McCraw and Arnold's Atlas of Muscle and Musculocutaneous Flaps

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Healing Bodies, Changing Lives

TRAPEZIUS

ANATOMICAL CONSIDERATIONS

Surface Markings

The trapezius is a sail-shaped muscle which originates from the midline of the back and the base of the skull and then sweeps in a lateral fashion toward the spine of the scapula and the tip of the clavicle. It is palpable throughout its course in the muscular person.

Origin and Insertion

The muscle originates from a broad aponeurosis, which extends from the twelfth thoracic spine to the cervical vertebrae and to the occiput of the cranium. The muscle has a broad insertion extending from the spine of the scapula to the tip of the clavicle. This important muscle offers multiple functions which elevate and retract the scapula and shoulder, tilt the head laterally and posteriorly, and assist in abduction of the arm.

Adjacent Muscles

Along its cervical origin the trapezius muscle overlies the deep muscles of the neck, including the semispinalis and the splenius capitis muscles. Inferiorly, both rhomboid muscles are deep to the trapezius muscle. Laterally, it covers a small portion of the latissimus dorsi muscle. As it sweeps to its insertion into the spine of the scapula and the acromion, the trapezius muscle covers both the supraspinatus and infraspinatus muscles.

Vascular Pattern

The dominant blood supply to the trapezius muscle is from the transverse cervical artery. This branch of the thyrocervical trunk passes from the anterior neck to the posterior neck and divides into an ascending and a descending branch at the border of the trapezius muscle. The ascending branch parallels the anterior border of the trapezius muscle in the shoulder and supplies the portion of the muscle which overlies the spine of the scapula. The descending branch passes beneath the trapezius muscle at the base of the neck and runs parallel to the vertebral column. In its longitudinal course the descending branch supplies the entire thoracic portion of the trapezius muscle. This distinct division of the transverse cervical artery supports separate and independent vascular territories of the lateral (shoulder) portion and the vertical (thoracic) portion of the trapezius muscle. This is the reason that both territories can also be raised as "island" myocutaneous flaps. In addition to the dominant longitudinal blood supply, there are numerous deep perforating vessels from the intercostal system which penetrate the paraspinous portion of the trapezius muscle. Because of the diffuse vascular connections within the trapezius muscle, the majority of the thoracic portion of the muscle can be raised on the deep perforating system to supply a "turnover" muscle flap. This vascular system is similar to the situations of the pectoralis major and latissimus dorsi muscles.

The upper trapezius muscle in the neck is supplied by branches of the occipital artery. This independent vascular arrangement allows the cervical portion of the trapezius muscle to form a separate myocutaneous flap, which can be extended onto the lateral shoulder as a fasciocutaneous flap. This horizontal trapezius myocutaneous flap is similar in outline to the Mütter flap (1842) except that it includes the cervical portion of the trapezius muscle to enhance the mobility and viability of the attached fasciocutaneous flap.

Motor Nerve

Spinal accessory nerve.

Sensory Nerve

Cervical and intercostal nerves.

USES

The trapezius muscle is seldom transposed as a pure muscle flap except for applications in the mid-thoracic spine. Even in this situation, a V to Y myocutaneous flap has the advantages of primary closure of the donor site and a more durable surface cover.

The trapezius unit is usually employed either as a horizontal shoulder fasciocutaneous flap or as a vertical "island" myocutaneous flap. The horizontal trapezius myocutaneous flap is used primarily for surface coverage problems of the ipsilateral neck, but it will easily reach the posterior occiput and can be extended onto the opposite neck. The excellent color match and similar replacement of neck skin are the commending features of this simple transposition flap.

The vertical trapezius myocutaneous flap is generally employed as an "island" flap and is the most accessible chest wall flap to the occiput. Because of its lack of proximity, it is a secondary choice for intraoral problems. It does serve as a reliable "second" flap for complex facial reconstructions. When the supplying transverse cervical artery is elevated to the level of the subclavian artery, the anterior arc of rotation of the vertical "island" flap includes the temporal area, the opposite neck, the inframammary fold, and the axilla.

The ascending branch of the transverse cervical artery can be used to carry the spine of the scapula and its overlying trapezius muscle as an "island" flap. This composite flap is seldom used because of its unfavorable donor site, but it will introduce living bone into the areas of the zygoma and mandible. In the case of complex facial reconstructions, the transverse cervical artery branches (ascending and descending) can be used to simultaneously carry the osteomyocutaneous flap from the scapula and the "island" vertical myocutaneous flap from the back.

REGIONAL FLAP COMPARISONS

The thoracic portion of the trapezius muscle can be advanced directly over the thoracic spine in a fashion similar to the bilateral latissimus dorsi advancement closure of the meningomyelocele defect. A unilateral trapezius muscle can also be rotated over the thoracic spine without harming its function since this only redirects the muscular origin. Rotation of the trapezius muscle onto the neck requires complete detachment of the muscular insertion from the scapula. Although the severity of a neck or an occipital defect may justify this maneuver, detachment of the muscle from the scapula may result in shoulder pain and inability to stabilize the shoulder in an overhead position. Unfortunately, this function is irreplaceable. It is better to consider first an "island" latissimus dorsi muscle flap for these defects. The latissimus muscle flap will usually reach the posterior neck and lower occiput, but if it does not, no bridges are burned, and the vertical trapezius muscle rotation flap can still be used. The same criticism or worse can be leveled against the "island" trapezius osteomyocutaneous flap. The benefits of transposing living muscle and bone to the face must be carefully weighed against the disadvantages of a ghastly donor site and a certain shoulder disability. An extensive "island" dissection of this type does qualify for the "gee whiz" category, but one case is enough for almost anybody's collection.

The horizontal (shoulder) fasciocutaneous flap is unmatched in its ability to introduce skin of similar color and texture to the anterior and lateral neck. By comparison, transposed skin from the back (latissimus and trapezius myocutaneous flaps) is too dark for the neck, and transposed skin from the anterior chest (pectoralis "paddle" and medial deltopectoral flaps) is too pale for the neck. The location of this skin-grafted donor site is far superior to the location of the skin-grafted pectoralis "paddle" or deltopectoral donor sites.

It should be emphasized that the horizontal trapezius flap includes only the trapezius muscle in the neck, not the shoulder or the back. Inclusion of the cervical portion of the trapezius muscle in the shoulder fasciocutaneous flap enhances the flap mobility into the areas of the chin and the anterior neck. This was an important consideration at a time when the deltopectoral, total forehead, and sternomastoid flaps were the only other choices in the "axial" flap reconstruction of head and neck cancer defects. Once other reliable flaps were developed, the horizontal trapezius flap was seldom used for oral cancer defects, in part because of its donor site, but more specifically because of the obligatory orocutaneous fistula. The horizontal trapezius flap is more often rotated posteriorly to cover difficult defects of the occiput and temporal areas as well as to reconstruct certain cervical and thoracic spine defects. Like the vertical trapezius myocutaneous flap, it makes an excellent flap of second election and a serviceable "duplicate" flap in situations which necessitate two major flaps. It also has the advantage of a separate blood supply from the occipital artery.

The "island" vertical trapezius myocutaneous flap finds its greatest usefulness in the correction of high occipital and temporal scalp defects which are not accessible to the other major flaps. Only the latissimus flap warrants a comparison in this regard. Even though the latissimus muscle is much longer than the trapezius muscle, its lateral rotation point limits its coverage to the lower neck and occiput. Although the "island" vertical trapezius myocutaneous flap will reach the midface and the oropharyngeal area, its lack of proximity and its donor site considerations have inhibited its applications in many defects of the head and neck area. The proximity of the pectoralis "paddle" and the reliability of the latissimus myocutaneous flap continue to commend their utility in the head and neck area. The arc of the "island" vertical trapezius myocutaneous flap also includes the axilla, the inframammary fold, and the upper half of the sternum when its supplying vessels are dissected to the level of the thyrocervical trunk. Nevertheless, this flap is rarely considered for anterior chest defects unless the pectoralis, latissimus, and rectus abdominis muscles are all congenitally absent or have recently died.

