The South African Society for Surgery of the Hand

Refresher Course

The Wrist and Tendon Transfers in the Upper Limb

13 - 14 March 1995

Arthur's Seat Hotel, Sea Point

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WELCOME

The wrist is the key to the hand. We hope to unlock some of its marvels today.

The session on tendon transfer should lead to lively discussion.

Ample time has been allowed for discussion in both sessions, because **YOUR** contribution is valuable to all Society members.

Enjoy your stay with Mother.

WIKUS DE JAGER
ORGANISER

Contents

Scientific Programme

MONDAY 13 MARCH 1995

07:15 - 08:00	Registration	
08:00 - 08:10	Welcome and Announcements	Dr Wikus de Jager

CHAIRMAN : DR M SINGER

08:10 - 08:30	Anatomy and Biomechanics of the Wrist	Dr D Rodseth
08:30 - 08:35	Discussion	
08:35 - 08:55	Examination of the Wrist	Prof KS Naidoo
08:55 - 09:05	Discussion	
09:05 - 09:15	Bone Scan of the Wrist	Dr PDR van Heerden
09:15 - 09:20	Discussion	
09:20 - 09:30	Wrist Arthrography	Dr H Becker
09:30 - 09:40	MRI of the Wrist	Dr J Lotz
09:40 - 09:50	Discussion	
09:50 - 10:10	Scaphoid Fractures	Dr AJ Wienand
10:10 - 10:20	Discussion	
1020 - 10:50	**TEA**	

CHAIRMAN : DR D RODSETH

10:50 - 11:10	Carpal Instability	Dr F Liebenberg
11:10 - 11:20	Discussion	
11:20 - 11:40	Arthroscopy of the Wrist	Dr N Freed
11:40 - 11:50	Discussion	
11:50 - 12:10	Kienböck's Disease	Dr LK Pretorius
12:10 - 12:20	Discussion	
12:20 - 12:50	Surgery of the Wrist in Rheumatoid Arthritis	Dr R Jaffe
12:50 - 13:00	Discussion	
13:00 - 14:00	**LUNCH**	

CHAIRMAN : DR LK PRETORIUS

14:00 - 14:20	Fractures of the distal radius and malunions	Dr C Maraspini
14:20 - 14:30	Discussion	
14:30 - 14:50	The TFCC and the distal radio-ulnar joint	Dr W de Jager
14:50 - 15:00	Discussion	
15:00 - 15:30	**TEA**	

CHAIRMAN : DR W DE JAGER

	Wrist Rehabilitation	
15:30 - 15:40	Physiotherapy for the Wrist	Mrs S König
15:40 - 15:50	Occupational Therapy Rehabilitation of the Wrist	Mrs H Buchanan
15:50 - 16:00	Discussion	
16:00 - 16:20	Wrist arthrodesis and proximal row carpectomy	Prof U Mennen
16:20 - 16:30	Discussion	
16:30 - 16:45	Wrist denervation	Dr R Boome
16:45 - 16:50	Discussion	

TUESDAY 14 MARCH 1995

CHAIRMAN : PROF KS NAIDOO

08:00 - 10:00	Mini Symposium: Tendon Transfers in the Upper Limb Panel: Drs R Boome, W de Jager, Prof U Mennen, Dr M Singer and Dr AJ Wienand	
08:00 - 08:10	Median Nerve	Prof U Mennen
08:10 - 08:30	Discussion	
08:30 - 08:40	Radial Nerve	Dr W de Jager
08:40 - 09:00	Discussion	
09:00 - 09:10	Ulnar Nerve	Dr AJ Wienand
09:10 - 09:30	Discussion	
09:30 - 09:40	Brachial Plexus	Dr R Boome
09:40 - 10:00	Discussion	
10:00 - 10:30	**TEA**	

CHAIRMAN : DR J FLEMING

10:30 - 12:30	Case Discussions: The Wrist Panel: Drs R Jaffe, F Liebenberg, LK Pretorius and AJ Wienand	
	Panel and participant discussion of wrist cases.	
	Everyone attending is invited to bring X-rays for discussion	
12:30	Closure by the President	Dr J Fleming

ANATOMY AND BIOMECHANICS OF THE WRIST : DR DF RODSETH

ANATOMY

For optimal function a wrist needs to be

(a) Stable
(b) Mobile

Stability and mobility often conflict with each other, the wrist compensates for this conflict with its unique anatomy.

Short, tight, strong ligaments provide the stability.

The complex intercalated arrangement of the carpal bones and the movements of these bones in relation to each other allow the range of motion present in a normal wrist.

There are seven groups of ligaments of the wrist:

1. Palmar radiocarpal ligaments
2. Ulna carpal ligaments
3. Dorsal radiocarpal ligaments
4. The Y-fibrocartilage ligament
5. The intercarpal ligaments
6. The pisiform complex
7. Carpo metacarpal ligaments

Weitbrecht's ligament
radio scapho cap.
Triquetro lunate
space of Poirier.

BIOMECHANICS

The distal row of the carpal bones follows the movement of the hand and alignment between them and the metacarpal is maintained.

