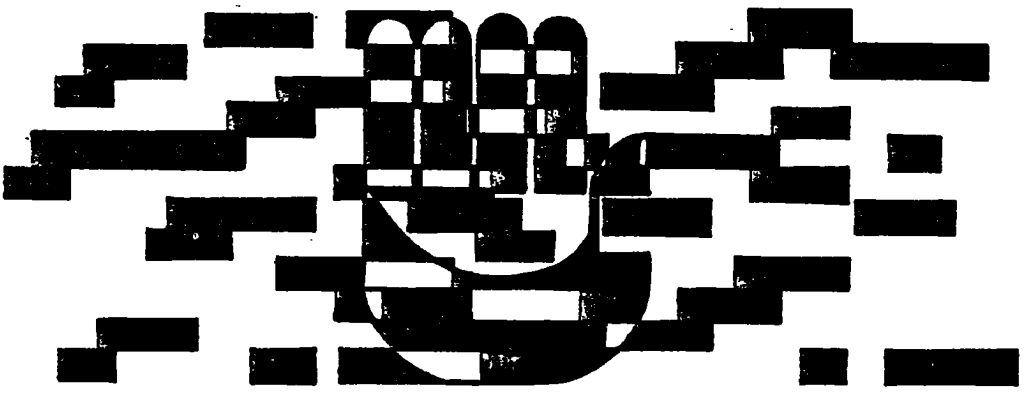
2-3 Apr. 1991.

MEDUNSA

SASSH

1991 REFRESHER COURSE



PROCEEDINGS

PREFACE

This fourth Refresher Course which is held under the auspices of the South African Society for Surgery of the Hand and MEDUNSA, aims to bring the information to you in the most practical way. The lectures contained in these proceedings reflect the opinion of the invited speakers, and not necessarily that of the SASSH.

Our sincere thanks to all the speakers who agreed to share their experience with those interested in hand surgery and therapy.

To all the organisers we would like to extend our sincere gratitude, particularly Mrs Mariette Steyn and Dr Jan Venter. Also a word of thanks to Janet Exter for the design of the cover page.

The kind support and participation of the exhibitors is greatly appreciated. We would like to acknowledge the following contributions which made this course possible:

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INDEX

SURGICAL TEATMENT OF CARPAL TUNNEL SYNDROME

DR R RAJOO : ORTHOPAEDIC SURGEON - TONGAAT

Carpal tunnel syndrome, the most common compression neuropathy of the upper extremity, was noted as early as 1863 by Sir James Paget.

a. SYMPTOMS

* Weakness, clumsiness of hand
* Hyperaesthesia/paraesthesia in distribution of median nerve
* Aggrevation of symptons if hand is used
* Pain in wrist/forearm
* Awakening from sleep with numbness and burning sensation
* Occasionally shoulder, upper arm pain.

b. INCIDENCE:

Female to male varies from 2:1 to 4:1
Age : 40 - 60 years
Both hands in majority, but dominant hand more.

c. DIAGNOSIS

85% certain with clinical assessment

* Phalen's test positive 80%
* Tinel sign positive 60%
* Sensory findings, eg. paraesthesia, numbness
* Nerve condition can be used. Prolonged motor or sensory conduction (usually at 3-5m per seconds may indicate tunnel syndrome. Sensory delay is more sensitive. Increase in latency in 90% of cases.

d. CONDITIONS ASSOCIATED WITH CARPAL TUNNEL SYNDROME

* OA first carpo-metacarpal joint
* Mucous cysts DIP joints
* Trigger fingers
* Heberden nodules

e. TREATMENT

i Conservative

a. Splinting. A dorso ulnar splint for 3-4 weeks; then night splint for 3-4 weeks

b. Local anaesthetic and steroid injection

c. NSAIDS/diuretic drugs/systemic steroids

ii Surgery

Indicated when conservative treatment fails, except in cases which are self limiting, eg. in pregnancy where the symptoms usually regress rapidly after delivery.

f. ANATOMY

Floor

Room

Contents

Variations

g. OPERATIVE TECHNIQUE

Basic procedure is release of transverse carpal ligament under tourniquet control and adequate anaesthesia. The incision is begun distally at distal border of ligament (level of the outstretched thumb), crossing the base of the palm in a zig-zag fashion ulnar to the long axis of the ring finger. The incision continues for approximately 3cm proximal to the wrist crease. In the forearm the superficial fascia is identified and divided. The ulnar border of the median nerve is identified and using Mac Donalds, the median nerve is protected and the ligament is divided. Division of the ligament is done in layers, dividing first the palmar fascia, then the transverse carpal ligament throughout its

course. This is sectioned under direct vision on the ulnar side of the median nerve. Release is complete when no more transverse fibres of carpal ligament is visualised. Following release, exploration of the motor branch is done. If it is transligamentous then the branch should be freed from its course. Following this the carpal tunnel is gently explored for any space occupying lesions, by gently retracting the tendons. The nerve should then be assessed and an epineurolysis performed without lifting the nerve off its bed. Advantage of this procedure is that if performed properly under magnification and using microinstrumentation, this is a "fasciotomy" for the nerve and internal fibrosis of the nerve can be visualised. If no additional surgery of the median nerve is anticipated, then the skin only is carefully approximated.

h. POST OPERATIVE

The wrist is immobilised in a light dorsal splint for 1-2 weeks. Finger flexion and extension should be encouraged.

i. RESULTS

Usually immediate improvement in pain and sensibility followed by a slight decrease at 1 week, then a gradual return to normality in 8-12 weeks. Patients with axonotmesis are anticipated to have advancing Tinel. If severe, motor and sensory signs may take longer to improve and recovery may be incomplete. Delay in decompression greater than 6 months is associated with a lower incidence of recovery.

j. INTERNAL NEUROLYSIS (ENDONEUROLYSIS)

Not routinely done

i Indications:
* Atrophy of thenar muscles
* Constant loss of sensibility in median nerve distribution
* Deterioration of light touch and 2 point discrimination

* Severe causalgia of median nerve
  (usually associated with trauma)
* Neuroma in continuity

ii Risks:

Destruction of interfascicular plexus and vascular damage due to interference with capillary network.
The more proximal the neurolysis the greater the risk, as plexus is less distally.
Magnification 3.5 - 7 times.
Limited to the nerve at most affected area, and only to the branches involved.

k. COMPLICATIONS

* Incomplete recovery
* Painful scar
* Damage to nerve

Beware proximal sites of compression

- ligament of Struthers
- between 2 heads of pronator teres
- thoracic outlet syndrome.

A.236

TRIGGER FINGERS

DR J VAN WINGERDEN : PLASTIC AND RECONSTRUCTIVE SURGEON - PTA

Digital Flexor Stenosing Tenosynovitis (Finger or Thumb)

Distinguish between acquired and congenital
Distinguish between primary and secondary, especially due to rheumatoid arthritis.

I. Adult presentation - the initial treatment

1. Rest by splinting; limit activity
2. Anti-inflammatory agents
3. Treat/control associated diseases, i.e. RA, gout, DM, OA)

II. Adult: non-rheumatoid additional conservative management.

Prerequisite - recent onset (few weeks)
- "locking" absent

Method: a. Intra-synovial steroid injection
Betamethasone, eg. "Celestamine"
b. Sterile precautions; #25/#26 needle obliquely into tendon sheath
c. Withdraw - inject 0,5 - 1ml
d. Splint in extension
e. Repeat once only, PRN after 3-4 weeks

III. Adult: non-rheumatoid surgical treatment

1. A1 pulley release
a. Local/regional anaesthesia; tourniquet
b. Oblique/transverse skin incision over pulley
c. Identify - retract- preserve both digital

nerves

d. Precise release of A1 pulley only (on radial side) (#11 blade, 15mm)
e. Confirm release, hemostasis, close tenotomy (7-0 absorbable suture)
f. Full ROM exercises within 2-3 days

2. Reduction flexor tenoplasty for bulbous flexor tendon enlargement <u>distal</u> to A1 pulley.

a. Bruner incision at PIP joint
b. Locate bulbous hypertrophy
c. Excise C2 pulley - expose tendon
d. Lateral epitendinous incision and retract
e. Excise central core of tendon; close tenotomy (7-0 abs)
f. ? Long acting steroid in wound

IV Adult : Rheumatoid disease - <u>surgical</u> management

a. Bruner incision up to DIP joint
b. Tenosynovectomy
c. Manipulate stiff joints gently
d. Resect ulnar slip of FDS if necessary
e. Preserve <u>all</u> annular pulleys to prevent:
- deviation of finger toward midline
- increased anterior MCP subluxation tendency
- bowstringing
f. Early postoperative motion (day 2-3)

<u>CONGENITAL PRESENTATION</u>

1. Present at birth (25%); also later in childhood (75%)
2. Bilateral 25%
3. Usually thumb but could be any/multiple digit(s)
4. Presents with fixed abnormal stance in flexion/extension

Treatment:

1. Differentiate - isolated deformity
   - part of malformation syndrome
   - from other "clutched thumb" anomalies
2. Spontaneous resolution : 30% if present at birth
   10% if identified later
3. Surgical treatment if not resolved between 1 and 3 years of age
4. General anaesthesia
5. Identify - retract - preserve both digital nerves
   Note vulnerable position of lateral (radial) digital nerve to thumb
6. A1 pulley release

A.114

OSTEO-ARTHRITIS CARPO-METACARPAL JOINT

DR DAN MARAIS: ORTHOPAEDIC SURGEON - PRETORIA

Common condition - most often post-menopausal women.
Always attempt conservative treatment before considering surgery.

SURGICAL TREATMENT

a. With instability but no osteo-arthritic changes
b. Arthroplasty
   - i Arthroplasty with rolled tendon graft (tendon interposition arthroplasty)
   - ii Silicon replacement arthroplasty
   - iii Hemi-arthroplasty
   - iv Swanson big toe prosthesis
c. Arthrodesis
   - i Cup and cone arthrodesis
   - ii V-shaped arthrodesis
   - iii Arthrodesis with bone-graft and others

DANGERS AND PITFALLS

1. Vascular
2. Superficial (sensory) branch of radial nerve
3. Assess joints proximal and distal
4. Reinforce soft structures

COMPLICATIONS

a. Arthroplasty
   - i Unstable
   - ii Reaction to silicone rubber
   - iii Fractured prosthesis

b. Arthrodesis
   i Non-union
   ii Unacceptable position (mal-union)
c. Infection
d. Vascular complications
e. Sympathetic dystrophy

ANALYSIS OF PROCEDURES

Arthrodesis against arthroplasty

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OSTEOARTHRITIS, HEBERDEN'S NODES & MUCOUS CYSTS

OF THE DIP JOINTS

DR J YOUNGLESON : PLASTIC SURGEON - DURBAN

Osteoarthritis of the DIP joints of the fingers tend to stiffen with time and form a pseudo-arthrosis. The following operations would be considered:

1. The persistent, painful joint may be arthrodesed.

2. Heberden's Nodules as such make only a cosmetic problem.

3. A mucoid cyst of the joint presents as a ganglion, a synovial sinus, or as a disruption of the nail plate causing a groove in the nail. Treatment of these complications will be discussed.

A.230

DE QUERVAIN'S DISEASE

PROF U MENNEN: ORTHOPAEDIC SURGEON - MEDUNSA

DEFINITION

De Quervain's disease is a stenosing tenosynovaginitis of the first dorsal compartment of the extensor retinaculum which carries the abductor pollicis longus and the extensor pollicis brevis tendons to the thumb.

PATHOLOGY

The etiology for the synovitis is usually unclear but can sometimes be atributed to overuse of the thumb in the abducted and extended position. It is sometimes seen with young mothers nursing babies.

DIAGNOSIS

The patient complains of pain directly over the first compartment which is usually hard. Crepitus can be found on palpation when the thumb is moved. This usually elicits pain directly over the tunnel. The Finkelstein test is usually positive.

DIFFERENTIAL DIAGNOSIS

Neuroma of the sensory branches of the radial nerve, arthritis of the first carpo-metacarpal joint and scaphoid pathology.

TREATMENT

The majority of patients will respond to non-surgical management consisting of local steroid injection and splinting. 5cc of a local anaesthetic plus 1cc of "Celestamine" ("Celestone") is injected proximal to the tunnel. Care is taken not to inject into

the tendon itself. Most of the time one can see a sausage-like swelling developing as the injected mixture moves through the tunnel and presents on the distal aspect. A second injection may be considered under exceptional conditions and only eight weeks after the first injection. Tendon rupture can occur with repeated or intra tendonous injections. Should the first injection fail, surgery is indicated.

OPERATIVE TECHNIQUE

This is a simple procedure which gives immediate relief. However, it is very important to note a few possible pitfalls.

The procedure can be done under general anaesthetic or regional block. A pneumatic tourniquet is used after exanguination of the arm.

A longitudinal incision or transverse incision is made over the hard swelling which can be palpated through the skin about two centimeters proximal to the radial styloid process. Once the incision is made through the skin, it is very important to identify the fine branches of the radial nerve. These should be retracted carefully to expose the tunnel. The tunnel is incised on the dorsal aspect leaving a palmar based flap. If synovitis is present, a limited synovectomy may be done. The second important point to remember is that one very seldom finds only two tendons. Any number of tendons, up to seven, can be found in this compartment. The compartment can be divided into two, or even more sub-compartments by septae which have to be released as well. The sub-compartments may lie deeper than the obvious superficial one, and this has to be excluded. One may sometimes find a muscle belly which extends up to the entrance of the compartment and may be a cause of pain as it abuts against the entrance of the tunnel.

The skin is closed with fine sutures and a radial plaster cast splint is applied for ten days. The patient is encouraged to move all the other fingers.

COMPLICATIONS

1. Damage to the sensory branches of the radial nerve may cause neuoromas which are extremely painful. If damage to the branches are noticed during the operation an immediate suture is advised to prevent neuroma formation. If however, a neuroma is formed at a later stage, I would excise the neuroma and resuture the nerve.
2. Persistent symptoms. This may be caused by either an incomplete division or unrecognised sub-compartment. One should also exclude the conditions under differential diagnosis.
3. Tendon sub-luxation. This may be an annoying problem for those who abduct their thumbs widely, such as in piano players. It is for this reason that the tunnel should be divided on the dorsal aspect, leaving a palmar based flap to prevent subluxation.
4. Hypertrophic scar formation. This problem could be minimized by subcuticular sutures, a minimum of ten days full immobilization and release of incision tension by using steri-strips across the incision. A painful scar may need some scar massage and ultrasound. Under certain conditions a z-plasty of the scar may alleviate the problem.