DISADVANTAGES

The primary disadvantage of the horizontal trapezius myocutaneous flap is the donor defect if a skin graft is required. This is particularly objectionable when the flap is extended onto the area of the shoulder because the lateral shoulder has the same propensity for dense scarring as the deltoid area. The potential sacrifice of the spinal accessory nerve has been suggested as a disad-

vantage, but neither branch of the spinal accessory nerve is necessarily lost in the elevation of either the vertical or horizontal trapezius flaps.

The primary disadvantage of the vertical trapezius flap is that it is located on the back. This creates positioning problems when it is used for intraoral defects or surface problems of the neck. This criticism obviously does not apply when the flap is used for coverage problems of the occiput and of the upper spine. The donor site considerations are even more serious in nature. The donor site scar and closure are acceptable if the cutaneous segment is no more than five centimeters in width. When the donor site is wider than this, closure of the back wound can be difficult, and tightly closed donor sites can impair the normal "stretchability" of the back skin in forward movements of the shoulder. Even a five centimeter defect is hard to close and may result in a wide scar. It probably is not possible to close a defect greater than nine centimeters primarily. When a skin graft is required for the closure of the donor defect, the appearance is remarkably bad. It is also a difficult area to skin graft because of the obligatory back movements. Disruption of this back wound must be a recognized possibility. It is a disastrous complication when it occurs because one may be asked to skin graft three sides of a prolapsing scapula. Early secondary closure following multiple operative debridements is the only acceptable conclusion to such a dire saga.

ADVANTAGES

The horizontal trapezius fasciocutaneous flap is an excellent choice for major coverage problems of the neck because of its proximity and favorable color match. As a simple transposition flap, it is more easily manipulated than either the pectoralis "paddle" or the latissimus myocutaneous flap. A trapezius muscle or musculocutaneous flap provides unique coverage of the upper thoracic spine, and the donor site of the transposition of one or both muscles is inconsequential unless it is necessary to separate the trapezius muscle from the scapula.

The "island" vertical trapezius flap serves as a reliable alternative to the other major chest flaps for problems of the head and neck area. Were it not for the donor site and positioning problems, it would be routinely considered. It can be directly transposed to the upper posterior chest, and its arc of rotation onto the occiput is unmatched by even the latissimus myocutaneous flap.

PITFALLS, COMPLICATIONS, AND DONOR SITE

Although it is possible to injure the spinal accessory nerve, it is rarely necessary to sacrifice this nerve in the mobilization of any of the trapezius flaps. The cervical (neck) portion of the trapezius muscle, which is included with the horizontal flap, is divided medial to the spinal accessory nerve while the vertical flap dissection is carried only to the level of the branches of the spinal accessory nerve. However, if the nerve is injured, it will cause the same drooping, painful shoulder disability which is associated with the resection of this nerve in a radical neck dissection. The horizontal flap can readily be used at the time of a radical neck dissection since its blood supply is gained from the occipital artery, which is above the area of the dissection. It is possible to use the vertical flap at the time of a neck dissection, but this adds a significant amount of tedium to the extirpation through the process of protecting the transverse cervical vessels. If a radical neck dissection has been done at an earlier time, one should expect that the transverse cervical artery will have been sacrificed. In this case, one may presume that the vertical flap would be unusable.

The most significant problems with both the transverse and vertical flaps involve their donor site defects. Whether the donor site is skin-grafted or primarily closed, it is sometimes difficult to obtain early primary healing because of back motion. Hypertrophic scarring is common when either donor defect is closed under tension. Disruption of the vertical trapezius flap donor site is a dreaded complication which may result in significant shoulder disability. The "salvage" closure of this disruption defect may even require the use of a secondary latissimus flap because of the magnitude of the resulting cavity.

1

Outline of the extended horizontal trapezius myocutaneous flap. The trapezius muscle is shown in red. Only the trapezius muscle in the neck is carried with the flap.

2

Elevated flap. The cervical portion of the
trapezius muscle is included with the
compound flap. The horizontal portion of
the trapezius muscle is undisturbed. The
distal skin of the flap is supplied by the
perifascial perforators as a fasciocuta-
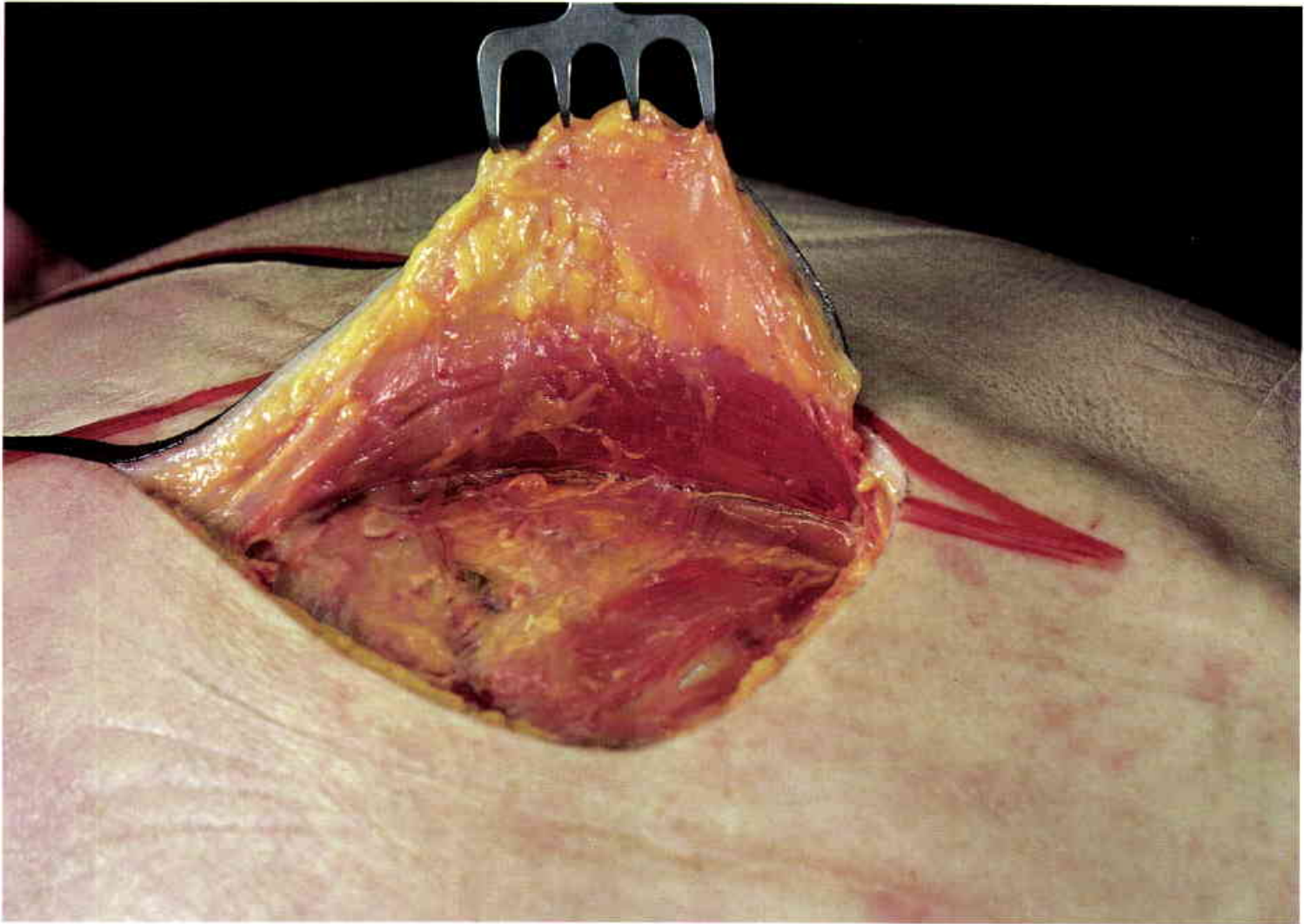neous flap.

