rhinologic surgery. From reports of 441 cases, the following comments may be made:

1. 95% showed an improvement in their allergies, but after six weeks, began to revert to their former allergy status.
2. 5% were worse following surgery.
3. 50% had a lasting definite improvement in health outside of the symptoms of allergy.
4. Postoperatively, allergy treatment seemed more effective.
5. A small number (2%) had postoperative inflammation and infection of the subcutaneous and submucous tissues.

In an analysis of this series, the percentage of infections were small in proportion to the number that presented symptoms of allergy. Apparently a latent allergy was activated by the surgical procedures without the advent of any infection. According to the concept of Godlowski¹¹ these patients may have been sensitized to the products of their own tissue toxic catabo-

lities by earlier operations or injuries. According to Fowler³, they may have developed tissue hypersensitivity as a result of nerve injury and changed capillary blood flow which makes tissues more liable to recurrence of previous symptoms and pathology.

We have the impression that in addition an increase or a resurgence of an allergic state occurs — as suggested by the prompt postoperative increase in the eosinophilia — and that the hypersensitivities are materially enhanced.

A lesser but very important phase of allergy-infection relationship which we are seeing very often is that in which the skin is involved. Due to the trauma of surgery, the anesthetic agents, or even the pre-operative medications, swellings, redness, ecchymosis suddenly appear during and soon after surgery, often in a very marked degree. Some patients because of all this (or even without all the external manifestations), become significantly sensitive to adhesive tape, flannel, and other materials which are used for applying external dressings and splints. Some people know beforehand about their skin sensitivities but others have had no previous warnings.

Surgery of the nose, in addition to other trauma and infection, has a vital relationship to allergy in general and to nasal and bronchial allergies in particular. The presence of allergy or its provocation by any trauma can predispose the individual to a variety of responses which will affect his health, his powers of healing and his resistance to infection.

We might briefly discuss five of these responses and states:

1. In the typical allergic rhinitis as described by Hansel¹, the mucosa appears pale, greyish in color, boggy or swollen. Definite polyposis may be present. There is definite obstruction to both ventilation and drainage. This, associated with nasal deformity, increases the difficulty in breathing and delays the responses to therapy. This type of patient requires the utmost control possible of the allergic process before any surgery is attempted. There may only be a family history of allergy, or an occasional occurrence of localized allergic reaction. But following surgery there can occur a precipitation of an acute allergic rhinitis followed by actual infection. In one patient it was difficult to control this reaction even in spite of pre-operation desensitization, antihistamine and corticosteroid therapy. Two years after operation, desensitization therapy and local treatment were still necessary. (We have no record of asthma being activated by surgical procedures.)

It might be added that activation of allergic manifestations may be on the basis of viral infections. This concept is becoming increasingly prevalent. Interest in the role that viruses and other organisms may play in allergic patients has been heightened by the report of Huebner and associates² on the presence of adeno-viruses, as a latent infection, in the respiratory tract. Further investigation is needed in the study of the relationship between all pathogenic organisms and allergic disease.

2. Postoperative inflammation and infection develop in the operative regions. Redness, swelling, and tenderness occur, with or without temperature. Frank pus may be present. Several explanations are possible.

- a. An infection from the patient himself or from "hospital" and personnel contamination usually with a staphylococcus infection (which at present is so prevalent).

b. Inadequate internal and external dressings with hematoma formation followed by infection; or excessive pressure on the soft tissues causing necrosis and infection.

The chief complicating deleterious effects of such reactions are the long duration of low grade infections and the actual permanent skin and subcutaneous tissue damage.

3. Local reaction in the operative region following external pyramid surgery — with similar swelling, redness and tenderness — occurs in a small percentage of cases in which the reaction cannot be explained on a basis of infection. The question arises — could this be a local reaction to adhesive tape and other dressing materials which become allergenic because of changes brought about by medications given pre- and postoperatively — such as the antibiotics, the enzymes, the barbituates, vitamins and narcotics and even the corticosteroids. Surgery differs from trauma in that these medications are so often used pre-operatively and soon thereafter.

It may be possible to have some sensitizing reaction from the surgery itself and a few hours later a more severe one from the products of destroyed cells and from the medications and materials employed. The Arthus phenomenon⁵ may offer an explanation for some of these reactions.

4. Fowler³, in his studies of tissue **hypersensitivity**, states that there is ample clinical documentation of the fact that local tissue injury as well as nerve injury tends to hypersensitize a tissue. This can cause increased capillary permeability, edema, hemorrhage, followed by more or less necrosis. This probably is the mechanism that occurs in rhinologic surgical procedures. This is called the "law of denervation" and can be seen in action in laboratory animals and demonstrated in man.