A.222

GANGLION

DR KEN PRETORIUS: ORTHOPAEDIC SURGEON - CAPE TOWN

Ganglions occur on the hand and wrist, and represent the major cause of soft tissue swelling in the hand and wrist, accounting for approximately 50-70% of all such swellings. The soft tissue swelling arise from fairly specific regions in the hand and wrist, and the most common are those attached to the dorsum of the wrist, the volar aspect of the wrist and the volar aspect of the flexor sheath of the annular I and II pulleys of the fingers. They are also found to a very much lesser extent in the distal interphalangeal joints of the fingers associated with Heberdens nodes, and also in the bases of the 2nd and 3rd metacarpal joints in the area of the insertion of the extensor carpi radialis longus and brevis tendons. Occasionally they may also be found in the Guyon canal and carpal tunnel, causing nerve compressions. These swellings have never been reported as malignant.

They may very often be confused with synovial thickening of the dorsum of the hand, but careful examination will reveal the difference. The synovial thickening will dimple on extension of the finger, showing clearly that the synovium is attached to the extensor tendons and retracts with it on the excursion of the tendon. The ganglion is not affected by finger movements.

The dorsal ganglion has been traced to a specific point on the dorsum of the wrist, namely the scapho-lunate articulation and any ganglion in the dorsum of the wrist should be traced back to this articulation. Failure to do so, and failure to excise a portion of the dorsum capsule will result in a recurrence of this ganglion in a short time following surgery.

The recurrence rate is approximately 30% and can be markedly reduced if an excision of the dorsal capsule is meticulously done and all connection between the scapho-lunate articulation and the dorsal capsule is eliminated.

There has been a suggestion by Kirk Watson that a rotary subluxation of the scaphoid may be simulated by too generous an excision of the scapho-lunate interosseus ligament. He also suggests that the cause of the ganglion, whether dorsal or volar, is in relation to the scapho-lunate or scapho-trapezium articulation, and that abnormal stresses in these areas are related to these two specific ganglia. Repeated trauma is a cause in a significant number of cases. Conservative treatment is not successful as a rule, and recurrences occur frequently.

Ganglions are definitely related to stressful activities, and enlarge with such activities and subside with rest. They may spontaneously enlarge, rupture and disappear, or enlarge rupture and re-occur. Ganglions should be excised if they interfere with function, and are cosmetically unacceptable.

Surgery of a ganglion is not an undertakening to be relegated to the end of a list under less than ideal circumstances. Adequate anaesthesia, full theatre facility and tourniquet exanguination are required. Adequate exposure is mandatory, and if the ganglion is large and threatens to rupture, it is better to aspirate this ganglion. This will greatly facilitate following it to its base and excising the base without a constant threat of rupture. When traced to the volar or dorsal capsule, it should be excised to a depth of 3 or 4mm so that intra-articular extension of the ganglion may be searched for and excised.

It is not necessary to close the capsular defect, and indeed any closure of the capsule defect very often results in a stiffness of the wrist articulation post operatively. Special care should be taken with the excision of the volar ganglion, as it is often in intimate relationship with the radial artery. One should, prior to surgery of a volar ganglion, be aware of the presence or absence of an ulnar artery, by performing Allens test. If an absent ulnar artery is found, the radial artery should be subjected to extra special care when dissecting close to it. It might be

necessary to leave a portion of the ganglion attached to the artery rather than risk damage to the artery by trying to shell it off.

The dorsal ganglion is very often in intimate relationship to the terminal branches of posterior interosseus nerve endings, and it is better to do a formal section of the posterior interosseus nerve proximal to the wrist level in order to avoid painful neuromata in this area post operatively.

Limited surgical procedures such as needle rupture, aspiration of the ganglion material and infiltration with steroid and forcible rupture of the ganglion are methods which are followed by limited success and very often result in speedy recurrence of the ganglion. This may however be attempted after the situation has been explained to the patient, and he has been notified of the possibility of recurrence.

Procedures such as transcutaneous fixation of the ganglion with suture material have been periodically reported in the Journals, but is not recommended.

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GAINT CELL TUMOUR OF TENDON SHEATH

PROF KS NAIDOO : ORTHOPAEDIC SURGEON - UNIVERSITY OF NATAL

This is one of the commonest tumours in the hand. Also known as gaint cell tumour, pigmented villonodular synovitis, xanthoma, fibrous xanthoma, histiocytic xanthomatous granuloma, plasma cell synovitis, benign synovioma etc.

It is a benign, encapsulated tumour of unknown origin. It is nodular and firm in consistency and is greyish-yellow or brownish-yellow in appearance. It arises from the white tissue of the hand, usually the tendon sheath or capsule of one of the IP joints. From its origin, it grows insidiously, extending through tissue planes and may present on one or other side of a digit or all around it. It burrows around tendons, surrounds the neurovascular bundle or displaces it and may cause pressure effects on bone. It is not <u>invasive</u> and is usually a painless swelling - hence the delayed presentation.

<u>Treatment</u>

Complete excision is necessary. The burrowing tendency of this tumour makes dissection difficult - but complete excision is possible because this tumour <u>does not infiltrate</u> other structures. A longitudinal approach is necessary and may be extended as required. Careful, systematic dissection is then carried out on the volar or dorsal aspects or both, and even around the digit. The neurovascular bundle should be identified early in normal tissue and then carefully mobilised. Sometimes currettage is necessary to complete the excision.

A.253

DUPUYTREN'S DISEASE

DR DAN MARIAS: ORTHOPAEDIC SURGEON - PRETORIA

"It is a challenge, not a blessing" (LD Howard)
With the present state of our knowledge, treatment remains empirical.
Many types of surgery are advocated, all with apparent success (McFarlane).
Treatment is based on training, technical skill and personal experience.

Know your anatomy - disease of fascia on the palm and digits

Medical recording
Most important, sketch of the hand. Howard says one picture equals one thousand words.

Measurement of limitation of motion. Neurovascular examination as well as intrinsic and extrinsic function. Check for Peyroni's and plantar nodules.

Discuss in detail nature of disease, complications - surgery not without risk.

Indications for surgery:
Never operate on a single nodule, band or pitting with rare exceptions.
Only with MP and PIP contractures.

Surgical procedures:
1. Fasciotomy only
2. Fasciectomy - total or local
   a. McCash
   b. Transverse or longitudinal incisions or both
      Leave as much fibro-fatty tissue as possible.

Identify neurovascular bundle
Always use four (4) power magnification with bi-polar coagulation.

Specific procedures:

1. MP-contractures
2. PIP-joint contraction
3. Disease of the little finger
4. Multiple finger disease
5. Recurrent contracture
6. Knuckle-pads

Post-Operative management:

1. Remove tourniquet
2. Elevate hand. Flush with saline. Use bi-polar
3. ? Drain. Loose dressings
4. Dorsal or volar plaster-of-Paris slab in extension.

Complications:

1. Damage to neurovascular bundle
2. Haematoma
3. Skin loss
4. Infection
5. Late complications:
   a. Joint stiffness
   b. Reflex sympathetic dystrophy - Sudeck's of bone

A.206

TENNIS ELBOW

DR JOHN FLEMING: ORTHOPAEDIC SURGEON - JOHANNESBURG

A tennis elbow is a partial tear of the extensor muscle mass inserting on to the lateral epicondular ridge of the humerus. It is caused by repetitive trauma of either a major or minor nature. It is a major problem to its hapless victim. This may be cured by rest, but most sportsmen are constitutionally incapable of providing this basic element of healing.

Splintage in one form or another which takes the strain off injured muscle is very effective. Rebuilding the power of the injured muscle is only possible in mild cases, or once the form of inflammation has settled because the presence of pain prevents the patient from doing his exercises. Physiotherapy is excellent in the early stages, either using cross frictional massage and ultrasound plus a variety of other modalities, such as laser. The backbone of the treatment is the cortisone injection supplemented by anti-inflammatory tablets. If the cortisone is placed correctly into the site of the muscle tear it seems to reverse the inflammatory process, remove the pain and either cure or allow the patient to develop a remission. It is often required to repeat this injection and it would be reasonable to do this on three occasions only.

Finally, and for a very small proportion of cases, those patients with either severe pain or resistent to intertendonous injections of Depomedrol, a surgical release of the extensor tendon on the lateral epicondular ridge works wonders.

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HAND SPLINTING: BASIC PRINCIPLES

CORRIANNE VAN VELZE: OCCUPATIONAL THERAPIST - MEDUNSA

INTRODUCTION

The proper use of hand splints is considered an essential part of the management of patients with an acute or chronic disease or injury of the hand and upper limb.

It is important that there is an excellent line of communication between surgeon and the therapist with extensive instruction to the patient not only with regard to splint use, but also to the objectives of splinting.

It should be stressed that although patients may have similar diagnoses, no two patients have identical splinting requirements. It is therefore imperative that splints are individually designed and fitted, using the principles of mechanics, fit, construction and design.

Who makes the splint is not really important - what is most important is, that if a patient needs a splint, he is provided efficiently and speedily with one that is both functionally and physiologically sound.

Principles of hand splinting

When splinting a hand, external forces are applied to it. It is therefore necessary to keep certain mechanical principles in mind to ensure that the splint is strong enough; does what it is supposed to do and also does not cause the patient too much pain or discomfort.

- Wider, longer splints are more comfortable and durable than short narrow ones. When a segment is being splinted the splint should extend approximately 2/3 of its length and be contoured to half its width.
- Rolled edges on the proximal and distal aspect of a volar splint and the distal aspect of a dorsal splint, cause less pressure than straight edges.
- Continuous uniform pressure over a bony prominence is preferable to unequal pressure on the prominence.
- If some splint components need to be narrow and the resultant force is great, a contiquous fit is necessary.
- Splints with a greater mechanical advantage will produce less proximal force, resulting in diminished pressure and increased comfort.
- As many splints make use of the 3 point pressure system, it is important to remember that the middle opposing force will be of greater magnitude that the force at either the proximal or distal end of the splint. Therefore the straps used over this area should be wide, in order to spread the pressure over a larger area.
- Friction can occur between the splint and the extremity. This usually indicates poor fit, improper joint alignment or inefficient fastening devices. Friction may cause skin trauma and if not eliminated, the splint can do more harm than good.
- If a splint is shaped in a trough, it automatically increases in strength. Use this principle to increase strength in an area of high stress (eg. at the wrist).
- Keep anatomical considerations in mind, eg:
  * Accomodate bony prominences
  * Maintain the arches of the hand
  * Use skin creases as boundaries for your splint.
- When making a splint, always mould it in the position in which it will be worn, eg. do not mould a splint with the forearm in supination - patients will <u>never</u> walk with the forearm in supination, always in pronation.

CONCLUSION

Failure to adhere to the principles of splint construction may result in splint disuse because of patient discomfort, splint breakage or more important, failure of the splint to correct the problem for which it was designed.

The challenge is to create a splint that not only meets the functional objectives, but is acceptable and well tolerated by the patient.

REFERENCES

1. Fess EE & Phillips A. Handsplinting: Principles and methods. CV Mosby, St Louis: 1987

A.210

CLINICAL EXAMINATION OF THE HAND

DR KEN PRETORIUS: ORTHOPAEDIC SURGEON - CAPE TOWN

It is useful to make a few observations before beginning the examination of the hand, such as the position in which the hand is carried, the use of a sling or splint and the correct or incorrect application of the splint or sling. Also the overall protectiveness which the patient gives to the hand and the general disposition of the patient as a whole.

Very often useful information can be gleaned as the patient walks into the consultingroom and takes his seat prior to any examination being embarked upon.

It is essential to have a routine method of examination which covers all the functional elements of the different components in such a manner that any malfunction is recognised. This method must be followed rigorously regardless of obvious pathology encountered along the way. The following divisions should be covered:

1. The skin

   The quality of the skin, especially rigidity, thickness, atrophy, presence or absence of calosities and scarring. The pinch test on the dorsum of the hand will give information regarding the subcutaneous tissue judged by the time the pinched skin takes to return to normal. The absence or presence of flexor creases in the interphalangeal, metacarpophalangeal and wrist joints. The quality of the palmar skin, especially signs of puckering or pits. The mobility of the web space, and any scarring in the web spaces between the fingers. The presence or absence of sweating which will give an indication of the vasomotor activity and/or in the absence of sweat the presence of a peripheral nerve lesion.

In a sharp light the glistening sweat droplets can be seen, and dryness of the skin can very easily be noticed where it borders on normal sweaty skin.

2. Circulation

The colour of the skin is noted for paleness, redness or cyanosis. The nailbed is expressed and the filling time noted for distal arterial flow. The digital arteries are palpated at the base of each finger on the ulnar and radial sides.

Each finger is individually milked from distal to proximal, and then the digital arteries are compressed at the base of the finger, then released to note the time taken for the finger to regain its original colour. The radial and ulnar pulses are palpated at wrist level.

Allen's test is done whereby the fist is clenched and pressure is applied to the radial and ulnar arteries, and when the fingers are extended the radial artery is released while pressure is maintained on the ulnar artery, and return of colour is noted. The process is repeated, releasing the ulnar artery and compressing the radial artery. Venous return is noted and any minimal oedema is easily observed in the dorsum of the hand, especially and less obviously on the palmar aspect of the hand.

3. Sweating

The presence of hyper hydrosis or absence of sweating is noticed, and mapped out.

4. Fingernails

Useful information can be gained. Indentations will signify pressure on the growth plate area, as with a mucous cyst extruding from the interphalangeal joint. Beaking of the nail will result from insufficient support from the underlying distal phalanx or from adherent scars over the pulp area.

The presence of infection in the nailfolds can be observed and previous scarring with adherence of the eponychia to the nail itself. Subungual haematomata, foreign body or extremely painful areas relating to a glomus tumour can be localised. Previous trauma resulting in fragmentation of the nail and abnormal subcutaneous nailrests can be observed.

5. Bony landmarks

The following bony landmarks are palpable subcutaneously about the wrist area. The distal radio-ulnar joint is balloted manually to attempt to produce a dislocation which should not be possible. At the same time the proximal radio-ulnar joint is also tested to ascertain the position of the radial head. Each of the carpal bones can then be individually palpated, and if necessary drawn on the skin with a marking pen.

The scaphoid tubercle and lateral fascet in the snuffbox can easily be palpated. The lunate in its dorsal area can be palpated, and the scapho-lunate articulation observed. The triquetrum can be palpated distal to the ulnar styloid, and the triquetro-lunate articulation observed.