3

Upward excursion onto the cheek.

4

Anterior neck coverage.

5

Temporal coverage.

6

Outline of the "island" vertical trapezius myocutaneous flap. The trapezius muscle is outlined in red. A wider flap, i.e. more than nine centimeters, is difficult to close primarily.

7

The trapezius muscle is first identified at its lower lateral margin. The medial margin of the trapezius muscle is then separated from the thoracolumbar fascia.
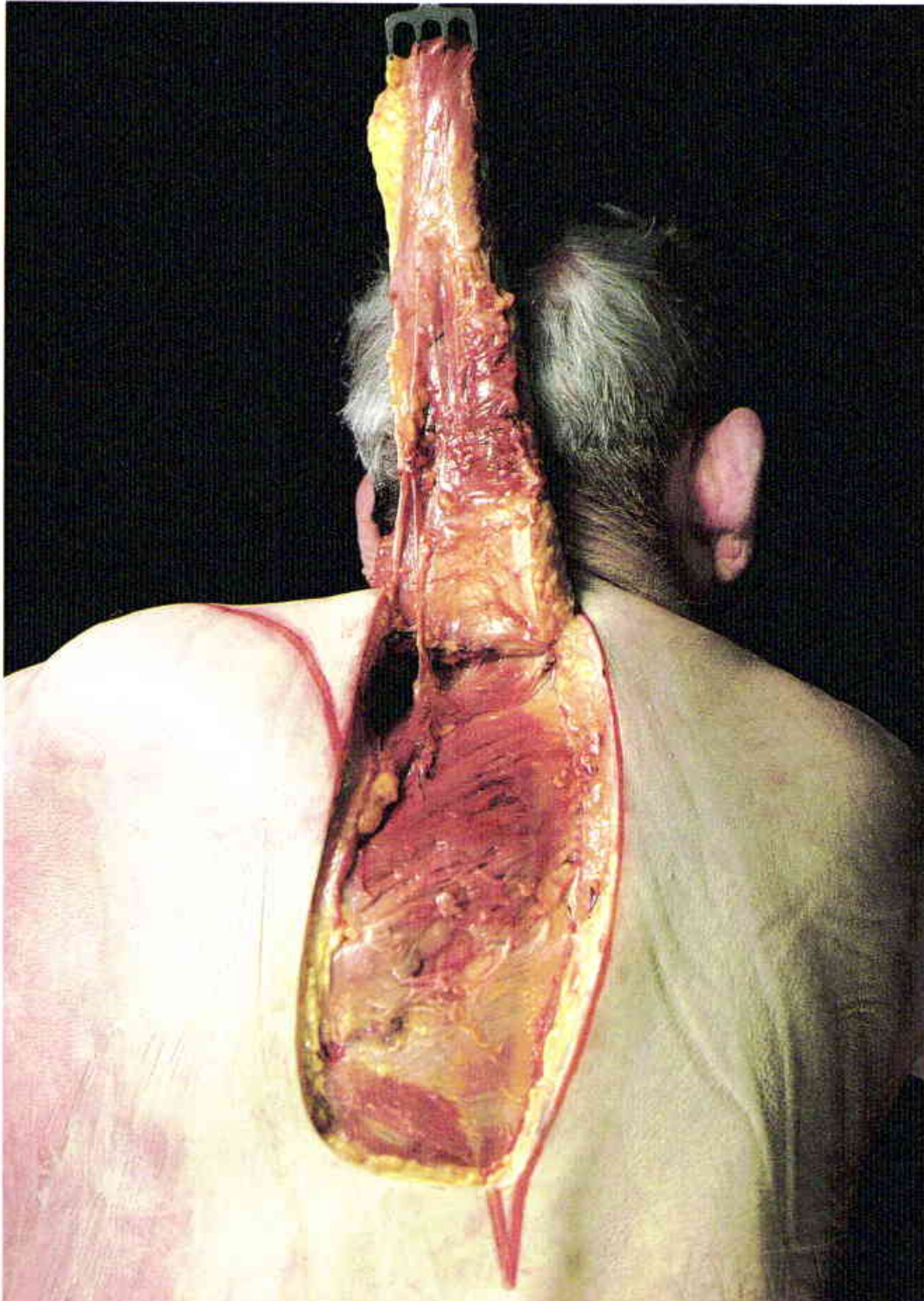
8

Only the vertical portion of the trapezius muscle is carried with the flap. The spinal accessory nerve must be protected as the cervical portion of the trapezius muscle is divided.
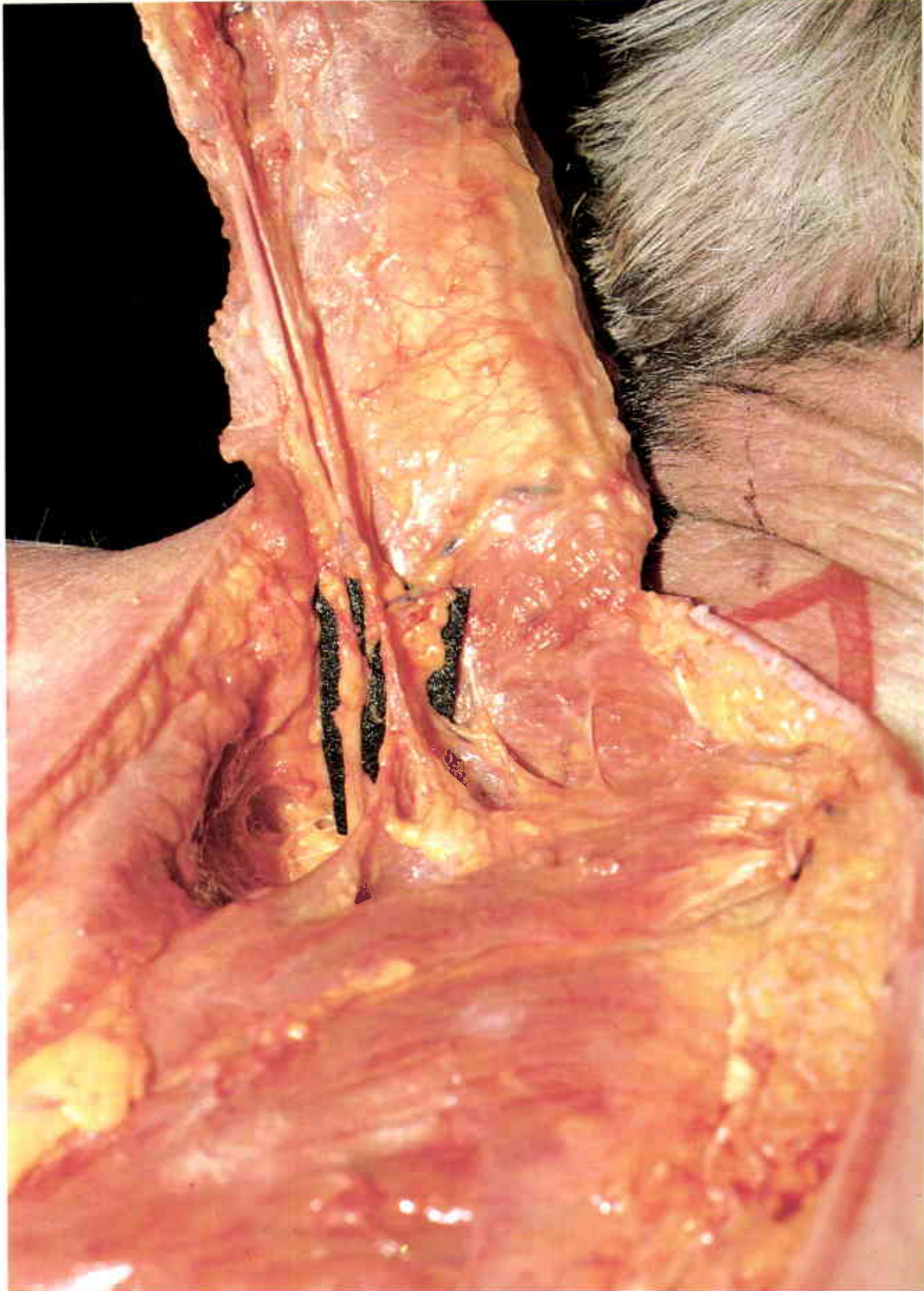
9

