

**A SHORT JOURNEY THROUGH  
THE LAND OF PLASTIC SURGERY.**



ME AND MY CAMELS WOULD LIKE TO TAKE YOU ON A SHORT JOURNEY  
THROUGH THE LAND OF PLASTIC SURGERY.  
WE HOPE YOU WILL ENJOY IT, FIND IT INTERESTING AND LEARN A LOT.

GRETA HESSELING, 1999

This book is for the Camelman.



## Preface 1

The purpose of the book: in 1998 I was invited by Dr. Abdel Nasser Al Munibari (at that time director of the Al Thawra General Hospital in Sana' a in Yemen), to come for a longer period of time to do some teaching and to upgrade his staff. Dr. Abdel Nasser arranged housing and food for me and took care of my personal safety. Dr. Zeeman, Chairman of Interplast Holland, arranged and payed for me the ticket to Yemen. The problem was that I could not find any book to do the teaching in Yemen, most books would be to difficult for my Yemeni students, most of them only can speak some English but are not able to read it well. So the idea of making a book for my students was born, as I had gotten the nickname: Camel Lady (by Dr. Abdel Nasser), it got the title: **Camelbook, a journey through the land of plastic surgery**, dedicated to the Camelman:

**Dr. Abdel Nasser**, for his encouragement and personal care. As you will notice, the book has many pictures and drawings, I hope the pictures and drawings also make the book attractive for those who don't speak or read English well, and they help to teach and make things understandable. So this is not a book primarily written for doctors but for nurses who would like to learn something about the basics of plastic surgery and for those people who would like to do teaching in a simple way, where ever they are. I hope many will find it useful and have fun to work with it!



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### About the author :

My first trip in 1983 to Ethiopia (with a very small team, one plastic surgeon, an anesthesiologist and me), was for operating children with NOMA, arranged and sponsored by Terre des Hommes Holland, three times we went there with the same team. In the years after that I went one time to Pakistan (sponsored by Interplast Germany), and then sponsored by Interplast Holland to: Lebanon, Vietnam, Uganda and about ten times to Yemen (one time ten weeks and one time five weeks without a team but just for teaching). Last year I went for the first time to Burkina Fasso with a team. I think this is the best way of spending your vacation, don't you think so too?

I started working and training in 1972 in a hospital in Zwolle as "assistent anesthesiologist", in 1973 I started the training for scrubnurse, and three years later I became responsible for, in english I guess you say "head of" plastic surgery in the O.T. and I am teaching students the basics of plastic surgery at the school for scrubnurses in Hengelo.

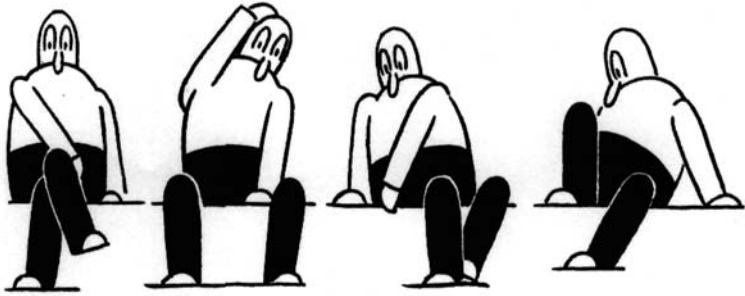
## Preface 2

Dear INTERPLAST friends,

I was fascinated when I got this book from Greta and we decided at once to publish it. The teaching aspect in INTERPLAST camps is often neglected and could now be supported by this practical guide for better understanding of the basic technics in plastic surgery in developing countries. It was written for nurses, students and interested doctors and is not a complete textbook of plastic surgery. Although You may find many details of operation procedures it is not a „cooking book“ for unexperienced surgeons. It would be very dangerous to start any operation, for example palate surgery, without a specialised assistance by a teaching doctor who knows about the hazards and rescue procedures. This book stands for close cooperation with the local hospital staff. Please let us know any improvements or remarks to support this idea. Let's work together for the benefit of our patients !



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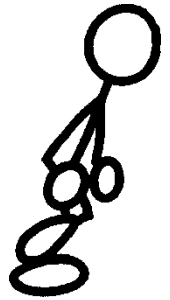
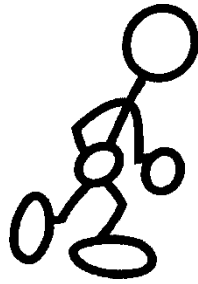
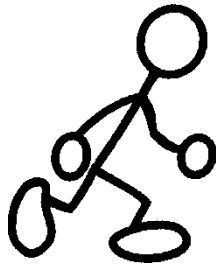
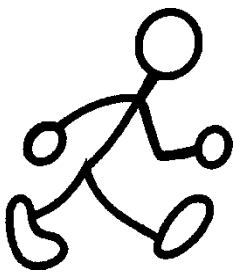
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# CHAPTER 1



## = SKIN =

Primary skin closure, wound debridement, skin grafting, tissue transfer, scar revision and Z-plasty are frequently used techniques in plastic surgery.

To understand these procedures and the process of wound healing, you need to know a few things:

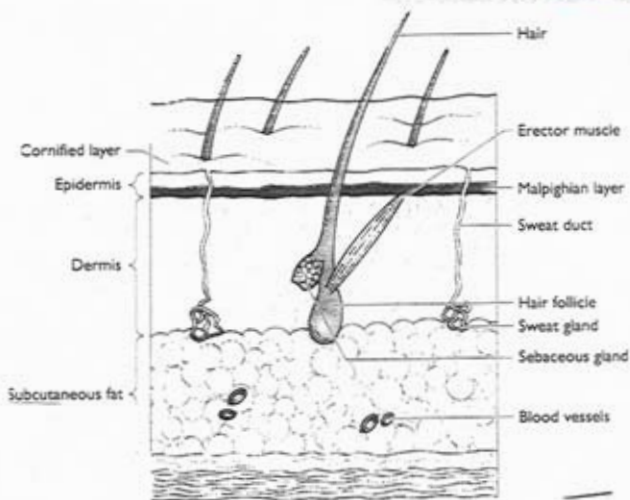
A little about the anatomy of the SKIN:

The skin is made up of two layers:

- 1.: the epidermis,
  - 2.: the dermis,
- with an underlying subcutaneous layer.



Structure of the skin:



### EPIDERMIS:

The non vascular outer layer of the skin.

The outer epidermal layer is a barrier, preventing the evaporation of water from the body and preventing absorption of water from the outside.

The epidermis consists of two layers which protect the dermis,

- 1.: a superficial-dead-layer,
- 2.: a deeper-multiplication-layer, called matrix. The matrix layer produces new cells, these cells "move" to the surface where they "die" and are continually replaced at the base of the epidermis.

### DERMIS:

The dermis is made up of collagen and elastic fibres. Collagen is the framework for all tissues and organs.

In the dermis are small blood vessels, sweat and sebaceous glands, hair follicles and nerve endings.

The dermal layer also forms a physical barrier preventing the access of bacteria.  
Main function: the control of body temperature, "feeling" and spread of pressure.

### SUBCUTANEOUS LAYER:

The subcutaneous layer is composed of fat lobules and connective tissue.





## = FUNCTIONS OF THE SKIN =

The skin is the largest organ of the body and covers the entire body. The skin is not just a simple packaging, but has many complicated functions. The skin not only separates the body from its surroundings, but is also the layer which connects mankind with his surroundings. The skin has at least 5 important functions for us:

### 1. Protection

The skin gives the organism (=body) protection against external factors.

We should think of the following factors:

- heat – dehydration,
- cold – freezing,
- ultraviolet and other types of radiation – burns,
- external violence (trauma),
- chemicals,
- bacteria – infections.

The skin prevents the body from excessive loss of water and other matter. This function is upset, for instance, in case of severe burns.



### 2. Sensation :

The skin is capable of sensing the surroundings and changes in the surroundings, such as: cold and warmth, damp, touch, pressure and pain.

### 3. Temperature Regulation:

The skin regulates the body temperature by secretion of sweat (evaporation) and the blood circulation (radiation of heat). When it is cold the blood vessels constrict (narrow), enabling the body to keep the heat in.



#### 4. Manufacture of Vitamin D:

In combination with sunlight the skin produces vitamin D, which is important in the storage of calcium.



#### 5. Communication:

The skin can give us information about:

\*A person's emotional state, for example fear, excitement, shame, exertion.

\*A person's work: indoor or outdoor work, heavy manual labour, etc..

\*Personal hygiene/care.

\*Disease. Not only skin diseases, but also some internal diseases give rise to skin changes.

The skin is the mirror of your well being.



#### 6. Excretion:

This is mainly limited to sweat secretion. The sebaceous glands in our skin secrete sebum, a substance which forms a thin film on the skin. This prevents the top layers of the skin from drying out too quickly. Sebum also has slight antibacterial properties.

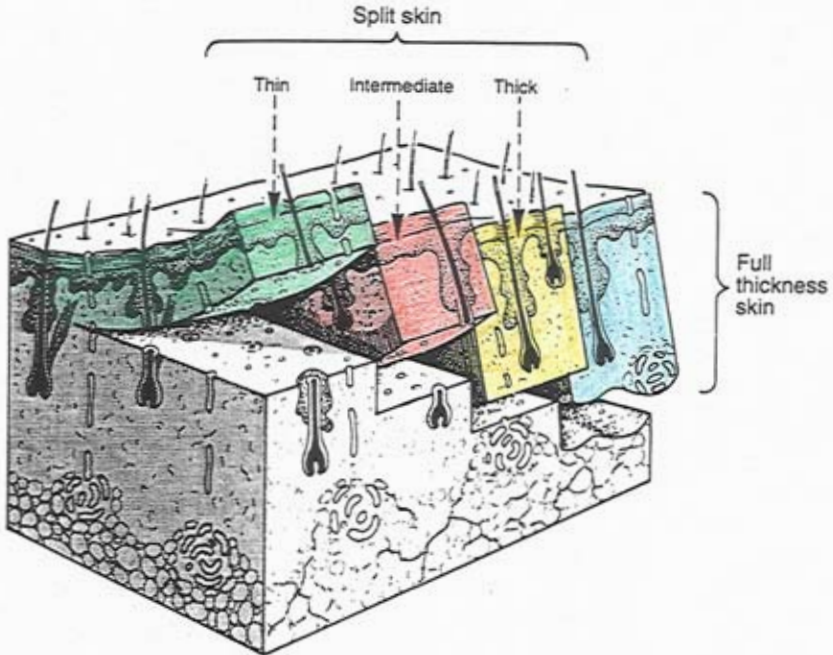


## =SKIN GRAFTS=

Skin grafts are divided into two categories: split-thickness and full-thickness.

### SPLIT-THICKNESS THIERS-TYPE:

this is a graft which does not include all layers of the skin but only the epidermis and the tips of the papilla of the dermis. It is a useful type of graft which takes well and is therefore very widely used by surgeons. However, as healing takes place it contracts, it does not contain elastic fibres, does not have any sweat glands or hair and may not, therefore, be cosmetically acceptable.



The thickness of various types of free skin grafts.  
They are described as thin, intermediate, or thick depending on the amount of dermis included.

Skin can be transferred from one part of the body to another, as a free graft.

And, as its name already says: a free skin graft is a piece of skin completely detached from the body when going from one place to another (from donor site to recipient area) and it has no blood supply of its own.

From its new place it gets a fresh blood supply as it develops an attachment.

Its size is only limited by the size of available donor area.

The amount of dermis taken depends on the desired thickness of the graft.

=SPLIT-THICKNESS (THIERS) GRAFT=

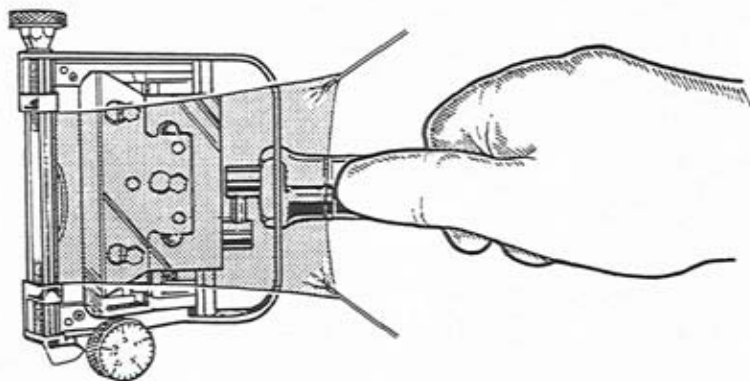


Cutting a split skin graft with the Watson

A split-thickness skin graft includes epidermis and a portion of the dermis. Because dermis is left behind, the donor site heals by itself. There will be epithelial outgrowth from the sweat/subaceous glands and hair follicles.

The greater the percentage of dermis in a graft, the less it contracts and the better the cosmetic result will be.

The thicker the graft, the greater the chance of graft loss, especially in a poorly vascularised recipient area.



Cutting a split skin graft with the Brown dermatome.

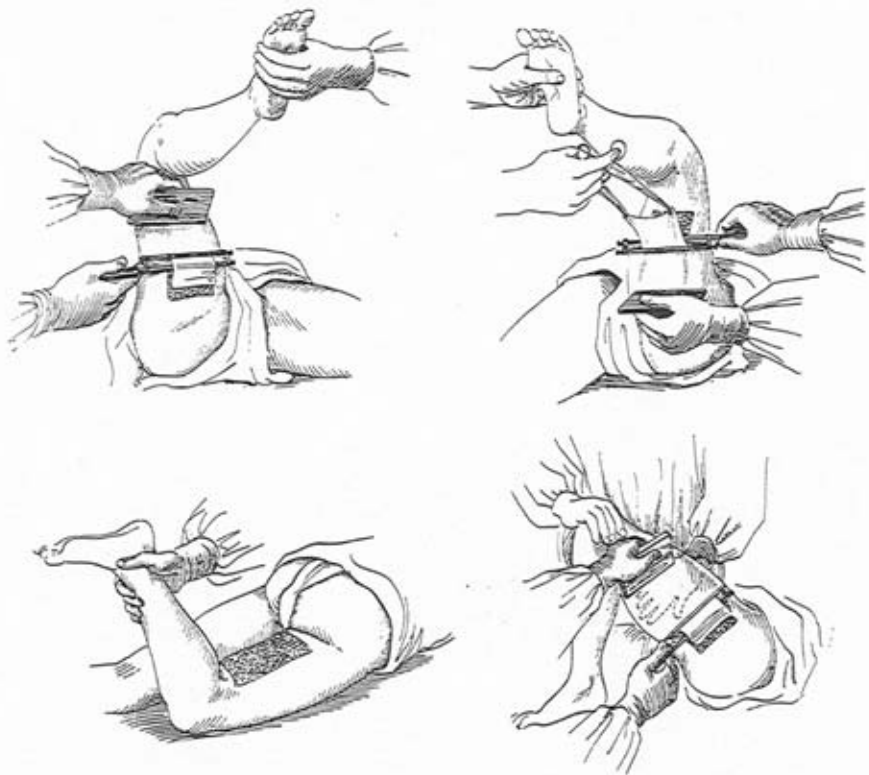
**Necessities for a split-thickness skin graft:**

- basic instruments
- dermatome and blade
- cautery
- paraffin
- paraffin gauzes
- gauzes
- peroxid
- saline
- (foam)
- (cotton with furacine)
- cotton
- bandages
- blade 15
- (tie-overs)
- suture: for example 4/0 or 5/0 vicryl rapide or skin staplers





**= PLACES WHERE YOU CAN TAKE A SPLIT-THICKNESS GRAFT =**



The position of the thigh for cutting a split skin graft from its various surfaces and the surface is presented to provide the maximum area of flat skin.  
In most cases the graft is taken from the thigh for transfer to another part of the body.