The lunate is doubly intercalated

(a) between the capitate and radius
(b) between the scaphoid and triquetrum

The escape movement of the scaphoid on radial deviation results in an AP or vertical position of the scaphoid and this motors the related movements of the proximal row.

The escape movement of the triquetrum acts as the motor for the related movements seen with ulna deviation.

The blood supply to the wrist comes via a number of dorsal and palmar arches.

The scaphoid capitate and hamate proximal poles are all vulnerable to avascular necrosis as their supply is intraosseous from distal to proximal.

The posterior interosseous nerve is responsible for supplying most of the innervation of the carpus.

The distal radio-ulnar joint (DRUJ)

The head of the ulna and the sigmoï notch are not completely congruent, both rotation and sliding of the joint takes place during pro- and supination. A number of structures stabilize the DRUJ:

(a) TFCC
(b) Sigmoïd notch
(c) Interosseous membrane
(d) Extensor retinaculum
(e) ECU and its sheath
(f) Dorsal carpal ligaments

The DRUJ bears approximately 20% of the axial load across the wrist and converts some of the load into tension of the TFC and interosseous membrane.

The main blood to the DRUJ comes from the anterior interosseous artery.

The main innervation is via the dorsal branch of the ulna nerve.

EXAMINATION OF THE WRIST
PROF KS NAIDOO

The wrist is often called the "low back" of hand surgery. Successful examination of the wrist requires the following:

- Thorough knowledge of the anatomy and biomechanics
- Careful history
- Sound clinical examination
- Awareness of the causes of wrist pain

This is supplemented by the appropriate special investigations.

CLINICAL HISTORY

This must include a history of the local (wrist) problem and a systematic general medical history.

Essentially one must find out if the problem is injury related or of spontaneous onset.

Be aware of:

- mechanism of injury
- unrecognised trauma
- work related factors
- sports or hobbies

Note:

- Pain: acute/chronic
  localise accurately

- Swelling
- Clicks, clunks, snaps, subluxations, triggering, crepitus
- Limitation of movement
- Neurological symptoms
- Vascular complaints

PHYSICAL EXAMINATION

- Patient must be relaxed and made comfortable
- Begin your examination of the whole patient, rest of upper limb or wrist as is necessary
- The examination is carried out in the usual systematic manner: inspection, palpation and movement
- Whenever possible, the patient should demonstrate the movement or position that produces the discomfort. Careful inspection and palpation may localise the site and source of pain, clicks or clunks.
- Examine the wrist in zones - dorsal and volar

Dorsal zones	Radial
	Central
	Ulnar
Volar zones	Radial
	Central
	Ulnar

- Examine both soft tissue and bone and joint structures of the zones
- Neurovascular examination must be performed as completely as is indicated

LOCAL INJECTIONS

Local injections of specific structures with short acting local anaesthetics may be performed to localise the site and source of discomfort.

LIST OF SOME CAUSES OF WRIST DISORDERS

Congenital:	Radial club hand Madelung's deformity
Trauma:	Fractures Non-union Carpal instability SLAC Wrist Distal radio-ulnar joint
Infection:	Acute Chronic NB! Gonococcal TB
Inflammatory:	e.g. Rheumatoid Arthritis (RA)
Nerve Syndromes:	Carpal Tunnel Guyon's Tunnel Post Interosseous Neuralgia
Tendon Disorders:	Tendinitis Stenosing tenosynovitis Subluxations/dislocations Ruptures
Ganglia:	Extraosseous Intraosseous
Degenerative:	O.A. localised generalised
Neoplasma:	Bone cysts Enchondroma Osteoid osteoma Metastasis
Kienböck's Disease	
Miscellaneous	e.g. Impingement: Radial Ulnar

BONE SCAN OF THE WRIST
DR PDR VAN HEERDEN

Triple-phase radionuclide imaging of the wrist with ^{99m}Tc-MDP is a highly sensitive technique for detecting carpal bone pathology in patients with unexplained pain or following injury to the wrist. It is especially valuable when initial conventional radiographs are normal or equivocal. Although scintigraphy is sensitive, its specificity is too low for a final diagnosis without further studies in many cases. It is, however, simple, relatively inexpensive and non-invasive and provides enough information to plan further investigations with more confidence.

A normal wrist scan virtually excludes any carpal bone fracture or significant injury to the intrinsic carpal ligaments. An intense focal area of radioactivity in a carpal bone is consistent with a fracture or avascular necrosis, while a tear in one of the intrinsic ligaments shows less intense focal concentration. Injuries to extrinsic ligaments of the wrist results in a diffuse increase of radioactivity as does non-specific arthritis. Furthermore, scintigraphy of the wrist is valuable in the diagnosis of tenosynovitis and reflex sympathetic dystrophy.

– Looks at disturbance in function not disturb. in anat.

– Technecium labelled white cells. for infect.

WRIST ARTHROGRAPHY
DR H BECKER

This is a relatively minor but nevertheless invasive investigation. Clinically there is only a miniscule demand so that the examination is only rarely performed. It is a fairly quick and easy examination which, in experienced hands, should not last longer than 30 minutes. Only a very small amount of contrast medium, not more than 4cc, is injected into the radiocarpal joint and films are taken after some gentle manipulation. A routine arthrogram includes antero-posterior, lateral and both oblique projections. There are five pathological entities for which a wrist arthrogram can be useful.