The following tests can be done on the three bones of the proximal row:
The scapho-lunate stress test where pressure is applied to the tuberosity of the scaphoid with the wrist in extension, and ulnar deviation, then bringing the wrist into flexion, and radial deviation. A sharp pain or click will be observed if the scapho-lunate joint is unstable, and the scaphoid is allowed to dislocate dorsally.

The Ballot test is when the triqetrum and lunate are firmly held and ballotted against each other. Normally this should not be possible.

The grind test is where the pisiform is firmly gripped and then pressed against the triquetrum and rotated producing crepitus if the underlying joint is degenerated.

The hook of the hamate can be palpated and also the articulating surface between the hamate and the bases of metacarpal IV and V. The capitate is the most difficult to palpate, but nevertheless the head of the capitate and its neck can be felt, and also the articulating surface between the head and metacarpal III. The trapezoid is palpated at the base of the carpal II deep to the insertion of the extensor carpi radialis longus tendon. Often there is a bossing present in this area, and a bursa beneath these tendons. The trapezium is easily palpated, as well as the trapezioscaphoid joint and the metacarpal I trapezium joint.

Once more a grinding test can be applied by pushing the metacarpal I down onto the trapezium and rotating the metacarpal to produce crepitus if degeneration is present. Telescoping of the metacarpal I to the trapezium producing pressure on the scaphoid can also elicit an ununited scaphoid fracture, if present.

The metacarpal bones can be visualised virtually in the length of each bone where they lie subcutaneously upon the dorsum of the hand.

Metacarpo-phalangeal joints are able to be abducted in the extended position, but are firmly fixed when flexed to 90 degrees due to tightening of the collateral ligaments. It should not be possible to angulate the flexed metacarpophalangeal joint, and if this is possible, then one of the collateral ligaments has been ruptured.

The PIP joints are stable in flexion and extension, as are the DIP joints. The range of movement of the wrist is 75 degrees extension, 65 degrees flexion, 20 degrees abduction and 30 degrees adduction.

The range of movement of the metacarpo-phalangeal joints is from 0-90 degrees, the PIP joints is from 0-110 degrees, and the DIP joints is from 0-80 degrees.

6. Tendons

On the dorsum of the wrist lies the extensor tendons in six fibro-osseus compartments. It is possible to examine each of these compartments, and each of the contained tendons in these compartments.

The flexor tendons are arranged so that the flexor carpi radialis passes through its own tunnel on the trapezium. The flexor carpi ulnaris lies with the pisiform bone as its sesamoid on the ulnar side of the wrist. The palmaris longis lies centrally and passes above the flexor retinaculum of the carpal tunnel, and the flexor digitorum sublimus and profundus and flexor pollicis longus passes through the carpal tunnel. An attempt should be made to examine each of the named tendons, with reference to excursion, locking, triggering or absence of movement. A stethoscope may also be used to elicit any crepitus in the area denoting a synovial thickening or abrasion.

The de Quervain tunnel is the first of the fibro-osseus tunnels of the dorsum of the wrist containing the abductor pollicis longus tendon and the extensor pollicis brevis. This area is notorius for an extra partition in its centre, resulting in entrapment of one of the tendons, and a synovitis of traumatic origin.

The Finkelstein test when the thumb is flexed into the palm of the hand, and gripped with the fingers while the wrist is put into forcible ulnar deviation, results in a very sharp pain in this area of the radial styloid which denotes a positive test and synovial irritation in the de Quervain tunnel. Another area of synovial abrasion is the flexor carpi radialis tendon, and this should be sought for and is very often missed as it passes into its tunnel.

Synovial thickening on the dorsum of the wrist is observed, and when the fingers are placed in extension, a dimple sign is noticed which will distinguish the extensor synovial thickening from a dorsal wrist ganglion which does not exhibit the dimple sign.

Triggering of the fingers and thumb is very common, and is a result of either synovial thickening, tendon thickening or sheath narrowing of the affected fingers. Synovial thickening of the flexor tendons as they pass through the carpal tunnel will result in median nerve compression symptoms with paraesthesias of the thumb, index, middle and ring fingers.

The flexor pollicis longus tendon should be tested by forcible flexing of the distal interphalangeal joint of the thumb. The profundus tendon of each finger should be tested by holding the PIP joint in extension and asking the patient to flex the DIP joint. Each sublimus tendon should be tested by holding the fingers not tested in extension, and asking that the finger which is to be tested, is flexed at the PIP joint.

Test for adherence of tendons upon the dorsum of the hand, or proximal to the wrist. Test for intrinsic muscle shortening. Localisation of extensor digitorum communis over the head of each metacarpal should be noted.

7. Nerves

It is useful to get into the habit of beginning any examination of the nervous system by enquiring and looking for a Horner syndrome. This draws attention to the possibility of a brachial plexus lesion and reminds one to examine each nerve individually.

a. The radial nerve.

The deltoid, triceps, brachio-radialis, extensor carpi radialis longis and brevis, supinator, extensor digitorum communis, extensor indicis proprius, extensor digiti minimi, extensor pollicis longus, extensor pollicis brevis and abductor pollicis longus.

The sensation of the dorsum of the hand, including the thumb, index, ring and middle fingers as far as the distal interphalangeal joints is tested. It is possible to palpate the radial nerve in the groove between the brachio-radialis at the elbow level in the radial tunnel and also in the spiral groove. Any scars in the region of the radial styloid should be noticed and damage to the superficial branches of the radial nerve.

The classical dropped wrist, fingers and thumb are signs of radial nerve damage in the lower arm area, and sparing of the wrist extensors and brachioradialis with paralysis of the extensors of the fingers and thumb indicate damage to the posterior interosseus nerve in the region of the neck of the radius.

b. The median nerve has no branches proximal to the elbow. The sensory distribution is the thumb, index, middle and half of the ring fingers on the volar aspect of the hand, including the thenar emminence on the palm.

The muscles supplied are the flexor carpi radialis, pronator teres, palmaris longus, flexor digitorum sublimus, thenar muscles and radial lumbricals. The radial half of the flexor digitorum profundus and the flexor pollicis longus are supplied by the anterior interosseus branch to the median nerve. Each of the abovementioned muscles should be examined, then decided whether the paralysis is due to a high or low median nerve injury.

Isolated injury to the anterior interosseus nerve will be noted by absence of the ability to pinch the thumb and index finger together in the classical nailpinch situation. The classical pointing sign is a result of a high median nerve lesion, whereas a low lesion will result only in paralysis of the thenar musculature.

c. The ulnar nerve

The ulnar nerve supplies sensation to the dorsum and volar aspects of the ring and little fingers of the hand, and also the palm and dorsum of the hand on the ulnar border. Each of these areas are supplied by different sensory nerves. The dorsal cutaneous branch of the nerve comes off proximal to the wrist level, and may be damaged individually and should be tested individually.

The motor supply of the ulnar nerve is the flexor digitorum profundus to the 4th and 5th fingers, and the flexor carpi ulnaris is in the forearm. The motor branch of the ulnar nerve in the palm supplies all the hypo-thenar musculature, the interossei and adductor of the thumb, as well as the flexor pollicis brevis.

A high ulnar lesion will result in paralysis of all the abovementioned muscles, a low lesion will affect only the intrinsic muscles of the hand. Muscle wasting will

be noticed with intrinsic paralysis and any intrinsic wasting should induce one to examine the eye for a Horner syndrome. This may point to a more sinister lesion in the apex of the lung, like a pancoast tumour involving the lower portion of the brachial plexus.

The classical lesion in the hand due to motor paralysis of the intrinsic musculature is clawing, meaning hyper extension of the metacarpo-phalangeal joints, with flexion of the interphalangeal joints. This occurs on the 4th and 5th fingers to a more marked extent, and to a lesser extent the 2nd and 3rd due to the lumbrical muscle being supplied by the median nerve, limiting the hyper-extension of the index and middle finger somewhat at the metacarpo-phalangeal joint.

There is a paradoxical abduction of the little finger due to paralysis of the abductor digiti minimi and the direction of the flexor and extensor long tendons being unopposed allowed abduction of the MP joint of the little finger.

The classical thumb sign is the Froment which is the inability to adduct the thumb, and the flexor pollicis longus is being utilised for this function. The Jeane sign is hyper extension of the metacarpo-phalangeal joint to the thumb simultaneously with Froment. This is actually a claw thumb position.

A.131

ULNAR NERVE PALSY

DR A MATIME: ORTHOPAEDIC SURGEON - MEDUNSA/GA-RANKUWA

INTRODUCTION

Ulnar nerve palsy produces significant functional disability in the involved hand.

The hand is clumsy, weak with loss of the "grasp rhythm", clawing and there is significant sensory loss.

AETIOLOGY

1. By far the commonest lesion is lacerations at the wrist and distal forearm, resulting in complete severing of the nerve.

2. Stab wounds and gunshot injuries to the arm.

3. Leprosy.

4. The various compression lesions, fractures and dislocations of the elbow.

THE PROBLEM

1. Loss of sensation : ulnar one and a half fingers, and the ulnar border of the hand.

2. Loss of propioception, which makes the ulnar nerve somewhat special.

3. Loss of ulnar intrinsics: interossei
   lumbricales (ring and little)
   hypothenar
   adductor pollicis
   deep head of flexor pollicis

brevis

4. Loss of FCU and ulnar half of FDP in high lesions.

TREATMENT

1. Explore and repair the nerve : preferably as a primary procedure, secondarily or nerve grafting.
2. Dynamic MP flexion splinting (more comfortable than the traditional "knuckle-duster"). This is done both pre- and postoperatively.
3. Intrinsic reconstruction by tendon transfers.
   * Over 85-90% of all adults will need these tendon transfers.
   * Should be done 3-6 weeks following nerve repair.
   * Zancolli type repair
     FDS p to p A1 pulley
     FDS r to r A1 pulley
     m A1 pulley
     1st dorsal interosseus.

     Where the long flexors were injured in the original laceration, we may consider one of the other procedures, using extensors.
   * Thumb MP fusion (occasionally IP fusion).
4. Rehabilitation by occupational and physiotherapists, with hand protected in a dynamic MP flexion splint up to 8-12 weeks. This rehabilitation program is <u>absolutely essential</u> if one hopes to achieve good quality results, and should not be overlooked.

In conclusion, with good and adequate early surgery, appropriate patient co-operation and motivation, and hard work from the therapists, we can greatly help to improve the lot of these greatly disabled patients, but should be humble enough to accept that we can never make that hand normal again.

A.141

RADIAL NERVE PALSY

DR N FREED : ORTHOPAEDIC SURGEON - PRETORIA

Radial nerve palsy usually follows blunt or sharp trauma to the nerve. Blunt trauma is most often associated with humerus fracture and gives rise to a high radial nerve palsy with loss of wrist extension and extension of the MP joints of the fingers, and loss of extension and abduction of the thumb.

Sharp injury to the nerve will give rise to a high or low lesion, depending on the exact site of injury.

Management of the nerve injury

All sharp injuries should be explored and the lacerated nerve sutured. Blunt radial nerve injuries are not routinely explored and spontaneous recovery is awaited which will occur within 6 weeks in more than 80% of patients with a fracture of the humerus and radial nerve palsy.

Initial management of the radial nerve palsy includes a wrist extension splint and maintaining full passive mobility of the fingers and thumb.

Tendon transfer for radial nerve palsy

Timing of the operation

These are done earlier than later and as soon as tissue equilibrium has been reached. The principles of tendon transfers are respected.

The standard transfer used at our institution is as follows:

1. Pronator teres to extensor carpi radialis brevis
2. Flexor carpi radialis to extensor digitorum communis including extensor indicis and extensor digiti-minimi
3. Palmaris longus to re-routed extensor pollicis longus.

Correct tension is critical to the success of this operation.

Post-operative management

The wrist is placed in 45 degrees extension, the MP joints in 45 degrees flexion with the PIP joints free to flex and the thumb is placed in extension and abduction. The POP splint is removed after a period of 3 weeks following which a removable wrist extension splint is used for a further 3 weeks. Full mobilisation is allowed after this period.

Tendon transfers for radial nerve palsy can be expected to give pleasing results with correct patient selection, operative technique and careful post-operative management.

A.267

MEDIAN NERVE PALSY

PROF KS NAIDOO : ORTHOPAEDIC SURGEON - NATAL

Median nerve paralysis may be classified into groups.

1. High Median Nerve Palsy: This includes:
   Sensory: Loss of sensation in the dominant part of the hand (radial three and a half digits).
   Motor : Paralysis of
   F.C.R
   P.T
   P.L
   F.P.L
   F.D.S
   F.D.P (index and middle)
   Thenar
   Lumbrical (index and middle)

2. Anterior Interosseus Palsy - pure motor paralysis invclving F.P.L and F.D.P (index and middle)

3. Low Median Palsy: combined sensory and motor loss
   Sensory : Radial three and a half digits
   Motor : Thenar muscles
   Lumbrical (index and middle)

Sensory loss following Median Nerve Palsy

The loss of median nerve sensation will result in severe impairment of hand function. This loss cannot be compensated even by skillful tendon transfers. This catastrophe can be prevented by selecting the correct initial treatment of median nerve lesions.

Sensory reconstruction

Free neurovascular island flap or free vascularised nerve graft can be done supplemented by visual substitution and re-education.

Motor loss following Median Nerve Palsy

The following tendon transfers can be used to overcome those functions lost by median nerve palsy.

F.P.L. Brachioradialis tendon
Brachioradialis must be mobilised adequately
Tension: perform anastomosis with I.P.J. of thumb in 20 degrees flexion with wrist in neutral.

Alternate transfer - E.C.R.L

Loss of F.D.P (index and middle) - side to side anastomosis (slightly tight) to FDP of ring and little fingers).

Opposition : Complex movement
Must familiarise with details

Choice of motors:

Low lesion : F.D.S ring finger
E.I.P

High lesion: E.I.P

Note: need for pulley or correct direction

Distal attachment: tendons of APB + EPL + expansion

Tension: Thumb must stand upright in full opposition with dorsum of hand and forearm lying flat on the table. Also the thumb must extend on flexing the wrist.

Note: Many alternate transfers and techniques available.

A.252

SENSORY REHABILITATION

MISS S GOWAN: CONTROL OCCUPATIONAL THERAPIST - JHB HOSPITAL

WHAT

A sensory rehabilitation programme is directed at helping a patient following peripheral nerve surgery to re-interpret the altered profile of neural impulses reaching the central nervous system, and so recover more than just protective sensation.

WHEN

The programme is introduced 5 to 6 weeks post surgery, provided no painful hyperaesthesia is present. In this case desensitisation is first carried out.

WHO

Patients following median nerve suture, digital nerve repair, replants and toe-to-hand transfers on the radial aspect of the hand.