Positioning the arm for cutting a split skin graft.



## = FULL-THICKNESS (WOLFE) GRAFT =

Full-thickness grafts consists of epidermis and the full-thickness of dermis but **no** subcutaneous fat. Because there are no epithelial cells (=no dermis = no sweat/sebaceous glands, no hair follicles) left in the donor area, the donor site does not heal spontaneously and the donor site must be closed with sutures or covered with a split-thickness skin graft.

A split-thickness graft tends to contract, to prevent contraction a full-thickness skin graft can be used, but there must be a well vascularized recipient bed and the defect should not be too large because taking a large full-thickness graft gives a large donor defect.

If there is a large defect, it is better to use a split-thickness skin graft.

A full-thickness skin graft requires optimal conditions to "take" successfully.

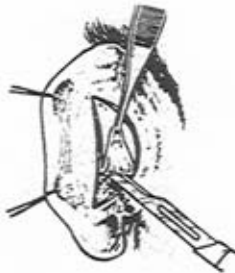
If a small full-thickness graft is used, the donor site can be closed by sutures.

If a large full-thickness graft is used and the donor site cannot be closed by sutures, it must be closed (covered) with a split-thickness graft.

A full-thickness graft is chosen in certain circumstances:

it does not contract easily and this makes it suitable for skin replacement around the mouth and the eyelids.

In the face for example, a correction of an ectropion with a full-thickness graft from behind the ear, will give usually the best colour and texture match.



Trimming fat from graft.

The method of cutting a full thickness graft.

### Necessities for a full-thickness skin graft:

basic instruments

ink

cautery

parafin gauze

gauzes

saline

(foam)

(cotton with furacine)

(cotton)

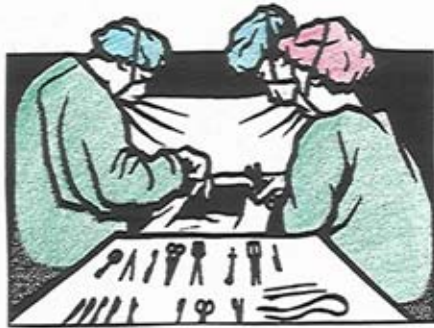
bandages

blade 15 and/or 10

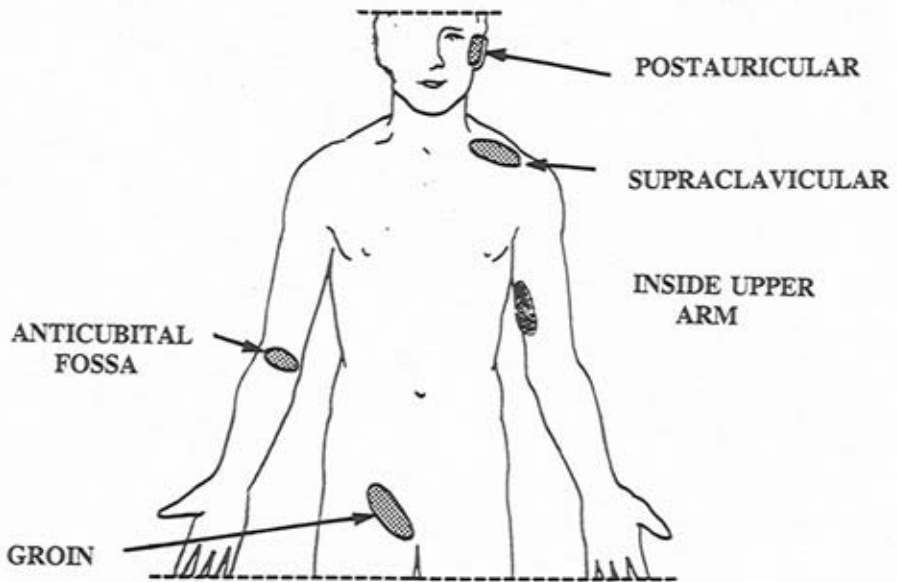
(tie-overs)

suture: for example 5/0 ethilon



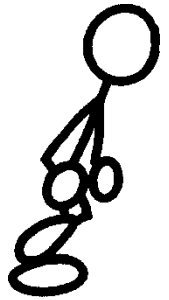
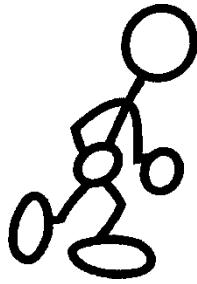
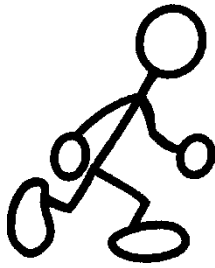
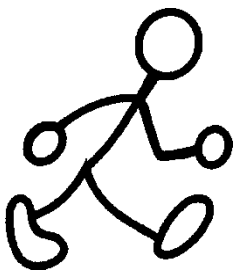


=PLACES WHERE YOU CAN TAKE A FULL-THICKNESS GRAFT=





## CHAPTER 2



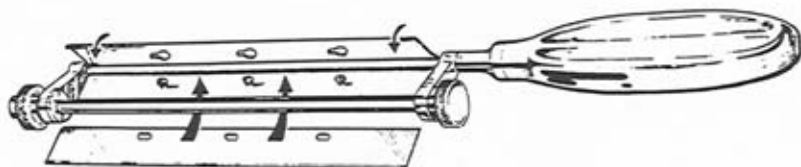
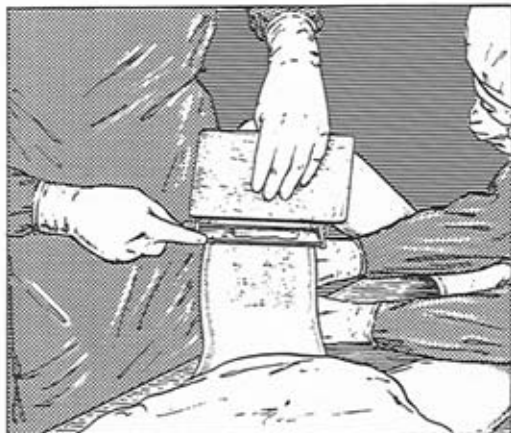
## =3 METHODS OF TAKING A SKIN GRAFT=

### 1. WITH A HANDKNIFE

A hand knife consists of a blade, about 25cm that fits into a handle which also includes a guide, this guide is adjustable for various graft thickness. Examples of these knives are the Watson and Braithwaite knives. When using a hand knife the skin is flattened by pressing a board at one end of the thigh by the surgeon, the hand of the assistant at the other end, while a "flat hand" supports the thigh.

The donor area is prepared by putting some sterile liquid paraffin on it, and a small amount is put on the under-surface of the knife.

The graft is spread over a paraffin gauze, this makes it easier to handle.



Humby Knife (*Watson modification*)

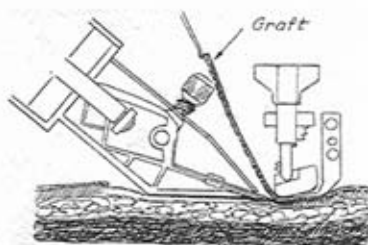
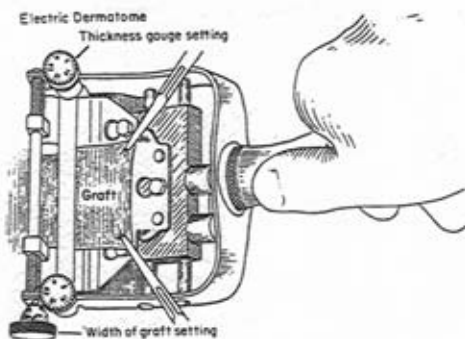
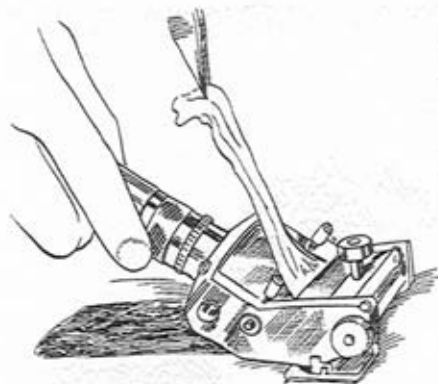
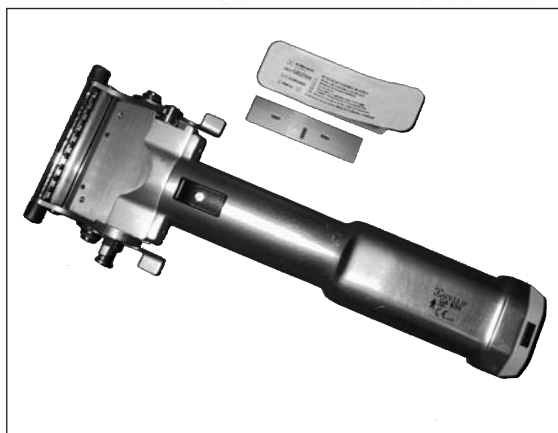
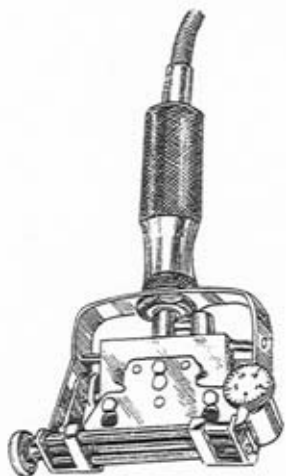


Humby Knife (*Bodenham modification*)



Humby Knife (*Braithwaite pattern*)

## 2. WITH A MECHANIZED ELECTRIC DERMATOME:



There are a number of dermatomes available to help the surgeon in taking a skin graft of reliable thickness and size. An example of these mechanized dermatomes is a Brown-Padgett dermatome.

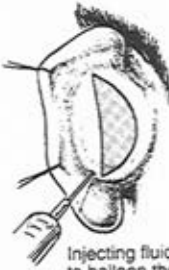
It has a removable blade which, when fixed in place, oscillates when power is transmitted to the device from an electric motor through a sterilizable cable.

The thickness of the skin graft taken is regulated by turning the adjustment knob to the appropriate thickness.

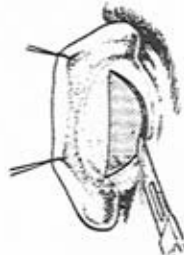
### 3. BY HAND WITH A 10 OR 15 BLADE:



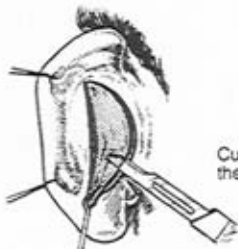
Making an outline of the graft



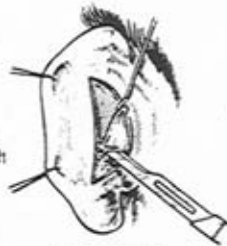
Injecting fluid to balloon the area



Incising along the outline of the graft



Blindly by touch



Under vision

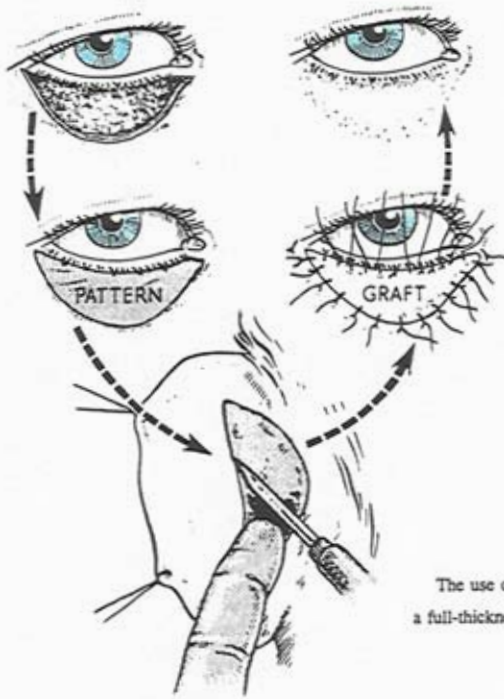


Trimming fat from the graft

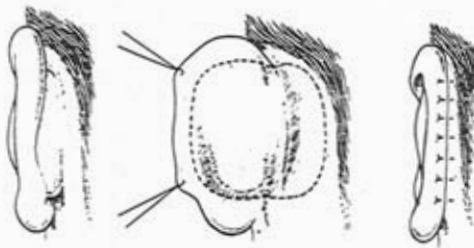
### THE METHOD OF TAKING A FULL-THICKNESS GRAFT.

**=THE METHOD OF CORRECTING AN ECTROPION=  
=**

The method of correcting an ectropion of the lower eyelid and the insertion of a postauricular full-thickness skin graft.

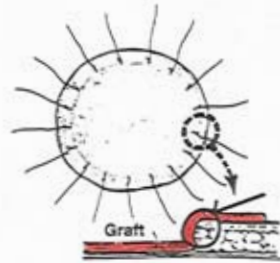


The use of a pattern in cutting a full-thickness graft to fit the defect.



The area within which postauricular skin is available and the method of closing the resultant defect.

=EXAMPLES OF SIMILARITIES AND DIFFERENCES BETWEEN=  
FULL-THICKNESS GRAFT AND SPLIT-THICKNESS GRAFT



FULL-THICKNESS SKIN GRAFT

The graft is cut to its prescribed pattern, fits the defect and is sutured edge to edge along its margin.

SPLIT-THICKNESS SKIN GRAFT

The graft is cut large enough to cover the defect with an overlap. The graft takes to the margin of the defect and the overlap is trimmed off.

## = MESH GRAFT =

Meshing: passing through a skin graft between two rollers (with knives), these rollers cut parallel slits (holes) in the skin.

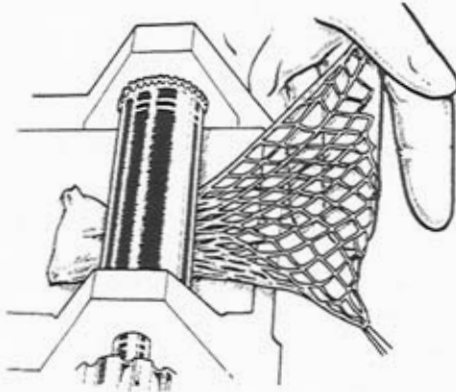


This meshing, or cutting parallel slits in the graft, allow it to "expand" like a fishnet when stretched.



Depending on the kind of mesh machine you use, you can expand: 1:1,5 1:3 1:4 1:6.

After expanding the graft you can cover a much larger area with the same amount of skin.

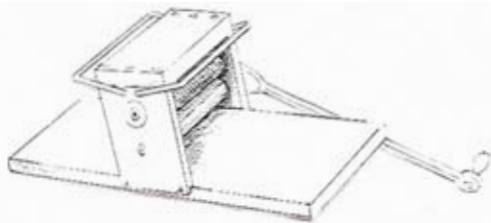


When there is not enough skin available for normal skin grafting, or when fixation of the skin graft is difficult (as in perineum or axilla), "mesh grafting" can be done.

Although the final results are not always very nice, it does allow skin to be put on surfaces where other methods may fail.