The transverse cervical vessels are seen on the undersurface of the flap (outlined with black felt). If these vessels are traced to the thyrocervical trunk, the flap will reach the inframmary fold, anteriorly. The creation of a pure (dangling vessel) "island" flap is not necessary for most applications.

10

Flap excursion onto the opposite shoulder.

11

Unique occipital coverage provided by the
vertical trapezius flap.
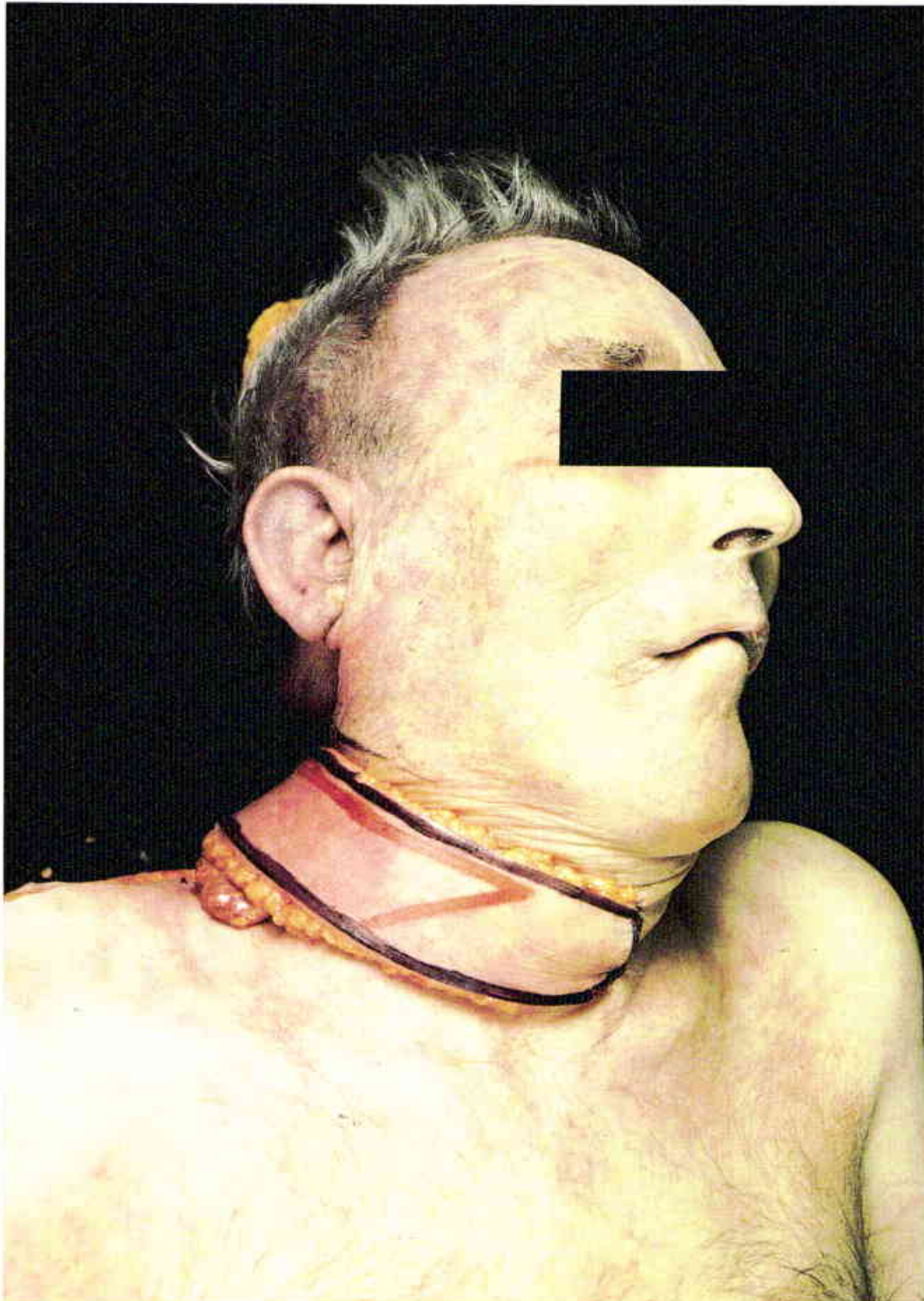
12
Anterior coverage of the opposite neck.

13

Coverage of the opposite cheek. The flap is seldom used for intraoral problems because of its lack of proximity and positioning considerations.

14
A young patient with a level III melanoma of the right neck. The area of skin excision is outlined. (Case of J.B. McCraw)

15
The standard transverse or horizontal trapezius flap can be transposed without a delay. The trapezius muscle is divided at the angle between the neck and shoulder. The flap distal to the neck is a fasciocutaneous flap. One cannot expect to primarily close a donor defect of this magnitude.

16

Following the neck dissection, the flap is immediately transposed to replace the resected neck skin. The donor defect is partially closed. The remaining trapezius muscle is visible on the donor site and will be skin grafted.

17

The lateral neck "bulk" is caused by levator hypertrophy. This "bulk" is never related to the trapezius muscle, since muscle is not transposed into the anterior neck.

18
The patient is alive and well ten years following the surgery. Note the excellent flap color match with the neck skin.