NORMAL ARTHROGRAM

The normal wrist arthrogram demonstrates the radio-ulnar articulation as a smooth cupshaped sac. There are usually two small pouches as well. One is the volar recess on the anterior aspect and the other is the pre-styloid recess. In some individuals, the pisiform-triquetrial compartment fills through a normal communication. Filling of any of the other joint spaces or tendon sheaths would be pathological.

TEARS OF THE TRIANGULAR FIBRO-CARTILAGE

When the triangular cartilate is torn, the arthrogram shows extension of contrast material into the distal radio-ulnar compartment. These tears are usually complete. Partial tears, which are seen as small pools of contrast material in the disc substance itself, are very unusual.

TRAUMATIC INTERCARPAL COMMUNICATIONS

This occurs when the interosseous intercarpal ligaments are ruptured. Contrast material then escapes from the intercarpal space into one or more of the intercarpal joints. These communications may also be the result of degenerative change.

When there is rotatory subluxation of the scaphoid bone, an abnormal communication demonstrates filling of the gap between scaphoid and lunate.

SCAPHOID FRACTURES

A wrist arthrogram may be used to distinguish between a true non-union and a fibrous union.

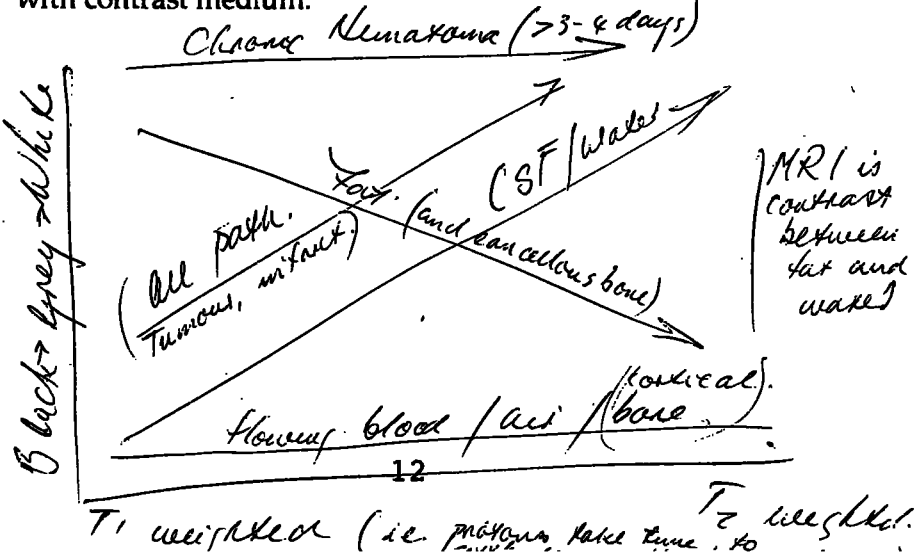
POST-TRAUMATIC SYNOVITIS AND DEGENERATIVE JOINT DISEASE

This is usually associated with irregularity of the capsular margins, intercompartmental communications, abnormal filling of tendon sheaths and of communicating cysts.

INFLAMMATORY ARTHRITIS

The findings are not specific. A common and early finding is diffuse corrugation of the joint capsule, visible even when the plain films are normal. Also seen are abnormal inter-compartmental communications including the distal radio-ulnar compartment due to destruction of the triangular fibrocartilage.

Lymphatic opacification can be observed in some cases and probably reflects excessive production of synovial fluid. Tendon sheaths and extra-capsular synovial cysts may also fill with contrast medium.



MRI OF THE WRIST
DR J LOTZ

MRI has become increasingly useful in defining soft tissue abnormalities, subtle bone lesions and ischemic changes in the hand and wrist. When properly performed, MRI may replace more conventional techniques in diagnosing certain disorders of the hand and wrist.[1]

The single most valuable application in contemporary imaging of the wrist, is the evaluation of avascular necrosis of carpal bones, most commonly in the lunate and following scaphoid fractures.

Patterns of osteonecrosis are variable on MRI, the inconsistencies apparently related to the chronicity or severity of the process. Focal or diffuse decrease in signal intensity in marrow fat on T1-weighted imaging is a constant, but non-specific finding.[2]

This uniform signal loss on short TR/TE sequences is the most reliable sign of avascular necrosis, specifically in the lunate. Comparison with T2-weighted images may be useful, with increased signal in the arly stages and may help to improve specificity. Later, when bone sclerosis occurs, the signal intensity will be reduced on both T1 and T2 weighted images. In either setting, comparison with routine radiographs is important.

MRI has been valuable in monitoring the response of avascular necrosis to conservative therapy.

In the carpal tunnel syndrome, the superior soft tissue contrast obtained with MRI, makes the technique ideal for identification of nerves, vessels and tendons in the carpal tunnel. Signs indicative of median nerve entrapment include swelling of the nerve, flattening of the nerve, bowing of the flexor retinaculum and increased signal intensity of the nerve on T2-weighted images.