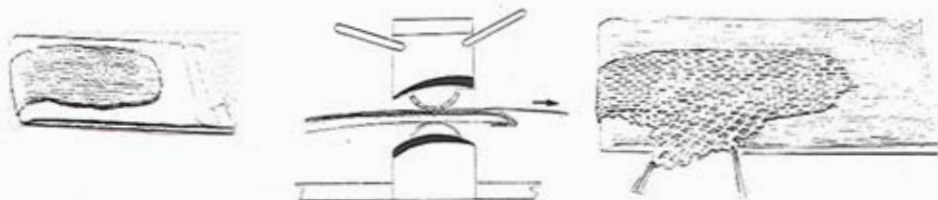
Meshing also gives the graft a bigger chance of a succes "take", while it allows blood or other wound fluids to seep through the perforations.





Various special devices are available to make the appropriate cuts in the graft.

A plastic skin carrier is used to carry the graft through the cutter. The plastic skin sandwich is passed through the cutting device between the rollers.



Stretched it can be expanded to provide covering up a much larger area.

The resulting holes in the graft are re-epithelialized from the strips of skin making up the mesh graft.

A piece of foam or cotton wool impregnated with furacine (nitrofurural solution 0,2%) is very useful for localised pressure on the graft and the dressing is completed with paraffin gauze, gauzes, cotton wool and crepe bandages, firmly applied.

Gauzes with peroxid are put on the donor side, left there for a few minutes, removed carefully and than the donor site is covered with paraffin gauzes, gauzes and a crepe bandage, also firmly applied.

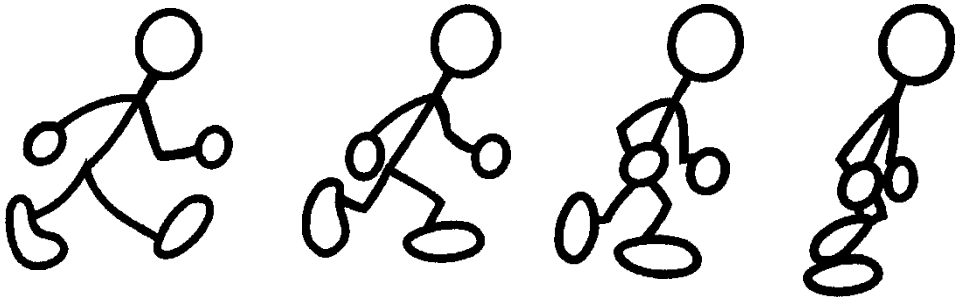
#### Necessities:

- basic instruments
- dermatome (hand or mechanical) and blade
- mesh graft machine
- paraffin
- paraffin gauzes
- (big) gauzes
- (furacin)
- bandages
- peroxid
- (sutures, 4/0 or 5/0 vicryl rapide or skin staplers)
- (foam)





### CHAPTER 3



## =HEALING OF THE DONOR SITE=

There is a difference in healing of the donor sites.

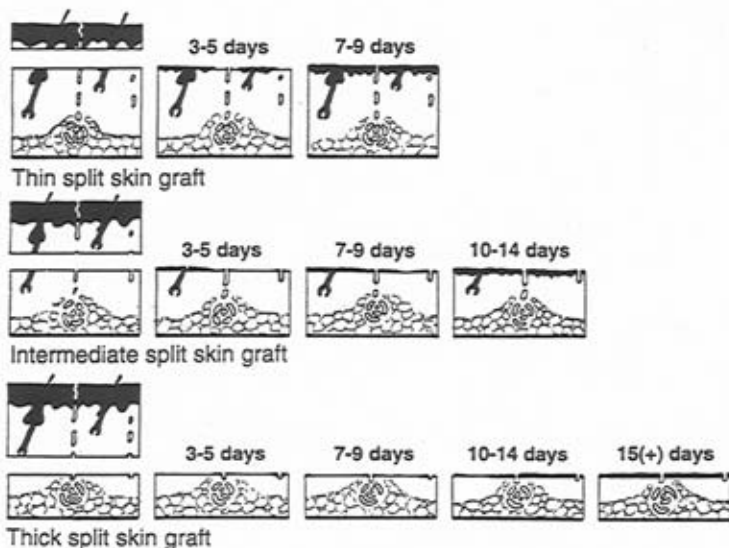
When a split skin graft is taken, skin is sliced off through the dermis, leaving behind parts of the sweat glands and hair follicles from which epidermis migrates to cover the donor site. The thinner the graft is taken, the quicker the donor site will heal, it depends on how much epidermis or dermis is left.

Epithelialization=new cells will be produced from what was left behind of the sweat glands and hairfollicles and that creates a new layer of skin.

If no sweat glands or hair follicles are left, the donor site only heals by granulation and healing takes place from the sides of the wound, so it takes much longer to heal.

Taking care of the donor site: after the graft is taken you can put a wet gauze with saline or peroxid (gives better haemostasis) on the wound and leave it there (untouched) for 5 to 10 minutes (will stop the minor bleedings). When big vessels are bleeding: use cautery. When the bleeding has stopped: a paraffin gauze on the wound, gauzes and a bandage firmly applied, but not too tight!

The biggest problem in treating a donor site is the fact that the dressing becomes extremely hard and sticks to the wound like glue. Removal causes bleeding and a lot of pain, as the new formed skin is torn off. It is better to leave the dressing where it is until it separates spontaneously, or if necessary, to soak it off.



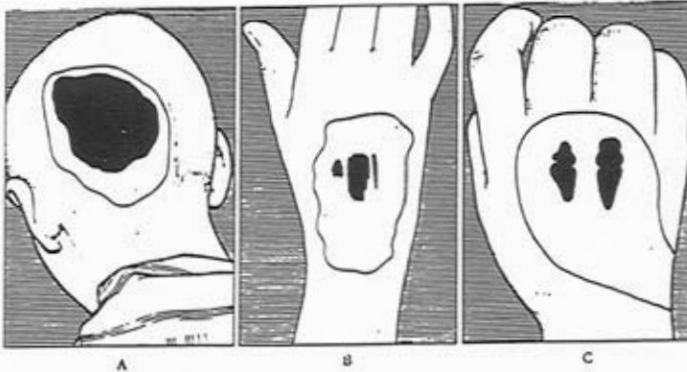
The healing patterns of the donor sites of the various thicknesses of split skin grafts.

## =FACTORS THAT INFLUENCE THE TAKE=

### TAKE DEPENDS ON RAPID VASCULARISATION

#### A GOOD RECIPIENT AREA

1. The recipient site must be able to make capillaries (very small blood vessels) for a new blood circulation.  
A skin graft placed on bare bone for example cannot produce capillaries.  
Granulation tissue is a poor recipient area to "take" a graft, as it will contract and form scar tissue.



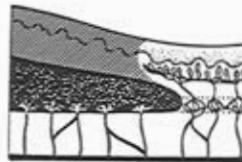
- a. Bare cortical outer table of skull.
- b. Bare tendon of extensor digitorum.
- c. Bare cortex of metacarpals and proximal phalanges with articular cartilage and open metacarpophalangeal joints.

#### GOOD CONTACT

2. The space between the graft and the recipient area should be reduced to a minimum. Blood clots (haematoma) or serous fluid under the graft will prevent capillaries growing into the graft. The shorter the distance to be travelled by the capillaries, the sooner there will be new circulation in the skin graft.  
Dressings (for pressure) will help to prevent blood clots forming under the graft (foam or tie-overs with cotton, bandage).



Close contact  
Rapid vascularisation



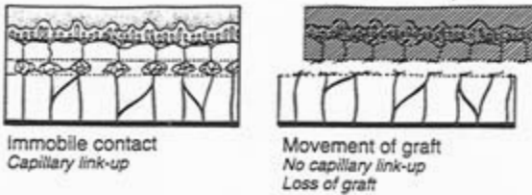
Separation by haematoma  
Failure to vascularise  
Loss of graft

## IMMOBILITY=NO MOVEMENT

3. Dressings are also used to keep the graft totally immobilized.

During the time that the capillaries are growing into the skin graft, the graft should not move, this would damage the new capillaries.

If necessary: plaster of paris as a splint, to immobilize the elbow or knee.



The influence of close immobile contact on the vascularisation of a free skin graft.

## INFECTION

4. As you probably can imagine, an infection (pus under the graft) will prevent the "taking" of the graft.

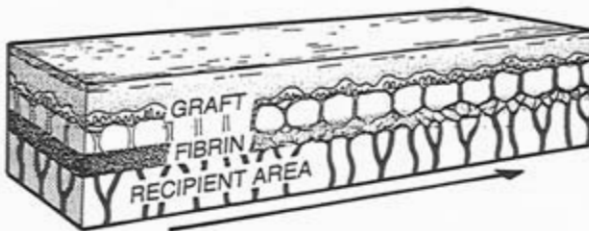
The cleaner the recipient area is (removing dead tissue,dirt), the better.

The sooner the grafting is done after the injury, the better.

## CONDITION OF THE PATIENT

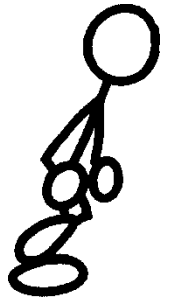
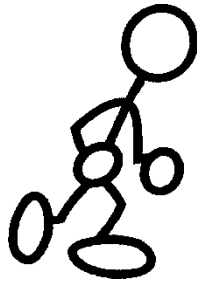
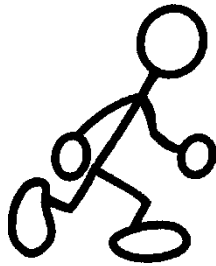
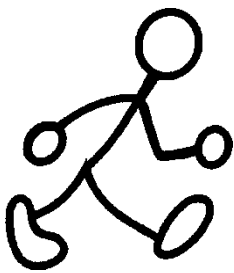
5. Malnutrition and diabetes mellitus can influence the take.

A thin split-thickness graft will take quicker and with less problems than a full thickness graft.



A diagrammatic representation of the process of 'take' of a free skin graft - the initial adhesion of the graft to the bed by fibrin, the growth of capillaries from the bed into the fibrin layer to link up with the capillaries in the graft, and the growth of fibroblasts into the fibrin clot to convert the initial fibrin adhesion into a fibrous tissue attachment.

## CHAPTER 4



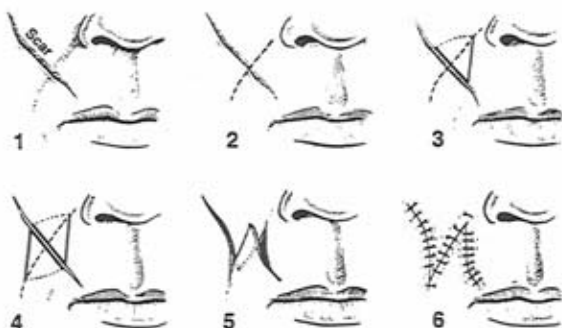
## =Z-PLASTY=

The Z-plasty is a procedure of transposing two triangular flaps.

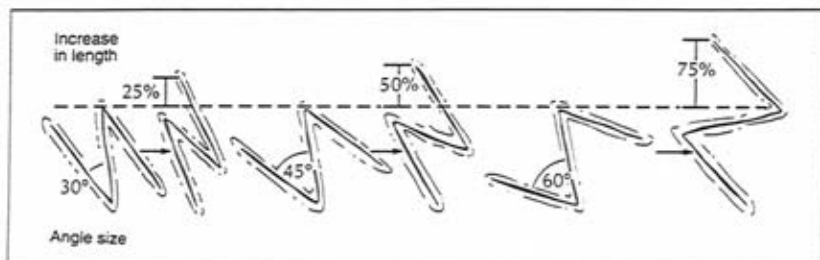


This is one of the most useful and frequently used procedures in plastic surgery.

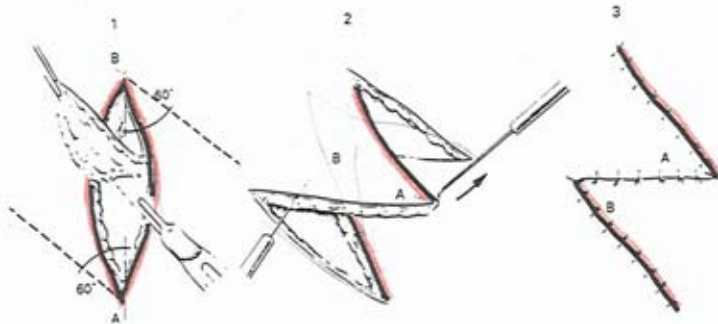
Used for the treatment of contractures or improvement of facial scars (break up or alter direction of linear scars to improve the cosmetic appearance).



The steps in planning a Z-plasty so that the transverse limb of the completed Z-plasty lies in a predetermined line, in this case the line of the nasolabial fold.



The design of a Z-plasty can vary depending on the need for increased length. Increased length may be particularly helpful for the revision of scar webbing.

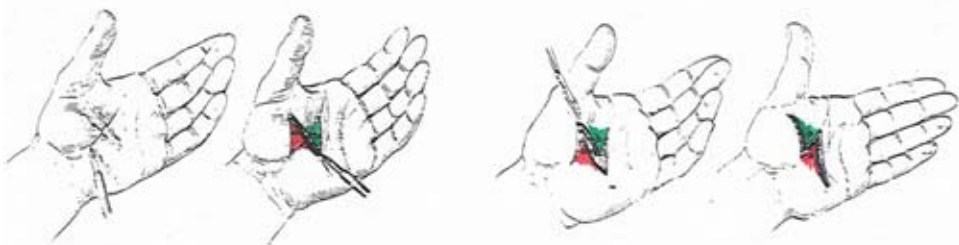


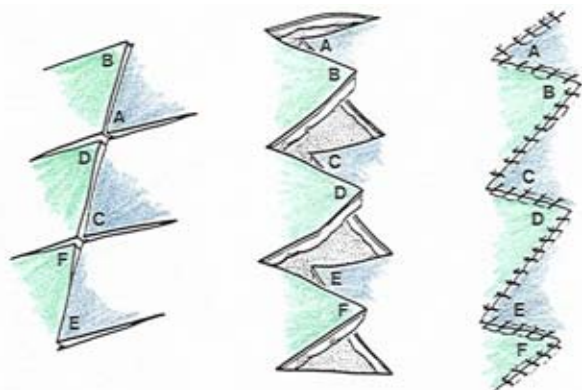
Transposition of the flaps has several effects, two of them are:

1. There is a gain in length along the central limb of the Z. Central limb = red.
2. The central limb of the becomes changed in direction.

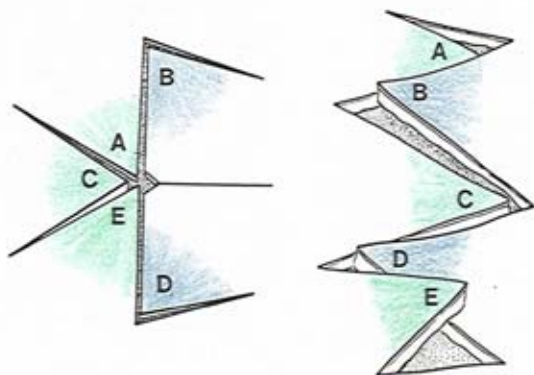
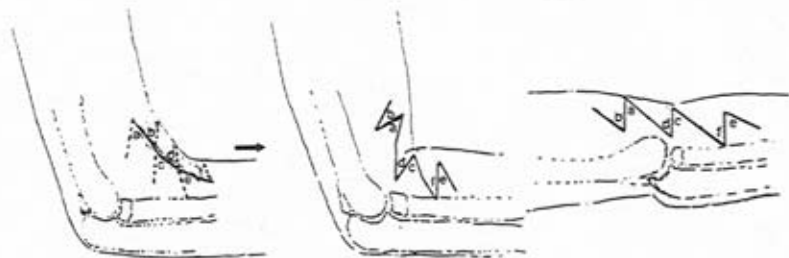
When a Z-plasty is used in case of a contracture, the central limb of the Z lies along the line of the contracture.