HOW

The programme followed is based on that of Dellon et al.

a. **Early phase**

A blunt object, generally another finger or the eraser end of a pencil, is moved from proximal to distal along the length of the area being re-educated, for moving touch. The same blunt object is used to touch a given area with varying pressure for constant touch.

The patient first observes, then closes his eyes and verbalises what he is perceiving and again observes to confirm what he is actually perceiving.

b. **Late phase**

Started once moving and constant touch are perceived at the distal phalanx. Various sized hexagonal nuts, a square nut, 2 cap nuts and a grooved button are used.

For constant touch:
- present largest and smallest hexagonal nut
- patient asked to discriminate
- grade by decreasing the size difference of the nuts

For moving touch:
- roll square nut (sharp) and hexagonal nut (dull) along finger
- patient asked to discriminate

For pinch:
- present large cap nut
- patient asked to discriminate between flat and rounded side
- grade to smaller cap nut and grooved button.

All exercises are performed by the patient as with the early phase with eyes open, closed and open again. Sessions should take place in a quiet area and not last longer than 15 minutes. Three to five sessions a day are recommended, the patient should use the nuts like "worrybeads" and he should also be encouraged to participate in a variety of functional activities to give additional sensory bombardment.

This programme can also be combined with activities such as the identification of various shapes, textures and everyday objects.

Re-education is stopped when two point discrimination shows no further recovery or normal sensation is achieved.

A120

PARONYCHIA

PROF C BLOCH: PLASTIC SURGEON - CAPE TOWN

Paronychia implies an infection of the paronychium, i.e. fold surrounding the lateral borders of the nail. It may be localised to above the nail plate or below. Paronychia is either acute or chronic in nature.

Acute Paronychia

Infection arises in the perionychium, i.e. the nail bed (germinal and sterile matrix) and surrounding soft tissue (paronychium). It is usually caused by Staphylococcus aureus. The paronychia may take one of several forms:

1. An infection of the semi-circular perionychial space. If treated very early (before pus forms) this can be cured by antibiotics alone, e.g. Penicillin. If pus is present, then a small instrument eg. a probe or scissors can be used to lift up the cuticle and release the pus (fig 1). This may have to be repeated.

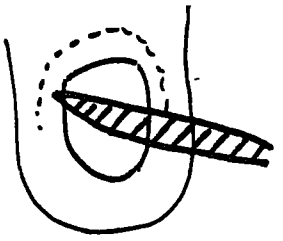
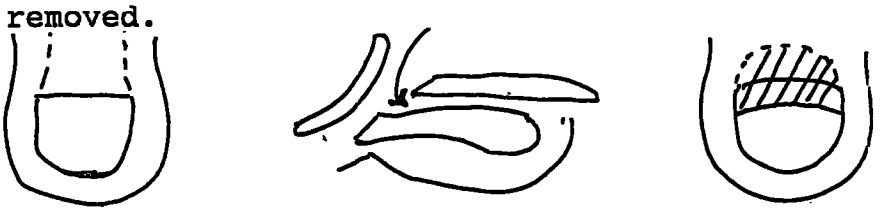


Figure 1

2. If the infection has spread more, the abscess must be deroofed by scissors and left open to drain. It is covered with a Betadine dressing. Antibiotics are unnecessary unless there is evidence of spreading infection, e.g. lymphadenitis or lymphaginits.
3. Sometimes, by the time the patient is seen, the pus has spread underneath the nail and the nail is floating on a sea of pus. Here it is necessary to remove the proximal nail

plate to allow drainage. Two incisions are made in the soft nail wall which is reflected back to gain access to the germinal cul-de-sac. The nail is lifted and the proximal portion removed.



Incisions Access Prox nail removed

The distal portion is left to prevent a painful nail bed. The proximal nail will regrow and displace the distal remnant. A Betadine dressing, changed at least daily, is all that is then required.

Chronic Paronychia

This is an entirely different disease entity from acute paronychia. The patient, usually a woman, presents with a long history of thickened, ugly and deformed nails which are often painful. The nails are ridged and heaped up. The causative organism is usually fungal, mainly Candida.

Thus the treatment is primarily non-surgical. An anti-fungal agent is given, e.g. Griseofulvin 500mg daily. This must be continued for some months as a new uninfected nail must grow out to replace the previous deformed nail. The patient must be told to keep her hands out of water, and if necessary, must wear rubber gloves. The fingers must be kept dry. Gentian violet 1% in alcohol is also applied along and under the nail fold twice daily using a small cotton bud to push back the cuticle.

If this treatment is ineffective on its own, then careful removal of the proximal nail can be tried.

Long-term treatment of chronic paronychia is often unsatisfactory.

A.204

SEPTIC TENOSYNOVITIS

DR FRANCOIS P DU TOIT: ORTHPAEDIC SURGEON - RICHARDS BAY

The anatomical features of the synovial flexor sheath of the hand are unique. Unqualified, the term tenosynovitis implies an affliction inside this sheath, with distinctive clinical features.

Accurate diagnosis depends largely on eliciting a history of a puncture injury, associated with significant pain and swelling of an immobile finger and pin-point tenderness along the flexor sheath. The fingertip extension test is conclusive (Kanavel). One must differentiate between infections inside and outside the sheath.

CLASSIFICATION

a. Isolated acute pyogenic septic tenosynovitis - with a history or evidence of penetration of the sheath (including surgery in or near the sheath), complicated by infection.

b. Associated with other hand infections.
   - Septic tenosynovitis may occur concomitantly with another infection in the same hand.
   - Thenar, mid-palmar or ulnar bursitis can represent the end-stage of septic tenosynovitis. Or, septic tenosynovitis can be the end-stage of a felon.
   - Iatrogenesis is one of the most important causes of the condition.

c. Non-pyogenic acute septic tenosynovitis - these injuries are even more devastating than the pyogenic types.
   - Injection injuries such as caused by diesel injection pumps or spraypaint guns fill the synovial sheath with the most irritating substances.
   - Organic venoms can be injected by bees, snakes, rays or stonefish, etc.

d. Subacute (aseptic) tenosynovitis
   - A metabolic condition such as rheumatoid arthritis can present as tenosynovitis.
   - Organic breakdown products such as from a previous bougainvillea thorn injury may become causative even after two or more weeks have elapsed since the incident.

All injuries which have penetrated the sheath demand the utmost care. Finally, the diagnosis must be certain before surgery is attempted. Also, penetration of the tendon sheath must be avoided unless there is a strong indication and the sheath must not be entered through an inflamed area. Prevention of septic tenosynovitis includes the drainage of felons.

What do you do with a sheath full of pus? The principles of treatment are:

- Drain distally
- Irrigate proximally
- If you are early enough, you might dispense with an indwelling drain.
- Be prepared to go back to theatre if necessary
- Institute early protective motion.

A.207

HUMAN FIGHT BITE INJURIES

PROF U MENNEN : ORTHOPAEDIC SURGEON - MEDUNSA

The human fight bite and its consequences have been termed the "cancer of the hand".

Although the occurrence of these injuries varies from centre to centre, mismangement will lead to disasterous results.

CLASSIFICATION

The human fight bite is divided into two types: Actual direct bites to the finger (bite wound) and the "fist fight" or "knuckle tooth wound". The bite wound is caused by biting a finger as one would bite a carrot. The knuckle tooth wound is suffered by the attacker hitting his opponent in the mouth.

PATHOLOGY

The combination of the mixed nature of the multiple organisms of the human mouth and the bruised and crushed tissue due to the tooth bite constitutes an ideal situation for infection. The management therefore has a three pronged attack, namely throrough surgical debridement, a comprehensive antibiotic regime and aggressive hand therapy.

TREATMENT

There is no place for conservative management or a look-and-see attitude in any of the human fight bite injuries. All wounds should be treated equally aggressively and explored thoroughly. (A good anaesthesia i.e. general or regional block and a blood-less field, but not esmarch exanguination, is essential to do a thorough debridement).

A surgical debridement is immediately indicated once the patient arrives in the hospital, which includes excising wound edges and exploring the depth of the wound. This is especially important in the knuckle injury where the moving tissue plains may give a false impression of a superficial injury. It is important to explore the wound right down to the joint. The wound should be copiously washed out with Ringers lactate. The wounds are left open but are covered by one layer of paraffin impregnated gauze (e.g. jellonet) followed by a number of absorbable gauze swabs and a volar Plaster-of-Paris splint to keep the wrist extended in about 30 degrees and the MP and interphalangeal joints in a position as close to the accepted functional position as possible, (i.e. MP's 90 degrees flexion, PIP and DIP's in extension). Since the splint is removed within 12 to 24 hours the finger joint positions are not crucial. All hands are elevated at all times above the level of the heart.

Antibiotic treatment is instituted immediately and includes intravenous cloxacillin 1g six hourly, intramuscular gentamycin 80mg eight hourly and oral metronidazole (Flagyl) 400mg eight hourly. Established osteomyelitis would be considered as an indication for amputation.

Postoperative management is instituted not later than the following morning and consists of regular hand baths, that is three times per day each lasting at least twenty minutes. Ordinary sterile luke warm water is used with standard soap. The patients are encouraged to mechanically clean and wash their own wounds. Dressing in between the hand baths consist of one layer only of paraffin impregnated gauze, making sure not to restrict the joints with any kind of dressing. The patient attends the physiotherapy and occupational therapy departments between the handbath sessions for intensive hand therapy, all aimed at regaining full function as soon as possible. Any sign of delayed response to the above management regime, e.g. no dramatic reduction of swelling, persistent drainage of serous fluid or pus and persistent pain within the first two days post-op, point to an

incomplete drainage and debridement, or presence of osteomyelitis. Repeated debridement should be performed without hesitation in such cases.

COMPLICATIONS

These include cellulitis, septic arthritis, osteomyelitis, tendon rupture, tendon adhesions and amputations. The shorter the time between injury to definitive hospital management the fewer complications occur and the quicker the recovery of full function. Most complications occur in patients who are admitted a week or more after injury. Inadequate surgical and medical management also lead to complications.

A.228

MANAGEMENT OF THE SWOLLEN HAND

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Oedema is a normal response of the hand to trauma and reduction of oedema must be pursued vigorously from the onset of the injury, as a relatively minor injury can ultimately become a major disabling condition. Oedema alone may not cause the hand to stiffen, but when accompanied by immobilisation, stiffness is inevitable.

The injured hand tends to naturally flex at the wrist. The flexed position of the wrist decreases dorsal venous drainage, swollen fingers tend to hyper-extend at the MP joints and the thumb adducts. Therefore, as soon as the necessary surgical procedures have been undertaken, the hand should be splinted correctly. This facilitates the reduction of pain and oedema as well as preserving the bony architecture of the hand.

Once the removable splint has been made, it is important (if possible) to measure the volume of the hand by means of the hand volumeter. This then enables both yourself and the patient to monitor the reduction in his hand volume on a daily basis.

Oedema is perpetuated by maintaining the hand in a dependent position. Proper elevation exists when the hand is higher than the wrist, the wrist higher than the elbow and the elbow higher than the shoulder. The hand should be elevated by means of a pillowslip during rest, and elevation should be encouraged in all activity sessions.

During activity sessions, an active range of motion of the entire upper extremity as well as concentrated motion of the injured parts must be encouraged. This is <u>not</u> a slow and restful motion, but the most <u>active</u> and energetic motion possible. This <u>pumping</u>

effect of the muscles and tendons is of considerable value in removing accumulated fluids. Joint motion serves to prevent stiffness due to the adhering of surfaces.

In conclusion a summary of the management steps:

* Splint - volar wrist extension splint (30 degrees) allowing free movement of the MP and IP joints
* Elevation - the hand should be kept above the level of the heart at all times
* Measure - by means of the hand volumeter, this should be done daily so as to monitor the reduction in oedema
* Activity programmes - full day inclusion, where the principles of active movement and elevation are adhered to.

A.175

FRACTURES OF THE PHALANGES

DR JOHN FLEMING: ORTHOPAEDIC SURGEON - JOHANNESBURG

Fractures of the phalanges consist of two basic parts - the bone and the soft tissue. It is not possible to treat the one without due regard for the other. In many ways the quality of the soft tissue is the key which determines what specific treatment will be given to the bone. The dictum: Compound fractures require open reduction and internal fixation - is usually accurate with fingers. If the nerves, tendons or ligaments are cut, they require immediate repair and associated fractures require stabilization.

In setting bony injury, it is most important to decide whether the fracture is stable or not. The dicta: Stable fractures should be treated conservatively and intra-articular fractures require open reduction and internal fixation - are generally true but the correct decision is determined by the prime objective of treatment, not by generalization. The prime objective of treatment is to restore function and a full range of movement within the normal planes.

A.132

METACARPAL FRACTURES (EXCLUDING BENNETTS FRACTURE)

PROF U MENNEN: ORTHOPAEDIC SURGEON - MEDUNSA

Metacarpal fractures can be divided into stable and unstable fractures. Stable fractures refer to fractures that will not displace once mobilization is started. Unstable fractures should be stabilized to allow early mobilization of the fingers of the hand. Even minimally displaced fractures or angulated fractures may be stable fractures due to the anatomical stability of the surrounding tissues e.g. third metacarpal base fracture. The emphasis therefore is to stabilize unstable fractures with the main aim being early mobilization to rehabilitate the hand.

TREATMENT

* Neck fracture fifth metacarpal:
  This is a very stable fracture. Controversy exists about the maximum angle of angulation allowed. Since the fifth metacarpal is a mobile metacarpal it is very seldom, if ever, necessary to reduce the impacted and angulated fifth metacarpal fracture. These fractures are simply treated conservatively with painkillers and early mobilization without any splinting.
* Base fracture fifth metacarpal:
  This is similar to the Bennetts fracture of the thumb metacarpal. Since these are essentially stable fractures, surgical intervention is not necessary and early mobilization is indicated. Any surgical intervention to correct the X-ray abnormality may end with annoying postoperative symptoms.
* Base fractures 2nd, 3rd and 4th metacarpals:
  These fractures are usually stable fractures and need only a volar splint to support the wrist in 30 degrees dorsiflexion, with the fingers and MP joints free to move. However, if instability is present a simple percutaneous K-wire fixation for three weeks should be sufficient.

* Neck fractures 2nd, 3rd and 4th metacarpals:

These are not common fractures. The mechanism of injury is not as consistent as the fifth metacarpal neck fracture. Therefore stable and unstable fractures present. The stable fractures should be managed with early mobilization. Unstable fractures can best be treated by open reduction and fixation with crossed K-wires.

