DUTCH FOUNDATION FOR POST GRADUATE MEDICAL COURSES IN INDONESIA

COURSE ON HAND

Proceedings

Surabaya
April 18 - 20, 2006
Auditorium School of Medicine Airlangga University
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ABSTRACT

Reconstruction of the burned hand often presents a formidable challenge. The need for reconstruction is the result of several contributing factors acting independently or in concert. They include the severity of the initial injury, involvement of specific structures, adequacy of initial care, prior management of burn wound, the quality of hand therapy, and the motivation and reliability of the patient and caregivers.

Deep second- and third-degree burns of the hand that are part of a large total body burn lead to other problems. First, in an effort to save a critically ill patient, clinicians often neglect the hands. Once the patient's survival is assured, the neglect is recognized but it is too late, and damage already has been done. Early elevation of extremity successfully reduces edema that can interfere with active and passive range of motion, leading to stiffness. If circumferential burns and marked edema suggest impaired vascular flow, early escharotomy of the wrist, intrinsic muscles, and digits can salvage digit length and prevent intrinsic muscle ischemia and fibrosis that could lead to fixed intrinsic minus deformities.

A generation of new dressings has made superficial second-degree burns a "non problem". As long as dessication and infection are prevented, healing should occur expeditiously in these burns, without long-term sequelae. Deep second-degree burns with or without large total body surface injury can be more complicated. Successful treatment of a deep second-degree burn of the hands nonsurgically in an outpatient requires an intelligent, cooperative patient. If not possible, it is far better to admit the patient and tangentially excise or dermabrade the burned tissue during surgery, saving unburned dermis and covering the wound with split-thickness skin graft.

Even if everything is done correctly during the acute phase, postburn deformities are still common and include:

- First webspace adduction contracture
- Webspace contractures
- Dorsal skin contractures
- Fifth finger abduction deformity
- MP joint extension deformities
• Extensor tendon adhesions
• Boutonniere deformity
• PIP flexion deformities
• Median and ulnar nerve compression syndrome
• Amputation secondary to ischemic gangrene
• Elbow and axillary contractures
• Heterotopic ossification of the elbow or wrist

Most commonly, these hand problems exist with other body part deformities, not usually as isolated injuries. The major problem is not a lack of technical training or operations available, but an overall plan.

**Common Indication for Reconstruction**

• Contractures
• Hypertrophic scars
• Stiff joints
• Unstable scars
• Vasomotor instability
• Cold intolerance
• Sensory abnormalities

Complete epithelialisation of wound within 3 weeks usually results in minimal scarring. Wound contraction develops due to contractile myofibroblasts, deposition of ground substances and collagen. The endresult is a shortened stiff scar that, if it crosses a joint will result in contracture.

Continued scar deposition in the reepithelialisation wounds results in a raised hyperemic pruritic wound that produces functional impairment due to rigidity and pain, as well as a severe cosmetic abnormality. Pain with any scar movement retards activity and continuous itching leads to scratching and skin breakdown. Open wounds increases pain and risk of infection resulting in more scar formation.

Both the contracture and the hypertrophic scarring process peak between 3 and 6 months after injury, but partially resolve at 12-18 months. Spontaneous scar maturing may be fastened with compression dressings or appliance of silicone gel sheeting.
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Later Reconstructive Surgery

1. Scar revision by Z-plasty, grafting, flap, or tissue expansion
2. Nailbed reconstruction or ablation
3. Extensor tendon repair or reconstruction for mallet or buttonhole deformity
4. Joint surgery for contracture. Capsulotomy or fusion in a functional position
5. Amputation if there is irreparable damage to a digit

Scar tissue has to be divided deep enough and far enough into normal pliable skin or subcutaneous fat. The border of the excision should be zig-zag shaped to prevent secondary retraction of the borderline.

The thickness of the graft to be interposed depends on the quality of the woundbed, the better the circulation the thicker the transplant can be. Thick grafts have more dermis and do keep their form and are less shrinking than thin grafts. Donor area of full-thickness skin grafts has to be closed by advancement or have to be covered with a split-thickness skin graft.

In few occasions it is possible to excise a scar and direct closure of the defect by advancement. Usually other tissue have to be brought in from the surroundings or by free transfer. For linear scar, one or more Z-plasties can be a good choice if the adjacent skin is available in sufficient quantity and quality. A good property of a Z-plasty is that the direction of the contracted fibrous fibres is diverted with a reduce chance of recurrence of the contracture.