Because the skin available for transposition is not unlimited (especially not in burn scars) the angle should not be bigger than 60 degrees. With a bigger angle it will be more difficult to transpose the flaps and suturing will become very difficult or impossible.





Multiple Z-plasties may be designed to break up scars and release contractures.



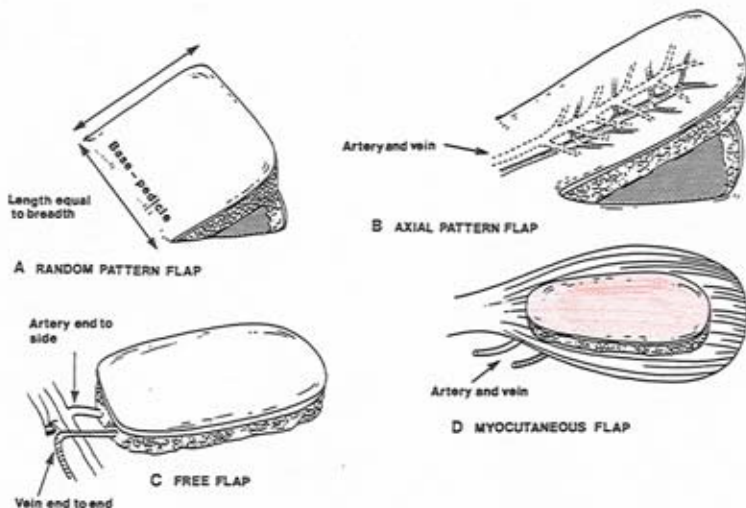
The five-flap Z-plasty (Jumping Man): A double opposing Z-plasty combined with a Y-V advancement.



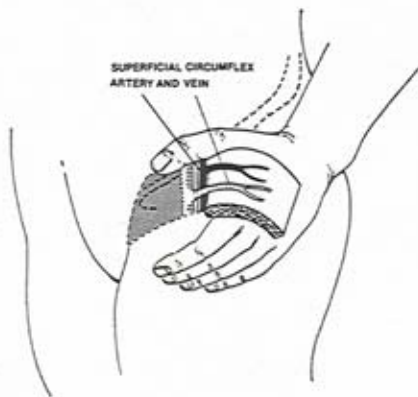
## = FLAPS =

A flap, in contrast to a free graft, is transposed from its donor site to its recipient area, while keeping its vascular attachment. In other words: flaps have an intact and functional arterial and venous circulation in a pedicle that stays attached to the body.

This vascular attachment supplies arterial inflow and provides venous outflow at the base of the pedicle.

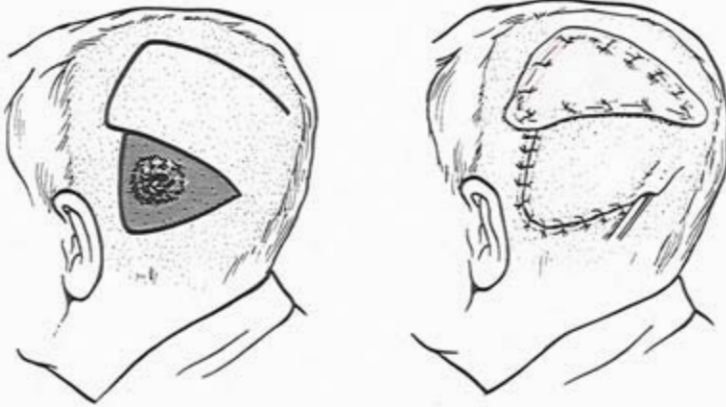


The successful transfer of skin flaps is dependant on keeping this attachment to the body, so that an active blood circulation can be maintained in the graft at the recipient area. This means these grafts, having their own blood supply, can be used to cover avascular areas such as exposed bone, tendon or open joints; areas where a split skin graft or a full-thickness graft cannot be used. The texture of a flap generally remains the same and the skin does not contract, it is suitable for use in areas where shrinkage could create problems, such as the front surface of joints.



Groin flap; example of an axial pattern flap to provide skin cover on defect on the hand.

The transfer usually leaves a secondary defect which, in most cases, can be closed by suturing. When this is not possible, this secondary defect must be covered with a split skin graft.



The use of a transposition flap following excision of a tumour of the scalp where excision left the bony vault of the skull exposed.

The excellent vascularity of the scalp permitted the flap to be designed with a ratio of length : breadth significantly greater than 1 : 1, rather than the square design which is standard in other sites unless the flap is recognised to have an axial pattern.

#### TYPES OF FLAPS:

1. skin flap: skin and subcutaneous tissue
2. muscle flap: muscle alone, which may be covered with a split-thickness skin graft
3. myocutaneous flap (myocutaneous flaps): muscle with overlying subcutaneous tissue and skin
4. fascial and fasciocutaneous flaps: fascia alone or fascia with overlying subcutaneous tissue and skin.
5. osteocutaneous flap: flap with multiple tissues, usually including bone, muscle, fascia and skin.

Flaps can be classified in **FOUR MAIN TYPES** (depending on the vascular characteristics):

1. Random Pattern Flaps
2. Axial Pattern Flaps
3. Myocutaneous Flaps
4. Free flaps.



#### Random and axial pattern flaps.

The presence of the axial arteriovenous system in the axial pattern flap determines the length : breadth ratio which is safe, compared with the random pattern flap where the absence of an axial vascular system generally limits it to a safe length : breadth ratio of 1 : 1.

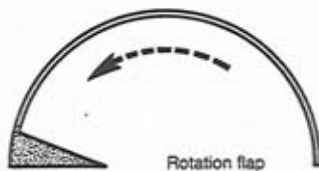
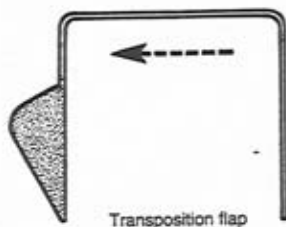
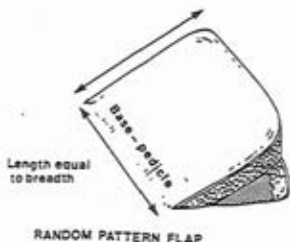
The first three kind of flaps are composed of skin and subcutaneous tissue (with or without fascia and/or muscle) which has an intact and functioning arterial and venous circulation.

### RANDOM PATTERN FLAPS:

Get their blood supply from the intradermal and subdermal plexus of vessels.

These flaps have no specific vessels in the pedicle but are based on a "random" blood supply.

This is limiting the length of these flaps, to keep a good blood supply in the flap the width of the pedicle base is usually made about the same as the length of the flap, is it called: ratio 1:1.



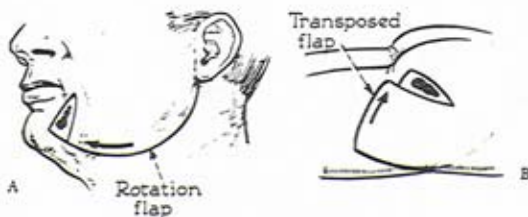
The flap can be taken as a local flap from the tissues in the direct surroundings of the defect, this flap is called: transposition flap.

Examples of different random pattern flaps:

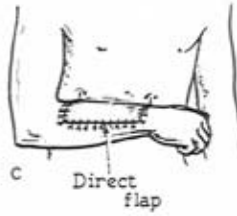
\*Z-plasty: transposition of two triangular shaped flaps, looking like a Z.

\*Rotation flap: a half circle of skin is rotated on to a triangular defect.

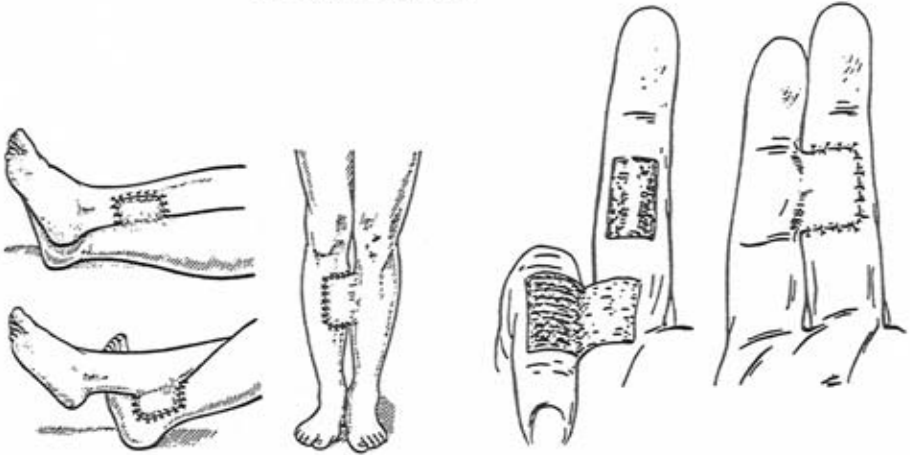
\*Transposition flap: a square of skin is transposed to cover a triangular defect.



When the flap is brought to a defect further away from the donor site it is called: a direct or distant flap.



The basic types of flap transfer.



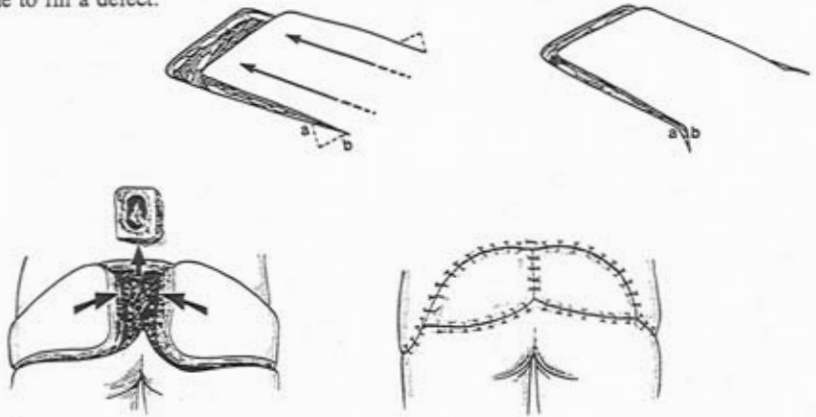
Examples of cross-leg flap positions

Examples of different direct or distant flaps:

- \*from groin to hand.
- \*from leg to leg.
- \*from finger to finger

### ADVANCEMENT FLAP:

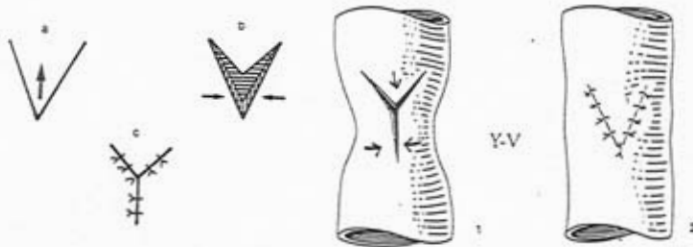
An advancement flap depends on a certain amount of stretching of the skin in moving it in a straight line to fill a defect.



A V-Y advancement is created by a V-shaped incision made in the skin.

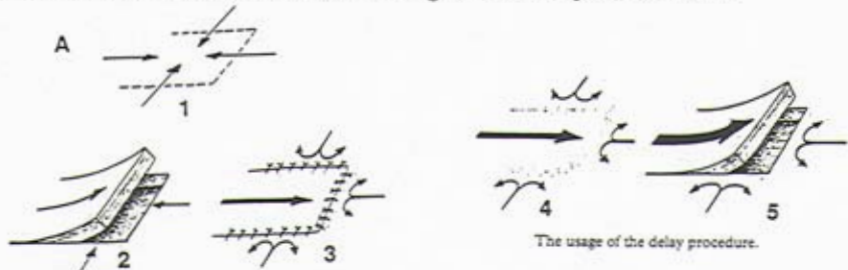
The skin on each side of the V is advanced and the incision is then closed by suture as a Y.

A V-Y advancement flap can be used for lengthening the columella or to close a small defect. This advancement flap can also be used as a Y-V.



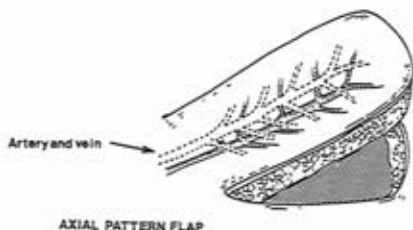
### A DELAY:

The delay principle is used to improve vascular efficiency, done to allow a safe transfer of a random pattern with a greater ratio than 1:1. The flap with its blood supply coming from all directions, is raised and stays attached by its pedicle, the flap is sutured back in its position and 10 to 14 days later again raised for transfer. Being only attached by the base, and blood supply is restricted to the blood vessels in the base, the supply will increase. Therefore there will be a safer transfer. And a greater ratio is possible than 1:1.

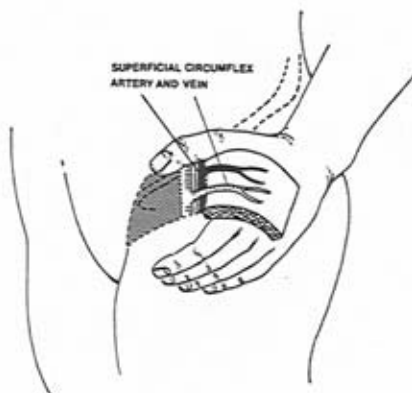


### AXIAL PATTERN FLAPS:

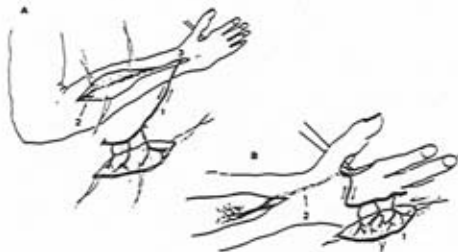
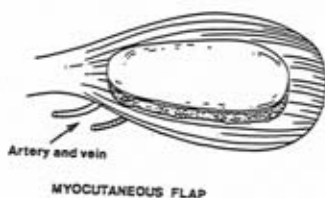
Get their blood supply from an arteriovenous system running along its axis, therefore the length of the flap can be much longer in proportion to the width (breadth) of the base.



Example of an axial vascular flap:  
From groin to hand.



Example of a myocutaneous flap:  
Skin flap with underlying muscle and attached blood supply



Island flap: soft tissue around the vascular pedicle is removed so that the flap is attached only by the axial vessels. The mobility of the flap is much greater and it can be rotated a 180 degrees or more. A neurovascular island flap can be designed by including a nerve within an axial vascular pedicle, permitting the skin to keep sensation.