* Metacarpal shaft fractures:

Isolated metacarpal shaft fractures which are undisplaced with a minimal dorsal angulation can also be treated by a volar splint with the wrist in 30 degrees of dorsiflexion and early mobilization of the fingers and MP joints. It is helpful to buddystrap the affected finger to a neighbouring unaffected finger. This will prevent any rotation. Unstable fractures of the shaft of the metacarpals include the oblique, comminuted and angulated transverse fractures. These unstable shaft fractures present with a dorsal angulation and shortening of the ray, due to the normal anatomical bowing towards the dorsal aspect, as well as the pull on the fragments by the intrinsic muscles and the long flexors of the fingers. These types of fractures need some form of stabilization since manipulation and external splintage often fail. Other reasons are that bony angulation will cause an unacceptable dorsal swelling, the sharp edges may result in tendon injury or skin perforation, the fingers are often rotated interfering with finger function. The fine finger balance mechanism is jeopardized by ray shortening. Open reduction and internal stabilization of these metacarpal fractures include Kirschner's wires placed in various fashions, such as intramedulary, crossed and transverse. Other methods include the use of small plates and/or screws of which the most important type is the small fragment set used by the AO group. The paraskeletal clamp-on plate is an alternative to stabilize metacarpal shaft fractures. External fixators can also be used as has been recommended.

COMPLICATIONS OF INTERNAL FIXATION

Complications include inadvertent pinning of tendons and muscle by K-wires (causing lack of finger movement, adhesions due to extensive dissection of the fractured area, weakening of the metacarpal by drilling holes through a relatively thin bone, causing stress concentration, technically demanding techniques with a long operation time, and a second removal operation which is the general rule for plates, screws and Kirschner wires).

OPERATIVE TECHNIQUE

Because of the mentioned complications I prefer to use the paraskeletal clamp-on plate for unstable metacarpal shaft fractures. A longitudinal incision parallel to the metacarpal is made. The extensor tendon is retracted to one side exposing the fractured area. Care is taken to preserve the periosteum while cleaning the fracture ends. The fracture is reduced by full flexion of the MP joint and pushing the distal fragment dorsally. A "micro-five" clamp-on plate is placed over the reduced fracture site and held in position by pushing down with the finger on the plate. The plate removing forceps is used in this instance to crimp the teeth of the plate around or into the bone. The reason for using this instrument rather than the crimping tool, is that the space between the metacarpals is limited. It is remarkable what a stable fixation one gets with this procedure. After the plate has been secured to the bone, subcutaneous soft tissue is pulled over the plate and sutured into place. The skin is closed and a bandage is applied. We have found that a volar splint to support the wrist for two days makes the patient much more comfortable and gains his confidence for the next step, which is mobilization of the fingers and wrist. A second removal operation is not necessary.

CONCLUSION

Since internal fixation of metacarpal fractures has a high complication rate, most fractures should be managed conservatively with the emphasis on early mobilization. However, some fractures need internal stabilization in order to allow mobilization. For the unstable shaft fracture, we suggest the use of the clamp-on plate which is simple to use, has a very low complication rate and allows immediate mobilization.

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SCAPHOID FRACTURES

DR A MATIME : ORTHOPAEDIC SURGEON - MEDUNSA

A fracture of the scaphoid is the commonest fracture of the carpus, and yet also the most undiagnosed fracture of the upper limb. Early diagnosis and adequate management offers the best prognosis for fracture union and ultimate functional outcome.

The mechanism of injury is most commonly a fall on the outtretched upper limb, resulting in hyperextension at the wrist. It is a fracture of the young adult and may be associated with other fractures or dislocations around the wrist, which one should always look for.

The diagnosis is both clinical and radiological, and it is not always easy to make.

The treatment of the scaphoid fracture depends on the severity of the injury:

> If the patient has significant pain to warrant radiological investigation, he should be treated as for a fractured scaphoid for 2-3 weeks with a Plaster-of-Paris cast, and then be re-evaluated clinically and radiologically, whether or not a fracture line is seen on the original film.

If there is radiological evidence (ulnar and radial deviated a-p x-rays of the wrist) of a fracture in the acute injury, it is classified into "stable" or "unstable" fractures.

> The "stable" fracture is treated in a plaster cast until there is clinical and radiological union.
>
> The "unstable" fracture is treated by open reduction and K-wire fixation, with a plaster cast until union.

Where there is delayed union or non-union, the fracture is then treated by open reduction, bone grafting and internal fixation, with a plaster cast until there is union.

The patients who present late, with symptomatic non-unions and already displaying significant degenerative arthritic changes, are treated on an individualised basis, depending on the specific findings and needs of the patient.

A.208

DISTAL RADIUS FRACTURES

DR F LABUSCHAGNE : ORTHOPAEDIC SURGEON - PRETORIA

SUMMARY

In this talk I would like to concentrate mainly on the indications and especially the technique of managing patients with comminuted fractures of the distal radius with the pins and plaster method.

From our experience and from the literature we know that this is a common but difficult problem to manage. The results of treating these fractures are not very satisfactory. Which ever method is used, it produces poor results.

The closed reduction of these comminuted fractures is usually not the problem, but it is the maintenance of the reduction that poses the problem. We also know that the management of the late case is unsatisfactory.

A method of pins and plaster treatment was devised which would provide the doctor treating the patient with an alternative method of treating these difficult fractures, by way of a method that is simple, readily available and produces fairly satisfactory results. This method provides a fixed traction system which prevents shortening of the radius at the fracture site and which permits free active motion of the fingers and full use of the hand, elbow and shoulder.

Because of the simplicity of this method it serves as an alternative method in centres where other methods and instruments are not readily available. Even the less experienced doctor can use this method provided he sticks to certain principles.

INDICATIONS

This method can be used in any patient with a fracture of the distal end of the radius where the reduction or the maintenance of the reduction poses a problem. It is generally agreed that most extra-articular fractures of the distal radius, especially the simple non-comminuted fractures, can be treated non-operatively and still produce good results.

TECHNIQUE

The procedure is done in a clean theatre under general or regional anaesthesia. The fracture is manipulated and the major displacements are reduced. While an assistant holds the arm, the hand, wrist and forearm are cleaned and draped in a sterile fashion. A 2,3mm Steinmann pin is inserted percutaneously through the base of the second metacarpal just distal to the flare, which can be palpated quite easily.

The pin is inserted in a dorsal direction from the first webspace, avoiding the first doral interosseus muscle, and exits between the second and third metacarpals on the dorsum of the hand, taking care to stay radially to the extensor tendons of the index finger.

At the point of insertion the pin is now bent dorsally to free the thumb, as it will limit abduction and extension if left straight. Two more pins are now inserted into the middle third of the radius from radially through the interval between M.brachioradialis dorsally and M.flexor carpi radialis volarly. Here it is important to obtain a bicortical purchase.

Prior to inserting the pins, skin incisions were performed according to Wagner's principles. A stirrup is now applied to the distal pin and the arm is suspended from a dripstand. A counter traction sling is applied to the upper arm, the position of the fracture is further maniupulated and controlled with an image in-

tensifier. Once satisfied with the reduction a below elbow plaster is applied, incorporating both sets of pins into the plastercast to act as an external fixator. Traction is maintained until the plaster sets.

The pins are now cut close to the plaster of Paris, but leaving 0,5cm to protrude. One must avoid cutting the pins too short which could lead to pins pulling through and losing purchase in the plaster. Generous trimming of the cast is now performed to ensure free movement of all fingers and the elbow.

The patient is usually admitted to hospital for the night for elevation and early mobilisation of the fingers. The pins and plaster stay on for 8 weeks after which the pins are removed and a new below elbow cast is applied, which stays on for another 4 weeks. Control x-rays are taken regularly to monitor the position and union of the fracture. Hand therapy is constantly advised to encourage mobilization of the affected limb in and out of plaster.

DISCUSSION

With this method good functional and anatomical results can be achieved in many patients with these difficult fractures. One usually succeeds to achieve and maintain reduction in most of these fractures. The technique is easy and complications are not common and when they occur, are usually minor. The common complication is pintract sepsis which is usually only superficial.

One should make sure that the diameter of the pin should not be less than 2,3 mm as thinner pins will tend to bend in the plaster of Paris and cause shortening at the fracture site. Loss of radial length remains one of the major factors responsible for poor results.

It is also wise to keep the pins and plaster on for 8 weeks as these fractures are usually not united by 6 weeks and premature removal may lead to displacement of the fracture.

CONCLUSION

Using pins and plaster treatment in patients with comminuted intra-articular fractures of the distal radius provides one with a reliable alternative method of treating these fractures.

A.249

THE TREATMENT OF BENNETT'S FRACTURE

DR R RAJOO : ORTHOPAEDIC SURGEON - TONGAAT

DEFINITION

A Bennett's fracture is an avulsion of the main substance of the base of the thumb metacarpal from the palmar articular base of the metacarpal. This main portion subluxates radially, dcrsally and proximally by pull of the thumb extensors, adductor pollicis, abductor pollicis brevis and especially abductor pollicis longus.

DIAGNOSIS

Radiologically - using the Billings and Gedda view.

TREATMENT

Principle

Accurate reduction of intra-articular fractures applies here as well.

Conservative

As advocated by Carnley, Blum & Griffiths, demands a fine sense of touch. Need traction where there is no inherent stability. Bennett's fracture has great potential for stability, provided the C.M.C joint is treated in full extension, so as to tighten the volar ligaments. Reduction can be attained under local anaesthetic, then a soppy wet POP is applied and moulded. The POP is kept on for 4 weeks with frequent X-rays. If this slips, then surgery is resorted to, but Charnley advises that a good result can eventually be obtained even if the position slips in plaster, or presents late.

Percutaneous

Pinning is the ideal method especially if image intensification is available. Usually reduce by distal traction and extension of the C.M.C joint, then pin the 1st metacarpal to the second metacarpal with the first metacarpal abducted 90 degrees away from the palm. Usually need two K-wires to hold this position, then a POP slab can be applied. If the fragments are large enough they can be reduced and pinned together, though this is tricky and not altogether vital.

Operative

Through a curved palmar incision (NB radial nerve branches and palmar branch of the radial artery). The abductor pollicis brevis and opponens pollicis is dissected subperiosteally from the metacarpal base. The capsule is opened and fracture fragments are visualised. Reduction is achieved with traction and manipulation and provisionally fixed with K-wires (unless the fragments are small). A lag screw is used to finally fix the fragments. The advantage is that motion can be started in 1 week once POP is off.

Traction

Spanberg and Thoren used oblique skeletal traction. This is a satisfactory technique especially if there is marked reduction using rubber bands attached to an outrigger. The thickness of the articular cartilage is 2mm, so a step off of 1mm does not prejudice a good result.

Rarely a Salter III fracture of the thumb metacarpal base occurs (a child Bennett's fracture). Reduction is essential.

Alternatives for mal-union

1. Realignment osteotomy
2. Arthrodesis of CMC joint
3. Implant arthroplasty
4. Resection arthroplasty
5. Leave alone?

A.237

MOBILISATION OF JOINTS

PAM DUKE: JOHANNESBURG HOSPITAL - PHYSIOTHERAPIST

There are two types of mobilisation used by physiotherapists: passive and active.
Passive: is what is done to a patient by an outside force, eg. a continuous passive movement unit, or by the physiotherapist herself.
Active: is movement which is done by the patient himself.

PASSIVE MOVEMENT can be categorised into two types:
Accessory and Physiological.

1. Accessory Movements are those movements which occur in a joint, but cannot be voluntarily produced, eg. in the PIP joint of the index finger, where there are rotatory and anterior/posterior movements. These movements occur as part of the normal movement occurring in a joint, but cannot be isolated voluntarily. These movements can be used therapeutically to assist in restoring movement to stiff joints, as well as relieving pain in the joint and/or surrounding structures (invoking the gate control theory of pain control by activating the mechano-receptors in the joints).
2. Physiological Movements are those which can be produced voluntarily by the patient, eg. flexion/extension of the fingers or elbow. These movements are performed through the available range or in a small amplitude at the end of the range, to increase the range.

ACTIVE MOVEMENTS are those which are produced by the patient on command. They can be free, assisted or resisted.

1. Free: these are any movements that the patient can perform through available range on command.

2. Assisted: any movement which can be produced voluntarily, but where the patient needs assistance to perform the full available range of movement because of weakness or stiffness.
3. Resisted: is any movement which occurs in the available range, but where resistance is applied to the movement to encourage it, where there is pain inhibition of movement; or the resistance is applied to improve the muscle perfcrmance and so strengthen the muscle/s.

The balance between passive, active and resisted movement must be carefully evaluated according to the condition (the injury must be evaluated: whether there is soft tissue injury, bone injury, joint injury or a combination of two or more).

Most bone injuries are accompanied by soft tissue injuries which are not recognised as such, and therefore go untreated. Early management of the accompanying soft tissue injury by electrotherapy modalities (eg interferential therapy or pulsed short-wave) will result in shorter rehabilitation time and less complications. Pain is also a well-known inhibitor of movement, therefore appropriate electroanalgesic modalities must be used in conjunction with movement therapy.

Cartilage healing and articular fractures are a challenge to surgeon and therapist alike. Salter et al (1980 and 1978) has shown that controlled passive movement improved the healing of damaged cartilage and maintenance of the anatomical joint architecture as opposed to immobilisation, thus in certain articular fractures passive movement initiated early in treatment will produce a better result than immobilisation.

MALLET FINGER DEFORMITIES

DR E BOWEN JONES: PLASTIC SURGEON - UNIVERSITY OF NATAL

DEFINITION

A partially flexed terminal phalanx that will not actively extend, caused by the rupture of the extensor apparatus.

PROBLEM

Hand gets caught eg. putting into pocket, etc.

CAUSES

1. Subcutaneous rupture of tendon over DIP joint due to blunt trauma over the dorsum of the joint with a flexed finger.
2. Sharp trauma - tendon divided.
3. Fracture of the base of the terminal phalanx insertion of the extensor tendon.
4. Rheumatoid arthritis.

DIAGNOSIS

Clinical examination - X-ray to ascertain bony involvement

MANAGEMENT

1. In the case of open division of the extensor tendon due to clean sharp trauma, repair with 5/0 ethibond, matress sutures. Splint DIP joint in hyperextension with a Kirschner wire.
2. In the case of a closed traumatic rupture of the tendon: Mallet Finger Splint for 6 weeks (not always successful).