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1. Berquist TH. MRI of the Musculo-Skeletal System. Raven Press 1990
2. MRI Decisions Vol 4 No. 2

Fat is light bulb
– no fat → dark. eg in ischaemic necrosis
eg Kienbock, prox pole scaphoid

SCAPHOID FRACTURES
DR AJ WIENAND

When studying a subject, to avoid reinventing the wheel, one must look critically at work that has been done previously.

The mechanism of injury is documented extensively but not much attention has been paid to rotational forces. This is probably the reason why there is uncertainty about the position of the wrist in conservative management.

In over 1000 cases treated with below-elbow thumb spica cast with the wrist in dorsiflexion, the union rate in waist fractures was 97,9%.

Decision to operate is made either initially or at 6 weeks, using a combination of Boonzaier's friendly signs, Cooney's criteria and Herbert's classification.

The type of operation is decided on the operating table.

Operations on non-unions of longer than 2 year's duration, give poor functional results. The aim is to accurately restore length and shape of the scaphoid which is difficult with this amount of resorption.

The other unsolved problem is the symptomatic small proximal pole non-union.

→ Macro ~~AP~~ ap in ulnr deviation for cortical RO? healing

CARPAL INSTABILITY
DR F LIEBENBERG

Carpal instability represents a spectrum of bony and ligamentous damage.

The wrist joint is inherently unstable, in effect spingloaded, but kept under control by ligamentous restraints and an intact scaphoid.

Carpal instability can be divided into two patterns, i.e. dorsal intercalary segment instability (DISI) and volar intercalary segment instability (VISI).

MECHANISM OF CARPAL INSTABILITY

i Lunate collapse, i.e. Kienböck's disease

ii When the radiolunate relationship is reversed after malunion of fractures of the distal radius

iii When scaphoid action on the lunate becomes abnormal after unstable scaphoid fractures

iv After various types of ligamentous tears

CLASSIFICATION OF CARPAL INSTABILITY

STATIC DYNAMIC

LATERAL MEDIAL PROXIMAL

LATERAL INSTABILITY (SCAPHOLUNATE DISSOCIATION)

The most frequent form of carpal instability

DIAGNOSIS

- Pain, swelling, tenderness
- Progressive grip weakness
- Watson-test
- Axial compression

RADIOGRAPHIC FINDINGS

- Scapholunate diastasis
- Foreshortening of the scaphoid
- Cortical ring sign
- Blatt sign
- Overlapping of scaphoid and capitate
- Increased scapholunate angle (DISI + VISI)
- Special investigations

CLASSIFICATION

Type	I	Dynamic
Type	II	Static
Type	III	Degenerative
Type	IV	Secondary

TREATMENT OF CARPAL INSTABILITY

A. Early

- Reduction by manipulation and immobilization
- Open reduction, K-wire fixation, ligament repair

B. Chronic

- Limited wrist arthrodesis (various carpal bones)
- Ligament reconstructions
- Capsulodesis
- Osteotomy for malunions (i.e. radius)

C. With Osteoarthritis

- Wrist arthrodesis
- Wrist arthroplasty
- Proximal row carpectomy
- Watson's SLAC wrist procedure

ARTHROSCOPY OF THE WRIST
DR N FREED

Wrist arthroscopy is a relatively new procedure. With the development in 1970 of a small joint arthroscope, Watanabe and his colleagues described its use in a number of small joints. In the early 1980's investigators refined wrist arthroscopic technique. These included Whipple in Richmond, Poehling and Koman in Winston Salem, Roth in London Ontario and Bora and Osterman in Philladelphia. In 1982 Bora and Osterman began using a small joint arthros-cope specifically designed to evaluate wrist joint problems. Specific modifications for the wrist included shortening of the barrel and a direct video camera attachment.

Wrist arthroscopy consists of the visual inspection of 2 composite joints - the radiocarpal joint and the midcarpal joint. Although the more obvious joint to arthroscope is the radiocarpal joint, because it is larger and apparently more accessible, it is essential to include the midcarpal joint in the examination for a number of reasons. The first and perhaps the most important relates the need to be able to see both surfaces of the scaphoid, lunate and triquetrum and to assess the status of the scapholunate joint and the luno-triquetral joint. The intercarpal joints involving the scaphoid, lunate and triquetrum are not visible or reliably assessable when viewed from the radiocarpal joint alone. All that is seen from this aspect is the convexity of the proximal row. Therefore, the entry of the arthroscope into the radiocarpal joint will restrict the area of examination to the proximal and dorsal aspect of the scaphoid, the dorsal aspect of the lunate and a glimpse of the triquetrum. The scaphoid and lunate fossae and the triangular fibro-cartilaginous complex are easily seen, and so radiocarpal arthroscopy is in its own right an essential part of the examination. It is also essential to see the capitate, the hamate and the relationship of the proximal and distal rows. This can only be seen through the midcarpal route and the combination of the 2 examinations significantly improves the surgeon's ability to arrive at a satisfactory diagnosis.