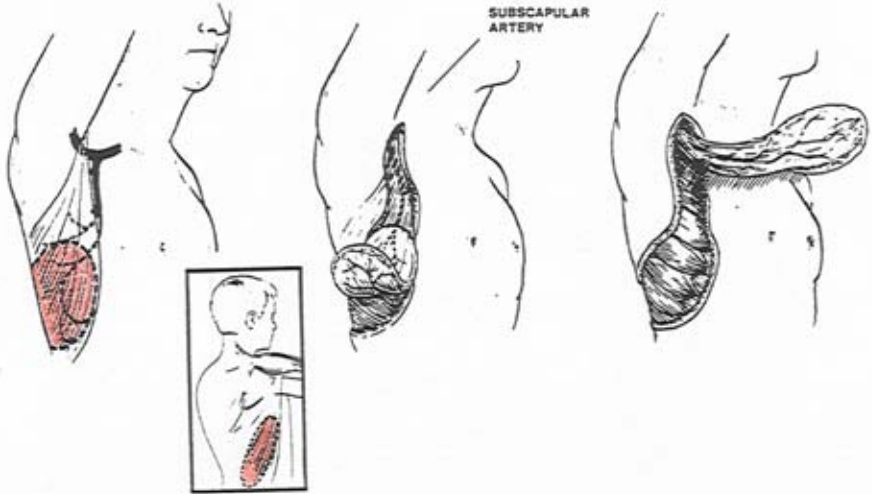


## MUSCLE AND MUSCULOCUTANEOUS FLAPS:

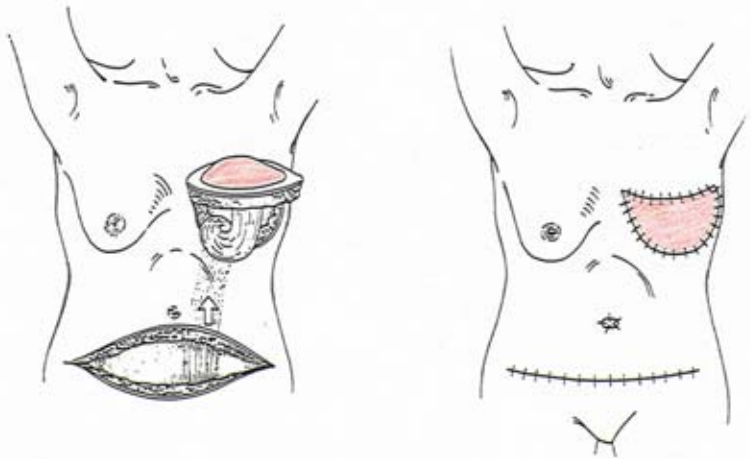
A muscle can be detached from its normal place and transposed on its pedicle to an area elsewhere.

Examples of musculocutaneous island flaps:

\*lattismus dorsi flap

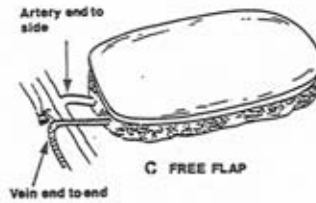


\*rectus abdominis flap



### FREE FLAPS:

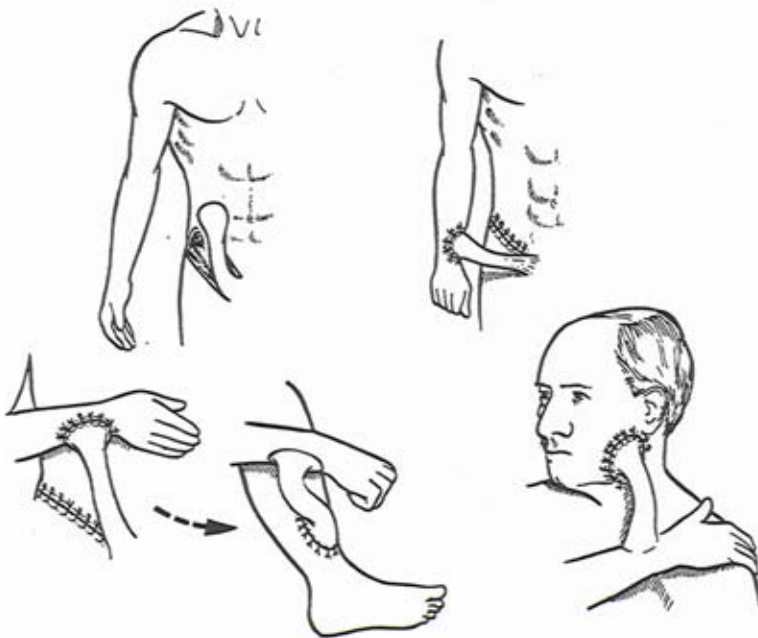
Are flaps totally detached from the body and transposed as a free flap to the recipient area, anastomosing its vascular system to vessels in the recipient area.



Before the time of micro surgical techniques to join small blood vessels together, flaps had to stay attached to the body by a pedicle.

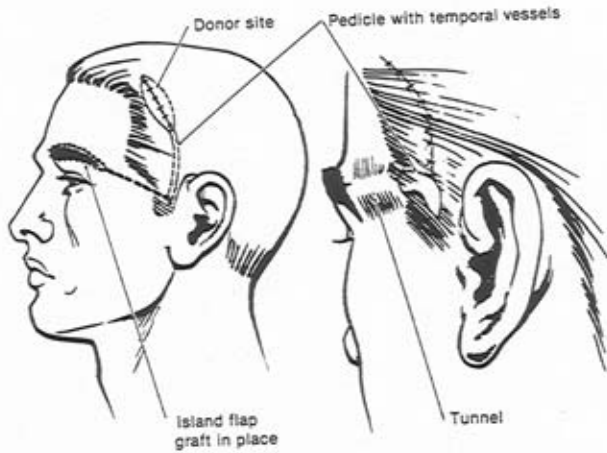
Thanks to micro surgical techniques it is possible to transfer a flap totally detached from its donor site, as a free flap, to the recipient area in one single operation, anastomosing its vascular system to suitable vessels in the recipient area.

Tubed pedicle flaps are therefore not commonly used any more nowadays.



Transfer of a tubed skin flap using a wrist carrier.



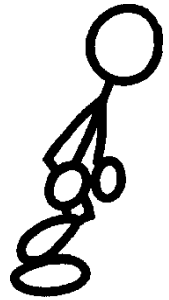
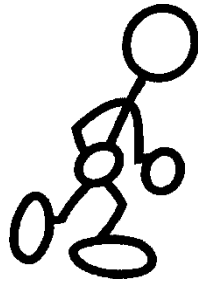
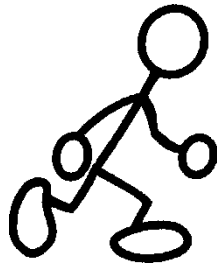
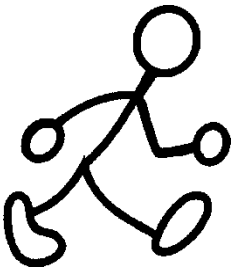


### POSTOPERATIVE CHARACTERISTICS OF SUCCESSFUL SKIN FLAP:

1. Colour and texture are the same.
2. Hair growth and sebaceous secretion characteristics of the donor site are kept.
3. Sensation is lost after flap transfer but may return within 6 to 18 months.
4. The flap provides a durable cover over bony prominences.
5. The flap continues to grow at the same rate as the body growth.
6. The excess bulkiness of the flap may be reduced by removing subcutaneous tissue.

Another solution to cover a defect with skin of the same texture, is creating extra skin by using a tissue expander.

## CHAPTER 4 A



## My favourite Transposition Flaps

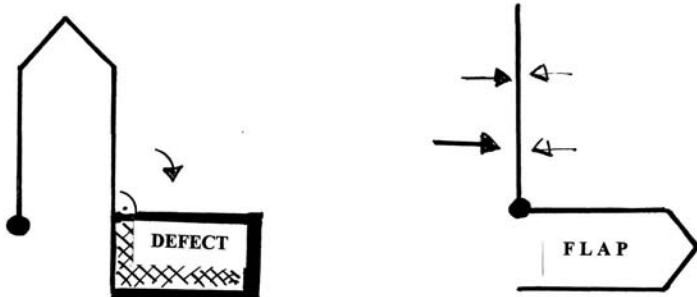
André Borsche

Transposition flaps are important tools for plastic reconstructive procedures to cover skin defects in joint areas or wound defects with open bone or tendons. They often bring more soft tissue in the defect than Z-plasties or V-Y-plasties. But correct planing of the flaps is essential for the success. There are some important rules to consider :

- 1) Transpositions flaps are usually random pattern flaps.
- 2) The ratio of length to width depends on the vascularisation of the flap region.
- 3) The flap is saver when you raise the flap near the basis as a fasciocutaneous flap.
- 4) Primary donorsite closure is preferable but not when there is to much tension.
- 5) Donorsite closure with skin grafts avoids tension on the flap.
- 6) The direction of the primary donorsite closure should be  $90^\circ$  to the flap axis.
- 7) Moderate longitudinal tension on the flap is tolerable - transversal never.
- 8) Cavities underneath flaps should be avoided and filled with vascularized tissue.
- 9) Compression on the flap may cause necrosis and delay of the healing process.
- 10) Hematoma could destroy flaps – therefor use small drainages.

### 90° Transposition Flap

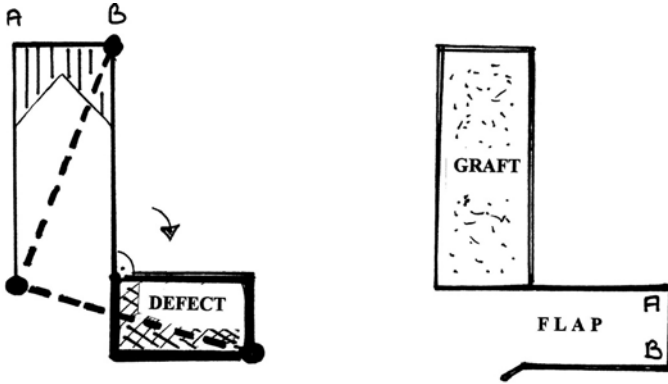
- This flap brings a lot of tissue in the defect.
- The primary donorsite closure is the limiting factor.
- No tension on the flap when closing the donosite in  $90^\circ$  direction.
- At the limbs anteriorgrade or retrograde flaps are possible.
- Donorsite closure proximal to the flap may cause venous problems.
- Advantage in joint areas: post op expansion possible and no contraction.
- Closure of large defects needs a combination of flap and graft.



**90° Transposition – Flap  
with primary donorsite closure**

## Transposition Flap with donorsite graft

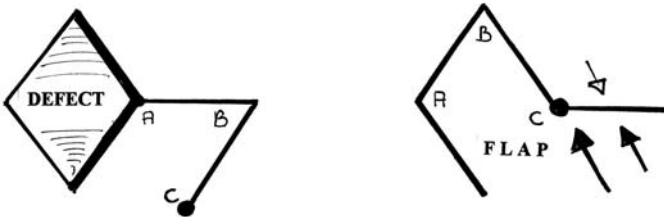
- This flap is universal available but not easy to plan.
- The flap must be longer than the defect.
- Measurements of the longest axis is mandatory.
- Hematoma underneath the flap could destroy the take of the skin graft.



**90° Transposition – Flap with donorsite skin graft**

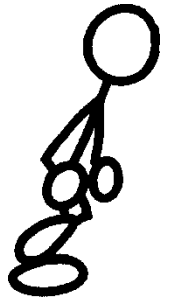
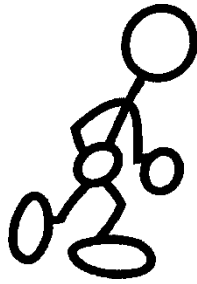
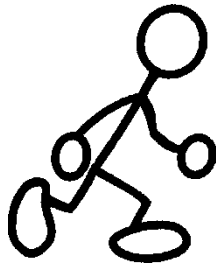
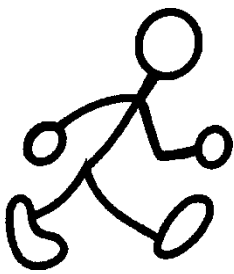
## Rhomboid Flap (Limberg)

- Very versatile flap with many variations in all directions.
- Primary donorsite closure without tension on the flap.
- Excellent vascularity and save healing.
- Ideal for small reconstructions in the face.



**Rhomboid –Flap (Limberg)**

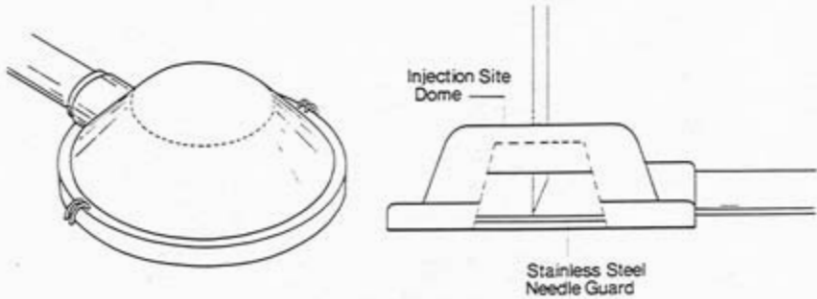
## CHAPTER 5



## = TISSUE EXPANSION =

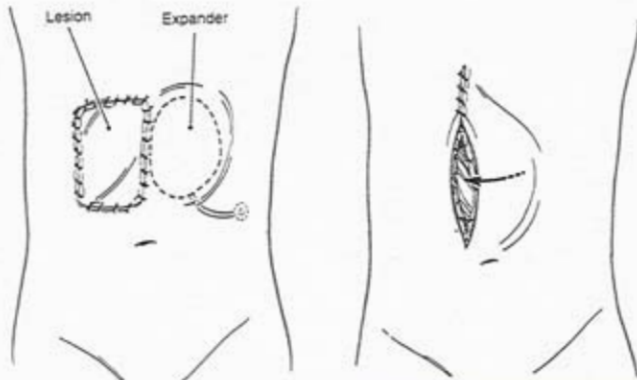
In this technique, a pre-shaped silicone reservoir (a "bag" like an empty balloon) that can be filled with fluid, is placed under the skin and inflated at intervals by injection of saline under pressure. The saline is injected into a small non-expansile reservoir (=dome or valve) which is placed at a distance from the expander, connected to the expander by a tube.

Aim: augmentation of soft tissue enabling advancement of wound edges for direct closure as well as for rotation and transposition skin and fasciocutaneous and musculocutaneous flaps.

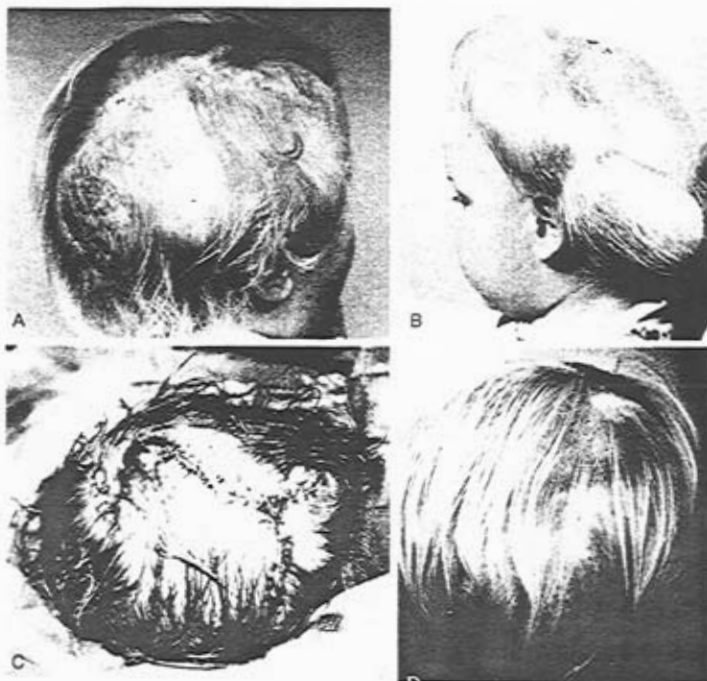


### Operation:

a pocket is made for comfortable placement of the expander (in unexpanded state) and haemostasis is done very well. A hematoma gives a bigger chance of infection. The valve is placed about 5cm. away in a separate pocket. After the wound is closed, enough saline is injected into the expander to fill the dead space in the pocket. The effect of the inflation is: stretching of the overlying tissue. In this way the skin is "expanded" and can be used for covering a defect. When the expansion is completed, it is removed, the extra skin can now be used to close a defect for example after scarring.