3. In the case of fracture of the base of the terminal phalanx, attempt reduction of the fracture. The chip of bone is too small for any fixation normally. Hold in hyperextension with Kirschner wire.
4. In rheumatoid arthritis and cases that have failed to respond to treatment outline, athrodese DIP joint in 30 degrees of flexion.
5. In cases of closed rupture, open repair may be performed through a proximally based flap incision. Results may be disappointing.

Mallett finger splints must be worn at all times, and checked at least every week to ensure that they fit well, and pressure is adequate but not excessive. Both K-wires and mallet finger splints must be kept in for 6 weeks. A threaded K-wire is useful to ensure that the track does not become septic, or the wire does not fall out. The PIP joint should be free to move fully and the patient instructed to move it.

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SWAN NECK DEFORMITY

DR JOHN YOUNGLESON : PLASTIC SURGEON - DURBAN

DEFORMITY

1. DIP hyperflexed
2. PIP hyperextended
3. MP flexed

PATHOLOGY

1. Dorsal subluxation of lat. tendons
2. Slack lat. tendons (longer than middle slip)
3. Full force on middle slip
4. Hyperextension of PIP
5. Unopposed FDP thus DIP hyperflex

CLASSIFICATION

a. Extrinsic
   1. Long extensors (Mallet, adhesion)
   2. Flexion contracture wrist and/or MP joint

b. Intrinsic
   1. Intrinsic spasm (eg. CP, RA, pain, Parkinsonism)
   2. Intrinsic shortening (eg. ischaemia, mal splinting)

c. Articular (PIP instability)
   1. Acute (trauma eg. FDS, volar plate)
   2. Chronic (eg. sinovitis, congenital looseness)

d. Mixed
   eg. flexion contracture of MP due to longstanding shortened intrinsics.

TREATMENT - surgical

a. Extrinsic
   eg. Tenolysis
   Mallet repair

b. Intrinsic
   eg. Littler I or Boyes intrinsic slide

c. Articular
   eg. Shorten volar plate
   FDS tenodesis (Swanson)
   Littler II (new Landsmeer)
   Fuse PIP joint
   Relax fan fibres
   Tendon transfer (re-route)
   Lengthen middle slip

d. Mixed
   May need combination of above.

The following operative procedures will be discussed.

1. Procedures to lengthen the shortened lateral bands of the extensor mechanism over the PIP joints
2. Operations to prevent the recurvatum or hyperextension deformity at the PIP joint due to the following:

   a. Disruption of the insertion of the flexor digitorum sublimus tendon.

   b. Hyperextension injury to the palmar plates and triangular ligaments.

BOUTONNIERE DEFORMITY

DR JOHN FLEMING: ORTHOPAEDIC SURGEON - JOHANNESBURG

The Boutonniere deformity is primarily caused by lengthening of the central slip of the extensor expansion which inserts on to the base of the middle phalanx, and a resulting imbalance in the extensor forces. This produces the typical picture of the flexed proximal interphalangeal joint and the hyperextension of the distal interphalangeal joint.

The Boutonniere deformity may be correctable, partially incorrectable or incorrectable.

A fresh laceration of the central slip is easily treated by suturing the damaged tendon to correct the tendon balance and splintage until the tendons are healed.

Partially correctable Boutonniere deformities are those which have been left untreated for a period of time. They have severe local oedema and require the passive correction of the flexion deformity of the proximal interphalangeal joint before suturing an extensor tendon.

Incorrectable deformities are those where long standing persistance of the deformity has led to a permanent change in the joint capsule so that the joint cannot be corrected to the neutral position, combined with volar migration of the lateral bands which make extensor tendons flexors of the proximal interphalangeal joint. In these cases often a Swanson arthroplasty, with a shortage of the bone stock is the only way to enable correct balancing of the extensor mechanism. An arthrodesis of the PIP joint may have to be considered as a last resort.

In conclusion, this is a very difficult problem to reach an answer satisfactorily for surgeon and patient. This requires skill and experience.

A.132

COMPARTMENT SYNDROME (FLEXOR)

DR K WIENAND: 1 MILITARY HOSPITAL - ORTHOPAEDIC SURGEON

The most important aspect is the diagnosis, which is essentially a clinical diagnosis and is based on a high index of suspicion.

The mechanism of injury, the velocity of the object causing the injury and the period that blood supply could have been interrupted by outside pressure, all serve to arouse your suspicion.

On examination all the P's quoted in the literature may prove useful, but to me the passive stretch test and sensory examination are crucial. At the one end of the spectrum we have the severely swollen limb which is tense, extremely painful and with the typical position of flexed wrist, extended MP joints and flexed IP joints. If peripheral pulses are not present, we may be dealing with a Holden I (arterial injury) and an arteriogram is indicated before surgery. This is obviously a case for decompression and there is no need for repeated examinations.

The majority of cases however, are admitted for observation because of our high index of suspicion. What do we observe? It is not sufficient to ask the nursing staff to watch the circulation! Chart sensation - vibration sense and light touch are the first to go. Do the passive stretch test on each muscle and chart:

1. at what degree of extension pain is elicited, and
2. what is the maximum extension that can be obtained.

These examinations must be repeated every 30 minutes. Surgery is indicated if there is deterioration of the condition, i.e. enlarged area of sensory loss, pain at a lesser degree of extension and increasing flexion contracture.

In the unconscious patient, or one with a paralysed limb because of a brachial plexus injury, diagnosis may prove more difficult and it is perhaps here where the measurement of compartmental pressures may prove helpful.

The incision is important as it may have to be used again, should a Tsuge muscle slide become necessary. The carpal tunnel and deep fascia of the forearm is released followed by epimysiotomy of all muscles. If the procedure has been delayed and the muscle is dead and does not contract on stimulation, the muscle must be excised, taking care to leave the tendons, especially the tendons of the profundi as long as possible to avoid having your suture line in the carpal tunnel when a subsequent muscle transfer is done. Usually the wound cannot be sutured, and the patient returns to theatre after 3 or 4 days. If the skin can be sutured with 4.0 nylon without breaking the suture material there is not too much tension on the skin. If suturing cannot be done, split skingraft can be applied, but this does cause fibrosis in the underlying muscle and tethering of the muscle and should be excised at a later date.

Immediate rehabilitation is commenced.
A.112

ULNAR NERVE COMPRESSION

DR FRANCOIS P DU TOIT : ORTHOPAEDIC SURGEON - RICHARDS BAY

ANATOMY

Various anatomical anomalies can predispose to compression of the ulnar nerve in the region of the elbow. The final diagnosis is often only made at surgery. Multiple-level compression (about the elbow) is regarded as a major cause of failed surgery if only one level has been decompressed.

EXAMINATION

The diagnosis may be difficult, and the location even more so. Normal sensation at the dorsum of the little finger strongly points against compression of the ulnar nerve at wrist level, but an intact FCU does not localise the compression to, at or below the elbow either. The concept is that nerves to some muscles (e.g. intrinsics) react sooner and more strongly to the irritations of compression than nerves to other muscles (e.g. FCU).

INVESTIGATION

The role of special investigations is discussed.

TREATMENT

Modalities are outlined. Internal neurolysis is rarely indicated, but external epineurolysis is frequently worth considering. Decompression in situ without transfer has merit; subcutaneous transfer or medial epicondylectomy are almost never warranted. Once transfer has been decided upon, the question is which technique of deep transfer? It is suggested that placing the ulnar nerve adjacent to the median nerve should be the procedure of choice.

SPECIAL CONDITIONS

Trauma, burns and leprosy are discussed - also failed surgery.

A.283

MP AND PIP JOINT DISLOCATIONS

DR R LAUBSCHER : PLASTIC SURGEON - PRETORIA

MP JOINT DISLOCATIONS

Anatomy

1. Volar plate becomes trapped dorsal to metacarpal head.
2. Lumbrical muscle lies on radial side
3. Flexor tendon lies on ulnar side
4. Metacarpal head "buttons"

Assessment

Dorsal longitudinal approach; observe the following:

1. Metacarpal head for possible fracture
2. Volar plate could be interposed and should be released
3. Digital nerves lie stretched over surface of metacarpal head just beneath the skin - vulnerable
4. Volar approach prevents inspection of metacarpal head after reduction

Management

Closed reduction usually unsuccessful
Open dorsal approach - release volar plate
- inspect metacarpal head after reduction

THUMB MP

Rupture ulnar collateral ligament
Gamekeepers
Skier's

SURGERY

Volar subluxation
Stener lesion
Chronic lesion - ? Arthrodesis

PIP JOINT DISLOCATION

Anatomy

1. Usually volar plate aspect of middle phalanx most involved because majority of collateral ligaments plus volar plate attach to this small fragment
2. Stronger finger flexor by-passes this joint
3. Extensor mechanism causes dorsal dislocation

Assessment

Most dislocations reduce spontaneously at time of injury, or is reduced by patient. No true assessment of injury can be made on X-ray - anterior or posterior X-ray may appear normal.

Type i - Hyperextension
Type ii - Dorsal dislocation
Type iii - Fracture dislocation stable/unstable

Evaluation is therefore clinical:

Consideration must be given to:

1. Relatively common associated fracture of the PIP joint of the finger in dislocation.
2. Degree of soft tissue injury eg. collateral ligaments
3. Chronic dorsal subluxation
4. Limited range of motion
5. Post traumatic arthritis

Management

Hyperextention injuries:

- Stable PIP joint : * early mobilization
  * buddy strapping
- Unstable joint i.e. ligamentous damage
  * consider surgery eg. radial colateral of index PIP
  * temporary K-wire across joint may be indicated
  * early mobilization
  * "buddy" strapping
- Dorsal dislocation:
  * after closed reduction manage as hyperextention injury
  * if closed reduction fails, do open reduction, buddy strap and early mobilization.
- Fracture dislocation :
  * surgery is mostly indicated
  * early mobilisation
  * "buddy" strapping
  * arthroplasty (for pain and stiffness)
  * arthrodesis (for pain)

A.148

WRIST DISLOCATIONS

DR A MATIME: ORTHOPAEDIC SURGEON - MEDUNSA/GA-RANKUWA

Dislocations of one or more of the carpal bones, with or without simultaneous fractures of the carpus, radius or ulna are very complex injuries.

The commonest mechanism of injury is hyperextension of the wrist joint, as in falling on the outstretched upper limb. Carpal dislocations and fracture-dislocations represent a continuum of progressive bony and ligamentous damage, resulting in various degrees of disruption of the anatomy of the wrist joint.

The patient will present with an appropriate history, a painful swollen wrist with or without clinical deformity, and with maximum tenderness over the involved area.

Postero-anterior and lateral X-ray views will often give the diagnosis if examined systematically and adequately, and further investigation is often not required.

I propose to deal with:
Lunate dislocations

* Peri-lunate dislocations
* Trans-scaphoid perilunate fracture dislocations
* Scapho-lunate dissociations.

These are probably the most commonly encountered injuries.

In my experience very few of these injuries can be treated adequately by closed manipulation, and whilst I still attempt it in the selected acute injury, one often finds it necessary to treat these injuries by open reduction and fixation with Kirschner wires to maintain the reduction. The operation is done through a volar approach, but if necessary we do not hesitate to use a combined volar and dorsal approach. Post-operatively the stabilized

wrist is protected with a POP splint for 3 weeks. After this short period of immobilisation the patient is subjected to a rehabilitation program.

Satisfactory results have been obtained through early diagnosis, appropriate and adequate treatment and a structured rehabilitation program.

A.140

AMPUTATIONS IN THE HAND

DR E BOWEN JONES: PLASTIC SURGEON - UNIVERSITY OF NATAL

INDICATIONS

Trauma, malignancy, ischaemia, sepsis, cosmesis, intractable pain and to improve function.

GENERAL PRINCIPLES

1. Surgery should be tailored to patient needs.
   a. A ray amputation is cosmetically better, eg. for a woman with damaged little finger, but this removes power and a transverse finger amputation may be better for a workman.
   b. If a finger is amputated at the base, it leaves a gap through which objects may fall.
   c. A workman needs a rapid return to work, and may happily sacrifice a finger to this end. A musician requires his fingers to be preserved at all costs.
2. Achieve good quality skin without scars over the palmar contact surface of finger tips.
3. Try to preserve tendon insertions in order to preserve movement.
4. In multiple finger amputations, length should be preserved.

DISTAL PHALANX

If bone is exposed, use Cutler flaps to cover bone end: minimal nibbling of bone may be necessary. If more than two thirds of nailbed is missing, radically excise nail bed.

MIDDLE OR PROXIMAL PHALANGES

If amputation is oblique, save a skin flap from the longest side. If transverse, do minimal nibbling and fish mouth closure. Keep a good fat pad between bone and skin.

THUMB

Preserve bone length at all costs. If needs be, cover with flap eg. neurovascular island pedicle flap from a finger.

TRANSMETACARPAL AMPUTATION OF THE HAND

Preserve bone length - cover with groin flap.

THROUGH WRIST AMPUTATION

Conserve length in acute situation. Either plan functional grip by Krukenberg procedure if bilateral or transferring a toe to grip the side of the stump. Alternatively in most cases amputation of the lower one third of forearm with good skin flaps to allow fitting a prosthesis.

RAY AMPUTATIONS

Indicated for cancer, cosmesis and for index finger function. Divide 2nd metacarpal obliquely proximally and strip off muscular attachments and re-attach to transverse metacarpal ligament of middle finger. For little and index, keep scar in Bunnell's line for cosmesis.

THE TENDONS

Do not sew flexor to extensor tendons over bone end. Pull flexor tendons out, cut cleanly and allow to retract to prevent infection in tendon sheaths.

THE NERVES

Cut cleanly, digital nerves 0,5cm and larger nerves 2cm proximally and insert into muscle to prevent painful neuroma.

A.138

ALGODYSTROPHY (SUDECK)

DR K WIENAND: 1 MILITARY HOSPITAL - ORTHOPAEDIC SURGEON

Like Wynn Parry I believe that all the painful syndromes are a spectrum of the same condition with partial damage to a nerve being the common denominator. Hence minor injuries probably damaging small nerves may give rise to causalgia minor and damage to a major nerve may give rise to causalgia major. The treatment remains the same.

We have probably all seen the condition where a Colles fracture has been reduced and a poor plaster cast applied stretching past the MP joints, constricting the fingers, not maintaining the metacarpal arch and preventing adequate finger movement. When the plaster is eventually removed, one is aware of a sweet/sour smell and the hand is dry and finger joints stiff and painful - this condition could have been prevented by applying a properly moulded plaster, allowing for mobility of finger joints, and use of the hand in activities of daily living (ADL). Prevention is thus the most important aspect of the management of these conditions.