The following excerpt from Zweifach corroborates the opinion of Fowler:

".....both allergic reactions and infectious reactions are enhanced by denervation. The intensity of these reactions is primarily a function of the small blood vessel supply to the area involved. This is clear from the classical histological picture of each. Edema, and perhaps the tissue hemorrhage, is more marked in the allergic reactions while necrosis and phagocytosis are more pronounced with infections, but no one can deny that both are largely concerned with what goes on in and around the capillaries, and that these in turn are controlled by precapillary sphincters and by constriction or dilation of the metarterioles and venules supplied by the larger vessels¹⁰."

The Shwartzman⁴ phenomenon may also play a role here. This classical laboratory experiment produces a planned allergic response in a localized area. A minute quantity of typhoid or other culture filtrate is injected into the skin of the ear of a rabbit. Twenty-four hours later 2 to 3 cc, of the same filtrate is injected intravenously. Hemorrhagic, necrotic areas appear at the site of the skin injection in about five to six hours. This reaction is intensified by removal of the superior cervical ganglion (in the rabbit).

It has been pointed out repeatedly that allergy is primarily a vascular phenomenon. Rich and Follis⁶, for instance, found that the Arthus phenomenon could not be produced in an area devoid of blood vessels.

Klinge⁷ found evidence to indicate that in the pathogenesis of allergic lesions produced both clinically and in the laboratory, fibrous necrosis of

the collagen fibrils is the earliest organic pathologic change. Similar changes in the ground substance also were observed by Rossle⁸. Material derived from the degenerated collagen tends to melt together into irregular eosinophilic masses. Both changes are seen following surgery and predispose the operated areas to infection.

5. **The stress reaction.** In addition to the hypersensitivity reactions of the nasal tissues to inflammation, infection, allergy and injury, the adaptation syndrome of Selye must be considered. Selye⁹ has designated the response to the defense reaction to stress as the "alarm reaction". Certain specific biological reactions take place only from specific stresses. For example, if streptococci enter the tissues, survive, and multiply, a local inflammatory reaction takes place. The body then builds up specific antibodies against these organisms. On the other hand, if the infection is severe enough, it will provoke enough constitutional stress to stimulate the pituitary-adrenal axis and start Selye's alarm reaction. This puts into play systemic reactions that in turn send impulses to the hypothalamus. This in turn stimulates the anterior pituitary to secrete corticotropin or ACTH. The increased ACTH stimulates the adrenal cortex to secrete the cortical hormones, glucocorticoids which are predominantly hydrocortisone. This is the "stress hormone". If the local reaction produces enough systemic stress, enough hydrocortisone is produced to inhibit edema and lessen the inflammatory reaction. If not, one must recognize the imbalance and supply the necessary medications in order to prevent excessive inflammatory and allergic reactions.

SUMMARY

The presence of allergy and infection has become more frequent due to the increasing scope of rhinologic surgery. Results of questionnaires indicate that the prevalence of allergy and infection can be explained by one of the following mechanisms:

1. Precipitation of an acute allergic rhinitis by surgery, secondary infection, or on the basis of a viral infection.
2. Postoperative inflammation and infection in operative site with redness, swelling and probably frank pus.
3. Postoperative local reaction not explained on the basis of infection is probably allergenic reaction, reaction to tape or other dressing material or local reaction to postoperative medications.
4. Local hypersensitivity activated by injury to tissues, blood vessels and nerves — probably on the basis of the Shwartzman phenomenon.
5. The stress reaction — local and general adaptation syndrome of Selye. Production of ACTH through activation of the pituitary-adrenal axis followed by inhibition of edema and inflammatory reaction.

The understanding of the potential effect of the trauma of injury, and surgery in addition to infection and allergy is very important to prevent the harmful sequelae.

INFECTION ET ALLERGIE DANS LA CHIRURGIE RHINOLOGIQUE

La présence d'allergie et d'infection est devenue plus fréquente en raison de l'importance croissante de la chirurgie rhinologique. Les résultats de

questionnaires indiquent que la prévalence d'allergie et d'infection peut être expliquée par les mécanismes suivants:

1. Rhinite allergique aigue causée par traumatisme chirurgical, infection bactérienne secondaire ou infection virale.
2. Inflammation post-opératoire et infection avec rougeur, gonflement et probablement suppuration dans la région opérée.
3. Réaction locale post-opératoire non attribuable à une infection, probablement réaction allergique au pansement adhésif ou à d'autres types de pansement, ou bien réaction locale aux médications post-opératoires.
4. Hypersensibilité locale activée par traumatisme des tissus, des vaisseaux sanguins et des nerfs — probablement, une manifestation du phénomène de Schwartzman.
5. Réaction de la tension — le syndrome d'adaptation de Selye, local et général. Production d'ACTH par activation de l'axe pituitaire-surrénal, inhibition de l'oedème et réaction inflammatoire.

La compréhension de l'effet potentiel d'une part, du traumatisme occasionné par une lésion ou par une intervention chirurgicale et d'autre part de l'infection et de l'allergie, est très importante dans la prévention des séquelles dangereuses.

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