The basic principles of arthroscopy of the wrist are the same as for all endoscopic work, viz using the correct equipment, that

the cavity is entered through the least traumatic route consistent with an adequate view of the area to be examined, a routine examination should be well-ordered and follow a set pattern, and finally, good records should be kept.

TECHNIQUE AND EQUIPMENT

Equipment:

1. Stand clamped to the side of the table, strong enough to take the weight of the patient's arm and drapes, and up to 5kg of freely suspended traction weights
2. Chinese finger traps
3. A connection from the traps to the stand
4. A strong sling to place upon the upper arm to which the counterweights are attached
5. Counterweights of 1kg each (up to five may be required)
6. Appropriate surgical towelling
7. Pneumatic tourniquet

ARTHROSCOPIC EQUIPMENT

1. A 2,4mm arthroscope is ideal with a 30° angle and a blunt obturator
2. A fine probe or hook
3. A light source
4. Television camera and appropriate monitor
5. The necessary irrigation fluid, e g Ringer's Lactate or Hartmann's solution

Additional useful equipment includes:

1. A 2mm grasping forceps
2. Fine curved scissors, both right and left curved and straight
3. Power shaving system, 2,9mm abraders and cutters

THE PROCEDURE

Local or general anaesthesia may be used.

Position on table:

The patient lies supine on the table, positioned so that the sling, which will allow the attachment of the counterweight can be free to hang without fouling the edge of the table.

The hand is then suspended from the overhead attachment via the finger traps and the counterweight applied around the upper arm to provide the necessary distraction.

LANDMARKS

Certain landmarks should be identified and marked on the skin with a sterile skin marker. These include:

1. The tubercle of Lister
2. The dorsal radial rim
3. The radial styloid process
4. The ulnar styloid process
5. The third metacarpal shaft
6. The capitate sulcus

The tendinous landmarks which should be identified include:

1. The extensor carpi radialis brevis
2. Extensor pollicis longus
3. Extensor digitorum communis to the index finger
4. The extensor carpi ulnaris tendon

ENTRY POINTS

The standard entry points are as follows:

1. The 3/4 portal between extensor pollicis longus and extensor digitorum communis
2. The 4/5 portal between extensor digitorum communis and extensor digiti minimi
3. The 6R portal, i e on the radial side of extensor carpi ulnaris
4. The 6U portal, i e on the ulnar side of the extensor carpi ulnaris
5. The midcarpal portal

The commonly used portals are the 3/4 portal, the 4/5 portal and 6R portal.

Entry into the joint is obtained by making a small incision which is just distal to the tubercle of Lister over the radiocarpal joint line. A small curved haemostat is used to bluntly dissect onto the joint capsule and is then pushed into the joint. Following this the blunt obturator is carefully inserted into the joint and the arthroscope is then connected. A routine inspection of the joint is then performed. The first structure which is seen in the normal wrist joint lying on the volar surface of the wrist, is the radio-scapholunate ligament, "the ligament of Testut". It is usually identifiable as a ligament or as an area of synovitis and fat. In this ligament lies the metaphyseal artery. This ligament acts as a beacon in the wrist as it clearly indicates the scapholunate junction and helps to orientate oneself for the further examination of the wrist joint. On the proximal side of the ligament and to its radial side is the scaphoid fossa of the distal radius, proximally and ulnar to the ligament is the lunate fossa of the distal radius. Lying behind the radio-scapholunate ligament and to its radial side is the radio-luno-triquetral ligament and still further radial is the radio-scapho-capitate ligament. To the ulnar side of the ligament of Testut is the anterior capsule thickened to form the radiolunate ligament and more towards the ulnar side proximally is the triangular fibro-cartilagenous complex and distally the luno-triquetral junction and the triquetrum.

Having completed a tour of the joint, the scaphoid may be stressed by pushing upon the tubercle and nothing any abnormal movements.

The order of examination of radiocarpal joint is then as follows:

1. The ligament of Testut
2. The scapholunate joint line
3. The radio-luno-triquetral ligament
4. The fossa between the radio-luno-triquetral and the radio--scapho-capitate ligaments
5. The radio-scapho-capitate ligament
6. The radial styloid process
7. The scaphoid from the waist to the proximal pole
8. The scapholunate joint line
9. The scaphoid fossa
10. The surface of the lunate

11. The lunate fossa
12. The posterior lunate recess
13. The radio-TFCC junction
14. The TFCC
15. The ulnar recess
16. The triquetro-lunate joint
17. The anterior capsule

The mid-carpal portal

The point of entry is in the depression created by the capito-lunate joint and the capitate sulcus, palpable just proximal to the capitate in the line of the third metacarpal shaft. The point of entry is steeply angled to gain adequate access between the capitate and the lunate. The first landmark is the tip of the head of the capitate and from this point the concavity of the articular surfaces of bones of the proximal row can be seen. There is an almost perfect fit between the scaphoid and the lunate, except anteriorly where the two bones diverge abruptly to leave a triangular defect filled with synovium. There is an equally good fit between the lunate and the triquetrum and any disassociation between these bones is easily seen from this vantage point. Moving the scope radially towards the scapho-capitate joint allows the whole length of the scaphoid to be examined. At the distal end of the scaphoid the posterior part of the triscaphae joint may be visualised. Moving the scope towards the ulnar side allows a view of the triquetro-hamate joint as well as of the capito-hamate and triquetro-lunate joints.