19
View of the donor site after secondary removal of the donor site skin graft.

20

"Delayed" horizontal trapezius myocuta-
neous flap for an extensive intraoral re-
construction. The "delay" was effected
by elevating the distal half of the flap and
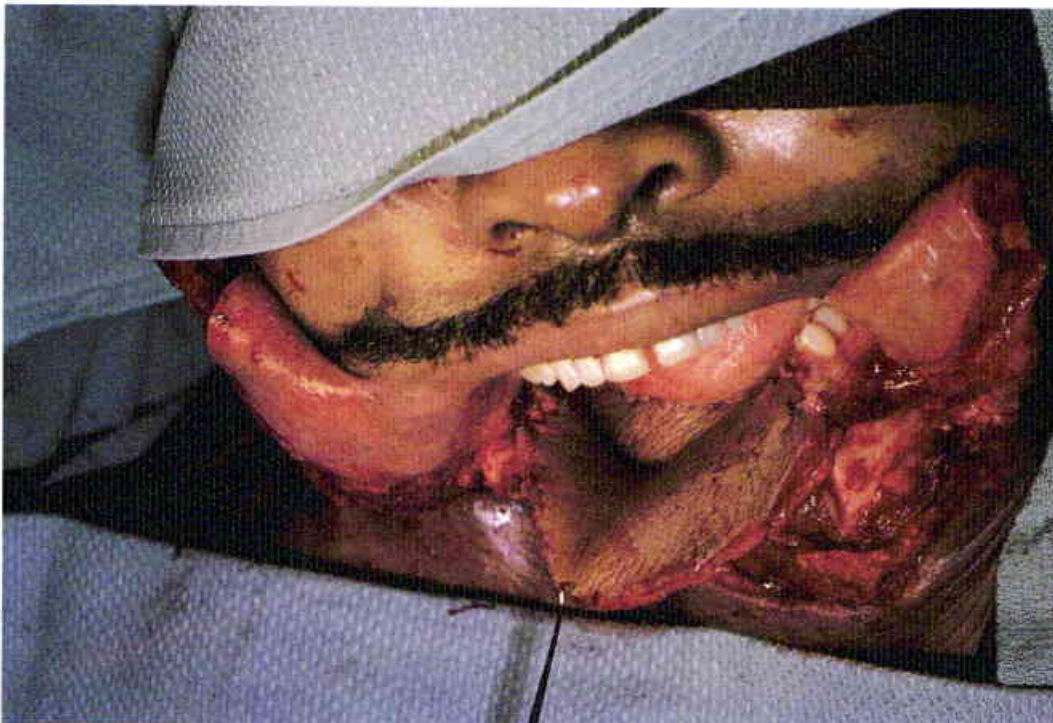resulted in some superficial loss of the
distal flap. (Case of J.B. McCraw)

21

Anterior excursion of the "delayed" hori-
zontal trapezius flap. The donor site had
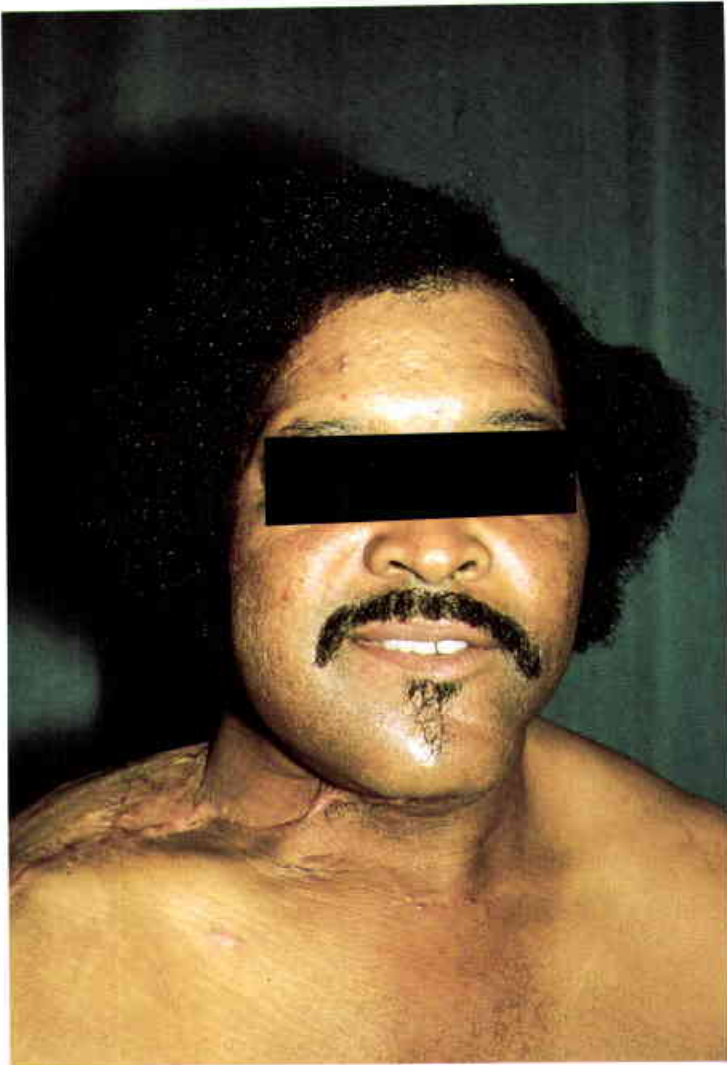been grafted at the time of the flap
"delay."
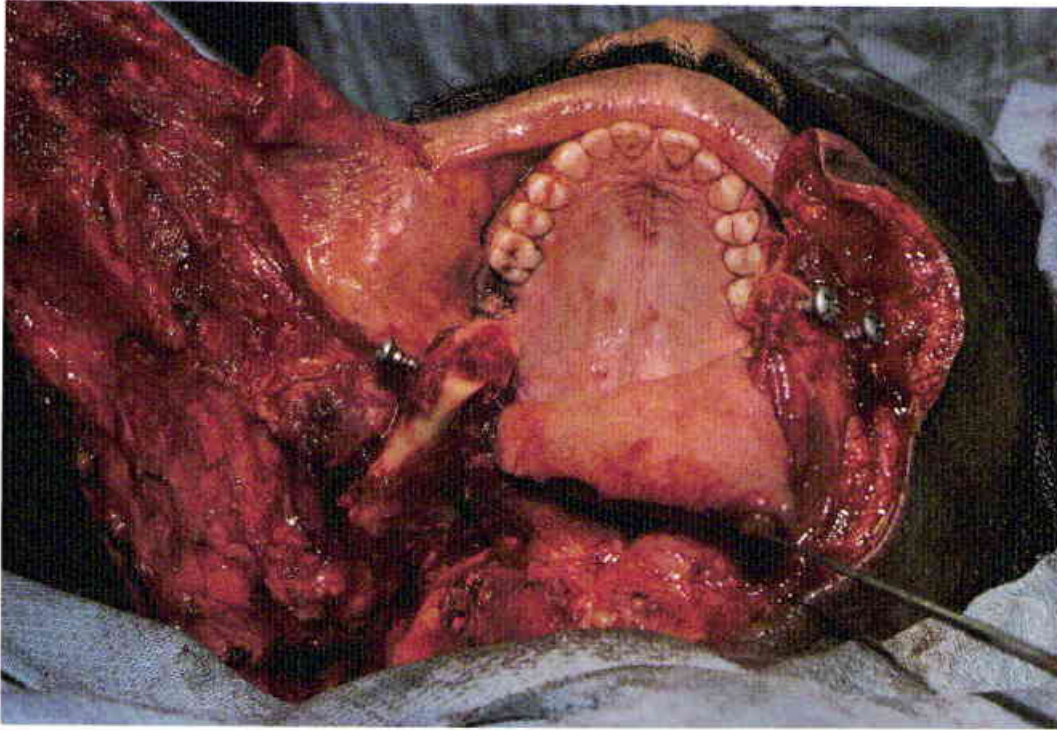
22

The tumor resection included the central
mandible, the floor of the mouth, and
one-half of the tongue.