Choice of donor site is made by the desire to transfer tissue from an area close to the defect, because this tissue is most similar (the same) to the tissue to be replaced



A. Young girl with extensive burn scar.

B. Two tissue expanders have been placed and are fully expanded.

C. Removal of the expanders and flap reconstruction.

D. Postoperative.



For deformities where there is not enough skin for advancement flaps, tissue expanders can be helpful. The unscarred tissue of the neck is expanded and after expansion it is brought into the area of the contracture. With expansion, it might be possible to avoid skin grafting at all.

Advantages of the use of tissue-expanders for closing a defect are:

- an optimal function and cosmetic result,
- avoidance of complications with flaps,
- avoidance of donor defects,
- minimal disturbance to sensibility,
- safe vascularisation,
- minimal operative procedures (surgical time, anesthesia, hospitalisation, reconstructions, complications).

Disadvantages:

- two operations,
- frequent visits to the out-patients department,
- costs.

Like in most techniques, tissue-expansion has its complications too.

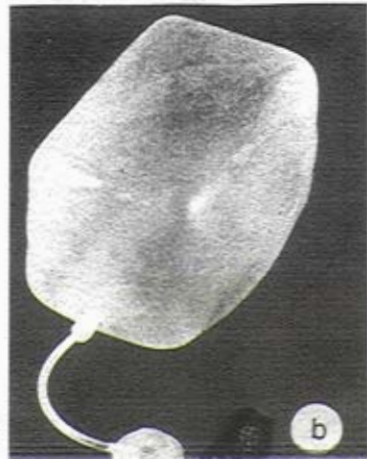
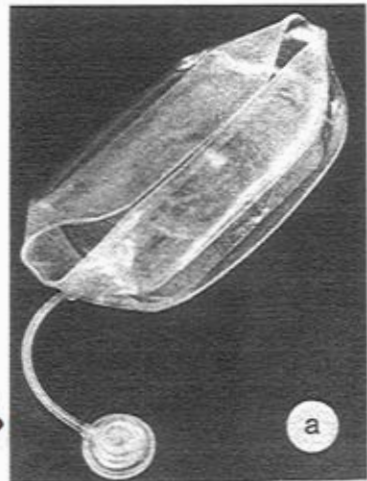
Complications in soft tissue-expansion:

- pain,
- haematoma,
- seroma,
- infection (every implantation has the risk of infection),
- circulation problems,
- leakage of the expander,
- skin shortage after expansion,
- dog ears,
- scar widening,
- psychological problems.



**Necessities:**

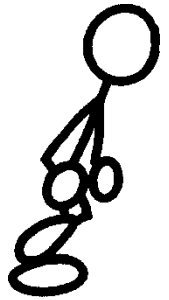
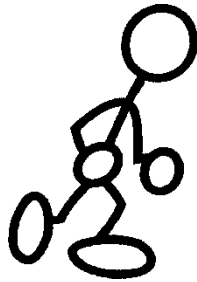
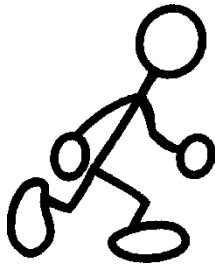
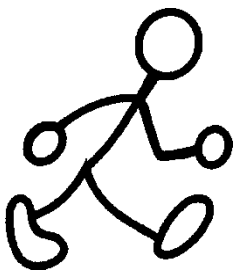
basic instruments  
gauzes  
saline  
blade 15 or 10  
ethilon 3/0 or 2/0  
needle 21 or 22 gauge  
ink  
cautery  
(vacuum drainage)



A rectangular tissue-expander of 250 cc with connecting tube and remote fill-valve, before (a) and after (b) inflation.



## CHAPTER 6

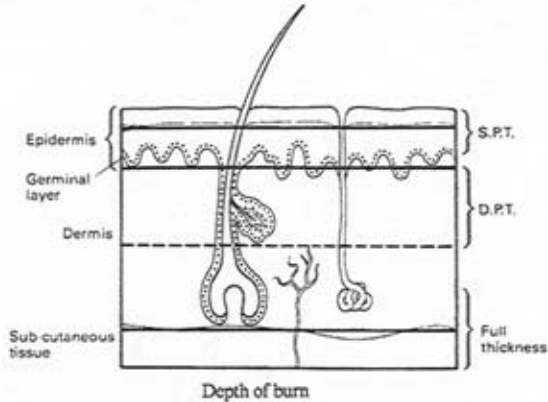


## = DEGREE OF (FRESH) BURNS =

Fresh burns can be categorized by degree:

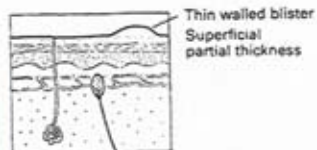
### 1. First degree burn:

The burned area appears red, erythematous and raised from the surrounding normal skin. Erythema alone causes no skin loss and will heal without scars. There is stinging pain and mild edema but no blistering. Healing is usually complete within one week.



### 2. Second-degree burn:

When there is a *superficial-partial thickness* burn, there is thin-walled blistering of the skin together with painful erythema and subcutaneous edema. The skin is red, weeping and tender. If blisters rupture, the wound weeps serum. This burn involves the upper layers of the dermis, but since it leaves the germinal layer intact, it will heal quickly with little scarring. The deep dermis is preserved and epithelialization of the wound develops from the surviving hair follicles and sweat glands. Healing will be complete in two or three weeks.



A *deep partial-thickness* burn will have a whiter appearance than a more superficial burn. As the germinal layer is lost, healing will be by migration of the epidermal cells from the skin appendages and wound edges.

Healing will be slow and there may be problems resulting from scarring and contractures. If the area is large then skin grafting must be done.



Deep partial thickness

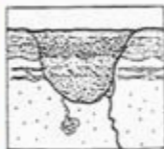
Damage to germinal layer

### 3. Third-degree burn:

Appears hard and leathery. There is full-thickness skin damage that goes to or into the subcutaneous tissue. The tissue destruction includes the deepest hair follicles and sweat glands, sensation is lost. Such burns will only heal from the skin edges, healing slowly and with problems of scarring and contracture.

Healing, if the wound is small, may take place by contraction and epithelialization from the healthy wound edges, but if a large area is affected, skin grafting is necessary.

After healing, even if the burn wound has been treated, there can be a very ugly scar (hypertrophic scarring).



Full thickness

## = HYPERTROFIC SCARS AND KELOID =

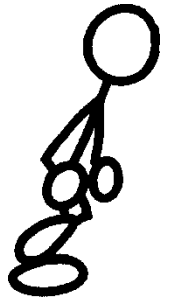
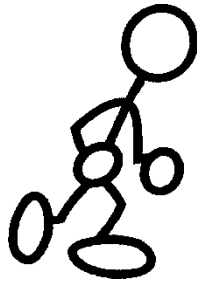
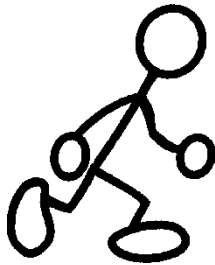
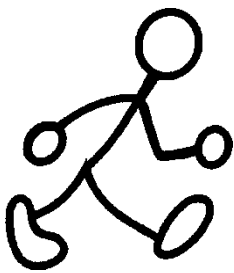
When a scar is becoming red and thickened, instead of becoming soft and pale, as it usually does, it is described as being either a *hypertrophic scar* or a *keloid*. Sometimes it is very difficult to tell whether it is a hypertrophic scar or a keloid. The hypertrophic scar is raised above the level of the surrounding skin but is not spreading to the surrounding normal skin. It sometimes regresses spontaneously.



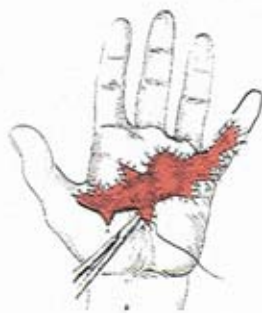
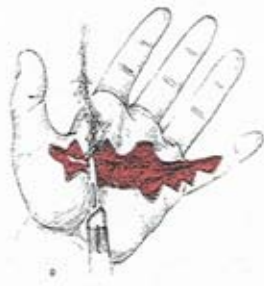
The keloid has a tendency to spread and involve the surrounding normal skin. Spontaneous regression is much less common. If a keloid is surgically removed, the probability that the new scar will develop a fresh keloid is extremely high.



## CHAPTER 7



Excisional release of a scar contracture results in a defect several times the size of the resected scar.

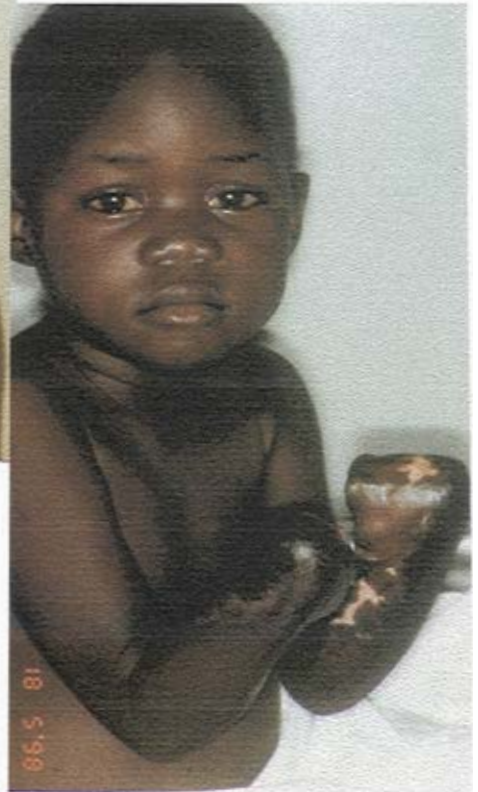


Skin grafting on the palm of the hand

## = CONTRACTURES =

A contracture is an abnormal shortening of scar tissue or muscle which makes it very difficult or even impossible to extend, for example, the arm.

A burn wound will contract until it meets an opposing force.



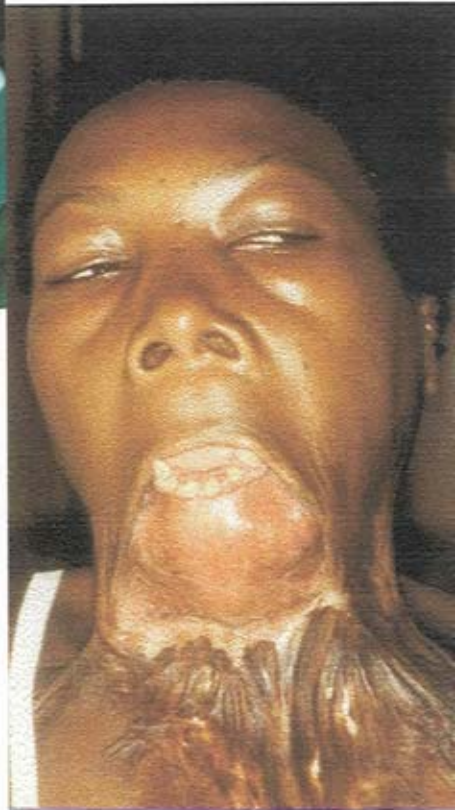
A contracture can lead to permanent disability.



### EYELIDS:

If a patient is not able to close the eyes, there is a risk that the cornea will become too dry, this can lead to damage, illness or blindness of the eye(s). Eyelid release and reconstruction of the eyelid has therefore a high priority.

A full-thickness skin graft or split-thickness skin graft can both be used.



### NECK:

Scarring and contractures of the neck region can severely limit function. When scarring extends upwards toward the face, eating and swallowing can be difficult and facial distortion can occur. Burn scars contracture of the neck is one of the most difficult problems to prevent. After burns of the hand, the neck is the second area affected by scar contracture. Which kind of surgical procedure (operation) is chosen, depends on the severity and extent of scar involvement. Skin grafts can contract and need long-term postoperative care. If possible, local flaps will be chosen to reconstruct the neck. Splints: their purpose is to prevent the problem of neck flexion contracture (= the chin is going towards the chest).

**AXILLARY:**

The shoulder joint is an extremely mobile joint.

It has a greater total range of motion than most other joints. Scar contracture of the shoulder can restrict functional independence.

Self care can be limited, not being able to dress, or it can give eating problems.

Sometimes an axillary contracture may not limit activities of daily life, however it can limit the patient to do specific work skills.

When the scar extends down the arm, elbow motion can be affected.



## HAND:

Severe hand burns may leave the patient totally nonfunctional. They may lose their ability to be productive at work or, even worse, may not be able to care for themselves. The goal of treating/operating burns of the hand is to get an optimal function with stable soft tissue coverage. Full hand motion is useless if significant contractures of the elbow or axilla prevent the patient from positioning the hand in a way, so that this motion can be utilized.



## PRURITIS:

Itching of healing (or treated) burns can be severe.

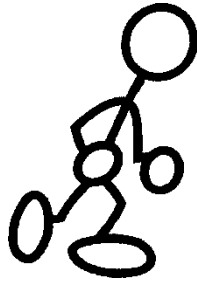
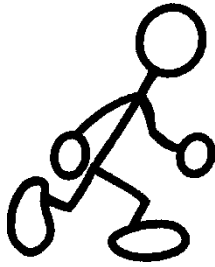
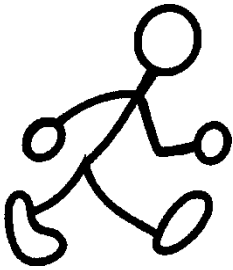
Application of an ointment may give considerable relief.

An ointment containing menthol and camphor feels cool to the skin, for a while it relieves the itching and sees to it that the skin is not getting too dry.

Olive oil will also do, but the most important thing is that the skin is not getting too dry.

Burn scar contractures may need surgical release with Z-plasty, skin graft, flap transfer and postexpansion tissue, growing children often need release and grafting when burns involves flexor areas (like neck, elbow, hands etc.).

# CHAPTER 7 A



## Functional disability in cases of burn scars in developing countries

André Borsche, Rémy Zilliox, Nuri Alamuti

Burns are one of the most frequent causes of accidents in the developing nations, because the daily life is closely connected with the handling of open fireplaces, whether for cooking, heating or working.

Especially children are in danger, because when playing they often come across unguarded fireplaces and therefore catch disastrous burns.

Since an acute treatment of burns according to our standards is often not possible, a consequence of a protracted healing by second intention are burn scars. In form of burn contractures they can lead to drastic deformations and functional disabilities.