Having examined the radiocarpal and midcarpal joints, the wounds are closed using simple adhesive skin closure strips. A well padded dressing is applied.

POST-OPERATIVE MANAGEMENT

A firm dressing is kept in place for 3 - 4 days. Gentle movements are started 24 hours after the examination. The patient is usually able to use the wrist actively within 10 - 14 days.

The above description will be illustrated and explained with the very essential visual material with presentation of the talk.

KIENBÖCK'S DISEASE
DR LK PRETORIUS

This disease is an isolated disorder of the lunate in which there is progressive collapse of the bone.

Kienböck's disease occurs most commonly between the age of 20 and 40 years and the male to female ratio is 2:1.

The clinical features are dorsal wrist pain, swelling due to synovial irritation, limitation of movement, decrease of grip strength and loss of power.

In advanced cases symptoms are those of established osteoarthroses of the wrist.

CAUSATION

Theories:

1. Interruption of the blood supply leading to necrosis of the lunate bone and subsequent fracture
2. Damage of the blood supply by primary fracture of a traumatic nature
3. Repeated stress on the lunate bone at the articulation between the radius and the triangular fibre cartilage articulation leading to micro fractures, the so-called "nut cracker sequence".

Blood supply of the lunate is by a single vessel dorsal and/or volar with a very simple anastomosis within the bone or else multiple vessels entering both dorsally and volarly and a good anastomosis in the substance of the bone.

STAGING OF THE DISEASE IS AS FOLLOWS

Stage 1 Normal radiological appearance

Stage 2 Increased density but unchanged size and shape

Stage 3 Collapse of the lunate leading to proximal migration of the capitate

(a) Normal scaphoid position in relation to the rest of the carpal bones

(b) The scaphoid assumes a vertical position with an obvious ring and scapholunate disassociation

Stage 4 Established osteoarthroses of radiocarpal articulation

A high index of suspicion is necessary when confronted with a patient with wrist pain of no obvious cause.

It is well to include Radioisotope bone scan as well as Magnetic Resonance Imaging in the diagnostic modalities.

TREATMENT

1. In stage 1 there is virtually no literature available for treatment as the diagnoses is seldom made in this stage.

   Immobilisation has been recommended and although symptomatically improves the discomfort, it has no effect on the subsequent progression of the disease. Compressive forces may still occur across the lunate bone.

2. Avascularity but no collapse.

   In this stage ulnar lengthening or radiol shortening may be effective to alter the stress pattern on the lunate bone.

3. (a) An external fixator may be applied to pull the carpus out to length. Dorsal or volar trephine or lunate performed and packed with either a vascularised decorticated pisiform from the colar aspect or with cancellous bone with a ligated arterial pedicle in the calcellous graft.

   The stage of collapse but no rotary subluxation of the scaphoid need to have procedures done to try and maintain the carpal height of the lunate and prevent futher collapse.

   (b) The stage of rotary scaphoid subluxation is an indication for tri-scaphoid fusion of the effective equivalent of scapho-capitate fusion to maintain the carpal height.

   The lunate may be excised or replaced with a tendon anchovy or a carved silicone spacer.

4. Treatment in this stage is virtually a salvage procedure and proximal row carpectomy or wrist fusion may have to be included in the options.

   Wrist denovation is also recommended in cases of severe pain.

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SURGERY OF THE WRIST IN RHEUMATOID ARTHRITIS : DR R JAFFE

The wrist is the keystone to the function of the whole of the hand. Without a stable wrist there is significant loss of wrist function. The management of the wrist must be taken in its total relationship both to the hand distally and the elbow and shoulder proximally before any decision is made as to what should be done.

As in all other areas in rheumatoid arthritis, the treatment is one by a multi-disciplinary team all of whom contribute towards the decision of what surgery should be carried out.

One must be aware of the natural history and progression of rheumatoid arhtirtis and the assessment should initially be by a physician, a physiotherapist, a surgeon and a social worker.

The treatment is aimed at (1) to correct complications by slowing down progression and retaining function; (2) late reconstruction and repair.

In the wrist early treatment is aimed at medicinal treatment with assistance from physiotherapy and splintage and local intra-articular steroid.

Surgical procedures are:

1. Synovectomy and tenosynovectomy
2. Tendon transfer to balance the wrist
3. Attention to scapholunate disassociation

In the late case, surgical procedures aim at reconstruction and can be chosen from the following:

1. Stabilisation of the radio-ulnar joint together with excision of the head of the ulna
2. Kapanji operation
3. Local fusion and excision of the radio-ulnar joint
4. Total wrist fusion
5. Correction of flexion deformity by osteotomy
6. Arthroplasty in selected cases
7. Reconstruction of ruptured extensor and flexor tendons and treatment of associated flexor and extensor tenosynovitis and decompression of the median nerve.