There is speculation as to whether a certain type of personality is prone to develop causalgia. My feeling is that sometimes, like Magnum, a little voice will warn you that something is a miss. Call this clinical acumen. Basically the sensitive type - who withdraws her hand when you want to examine it, who complains more than normal, who has un unstable background - should sound an alarm. The pain must be treated by adequate stabilisation of the fracture, allowing use of the limb, and if the patient will not do this on her own, she must be placed in a structured rehabilitation programme. The cause may be soft tissue damage without fracture. The painful part must be splinted to diminish pain, but most important the limb must be used in A.D.L. Thus in

prevention and in the early cases the damaged part is splinted in such a fashion as to allow adequate use of the remaining portion of the limb.

In the later cases of established Sudeck's atrophy, the treatment becomes more difficult. This is a serious condition and all modalities at our disposal must be used to treat the condition, i.e. a full rehabilitation team with psychological support. Splintage is still important to minimize pain and mobilisation of the joint is started distally first, DIP, then if adequate pain free motion is achieved, PIP joints etc.

Tegretol medication, the use of Tens and Guanethedine blocks are valuable in diminishing pain. In the pain free periods the pattern of usage of the limb must be established. In severe cases one may have to settle for optimal function without pain, i.e. ankylosis or arthrodesis of certain painful joints in a functional position.

The message I would like to impart is that the established Sudeck atrophy is a disaster, but it can be prevented by a high index of suspicion and adequate management of relatively trivial injuries.

A.111

DESENSITISATION

MADELEINE LE ROUX : 1 MILITARY HOSPITAL - OCCUPATIONAL THERAPIST

INTRODUCTION

Desensitisation is a modality to decrease hypersensitivity of skin to tactile stimulation. Several techniques are used including stimulation with non-irritating media progressing to various doweltextures and contact particles, the judicious use of vibration, as well as the performance of functional activities as means of desensitisation.

INDICATIONS:

* Neuromas
* Sensitive amputated tips (stumps)
* Hypersensitive scars and surrounding areas
* Nerve injuries with dysesthesia (a painful and persistent sensation induced by a gentle touch of the skin)

CONTRA-INDICATIONS:

* Diffuse pain will not be helped with this technique
* Do not use desensitisation in areas with open wounds
* Desensitisation has greatest effect on cutaneous sensitivity
* Deep pain is not remediated with desensitisation.

TECHNIQUES:

After documentation and testing, treatment is begun with the texture, particle and vibration level the patient can tolerate for 10 minutes. After that the patient progresses to the next texture, or particle in the hierarchy stated below.

Treatment is done about four times per day for 10 minutes, 90% of the desensitisation programme is done by the patient himself, or a close friend, eg. wife or girlfriend.

a. Doweltextures range from moleskin to velcro hooks, eg.

1. Moleskin
2. Felt
3. Wool
4. Velvet
5. Toweling
6. Velcroloops (soft)
7. Hessian
8. Sandpaper (fine)
9. Sandpaper (rough)
10. Velcro hooks (hard)

The patient is instructed to use a dowel that is slightly irritating, but which he can tolerate by rubbing, rolling or tapping on the sensitive area for 10 minutes. The dowels are carried with the patient and used during the day.

b. Contact particles are contained in a 2 litre ice-cream container into which the patient is instructed to immerse the hand. The 10 particles range from cotton to plastic cubes, eg:

1. Cotton
2. Terry cloth pieces
3. Dry rice
4. Popcorn
5. Beans
6. Macaroni
7. Plastic wire insulation pieces
8. Small pebbles
9. Large pebbles
10. Plastic squares.

The patient is instructed to put his hand in the particles and either move the hand about in the particles, or drop them onto the area, such as the back of the hand or other

parts not involved in the grasp. The patient must choose the particle that is slightly irritating but tolerable for 10 minutes.

c. Using various vibration sources such as battery and electric vibrators with various shaped attachments to home sources such as electric mixer, bender, manicure set or orbital sander. Stimulation is done to adjacent skin, gradually advancing to sensitive area. Use low vibration speed before progressing to high speed.

The patient's treatment regimen includes therapeutic activities such as pottery and the wheel; Macramé; leatherwork; woodwork; ADL and work simulation.

REFERENCES:

1. Lee DA. Evaluation of Sensibility an Re-education of sensation in the hand. Williams & Wilkins, Baltimore 1981.
2. Hunter, Schneider, Mackin, Bell. Rehabilitation of the Hand. The CV Mosby Company, St Louis, 1980.
3. Trombly CA, Scott AD. Occupational therapy for Physical Dysfunction. Williams and Wilkins, Baltimore, 1977.
4. Mennen U. The Hand Book; A practical approach to common hand problems. Southern Book Publishers, 1987.
5. Boscheine-Morrin J, Davey V, Conolly WB. The Hand. Fundamentals of therapy. Butterworths.

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SKIN SUTURE AND CLOSURE

DR LE ROUX FOURIE : PLASTIC SURGEON - HALFWAY HOUSE

AIMS

The aim of the surgeon when suturing a wound is to make the scar as inconspicuous as possible. This is an extremely precise procedure. By using fine instruments with small needles and fine suture material this can be achieved with greater ease. With instrument knot tying wound tension can be regulated and knot placement carried out with great finesse after only a little practice.

GENERAL PRINCIPLES

When making incisions the scalpal should be at the right angle to the skin. Meticulous haemostasis reduces the risk of post operative haematoma formation and subsequent infection. Tissues should be handled gently with fine instruments to avoid devitalization. The wound margins can be handled either with a fine forceps or with Gilles skin hooks. As most surgeons prefer using the dissecting forceps, individual preference will decide whether a toothed or non-toothed variety will be used. It should however be noted that both should be used with due regard to the trauma that can be caused to the wound edges. First time accurate placement of the suture is the goal.

CHARACTERISTICS OF THE IDEAL SUTURE MATERIAL

1. Good handling characteristics - i.e. knot easily, good holding capacity and minimal tissue drag.
2. A high tensile strength
3. Minimal tissue reaction
4. Non-capillary or wick action
5. Non-allergenic
6. Non-carsinogenic

7. Easily sterilizable.
8. Inexpensive
9. Easy conformability.

CLASSIFICATION OF SUTURE MATERIALS

Suture materials are divided into absorbable and non-absorbable sutures, which are made from synthetic or natural materials. See Table 1.

SUTURE TECNIQUE

The aim is an accurately co-apted wound as atraumatically as possible.

Because the needle is curved it moves readily into a circle. By utilizing this circle minimal tissue drag and cutting is obtained and better suture placement achieved. Remember that for a period after suturing the wound is oedematous and the tightly tied suture tends to cut into the wound edges leaving definite stitch marks. This must be taken into account when tying the suture. It is advisable not to tie the wound too tightly but to only co-apt the wound edges. The correct suture tension avoids blanching of the skin held by the suture.

As the inherent strength of the skin is carried by the dermis, it is advisable to use interrupted sutures with an absorbable type of suture in the dermis layer and the subcutaneous tissue, thus utilizing non-absorbable skin sutures only to co-apt the wound edges with minimal tension. A buried interrupted subcutaneous intradermal suture with a deep knot is utilized for this purpose.

When placing the skin sutures, it is pertinent that the needle enters the skin as near the wound margin as possible, and at the right angles to the skin. A larger amount of tissue in the depth

of the wound, (thus creating an unequal circle with the greatest diameter in the depth of the wound), ensures eversion of the skin edges with a linear scar once the sutures are removed.

SUTURING TECHNIQUE

1. Interrupted sutures. The usual suture is a simple loop suture which is knotted at one or other side of the wound. The aim is to bring the skin edges together with absolute accuracy avoiding overlapping of one margin. By utilizing a larger circle in the base of the wound, the wound edges are everted ensuring complete dermal apposition. Remember that the tension on the wound must be taken up by subcutaneous interrupted dermal sutures.

2. Vertical Mattress suture. This suture has little tendency to leave stitch marks if it is not tied too tightly and is removed early. The superficial bite should be minimal to lessen the tendency to invert the wound edges.

3. Buried absorbable sutures. Interrupted buried absorbable sutures with a knot placed deeply, are used with the idea of taking strain off the wound edges by putting the strain on the dermis as described previously. However, the ability to prevent wound stretching is doubtful. The main value is probably to eliminate a dead space and prevent wound haematoma.

4. Continuous intradermal suture. This suture can be done with either an absorbable suture material that is left in place, or non-absorbable suture that can be removed 10-12 days after suturing without leaving stitch marks. If used with proper care, accurate skin edge apposition is possible. It must be mentioned again that proper interrupted intra-dermal sutures should be used for wound apposition.

5. Continuous sutures.
   i. Continuous locking suture
   ii. Contiunuous non-locking suture.

WOUND TENSION

The final outcome and appearance of the wound depends on the surgeons capability to prevent tissue tension across the suture line. Tension causes ischemia of the wound edge with subsequent necrosis, secondary infection and wound dehicene. Wound tension is also a major contributing factor in the formation of hypertrophic scarring and keloid formation.

Methods to reduce wound tension include:

i. Wide undermining of the wound edges
ii. Appropriate suture of the dermal and sub-layer with absorbable sutures to approximate wound edges.
iii. The use of sterile skin closure strips (Steri-strips) to lessen tension across the suture line. These strips can also be placed after removal of the sutures to co-apt the wound edges for a futher period.
iv. The primary use of skin grafts or flaps in wounds that are too large to close primarily without undue tension.

REMOVAL OF SUTURE

To reduce the incidence of stitch marks by sutures that are left in for an extended period of time, skin sutures should be removed at the appropriate time. Clinical experience dictates when sutures should be removed, but other factors such as wound tension, the area of the body in which sutures have been placed, or the presence of complications such as wound infection, also dictate when sutures should be removed. On average sutures are removed after 7 days. A continuous sub-cuticular suture can remain in for an indefinate period, especially if an absorbable type of suture is utilized.

TABLE 1.

PROPERTIES OF COMMON SUTURE MATERIALS

Material	Nature	Type	Tissue response	Retention of tensile strength in vivo	Handleability	Potential advantages / disadvantaged
catgut	sheep submucosa	absorbable	inflammation more marked with plain catgut than chromic.	plain - 2/3 lost in 5-6 days chromic - 2/3 lost in 10-15 days	moderate	unpredicatable loss of tensile strength; potentiation of sepsis though this is limited by absorption; variability of natural product
reconstituted collagen	sheep mucosa	absorbable	inflammation as with catgut	as for chromic catgut	moderate	as for catgut, but more reliable product
polyglycolic and polyglactin 910 vicril / dexon	synthetic polymer	absorbable	slight - absorbed with variable but muted inflammatory reaction	variable - 1/2 lost in 15 days	good	predictable loss of tensile strength; less potentiation of sepsis than catgut
PDS polydioxanone	synthetic polymer	absorbable	slight	1/2 lost in 28 days	moderate	as above
linen	vegetable	non-absorbable	moderate inflammation	1/3 - 1/2 strength lost in 3-6 months	very good	cheap; variable supply and performance
silk	silk worm	non-absorbable	mild to moderate inflammation	1/2 strength lost in 2-12 months	very good	fairly cheap, cost likely to rise; variable supply
nylon	synthetic polyamide	non-absorbable	minimal	2/3 strength retained up to 6 months	poor in monofilament, good in braid	knot slippage in monofilament
polypropylene	synthetic	non-absorbable	minimal	as for nylon	superior to monofilament nylon	elastic; knot slippage; can fracture, e.g. artery
coated polyester	synthetic(PTFE coated braid)	non-absorbable	minimal to moderate	as for nylon	good (braid plus monofilament coat)	knot slippage; coat fracture leads to increased inflammatory response
polytetrafluoroethylene Gore-Tex	synthetic (expanded PTFE)	non-absorbable	minimal	as for nylon	good	expanded microstructure allows incorporation into tissues; minimal sutureline bleeding(artery)
stainless steel	synthetic	non-absorbable	virtually nil	monofilament shows fatigue fractures at 1 year	poor in monofilament moderate in braided	inert; troublesome knots and wound pain

INTERNAL FIXATION OF FRACTURES OF THE HAND

DR N FREED : ORTHOPAEDIC SURGEON - PRETORIA

The goal of fracture treatment is to achieve union and restore function of the injured part to as near normal as possible, as soon as possible.

The ideal internal fixative in the hand should ideally have the following characteristics:

1. Require minimal soft tissue dissection for insertion
2. Provide sufficient stability for early active mobilisation
3. Should not interfere with the free gliding movements of tendon and muscle and not obstruct full joint movement
4. Should be easily removable
5. Should be a user friendly implant
6. Must be conducive to good physiological bone healing

Indications for open reduction

Early mobilisation of the fractured hand is essential for a good result. The majority of unstable fractures require internal splintage to realise this goal

The following methods of fracture fixation are available:

1. Closed reduction with percutaneous pinning
2. Pins with open reduction
3. Screws
4. Plates and screws
5. Clamp-on plate
6. Tension band wiring
7. Combination of the above

The indications for each of the above methods of internal fixation is discussed and examples demonstrated.

The ubiquitous Kirshner wire remains a very useful internal fixative in the hand surgeon's fracture armamentarium.

The complications of open reduction are discussed.

In general, the internal fixative which is the easiest to insert, which requires minimal soft tissue dissection, which allows early mobilisation and which has a low complication rate is the one to opt for.

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VESSEL SUTURE

PROF BJ VAN R ZEEMAN: PLASTIC SURGEON - CAPE TOWN

The use of the operating microscope, micro-instrumentation and microsutures lead to improved techniques and better surgical results.

Carrel and Guthrie provided the basis of modern vascular and transplantation surgery in the first decade of this century.

Seidenberg (1958) was the first to make an effort to repair vessels in the microvascular range, 1.5 - 3.0 mm. However, they were hampered by the lack of small sutures. As recently as 1962 7-0 silk was the smallest suture available.

The surgeon should pay attention to a comfortable position at the operating table and adequate exposure of the operating field.

Proper vessel suture technique includes:

- Repair normal vessels with normal flow
- Use the operating microscope
- Gentle handling of tissues
- Adequate debridement
- Similar diameter of vessels
- Normal vessel tension, no kinking or twisting
- End-to-end or end-to-side anastomoses
- Vein grafts
- Correct suture tension and spacing

Vessel ends are prepared by resection of periadventitial tissue. The adventitia with its vasa vasorum and neural supply should be preserved. The vessel ends are placed into a double apprcximating clamp. The lumen is irrigated with heparinized plasmalyte-B.