In these cases reconstructive surgery is demanded to improve the quality of life of these persons. (*image 1*)

For more than 20 years **INTERPLAST Germany** has been organizing surgical team trips to Africa, Asia and South America. These trips are aimed to help these burn victims with reconstructive surgery. So we developed treatment strategies which are conducted according to the restricted possibilities of developing countries. Intensive aftercare, scar-compression therapy or physiotherapy is rare. In the following, some typical, frequently occurring contractures and their plastic reconstructions are described.

The reconstructive surgery of late consequences of burns demands in the case of a complex scar formation often a combination of different techniques, whose valency depends on the effectiveness and the security of the application. Therefore especially **rotation lap plasties** and **full thickness skingrafts** in the cases of the separation of contractures and the healing of defects have turned out to be a good solution. While successive z-plasties and y-v-plasties can be carried out safely, they often bring, in case of serious contractures, only a limited functional gain. Particularly, if only closed tissue can be shifted. Split-skingrafts should only be the last possibility to heal the defect, because it is subject to the degeneration tendency in the joint area and therefore it could lead to unstable scars. Extensive microvascular techniques are the exception and are reserved to the specialists, because on simple conditions often only limited postoperative surveillance is possible. (*Image 2 a,b,c*)

The selection of the reconstructive technique depends on the quality of the adjacent tissue and the remaining skin-soft tissue-reserves. If there is enough adjacent, non burned tissue, the **fasciocutaneous rotation lap plasty** is the best solution for secure healing and subsequent results.

If extensive contracture areas are concerned, the best solution is a combination of **muscularcutaneous island flap plasty** and a skin graft and the lap plasty should prevent a contracture relapse.

*(image 3 a,b,c) (image 4 a,b,c,d)*

In case of the reconstruction of serious joint contractures a 90 degree rotation lap plasty is very successful. On the conditions in the developing countries this plasty (with a correct planning) is healing better than a soley skin graft (risk of infections and hematoma) and there is no postoperative degeneration tendency such as in cases of slit-skingrafts. If it is possible to place the rotation lap in the course of the joint axis and therefore crosswise to the contractureline, better movement abilities can be achieved after the healing than by using the successive z-plasty. Especially for children in their adolescence it is important to use elastic scarless tissue for the breaking of the scar cord to avoid a later contracture relapse. *(image 5 a,b,c)*

For the separation of big joint contractures near the torso on the axilla, neck and hip, often big defects emerge which are covered best with a muscularcotaneous rotation lap plasty like latissimus, trapezius, rectus abdominis (VRAM) or tensor fasziae latae (TFL). These methods bring in enough perfused tissue to the deeply scarred area and enable a healing without infections. *(image 6 a,b,c)*

As long as the developing countries do not have the possibility to build up an exhaustive urgent surgery care for the victims of burns, countless patients are furthermore dependent on secondary reconstruction. During the INTERPLAST surgery trips therefore the direct help for the patients and the training of the on site doctors play an important role. They should be skilled in the basic techniques of reconstructive surgery like skin grafts, z-plasties and rotation lap plasties to be able to help their own patients better in the future.

*(image 7 a,b,c,d)*

### **Images:**

1. Serious burn contracture, healing by second intention
2. Combination of local flap plasty and full thickness skingraft
3. Mento-sternal separation of the contracture and fasciocutaneous epaulette-lap on both sides with full thickness skingraft
4. Muscularcutaneous trapezius-lap plasty and healing result after 2 years.



5. After the separation of the cubital joint contracture, the vessels and nerves are exposed, which will be covered with a 90 degree rotation lap plasty. Remaining defects will be engrafted

6. Serious burn contractures in the hip or pubic region treated with a VRAM and result after 3 years.

7. Burn contracture in the shape of an arch at the arm, torso and leg, treated with a combination of rotation lap plasty and skin graft. And following on the spot instruction of the doctors and nurses concerning the aftercare.



image 1



image 2 a



image 2 b



image 2 c





image 3 a



image 3 b



image 3 c



image 4 a



image 4 b



image 4 c



image 4 d



image 5 a



image 5 b



image 5 c



image 6 a



image 6 b



image 6 c



image 7 a



image 7 b



image 7 c

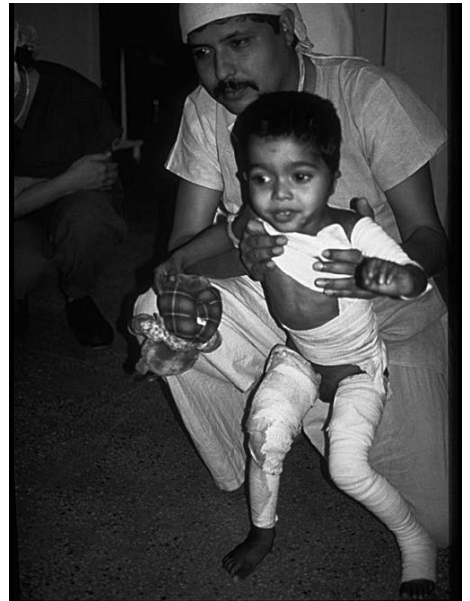
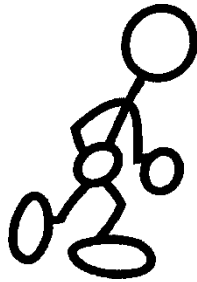
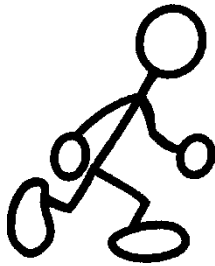
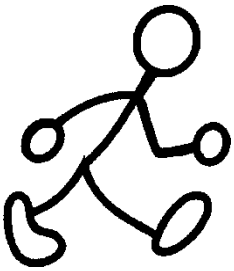


image 7 d

## CHAPTER 8

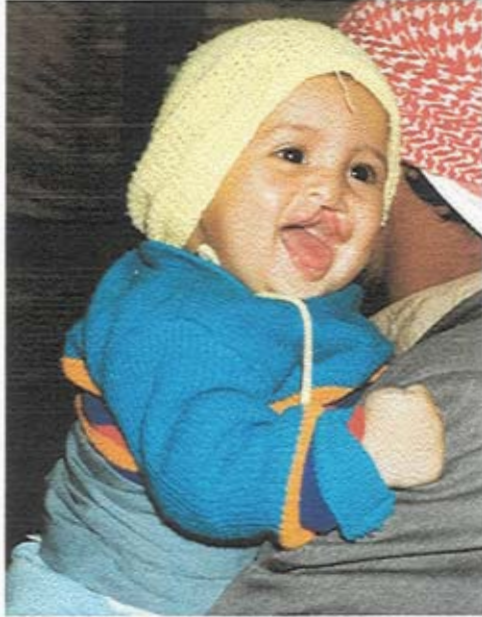


## = CLOSURE CLEFT LIP =

**Aim:** the aim of closing a cleft lip is: creating a lip with acceptable appearance.

**Function** is the primary goal; this means the muscle repair has to be the first aim, the next aim is to produce a child who has a natural appearance, eats well and speaks without difficulty. The lip should look natural and symmetrical in whistling, talking, drinking and pouting.

**Operation:** all the various skin incisions for a unilateral cleft lip can give good results. There are a number of alternative operations that can be done to close a lip. The surgeon should use the technique that gives him (and the patient) the best result.



**Operation procedure:**

- A. After the drawing is made, local anesthesia is given (to prevent too much bleeding).
- B. The tissues are undermined and mobilized at each side of the cleft (the orbicularis muscle is divided from the dermal attachments and is divided from the alar base).
- C. This goes all the way up to the nose and toward the cheek, in order to lessen the tension when the wound is closed.



A



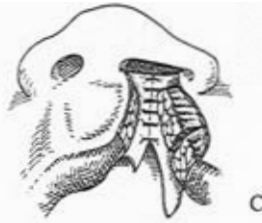
B



C



C. sutures for the mucosal and nasal floor repair.



D. both sides of the released musculus orbicularis oris are brought together and sutured with an absorbable suture.



E. closure of the skin with a Z-plasty. When there is too much skin, this is excised with a blade or sharp pointed scissors.



#### Necessities:

basic instruments  
suction  
cautery  
gauzes  
saline  
blade 15  
syringe 2 or 5 cc with 25 gauge needle  
local anesthesia (jungle juice)  
throat pack

ink  
sutures, for example: mucosa: 4/0 vicryl or 4/0 monocryl  
muscle: 4/0 vicryl or 4/0 monocryl  
skin: 5/0 vicryl rapide or 5/0 ethilon

If you are not sure which suture: asked the surgeon, just don't open any suture unless you are really sure!

(steristrips, not for every surgeon)

**Ointment in the eyes and plaster on the eyes before you disinfect. Disinfect in the eyes can cause serious problems!!!!!!!!!!!!!!!!!!!!**



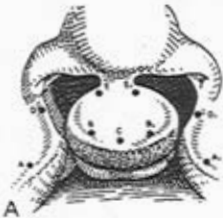
**= CLOSURE DOUBLE CLEFT LIP =**

Aim: satisfactory circular repair of the orbicularis muscle for a proper function of the upper lip with normal growth and development of the lip.



Operation procedure:  
starts with a throat pack, done by the surgeon or the anesthetist.

A. skin markings for bilateral lip repair.



B. excision of tissue.



C. prolabial skin and mucosa freed from the premaxilla and rotated forward.

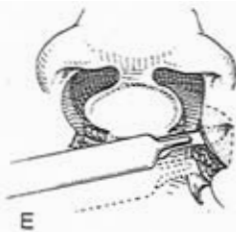


D. raising of an advancement flap of mucosa.





E. the muscle is freed from the skin and mucosa.



F. closure of mucosa.



G. repair of the orbicularis oris muscle.



H. the prolabial skin and mucosa are draped over the repaired muscle and sutured.



### Necessities:

basic instruments

suction

cautery

gauzes

saline

syringe 2 or 5 cc with 25 gauge needle

local anesthesia (jungle juice)

blade 15

throat pack

ink

sutures: for example: mucosa: 4/0 vicryl or 4/0 monocryl

muscle: 4/0 vicryl or 4/0 monocryl

skin: 5/0 vicryl rapide or 5/0 ethilon

If you are not sure which suture, asked the surgeon before opening anything!

(steristrips, not for every surgeon)

**Ointment in the eyes and plaster on the eyes before disinfecting!!!!!!!**



## = THE ABBE FLAP =

The principal indication for this procedure is a tight upper lip, which can result after (bilateral) cleft lip repair.

### Operation procedure:

The Abbé flap procedure transfers a full thickness wedge of the lower lip (containing skin, muscle, and vermillion border based on a narrow pedicle) to the upper lip. It is an axial pattern flap based on the inferior labial artery. In planning the lower lip flap, the pedicle should lie opposite the midpoint of the upper lip to allow it to insert without pull or distortion. No more than 30% of the lower lip can be used to transfer, otherwise the lower lip would become too narrow.



A. drawing and planning of the M-shaped Abbé flap with a pedicle opposite to centre point of the upper lip defect.



B. excising scar tissue in the upper lip and creating the recipient defect.  
The flap is raised on the inferior labial artery and rotated 180 degrees into place.



C. sutured in layers: mucosa, muscle and skin. The lower lip is closed in the same way.



D. division (cutting) of the flap 2 weeks later and completion of its insertion.

#### Necessities:

basic instruments  
 suction  
 cautery  
 blades 15 and 11  
 sutures: skin: 5/0 ethilon  
           mucosa: for example 4/0 vicryl  
           muscle: for example 4/0 vicryl



**Ointment in the eyes and plaster on the eyes to close the eyes during the operation!**

Steristrips (not for every surgeon)

In case the patient cannot breathe through his/her nose, you can use a piece of silicon drain or piece of an intubation tube with some vaseline on it and put it in one of the small openings of the mouth.

## = CLOSURE CLEFT PALATE =

Aim: the aim of surgery on palatal clefts, is to achieve normal speech, preventing air coming out of the nose during speech. This more important than perfect appearance or dentition.

Operation procedure: a V-Y Veau-Wardill palate repair (push back procedure).



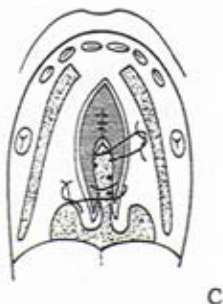
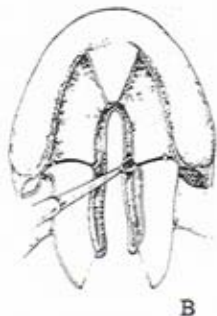
A. the defect showing the dotted lines of incision.



B. two mucoperiosteal flaps are raised, conserving the greater palatine arteries.



C. a cleft palate raspatory is used to free the nasal mucosa from the bony hard palate. The flaps are transposed medially and are joined in the midline with three layers of sutures.

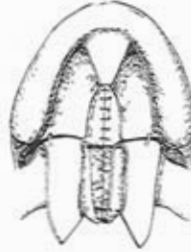


D. closure of the nasal floor.



D

E. the muscle is sutured in the midline as a separate layer.



E

F. the oral mucosa is closed.



F

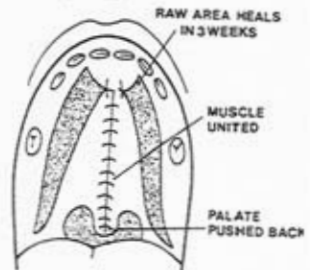
G. completed repair with gap left on either side of the hard palate, which may be left open or by some surgeons filled with a Whitehead's varnish pack.  
The raw area heals usually in two or three weeks.



G

#### Necessities:

- cleft palate set
- suction
- cautery
- gauzes
- saline
- 5 or 10 cc syringe
- (luerlock) and 23 gauge needle
- local anesthesia (jungle juice)
- throat pack
- blade 15
- (sometimes a hooked beaver knife)
- (sometimes tabotamp, in case it doesn't stop bleeding)
- ink
- (Whitehead varnish, (but not for every surgeon)
- suture: for example 4/0 monocryl with two needles.



**Ointment in the eyes and plaster on the eyes before disinfecting!!!!**  
**(some sterile vaseline on the lips before and after the operation)**



## = PHARYNGOPLASTY =

Despite technical improvement in the cleft surgery, there are quite a lot of patients postoperatively who speak with hypernasality (= too much air escaping through the nose during speech, because of a short soft palate).

The aim of a pharyngoplasty is lengthening the soft palate with a mucosa flap from the back of the pharyngeal wall.

Operation:

Some sterile vaseline on the lips, then the mouthgag is placed.

Local anesthesia is given.

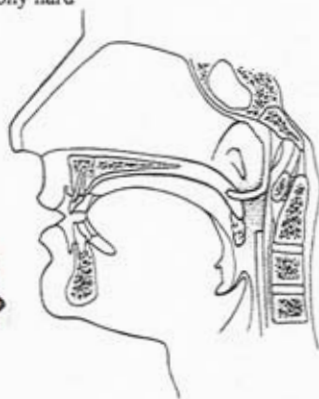
The pharyngeal mucosal flap is lifted from the back of the pharyngeal wall.

After inspection of the donor bed and if necessary, coagulation to control bleedings, the surgeon puts in a moist throat pack. This is to prevent blood coming in the airways and to aid hemostasis.

A push back incision is made and the soft palate released from the bony hard palatum.

The flap is sutured to the freed margin of the soft palate.

Closure of the palate.