FRACTURES OF THE DISTAL RADIUS AND MALUNIONS : DR C MARASPINI

ANATOMY AND MECHANISMS OF INJURY

A review of the ligamentous structures of the wrist joint confirms that the maximal strength of these structures is volar.

This combined with the fact that 90% or more of injuries to the wrist are due to stresses applied in dorsiflexion, explains the frequency and prevalence of dorsal displacement in these injuries.

It should also be borne in mind that the normal inclination of the distal radial articular surface averages 12° volarward. In addition the distal radius slopes from radial to ulnar sides by 14° to 20°.

FRACTURES WITH DORSAL DISPLACEMENT

The most common of these injuries is the Colles fracture, described approximately 180 years ago.

COLLES FRACTURE

The single most common characteristic of this fracture is the fact that it always collapses into a dorsiflexion deformity pattern. X-rays will reveal a sharp fracture through the volar surface of the radius, comminution of the dorsal cortex and dorsal displacement and tilt of the distal fragment.

The Frykman classification of these fractures is reviewed. In my opinion this has limited prognostic and therapeutic value; in essence the more complex the fracture pattern, the higher the risk of complications and malunion.

The classic method of treatment by closed reduction and application of plaster remains the method of choice. Great care should be taken to obtain an accurate reduction at the initial manipulation. Equally important is frequent and meticulous follow-up to ensure that the reduction is maintained, even at the cost of re-manipulation if position is lost.

follow-up to ensure that the reduction is maintained, even at the cost of re-manipulation if position is lost.

In my opinion the external fixator has a definite but limited place in the treatment of this fracture. It should be reserved for the particularly comminuted and unstable fractures, particularly in the younger patient. In such cases the possibility of bone grafting, percutaneous wiring or even limited open reduction and internal fixation in conjunction with the use of the external fixator, should be borne in mind.

Malunion is common, particularly in the elderly female, but though often cosmetically displeasing, it is not necessarily synonymous with poor function.

The dreaded possibility of RSD should always be borne in mind and treated vigorously.

BARTON'S FRACTURE

This so-called dorsal rim fracture may be viewed as a variant of the Colles, on account of the dorsal direction of the displacement of the distal fragment. The distinguishing factor is the intra-articular nature of the fracture line.

Plaster immobilisation may suffice, but meticulous care should be taken to reduce the articular surface accurately. For this reason alone open reduction and internal fixation is often advisable.

FRACTURES WITH VOLAR DISPLACEMENT

These comprise the Smith fractures and are much less commonly seen. The Thomas classification is reviewed, but in my opinion is both confusing and unhelpful. The most relevant factor is to distinguish between the metaphyseal or Smith's fracture (which is the counterpart of the Colles fracture) and the intra-articular or reversed Barton's fracture.

According to Smith's original description the mechanism is a fall on the back of the hand. This has been disputed however, and it is suggested that a more likely mechanism is a fall on the fixed dorsiflexed hand, with the forearm rotating from supination into pronation.

Conservative treatment with an above elbow plaster with slight flexion of the wrist and supination of the forearm may suffice. In the case of the reversed Barton's fracture or an unstable Smith's fracture open reduction and fixation with a volar buttress plate is recommended.

The commonest complication of these fractures is mis-representation of the initial X-ray as a Colles type of injury.

OTHER DISTAL RADIAL FRACTURES (These are mentioned for completion.)

FRACTURES OF THE RADIAL STYLOID

Two variants of this injury are recognised.

The so-called "Chauffeur's" fracture is a fracture through the base of the styloid and was attributable to sudden change of direction of a crank handle with backfiring of the vehicle. Nowadays this fracture is still seen as a result of encounters with other vehicular components such as steering wheels or handle bars.

The mechanism of injury in these fractures is probably avulsion by a force transmitted through the radiocarpal ligaments volarly. Treatment in a below elbow plaster with slight ulnar deviation is usually sufficient, but additional percutaneous pinning may be useful in cases of gross displacement.

Fractures of the tip of the radial styloid are usually avulsion injuries of the radial collateral ligament.

INJURIES OF THE DISTAL RADIO-ULNAR JOINT

These often form an integral part of the fractures described above, as well as Galleazzi and Essex-Lopresti injuries. In most of these instances they tend to assume secondary importance during management of the fracture, and are thus largely ignored - with occasional troublesome after-effects.

It should however be remembered that they may also occur as isolated injuries, which are often initially missed, with resultant delay in management.

MALUNION OF THE DISTAL RADIUS

This is not an uncommon problem following distal radial fractures. If the articular surface was uninvolved by the fracture, the functional disability is often not significant, despite a poor cosmetic result.

However, if the articular surface has been significantly disrupted by the fracture and inadequately reduced, the loss of function and level of pain are often severe.

Treatment should always be aimed at pain and loss of function, rather than at cosmesis and a radiological appearance.

A careful evaluation of the patient's functional limitation and level of pain is essential, but often not easy to obtain.

In my limited experience the results of unpicking and attempting to realign these intra-articular fractures has been singularly disappointing, with little if any improvement of function or relief of pain. One must bear in mind that the final step in this sequence may well be arthrodesis of the wrist joint.