23

The trapezius flap was used to provide in-
traoral lining as well as coverage for a
mandibular bone graft.
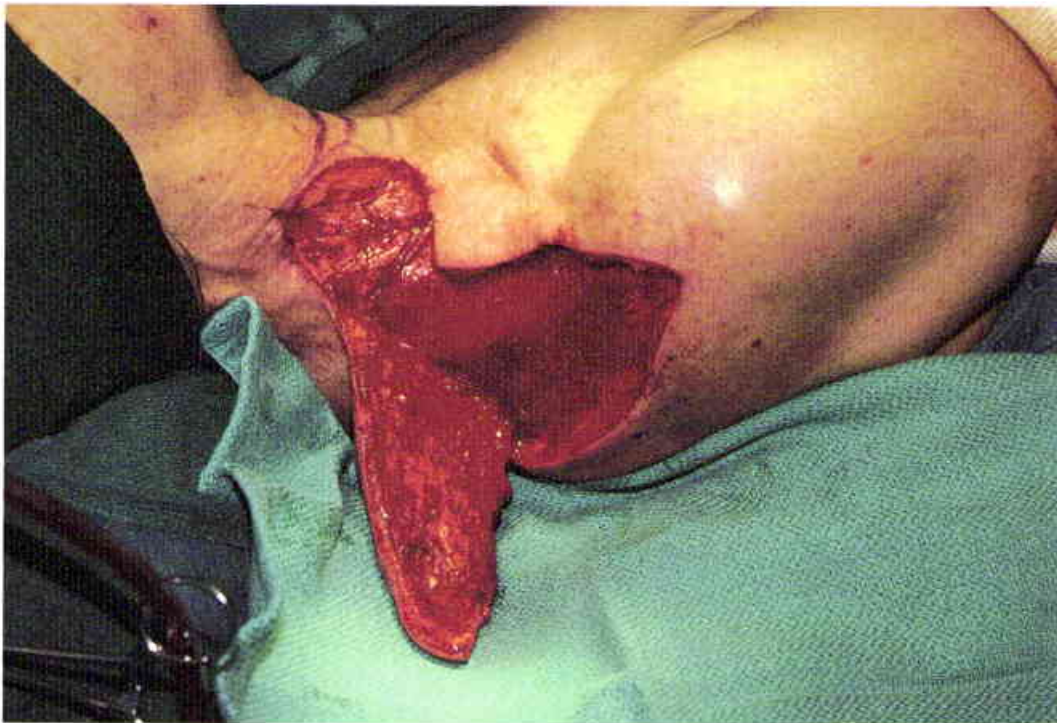
24
Anterior view of the mandibular contour.

25
The proximal portion of the trapezius flap was returned to the neck to cover an exposed carotid vessel. Note the unsatisfactory donor site appearance.

26

Malignant transformation of a long-standing irradiation ulcer of the neck. (Case of J.B. McCraw)

27

Deformity following tumor resection and elevated horizontal trapezius flap. Note that the distal flap is only a fasciocutaneous flap and does not include the underlying trapezius muscle of the shoulder.

28

The fasciocutaneous portion of the flap is rotated into the neck defect. It was not necessary to either elevate or divide the trapezius muscle in the neck to obtain an adequate flap rotation.

29

Healed flap at six years. The donor site was primarily closed.

30

The color match of the flap skin and neck skin is excellent. Shoulder function is unaffected by the use of this fasciocutaneous flap.

31

Invasive squamous cell carcinoma of the left neck arising in an irradiation ulcer. The patient was treated for Hodgkin's disease thirty years earlier. This 1975 case predated our present capabilities with the pectoralis and latissimus myocutaneous flaps. (Case of J.B. McCraw)

32

An extended "opposite" horizontal trapezius flap was "delayed" by making parallel incisions and undermining the midportion of the flap. A neurosurgical head-frame was used to simultaneously gain access to both the right neck and the left neck areas.

33

The flap was rotated from the right shoulder to the left neck to cover the area of the tumor excision and the radical neck dissection. It was not necessary to use the "random" portion of the flap. It can be seen on the donor defect as a full thickness graft.

34

Seven years following the surgery. It was possible to resurface the majority of the neck with this "opposite" trapezius flap. The "dog ear" was never removed at the patient's request.

Seventy-six-year-old male with a chronically infected cervical laminectomy wound. Two previous attempts at direct closure had been unsuccessful. A combined horizontal and vertical trapezius myocutaneous flap is outlined on the left shoulder. (Case of P.G. Arnold)
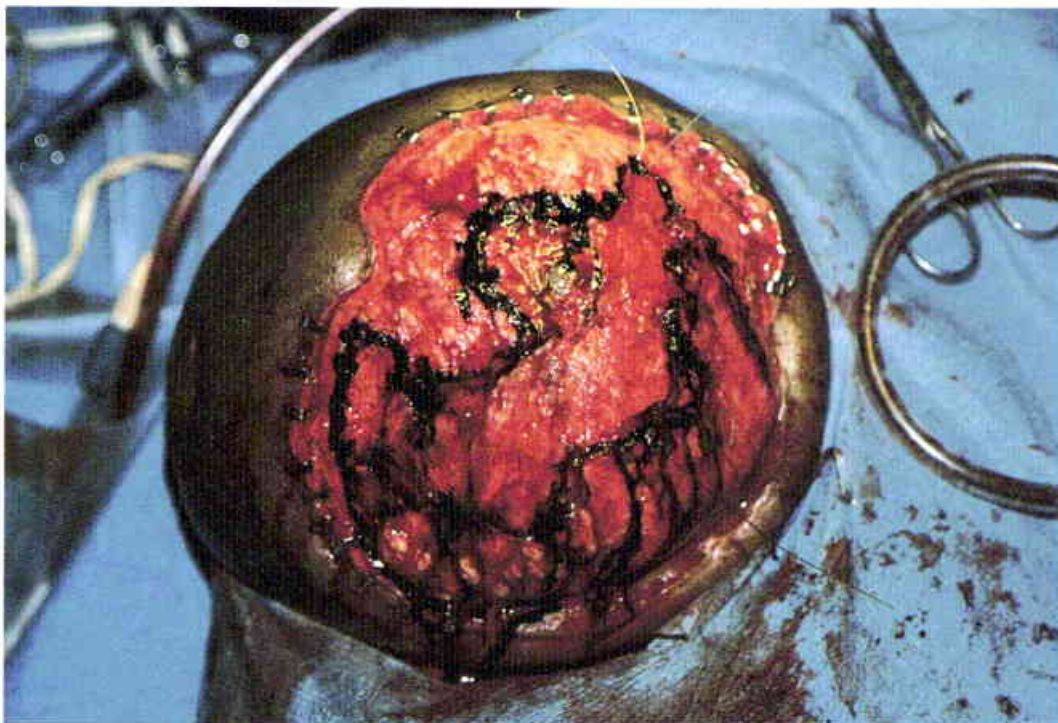

36

Two years following the V-Y closure which advanced the flap from the left shoulder to the upper back. The trapezius muscle provided good coverage of the thoracic spine.
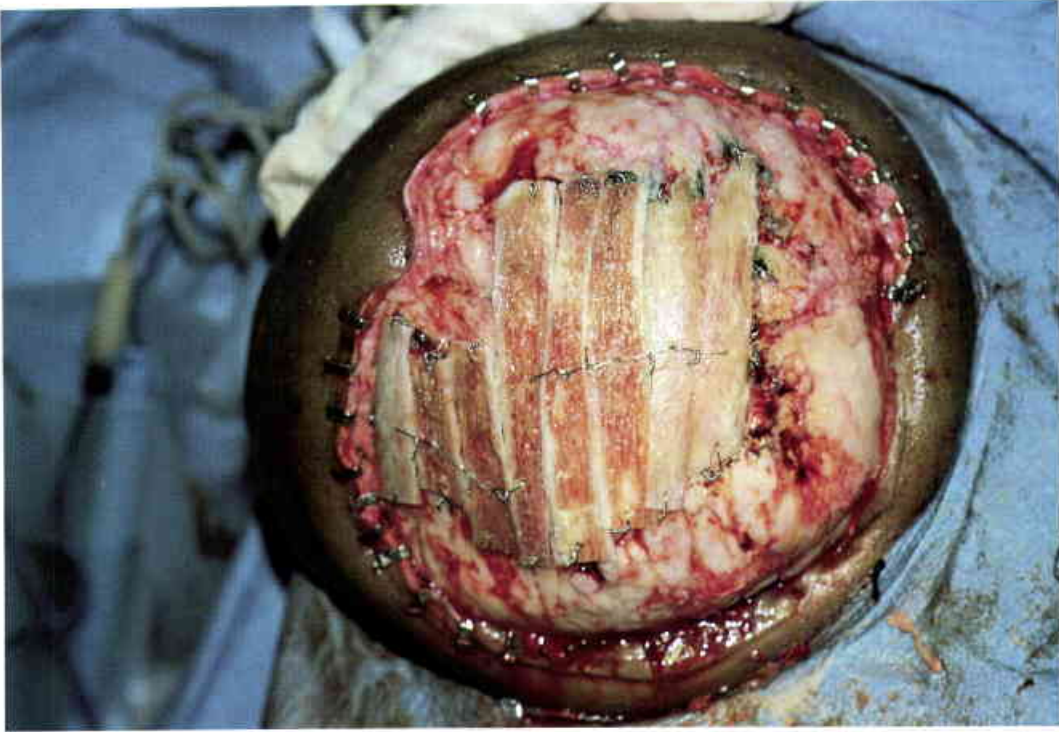
37