### Necessities:

cleft palate set

suction

cautery

gauzes

saline

5 or 10 cc (luerlock) syringe and 21 (23) gauge needle

local anesthesia (jungle juice)

blade 15

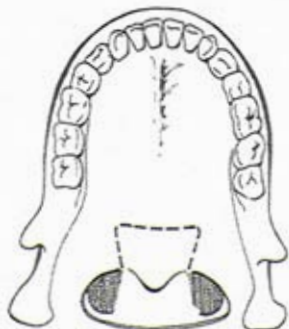
(hooked beaver knife)

ink

throat pack

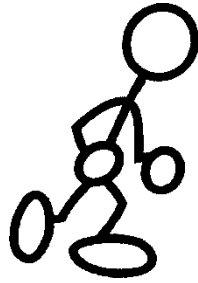
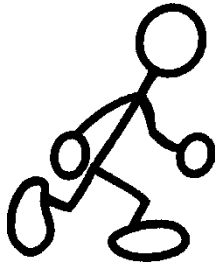
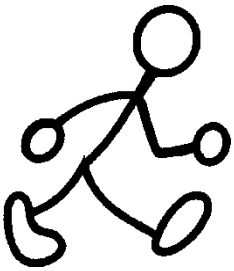
suture: for example: 4/0 monocryl with two needles or 4/0 PDS

sterile vaseline



Cranial view. The healed flap

## CHAPTER 9





## = SYNDACTYLY =

Syndactyly (two or more fingers grown together) and polydactyly (more than 5 fingers on one hand), are the most common congenital (means you are born with it) malformations of the hand.

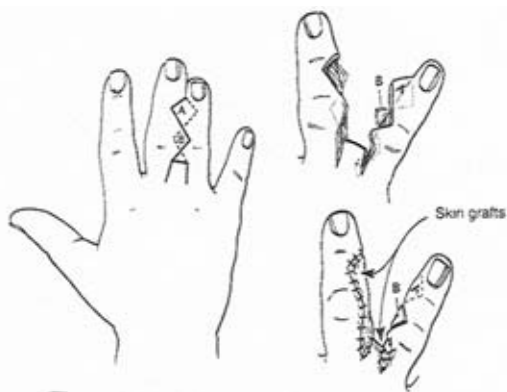
The degree of the deformity ranges from minor fusion of two fingers to complete fusion of all fingers.

It is very often familial, it can be on one or two hands and there can be webbing of the toes. Syndactyly can be part of a syndrome.

Separation of the fingers is done by division of the skin bridges and the resurfacing of the fingers is done with local flaps and full-thickness skin grafts, often taken from the groin.

On two fingers that are grown together, there is less skin, than on two separate fingers. Therefore a skin graft is always needed after separation of the fingers.





### Design and release of a syndactyly.

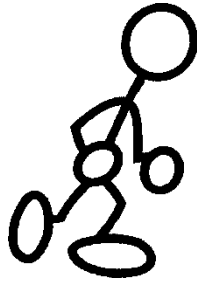
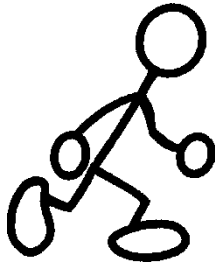
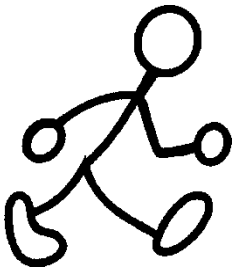
Release requires a full-thickness graft to at least one and sometimes on two fingers.

#### Necessities:

tourniquet  
 basic instruments  
 cautery  
 absorbable suture for children (for example 5/0 vicryl rapide)  
 gauzes  
 ink  
 blade 15  
 paraffin gauze  
 small piece of foam or cotton with furacin  
 cotton and bandage



## CHAPTER 10



## = SUTURES AND SUTURING TECHNIQUES =

A suture is a stitch used in surgery to approximate living tissues or structures until the normal process of healing is complete.

A ligature is a suture to encircle a blood vessel to prevent or control bleeding.

Ligatures and sutures are classified in two main groups:

1. Absorbable, such as: catgut, vicryl, monocryl.
2. Non-absorbable, such as: ethilon, prolene.

The strenght of all absorbable sutures is lost well before absorption takes place.

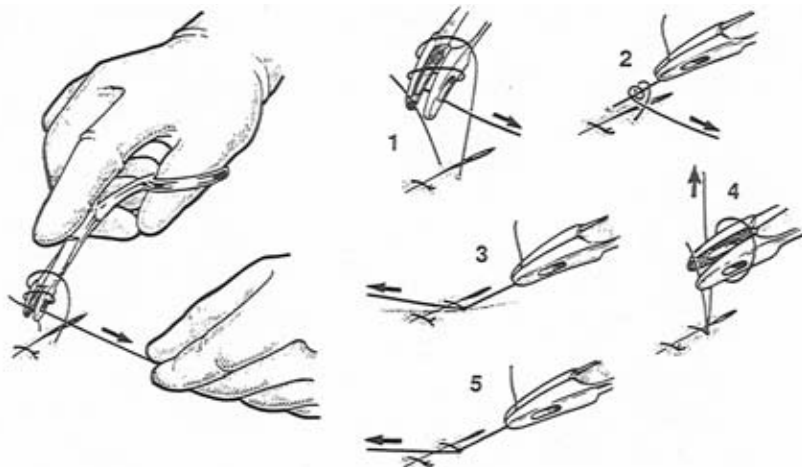
Some absorbable sutures lose their tensile strength relatively quick, for example: catgut and vicryl rapide. Others keep their tensile strength much longer, for example: p.d.s. and vicryl.

Sutures discribed as monofilament are made from a single strand or filament which is very smooth and passes easily through the tissues.



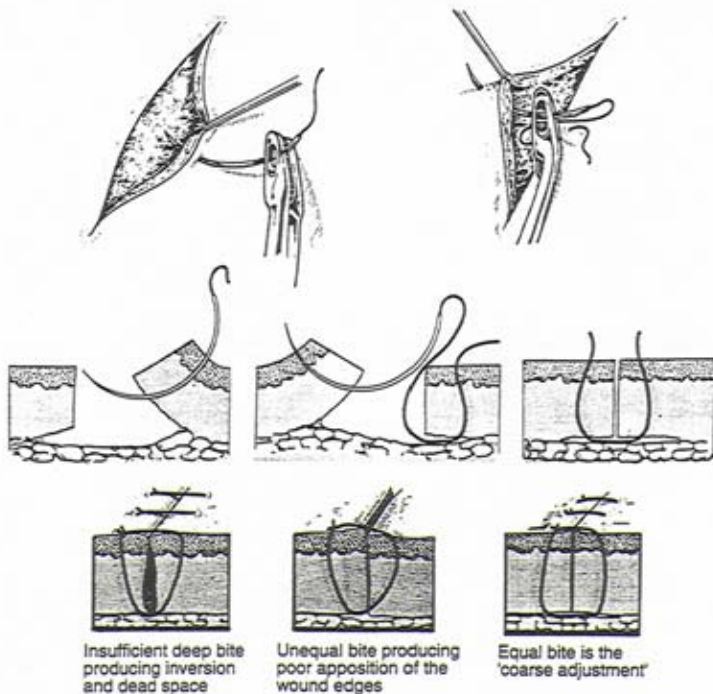
Multi filament sutures consist of several strands of material, twisted or braided together. These pass less easily through tissues. This problem can be reduced by coating the surface of the suture material.





Instrumental tying of a suture.

The more a wound is traumatised during suturing, the less good is the cosmetic result. Therefore suturing should be done as atraumatic as possible. Sutures should not be tied too tightly as slight oedema of the wound tends to develop for a short time after a wound is sutured. Tied too tightly, the suture cuts in more rapidly and is more likely to leave a suture mark (zipper).



= COMMONLY USED TYPES OF SKIN SUTURE =

There are several types of skin sutures:

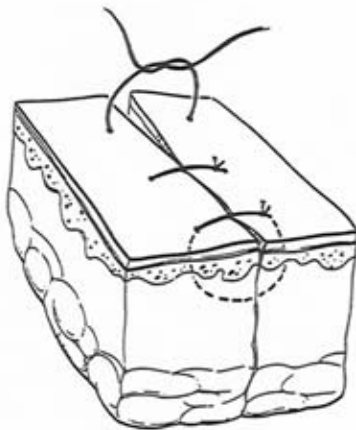
**1. Interrupted:**

A: Simple series of loop sutures knotted on one side of the wound

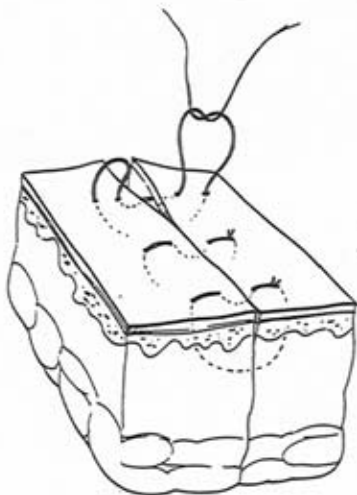
B: Vertical mattress suture

C: Horizontal mattress suture

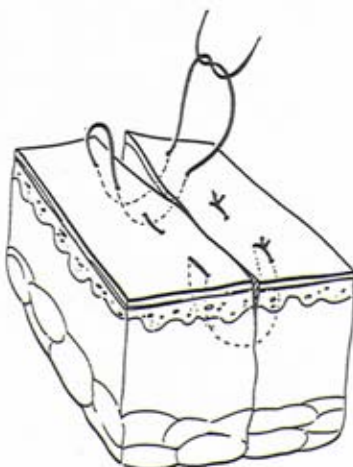
Simple interrupted skin suture.



Vertical mattress suture.



Horizontal mattress suture.



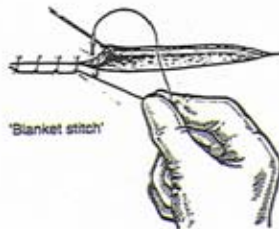
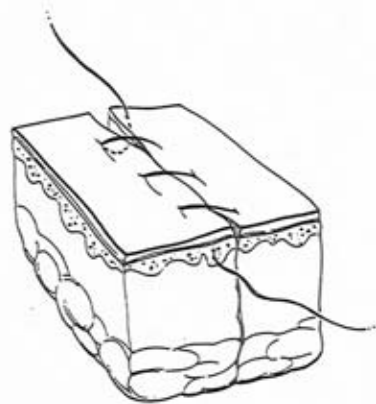
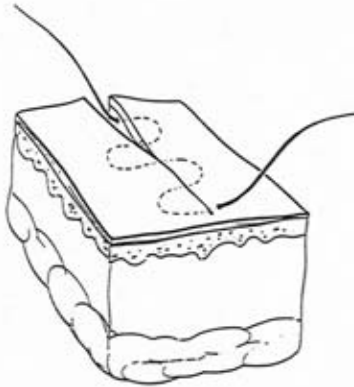
## 2:Continuous:

A:Intradermal continuous suture. This is a good method of skin closure, this technique avoids the risk of any skin suture marks.

B:Continuous over-and-over suture: rapidly done and hemostatic, it has the disadvantage of leaving suture marks and is not used in visible areas.

C:Skin staplers and skin clips: early removal is essential in visible areas to avoid permanent staple marks on the skin.

D:Tissue adhesive, not used by Interplast Teams.





## Subcutaneous



Buried absorbable suture  
with knot placed deeply

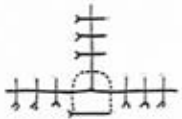
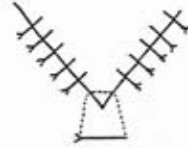
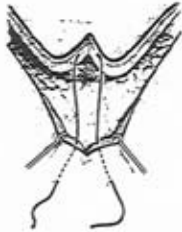
can be placed so as to eliminate any dead space, to reduce tension across the wound and to approximate the wound margins.



Suture strangulation  
causing flap tip necrosis



Incorrect placing of suture  
causing 'bunching' of the flap tip



Method of insertion and applications of the three-point suture

The three-point suture.



Dermal sutures are  
placed so that the knot lies in the  
depth of the dermis.

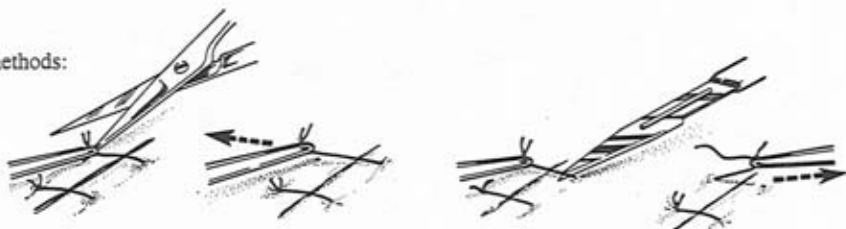
## =TECHNIQUE OF SUTURE REMOVAL=

Incorrect method:



Incorrect removal: the suture is pulled away from the wound.

Correct methods:













Correctly removed: the suture is pulled towards the wound.

The technique of suture removal, showing the use of a sharp pointed scissor and a blade nr.11.

Incorrect removal, pulling the suture away from the wound, causes added tension across the wound and may cause dehiscence of the freshly healed wound.

When you don't have a pair of sharp pointed scissors or you have a pair of scissors that don't cut very well, you can use a blade nr.11.

# ATRAUMATIC\* NEEDLES

NEEDLE TYPE	POINT GEOMETRY	DESCRIPTION	USE
Taper Point		Round shaft, straight or curved, tapered point, no cutting edge	Soft tissue closure such as gastrointestinal, fascia, vascular and most soft tissues below the skin surface
Penetrating Taper		Taper body with finely sharpened point. Optimum penetration with less tissue wound	Ligaments, tendons, calcified, fibrous and cuticular tissue. Mostly used for vascular, thoracic, plastic, OB/GYN and orthopaedic surgery. Excellent penetration through synthetic grafts and scar tissue during repeat surgeries
Blunt Point		Taper body with a rounded point, no cutting edge	Primarily for liver repair or other friable tissues where neither cutting nor piercing properties are desirable. Also used in parasternal closures
Protect*point		Taper body with a blunted point, no cutting edge	Used primarily in fascia and mass closure to minimize the potential of needle sticks.
Reverse Cutting		Triangular point with cutting edge on the outer curvature	Skin closure, retention sutures, subcutaneous, ligamentous or fibrous tissues
Cutting Taper		Reverse cutting tip with taper shaft. Similar to DT series	Used in microsurgery for excellent penetration through tough tissue, i.e., vasovasostomy, tuboplasty, etc.
Hand-Honed Reverse Cutting		Same as reverse cutting, but hand-honed for added sharpness	Primarily used in plastic surgery for delicate work and where a good cosmetic result is a concern
Scalpel Side Cutting		Two cutting edges in a horizontal plane	Ophthalmic surgery for muscle and retinal repair. Also used for delicate eyelid and/or plastic surgery. Cutting edges "ride" along scleral layers
Regular Cutting		Triangular point with cutting edge on the inner curvature	General skin closure, subcutaneous tissue, sometimes for ophthalmic surgery, plastic or reconstructive surgery
Lancet Point		Spatula needle with the cutting edge on the inner (lancet) curvature	Ophthalmic and microsurgery

THIS IS THE END OF THE JOURNEY  
THROUGH THE LAND OF PLASTIC SURGERY.  
ME AND MY CAMELS WILL GO ON.  
THERE ARE MORE PLACES TO SEE IN THE LAND  
OF PLASTIC SURGERY.  
WE HOPE TO MEET YOU AGAIN  
ON THE NEXT JOURNEY  
AND THAT YOU HAVE ENJOYED THIS ONE.





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