The evolution of skin flap technique

JOHN CONLEY (New York)

THE regional soft tissue flap has been one of the biggest advances in technical surgery of the head and neck. The old timers were expert with their modalities but there was no way of reconstructing an extensive ablation of the head and neck, except by pulling it together with heavy catgut or silk or resorting to a distant tube that would be moved in over six months to a year. This now is history. Experience with the regional flap has permitted the modern surgeon to carry out any type of ablation that is necessary and then to be able to move, without delay, as much as 500 sq. cm. of regional tissue. This tissue can be used to resurface, to augment, to prepare for future plastic surgery, to make a new gullet or to protect the carotid artery. It is not possible to practise modern head and neck surgery without an intimate knowledge of these flaps. With experience of somewhat over 1000 regional flaps, it is now possible to say which are dependable. On the basis of having these dependable flaps a new concept was thought of—that of moving a regional flap with a piece of bone attached to it. New concepts bring with them an overwhelming feeling of euphoria and tend to get out of proportion. These flaps should not be used to the patient's disadvantage—only in selected cases. The best way still of handling head and neck cancer is to cut it out and repair it immediately with the tissues left in the area and there is still a place for the free autogenous bone graft. This new concept, however, can be applied where present methods are inadequate, unsatisfactory, or where there are no methods available, e.g. the Andy Gump deformity with loss of chin and the floor of the mouth.

A group of flaps have been conceived, attached to skin, muscle and bone and already fourteen different varieties of bone pedicle flaps have been used and eight more are being designed for future use. A lateral cervical flap, picking up part of the clavicle. A sterno-mastoid muscle flap with or without skin, picking up the medial part of the clavicle. An anterior chest flap, picking up an anterior part of a rib. A delto-pectoral flap, picking up the lateral part of the clavicle. A very utilitarian flap, though not very popular, which swings down into the axilla and picks up the lateral part of the sixth and/or seventh rib. A posterior cervical flap with skin, trapezius muscle and the posterior part of the clavicle. One a little further back with skin trapezius and spinous process of the scapula, or medial part of the scapula. Forehead flaps, which were used as early as 1896 for rhinoplasty utilizing either the frontal bone or zygoma. These

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flaps should be planned and developed on a cadaver before using them clinically.

It is important to use as little hardware as possible to fix these flaps in position. After raising several of these clavicle flaps it was noticed that dropped shoulders were developing as a part of the clavicle had been removed. So the clavicle is now split with a Striker saw and only the outer table brought up. This repair may be combined with a forehead flap to provide inside cover and an alveolus. If an adequate alveolus is not created, an epithelial inlay skin graft can be inserted so a denture may be worn.

A brilliant idea which, unfortunately, has not worked out quite so well in practice is an even more complex flap which increases the possible variations enormously. This is a muscle-skin island-bone flap. For example, a sterno-mastoid clavicle flap plus a piece of skin from over the clavicle. The skin is to line the floor of the mouth, the bone is for the mandible, and the muscle for augmentation. Ninety per cent of these skin islands formed a wet ischar in the floor of the mouth, but the bone was partly lost in only six cases and healing was by secondary intention taking only two months.

The names of these flaps should really be standardized for ease of discussion. Large flaps cover so much anatomy that it is easier to use a regional designation, for example, an anterior superior oblique chest flap, which curves down over the breast into the axilla where a rib can be picked up. The skin here is non-hair bearing even in the male. The curve of the rib is suitable for the mandible and can be tailored and when the graft has taken the pedicle is released and dropped back onto the chest. The rib is only connected to the pedicle by a rather loose fascial connection but it seems to be adequate for transport. The clavicle has a tendinous attachment to the skin which is much more vital physiologically. The intercostal muscles are retained on the inferior surface of the rib, as the intercostal artery runs here and aids re-vascularization and also the muscle mass helps with augmentation.

The next problem area is the posterior third of the tongue and palate. Defects in this region can be filled best with temporalis muscle flaps with bone taken from the temporal or parietal bones. The temporalis muscle is left attached to the coronoid process. It is very important not to disturb the intra-temporal region as the temporalis muscle obtains its blood supply from two vessles here. The pedicle is then threaded underneath the zygoma, which must be fractured and the bone is then wired into the defect in the mandible. There is no difficulty in swinging this flap right down into the region of the digastric muscle. The temporalis flap is much more useful, however, for other regions in the face, for example, to fill in a surgical defect of the orbital margins. In young people it is possible to remove just the outer table of the temporal bone so that there is no

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exposure of the underlying dura. This flap is then tunnelled under the region of the temple and the bone split and used to produce an upper and lower orbital margin. This technique can also be applied to cases of severe trauma to the face or to congenital anomalies.

Even more sophisticated flaps can be used. For example, to treat a recurrent cancer of the angle of the lips with trismus and two positive nodes in the neck, a large through and through cut out was performed including the maxilla, the mandible, full thickness of the cheek, and the parotid. This defect was filled by (*a*) a forehead flap swung down to form a lining for the cheek, and (*b*) a long anterior superior oblique chest flap for external covering with a rib to make a new mandible. With this extent of cut out, the arterial supply to the temporalis is destroyed so the base of the pedicle is made much wider. These large flaps must be supported carefully post-operatively as the patient is walking about and the weight of them would be sufficient to pull the suture line apart.

This is not really a new concept but a development of other people's work. These sorts of flaps were used on the nose in 1896 and orthopaedic surgeons are now trying to transplant a rib into the arm, but these techniques have not been applied to the head and neck before. In fifty cases, using fourteen techniques, many of which have problems of course, three flaps have been lost completely and six others had minor complications. These flaps cannot and should not be used in all cases, but they are applicable in these extensive procedures where no other techniques are satisfactory.

Professor Harrison: How do you fix the clavicle to the remaining mandible?

Dr. Conley: Matching these bones of course creates problems. As the rib is not the same shape as the mandible, one must plan the flap carefully. The lateral portion of the rib has a curve which is similar to that of the mandible, but if only a short piece of mandible is needed the clavicle is probably best. There is of course no bone the same shape as the angle of the mandible so the bone for here has to be either dowelled or fractured. It is not a good idea to put in too much 'hardwear' to replace bones as it either falls out or has to be taken out and as little as possible is used to fix any bone grafts. At present only one or two wires are used and a Barton bandage for support. External fixation and internal pinning all add to the complications.

Mr. Omar Shaheen (London)*:* In the case of the oblique chest flap, which is very long, is it, like the delto-pectoral flap, based on the perforating vessels from the internal mammary artery?

Dr. Conley: Yes. It is a very good flap. It has the enormous advantage that the skin is non-hair bearing and can be transposed into the

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mouth. The ribs must get considerable nourishment from this flap because previously when free grafts were put into the oral cavity they would be lost, but with these flaps, even when the bone was exposed, in not one case was the whole bone lost. These flaps present many investigative problems—what happens to these bones, are they cannibalized and then reconstituted, or do they remain intact?

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