Sixteen-year-old female who presented with congenital absence of the skull that had been previously covered with split-thickness skin grafts. (Case of T. Arganese, R. Albin, and R. O'Donnell)

38

Appearance following removal of the skin grafts.

39

The skull was reconstructed with a split
rib cranioplasty.

40, 41

Appearance six months following a vertical trapezius myocutaneous flap reconstruction.

42
Skin-grafted donor site at six months.

43

A sixty-nine-year-old female with a large orbitomaxillary nasal defect following resection of a recurrent basal cell carcinoma five years previously. Five thousand rads of irradiation were given in the postoperative period. (Case of H. Rosen)
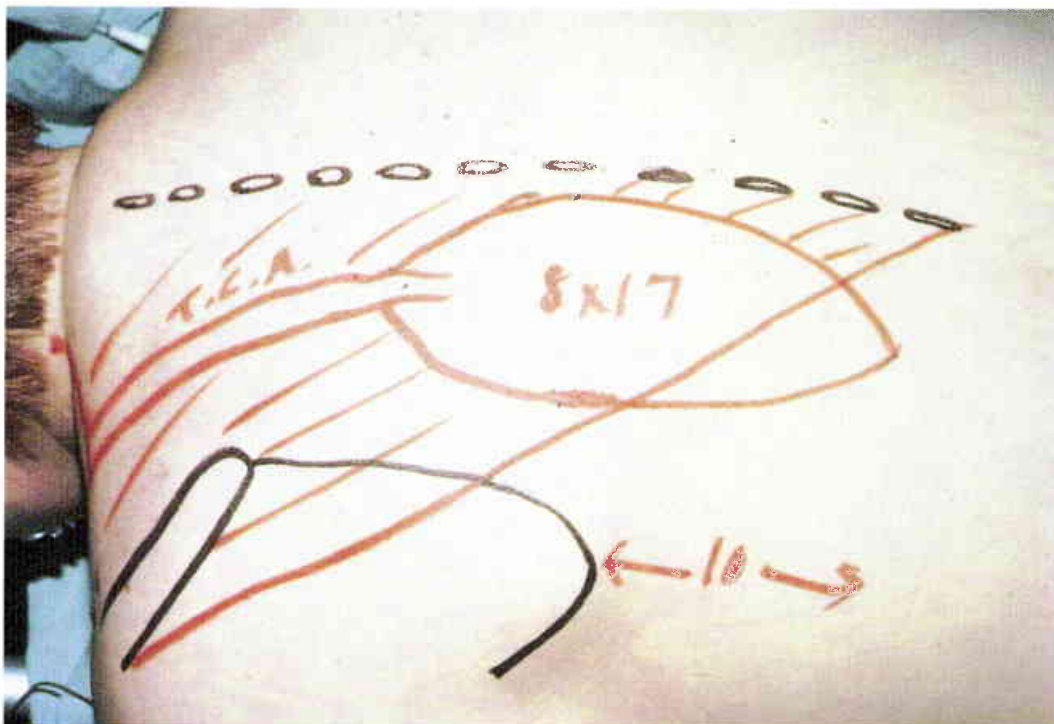

44

Standard design of an extended vertical trapezius myocutaneous flap. The long axis of the flap lies midway between the vertebral spine and the medial border of the scapula. The distal margin of the flap extends ten centimeters below the tip scapula.
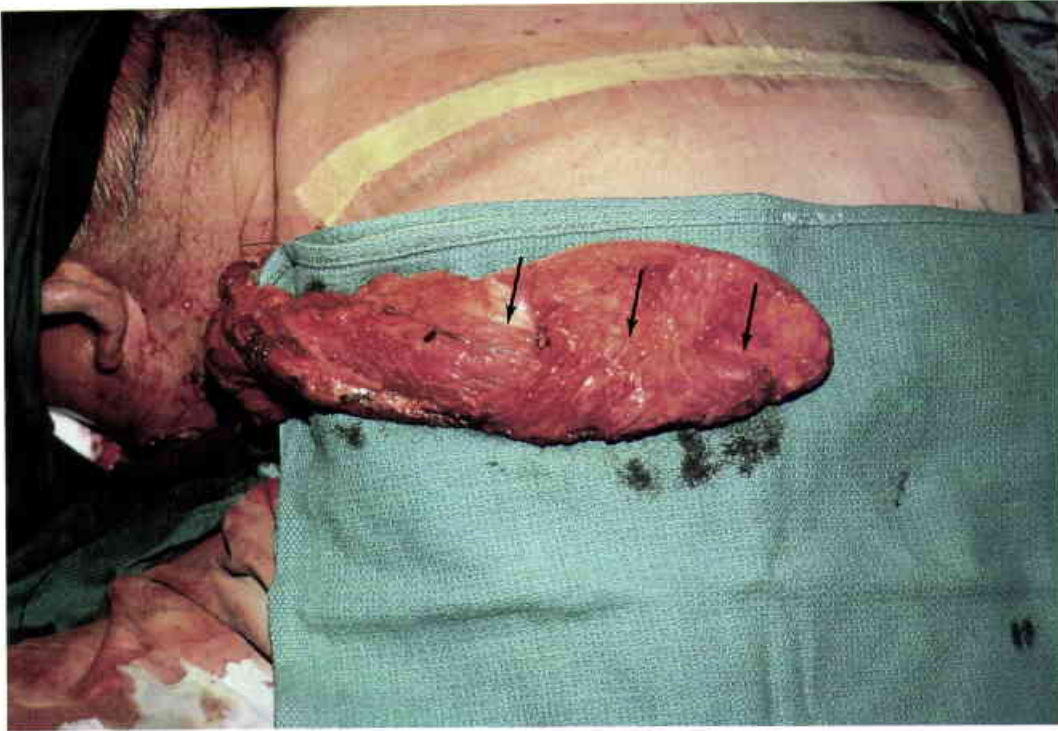
45