Flap reconstruction of localized burns should be considered under the following circumstances:

- When the recipient bed will not support a skin graft
- When vital structures such as nerves, bare tendons and joints are exposed
- When early flap reconstruction of specialized areas such as the thumb tip and the first web will give a superior result to a skin graft

The choice of flap will depend on the site of the burn, the availability of a suitable donor flap. Although there is a bewildering array of local and regional flaps with which to reconstruct the hand, it may occasionally be necessary to use a distant flap. The pedicled groin flap has been used to resurface defects that could be closed by local methods. It has disadvantage, that the hand is placed in a dependent position for 2-3 weeks, is relatively immobile during this period and resting splints cannot be applied; swelling and stiffness are therefore a risk with this tech
nique and increasingly, free flaps, which do not suffer from these
drawbacks, are used instead. With the wider availability of microsurgical
expertise, free flaps are no longer used as a last resort but may be used
in the primary reconstruction because they provide the best reconstruc-
tive option.

Another surgical corrective method to be mentioned is the tissue
expansion. Prior to transposition, the donor area can be stretched by
filling an expander under the skin. Filling the expander in several weeks
or months the overlying skin can be expanded. After removal of the ex-
pander, the stretched skin is used to fill the defect. The optimal location
for an expander is over an hard underground as the skull or the thorax.

Scarring over the dorsal aspect of the distal part of the finger causes
distortion of the eponychial fold which can be reconstructed by releas-
ing the skin proximally and allowing it to ruck up distally, recreating the
eponychial fold. A graft or local flap is placed proximally into the defect
caused by the release.

Hyperextension at the metacarpophalangeal joint occurs as a result
doral scarring. This is treated by incising the scars over dorsal
aspect of the hand, proximal to the metacarpophalangeal joints. Follow-
ing release of the contracture can be fixed temporarily in flexion with
Kirschner wires and a skin graft or flap is inset into the defect on the
doral aspect of the hand.

The proximal interphalangeal joint contractures may be much more
difficult to correct. Division of the checkrein ligaments of the proximal
interphalangeal joints as well as release of the overlying skin contracture
may be necessary to correct the deformity. Full extension of the proximal
interphalangeal joint may not be achieved even after these maneuvers.
Following their release, the joints should be held in place with Kirschner
wires until healing of the overlying skin has occurred. The wires are then
replaced with external splints and the correction is maintained using a
combination of external static splinttage and dynamic splints.

Aims of Therapy
1. Prevention of deformity
2. Maintenance of joint movement
3. Maintenance of mobility and use of all unaffected joints
4. Restoration of maximum function
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Scarring over the dorsal aspect of the distal part of the finger causes distortion of the eponychial fold which can be reconstructed by releasing the skin proximally and allowing it to ruck up distally, recreating the eponychial fold. A graft or local flap is placed proximally into the defect caused by the release.

Hyperextension at the metacarpophalangeal joint occurs as a result of dorsal scarring. This is treated by incising the scars over dorsal aspect of the hand, proximal to the metacarpophalangeal joints. Following release of the contracture can be fixed temporarily in flexion with Kirschner wires and a skin graft or flap is inset into the defect on the dorsal aspect of the hand.

The proximal interphalangeal joint contractures may be much more difficult to correct. Division of the checkrein ligaments of the proximal interphalangeal joints as well as release of the overlying skin contracture may be necessary to correct the deformity. Full extension of the proximal interphalangeal joint may not be achieved even after these maneuvers. Following their release, the joints should be held in place with Kirschner wires until healing of the overlying skin has occurred. The wires are then replaced with external splints and the correction is maintained using a combination of external static splintage and dynamic splints.

**Aims of Therapy**

1. Prevention of deformity
2. Maintenance of joint movement
3. Maintenance of mobility and use of all unaffected joints
4. Restoration of maximum function

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Course on Hand, April 18-20, 2006
Problems of Reconstruction

Although preoperative analysis and patient planning are the most important considerations, burn trauma present unique reconstructive problem. For instance, reconstruction usually is achieved by incision or excision of scars followed by split-thickness skin grafting, the use of local, distant, or free-tissue transfer. The surgeon must be careful in explaining prospects of failure to the patient. A patient who has loss all fingers in the burn accident might reject the great toe transfer to build a thumb because the feet are the only normal parts of his or her body left. The loss of self-image is so devastating that the patient does not want further deformity, regardless of the gains.

Nevertheless, a number of basic guidelines are applicable including the following:

1. Adhere to the reconstructive ladder, from simple to more complex
2. Choose the best reconstructive for patient
3. Plan alternatives and second options in advance
4. Review the options with the patient and permit the patient to participate in the decision – making process
5. Do not let personal bias or goals distort the objective
6. Amputation of a part may be a reasonable and necessary treatment option
7. The most simple solution may not be the best solution
8. Always be cognizant of the patient needs in term of the activities of daily living, occupation, and underlying psychological and psychosocial criteria.

There is no "cookbook" for reconstructing the burned hand. Whereas an appendectomy cures appendicitis, no single surgical procedure or series of procedures sures burns. Although physicians as healers do not want to destroy hope, ethics command that we attempt to keep these patients focused on reality. Although there is always something that could be done, judgment dictates what should be done. The major goals are early independence and resumption of preburn lifestyle for the patient. A thoughtful surgical plan set up in conjunction with the burn team and with timed goals gives the patient the best chance for success.
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