Glass

ACCELERATION OF TRANSFER OF TUBE PEDICLES AND FLAPS

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From the earliest known descriptions of pedicle flaps in the Egyptian papyri (3,000 - 2,500 B.C.) and the Hindu Susrutas Samhita (1,000 B.C.), until the first World War, little advance of importance was made.

It was Halstead, in 1898, who first reported multiple transfers of a flap to the face, and he called this "the waltzing flap." Soon it was realized, and well described by Manchot, in 1889, that the arterial blood supply to the different skin regions of the body played an important role in the success of the viability of the flap. From this, the accepted idea of avoiding crossing the midline came into being.

The description of the tube pedicle, by Gillies and Filatov, in 1917, brought a sudden impetus to the use of pedicle flaps in the repair of large defects.

The equal importance of venous drainage to arterial blood supply was recognized by Mayo in 1918, who suggested superficial scarification of the flap to allow surface drainage until proper vessel drainage is established.

As recently as 1920, symbiotic transplantation, or the attachment of one person to a flap raised from another, was thought possible, and O. Laurent reported 4 cases where there was a successful repair of extensive defects of humerus and femur by fastening together donor and recipient for 8 to 10 days. We wonder today how authentic were the observations both as to take of graft and speed of transfer.

The factors concerned in choosing a flap to cover a defect on the head and neck, are many. Of primary importance is the assessment of size, shape, and location. The age, sex, mental and social status, and general physical condition are of significance. The use of some particular type of flap might give an excellent cosmetic result, but the time required and the length of hospitalization might be beyond the means of the patient.

The advantages of using a contiguous flap are that the color and texture are similar to those of the skin surrounding the defect, and the time required for reconstruction is short. However, there may be scarring and objectionable deformity in the donor area, and one might be limited because the bordering tissues are scarred or contain little fat, and are small in size.

In neighboring flaps, the time needed for reconstruction is short and those flaps can be used for larger defects. They have the disadvantages of scarring and can only be used in the upper part of the face.

Distant flaps, although they can be used to reconstruct defects in almost any location on the head or neck, having enough tissue and fat and the scarring of the donor area being of no great importance, have certain disadvantages. They are of different color and texture, and the flap will retain its original characteristics, so that if it is taken from a fat deposit area and the patient gains weight, the flap will also get fat. Also, the time in preparation and

transplantation to the head and neck is great.

It is generally accepted that an abdominal tube pedicle may have one end divided after 25 to 30 days. Shorter period of division may be safe when there is a definite artery in the flap and the length of the flap is short, as in the Abbe lip repair.

High speed travel and the advancement in the surgical care of malignant tumors have provided such a large number of facial and other deformities, that the need for more effective methods of plastic reconstruction has become more and more apparent.

The ideal is to shorten the periods of waiting between stages of the transfer. Besides reducing the time of hospitalization and discomfort of fixation, it reduces the amount of scar tissue under the flap, or inside the skin tube so that the tissues remain soft and pliable and requires practically no trimming at the new inset. Thus pedicles can be divided with confidence, and tiresome, scar producing division by delay, can be avoided.

Living as I do in Israel, we are always confronted with wounds of the face as the result of missiles or shrapnel. Since my department receives 80% of the soldiers who need reconstruction, we have always sought means of reducing morbidity and rapid rehabilitation of the patients to society.

At the end of the six-day war in June, 1967, I was introduced to a new form of therapeutic treatment known as Diapulse* therapy. This is the application of pulsed high frequency, high peak power electromagnetic energy for the acceleration of normal bone and tissue healing.

Prior to this time, it was always felt that the efficacy of this high frequency energy was due to the penetrating nature of the heat produced, and we had fear of causing burns in the insensitive tube pedicles. As you know, a tube and a flap after transferring and cutting it, is insensitive. We probably could accomplish a certain degree of blood volume with simple diathermy, but with diathermy, there is a danger of burn, and a patient who is insensitive may burn his flap or tube. This sometimes happens after three transfers and is a tragedy because we can lose a tube or flap after 3 months or 6 months hospitalization. However, with Diapulse, the heat factor was eliminated and the danger removed.

*Diapulse Corp. of America, Lake Success, New York.

Following the investigations of Erdman on "Increased Peripheral Blood Flow During Application of Pulsed High Frequency Currents," and Cameron's "Experimental Acceleration of Wound Healing by the Use of High Frequency Currents," both reported in the American Journal of Orthopedics, we decided to apply this phenomenon in tube pedicles. Accordingly we began treating all our tube pedicles with Diapulse.

So far, with Diapulse, we have succeeded in reducing hospitalization by about 25%. When we have complicated flaps and a patient is in a huge plaster for a month, he is very happy when it can be reduced to three weeks. We also recognize that a patient who is lying in bed a long time in very uncomfortable positions in plasters because of attachments of tubes, tends to lose courage and become despondent. Psychologically, he becomes injured, and if you can get him out quicker, and rehabilitated more rapidly, the chances of his becoming a chronic invalid thinking that "the Government owes him a living," becomes so much less.

Now, in order to assess when a tube can be transferable, I used Hynes' method. Hynes' method of assessing or judging when the tube has enough blood supply is to clamp the distal end of the tube and we put in .2cc. of a 1.2% atropine solution at the end of the tube. Now, to some of you, it may seem like a terrific amount of atropine. It is. The signs of atropine are (1) rapid pulse, (2) dryness of the mouth, and (3) dilation of the pupils. We gave these young male patients something to read. If the test was positive, they would have difficulty reading within 20 to 25 minutes. We also found the dryness of the mouth and an increase of pulse rate.

When we got these results within a half-hour of injection, we knew that there was a return circulation to the end of the tube and flap, and it could be transferred at that time.

In a series of 19 cases, we found that with the use of Diapulse, we were able to get positive atropine absorption test results in tube pedicles, after 16 to 22 days. This has meant a shortening of tube transfer time, at each stage, from 6 to 12 days, reducing, without pain, the time factor by one-quarter to one-third, in transferring of tubes and flaps, compare to what we had been used to previously

in these operations. If the patient had to have 10 operations and we could save a week each time, it would save us at least 10 weeks throughout this period.

To us this meant that a patient who would normally need a year's hospitalization (and this is quite common in reconstruction of face and major reconstruction where we have to move various tubes from all over the body), would be saved three months.

ILLUSTRATIVE CASES

Routinely, our patients are treated with Diapulse twice daily—ten minutes over the tube and flap areas, and 10 minutes each over the liver and adrenal areas, until all procedures are completed.

CASE 1. Through and through bullet wound of face resulting in destruction of hard palate. The defect in the palate was repaired by a tube pedicle from the arm, in 3 stages. Total time of treatment—43 days.

CASE 2. Shrapnel wound of side of jaw with total loss of soft tissues over mandible but no fracture. Repaired with a neck tube in 3 operations. Total time of treatment—39 days.

CASE 3. Shrapnel wound of face with total loss of upper lip and parts of both maxillae. Repaired with neck tube and vermillion lining from lower lip. 5 operations. Total time of treatment—64 days.

CASE 4. Shrapnel wound of face with partial loss of angle of mandible and soft tissues of face including lining of mouth. Repaired with thoracoacromial flap, in 6 operations. Total time of treatment—45 days.

CASE 5 Schrapnel wound of face with partial loss of maxilla. Repaired with thoracoacromial flap in 3 operations. Total time of treatment—45 days.