The donor site is closed primarily. The vascular pedicle is rotated 180 degrees demonstrating the "random" portion of the flap. Arrows point to the border of the trapezius muscle.
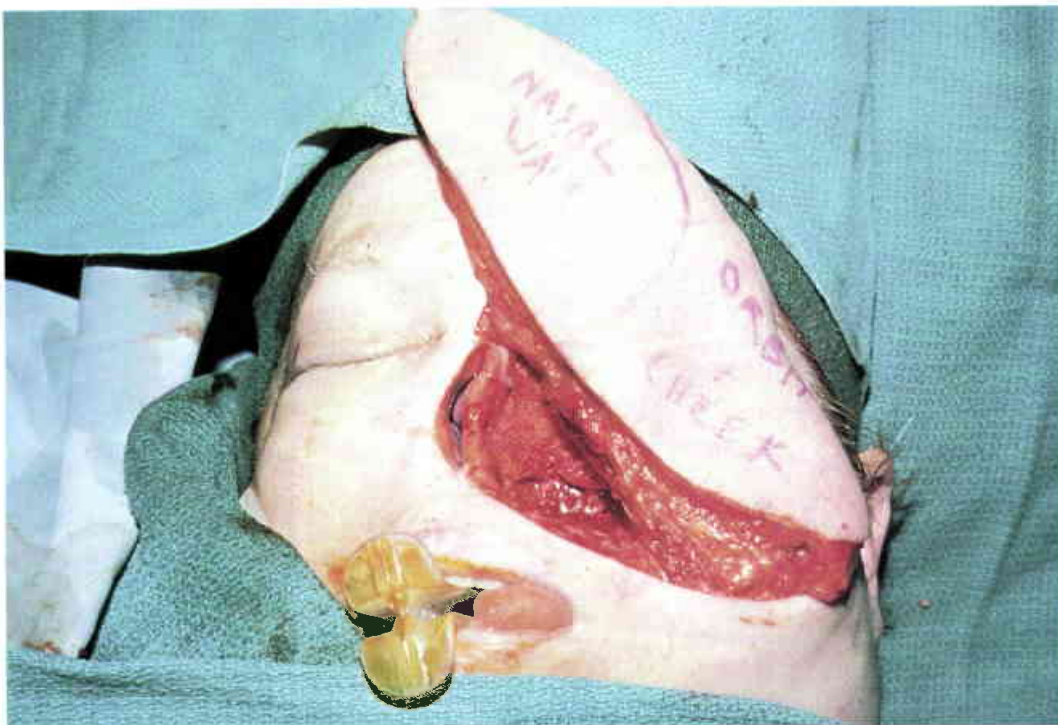
46

The flap is tunneled subcutaneously onto the cheek and orbit. The distal half is used to reconstruct the lateral nasal wall and the nasopharynx in preparation for a nasal reconstruction.
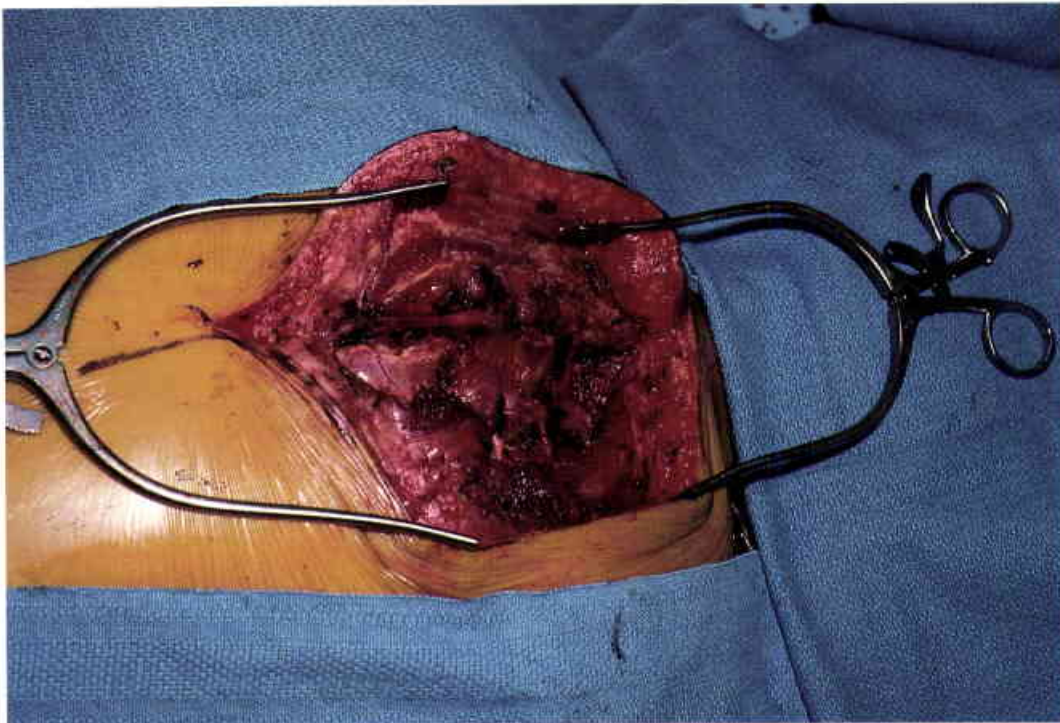
47

Appearance eighteen months following in-
set of the trapezius flap and eight months
following a forehead flap nasal
reconstruction.

48

Forty-six-year-old woman with a hemangiopericytoma of the right paraspinous musculature in the upper thoracic area. (Case of P.G. Arnold)
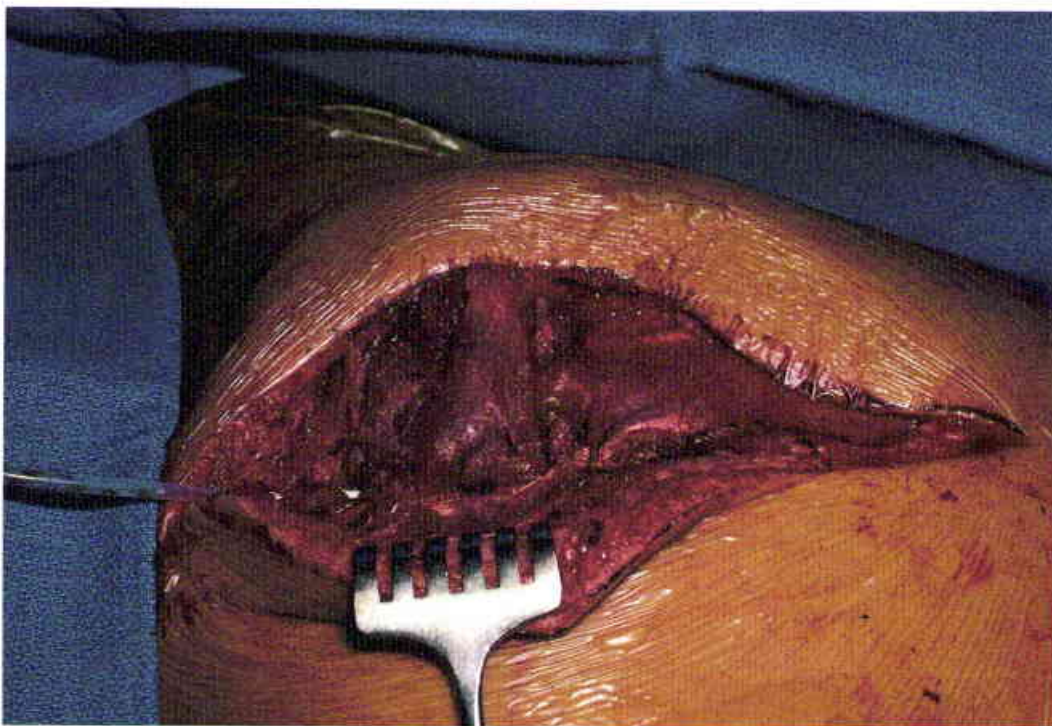

49

The wide excision of the tumor, as well as the right trapezius and paraspinous musculature, resulted in a large dead space and exposure of the thoracic vertebrae.

50

The left trapezius muscle was elevated as an ''island'' flap on the proximal vasculature.

51

Transposition of the ''island'' trapezius muscle flap to cover the bony defect.

52
Primary closure of the skin. Note the
bulk provided by the left trapezius muscle
flap.

53
Healed wound at two months.

TRAPEZIUS

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