End-to-end suturing is the most commonly performed method and interrupted full thickness wall sutures are used. The needle is passed through at right angles to the wall at a distance from the margin slightly greater than the thickness of the vessel wall. The posterior wall technique is used in cases where it is impossible to turn the clamp over.

End-to-side anastomosis is used in vessels of dissimilar diameter or where there is only a single vessel which should be preserved. This technique is mainly used for arteries and the posterior wall is sutured first.

The goal in spacing vessel sutures should be to obtain an ultimately leak-free anastomosis with as few sutures as possible.

The patency of all anastomoses should be verified before closure of the wound.

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FLEXOR TENDON REPAIR

DR KEN PRETORIUS: ORTHOPAEDIC SURGEON - CAPE TOWN

BASIC PRINCIPLES

All flexor tendon repairs should be done in the operating theatre with adequate anaesthesia and under bloodless field. The wound should be carefully cleansed and debrided and the extent of the injury determined. If the original laceration has to be extended for better exposure and repair, proper incisions must be utilised (Fig 1).

Careful consideration should be given to the viability of any skin flap created by extending the wound. Incisions should not cross flexor creases. Minimal debridement of tendons is necessary and only the cut ends should be handled. Associated fractures and digital nerve injuries are not contra-indications to primary repair. Fractures should be stabilised with K-wires in such a manner that joint or tendon motion is not impeded. The recovery of repaired digital nerves is not apparently compromised by the restricted early motion required for tendon gliding. Injuries to the volar plate should be repaired with fine non-reactive sutures such as 6-0 Mersilene.

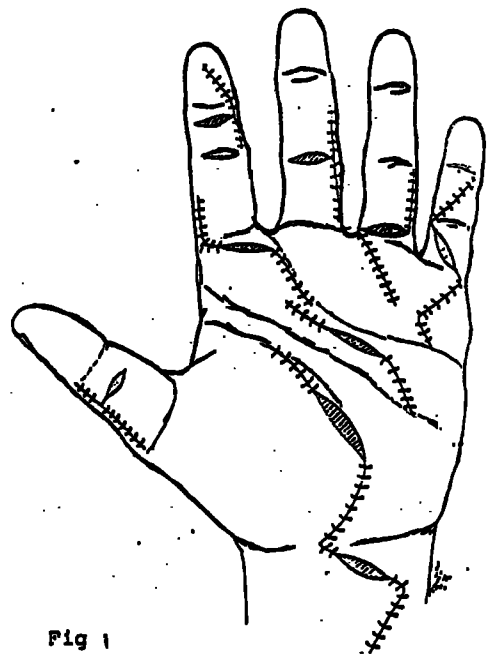

Fig 1

SUTURE MATERIAL

The ideal suture material should be non-reactive, non-rigid, of small calibre, strong, easy to handle and able to hold a good knot. Prolene and braided polyester fit the above requirements well. Prolene however, has a tendency to slip and untie, great care must be taken when knotting this material. A suture of 4-0 is usually necessary, but 5-0 is sufficient in children, particularly in zone II.

SUTURE TECHNIQUE

Numerous suture techniques have been devised for tendon repair. (fig 2)

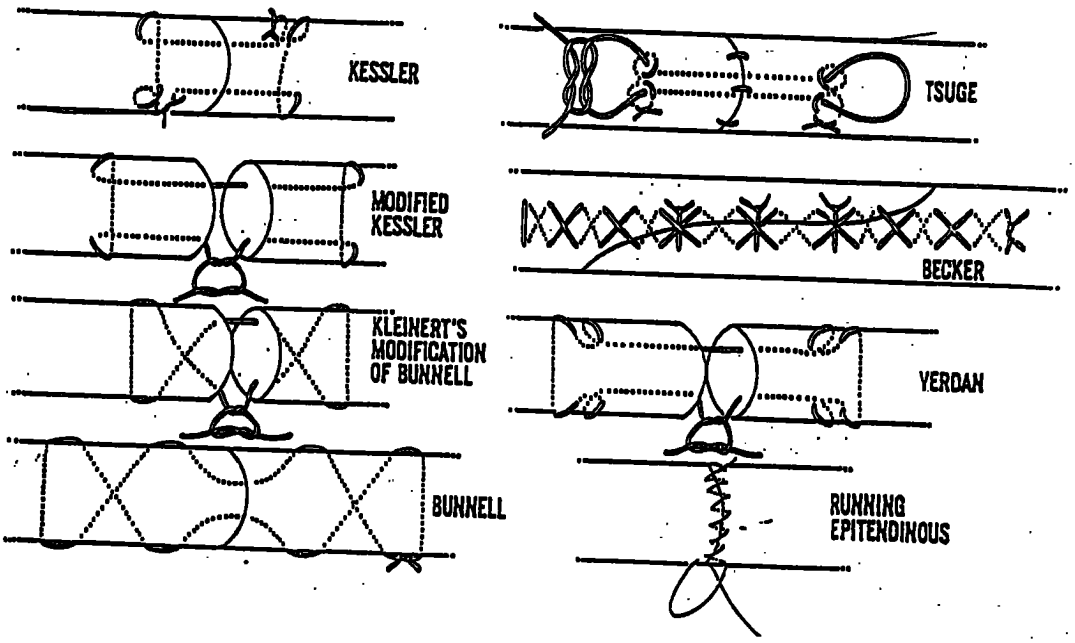

Fig 2

The Bunnel and Kessler sutures provide nearly equal strength initially, but the Kessler suture is 3x stronger on the 5th day post-repair. From the 10th day onwards, there is no significant difference between the strengths of the two methods.

A running 6/0 Prolene or Mersilene epitendinous suture should be used to complete the repair - particularly in Zone II. (Fig 3)

Fig 3

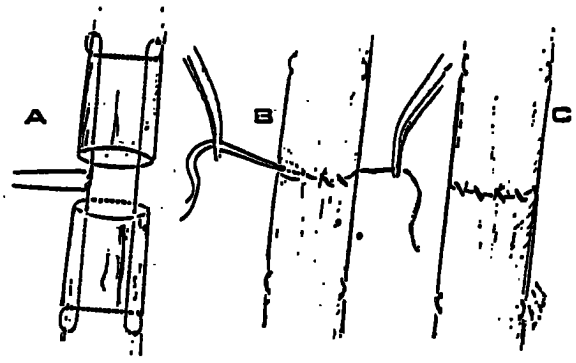

Fig 3

Fig 4

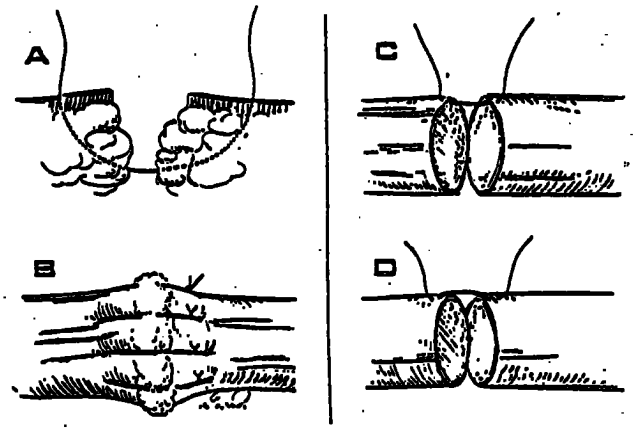

Fig 4

Fig 4.

a. When placing a suture in skin, one attempts to evert the edges
b. such a suture in tendon exposes tendon fibres
c. the pass of the needle should be long and shallow, taking only epitenon
d. if eversion still threatens, an inverting Lambert suture should be used

POST-OPERATIVE SPLINTING

The tourniquet is deflated and good haemostasis is obtained prior to wound closure. Haematoma formation can lead to wound healing problems, tendon adherence, rupture and infection, therefore drains are recommended. Wounds are closed with fine (5-0) interrupted nylon sutures.

A bulky dressing is applied, keeping the wrist and finger joints in flexion. The drain is removed the following day and the dressings in 2-4 days. Following wound inspection, a light dressing is applied which restricts movement as little as possible, and the patient is referred to occupational therapy for an elastic band splint.

POST-OPERATIVE MOBILISATION

Although exact techniques vary, the tendon must glide through the sheath for at least short distances during the early weeks (3-5mm of extension motion at the anastomosis site is sufficient to prevent firm adhesion formation), but forces on the suture must be controlled to prevent disruption. In children, post-operative mobilisation may proceed more slowly without jeopardizing the results, but for adult motion must be initiated without undue delay (2-4 days).

A dorsal splint maintaining the wrist and MP joints in 30-60 degrees of flexion, reduces tension on the repair. A rubber band is attached to the nail of the injured finger by means of a heavy suture or a glued-on dress hook that it is attached proximally at the anterior flexion crease of the wrist to flex the IP joints. Active extension of the finger at the IP joints draws the tendon repair distally in the sheath and stretches the rubber band (the tension of the rubber band must be such that the finger can be fully extended at the PIP and DIP joints, otherwise flexion contractures may result). (Fig 5)

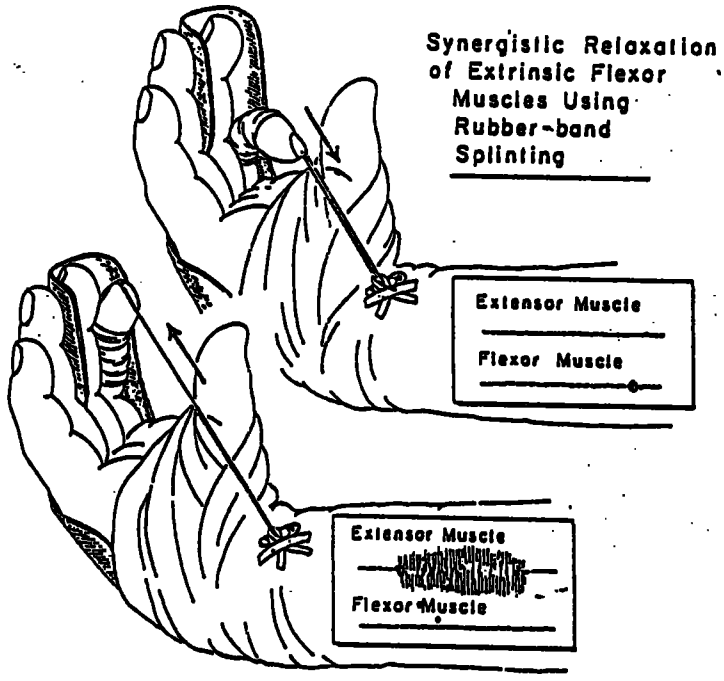

Fig 5

The digital flexor muscles have been shown to be electrophysiologically quiet during this action, so tension on the suture line is generated only by the visco-elasticity of the muscle belly. When the patient relaxes the extensors, the rubber band, rather than active flexor muscle contraction flexes the finger and allows visco-elasticity of the flexor muscle to move the repair site proximally. The exercises are done 3x a day with 6 to 8 motions for each tendon per session (fig 6)

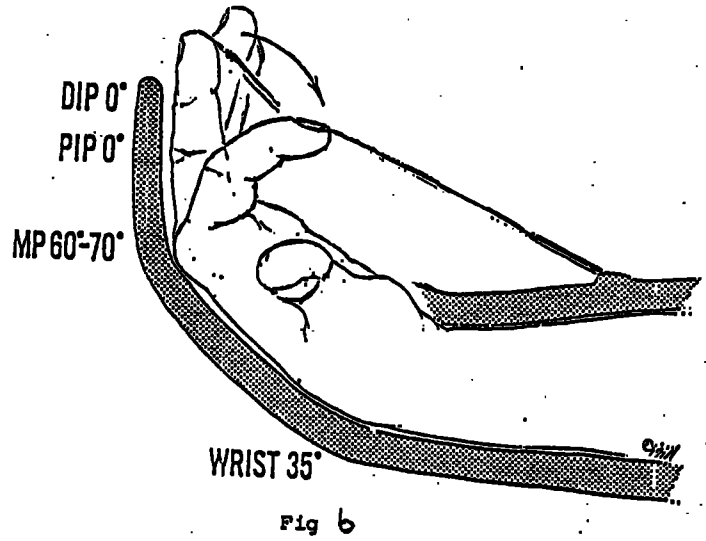

Fig 6

By 4 weeks post-operative, the repair is generally strong enough to allow repositioning of the wrist and MP joints in neutral, with the elastic band attached to a wrist strap. Splinting can be discontinued at 6 weeks and progressive forceful, active flexion and extension and finally passive extension exercises are carried out.

Theoretically, the tendon repairs that are most likely to rupture are those performed through relatively avascular areas since intrinsic tendon healing at these sites is delayed - injuries in such areas may therefore require more cautious post-operative mobilisation. A ruptured repair is an urgent matter and should be resutured.

Adhesions cause far more post-operative difficulties than do ruptures. If satisfactory motion has not returned after at least 3 months of conscientious hand therapy, a tenolysis may improve the result.

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NERVE SUTURE

DR N FREED : ORTHOPAEDIC SURGEON - PRETORIA

Nerve injury is a common occurrence. The ultimate result is directly dependent on the initial management of the injury.

Correct management requires the following:

1. An understanding of the basic anatomy of the injured nerve
2. Adherence to the basic principles of wound management
3. The accurate suture of the injured nerve
4. Careful post operative follow up management.

Timing of repair

Primary repair is always better than secondary repair, provided that the circumstances are conducive to such a repair.

Primary repair

Epineurial repair is the traditional method of repair and the repair most commonly used in most hand units. Magnification should always be available, either loupe or an operating microscope, if available.

Technique of repair

Following adequate wound debridement the nerve ends themselves are cut back until all evidence of damaged nerve has been debrided. The epineurium must be clearly identifiable on both ends of the cut nerve. The goal of the epineurial repair is to establish continuity without tension and in the correct rotational alignment. The rotational alignment should be established by aligning the cut vessels on the surface of the nerve and also by noting the fiscicular arrangement and matching the two ends of the divided nerve. An 8.0 - 10.0 nylon should be used for establishing the continuity of the divided nerves. If approximation of the cut ends is possible with 8.0 nylon the tension is correct. The number of sutures used should be as few as possible to assure adequate approximation.

Post-operative management

The nerve suture is protected post-operatively by immobilising the joint above and below the suture with a plaster cast to prevent excessive tension on the healing nerve. The cast can usually be removed within a period of 3 to 4 weeks following which the distal and proximal joints are carefully mobilized. All patients are advised as to the protection of the anaesthetic areas of the limbs. The patients are seen at regular intervals and an advancing Tinel sign will give an indication as to the progress of the regeneration of the injured nerve.

Fascicular and grouped fascicular repair

Will be demonstrated and briefly discussed

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