The best treatment of malunions in these fractures is to avoid them at all costs by meticulous reduction ab initio.

THE TFCC AND THE DISTAL RADIO-ULNAR JOINT : DR LT (WIKUS) DE JAGER

ANATOMY AND BIOMECHANICS

The distal radio-ulnar joint (DRUJ) is stabilised by the TFCC (triangular fibro-cartilage complex) which consists of the TFC (triangular fibro-cartilage) and the ulnar carpal ligament. The ECU tendon and its sheath are important stabilisers.

DIFFERENTIAL DIAGNOSIS OF PAIN AND/OR CLICKING ON THE ULNAR SIDE OF THE WRIST

1. DRUJ
   - isolated disc lesions
   - instability
   - impingement
   - incongruity
2. Lunate triquetral instability
3. Piso-triquetral joint pathology
4. ECU tendon subluxation

SPECIAL INVESTIGATIONS

1. X-RAYS
   (a) Routine views: The standard films include a PA and lateral, both done with the forearm in neutral rotation. Oblique views may be useful
   (b) Stress views: A pronated lateral weight-carrying view can confirm dorsal DRUJ instability. Clenched fist views help exclude carpal instability
   (c) Tomograms: To assess intra-articular extension of fractures
   (d) CT Scan: To confirm subluxation of the distal radio-ulnar joint
   (e) Bone Scan
   (f) Arthrogram: To exclude tears of the TFC
   (g) Arthroscopy: For diagnosis and debridement of TFC tears

TREATMENT

Much recent development. The best options are not yet known.

1. Isolated disc lesions
   Cortizone injections and static wrist splint
   Neutral or ulna minus : limited debridement of tear
   Ulna plus : debridement of tear and ulna shortening
2. Instability
   (a) Acute
   Associated injuries of the radius are common, e g radial head fractures in Essex Loprosti fracture, Galleazzi and distal radial fractures. The distal radio-ulnar joint should be reduced closed and immobilised in an above-elbow cast for 6 weeks. If closed reduction is unsuccessful, open repair of the TFCC, i e tension band wiring of the ulnar styloid fracture or re-attachment of the TFCC is indicated.
   (b) Chronic
   Repair by styloid or TFCC re-attachment if possible. If this is not possible, reconstruct by using part of FCU or ECU through a drill hole in the ulna.
3. Ulno-carpal impingement syndrome with ulna plus
   (a) Without radio-ulna arthrosis: ulna shortening osteotomy
   (b) With radio-ulna arthrosis: se below
4. DRUJ incongruity
   (a) Active patients
   Bovers resection arthroplasty or the Sauve Kapandji procedure. The ulna plus must be shortened and instability must be corrected
   (b) Sedentary patients
   Darrach procedure. Instability must be corrected.

PHYSIOTHERAPY FOR THE WRIST
MRS S KÖNIG

SUMMARY

Rehabilitation of the wrist is always a challenge, because any pain experienced in it, adversely affects the independance and functioning of the patient.

Irrespective of the pathology, the aim of treatment remains the same, viz

- Relief the pain
- Strengthen the muscles

Once this has been achieved, can the patient and his hand be fully rehabilitated.

Our basic treatment regime at 1 Military Hospital is as follows:

1. Pain management with the following modalities:
   - TENS
   - Interferential therapy
   - Cryotherapy
   - Trigger points
   - Supportive splinting
2. Strenghening of all the muscles which pass over the wrist through:
   - Springs/putty
   - Weights
   - Elastic bands
   - Rings
   - **NB**: HOME EXERCISES
3. - Mobilisation - only in painfree range with:
   - Reduction of swelling
   - Exercises
   - Tubigrip strapping
   - Massage
   - Dynamic splinting

4. Education of the patient regarding his/her condition
5. "Honest" prognosis on the wrist
6. Weekly monitoring of the wrist range of movement
7. Psychological support whenever necessary

A last point:

1. Team work: the patient being the most important member
2. Treat the patient **and** the hand
3. Treatment is the patient's responsibility

No two people recover at the same rate and to each one his/her injury is the worst.

OCCUPATIONAL THERAPY REHABILITATION OF THE WRIST

MRS H BUCHANAN

All wrist injuries require some form of rehabilitation. Although there is a diversity in type and severity of wrist injuries, general rehabilitation principles remain the same. A programme involving both splinting and exercise is often essential to maintain or restore wrist function.

Oedema of the injured wrist is always present to some degree. Treatment includes early elevation and active movement. Active wrist movements through the patient's optimal range should be commenced as soon as possible. In occupational therapy, the emphasis is on encouraging normal use by incorporating therapeutic activities into the treatment plan. Work requirements should be assessed and an adequate home programme provided. Splinting may be necessary to protect and support the wrist in its final stage of healing. The final phase of treatment involves wrist strengthening exercises. A graded activity programme with gradually increasing resistance is used for this purpose as well as to prepare for the patient's return to work.

This paper focuses on the above aspects involved in wrist rehabilitation beginning at the time of injury.

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WRIST ARTHRODESIS AND PROXIMAL ROW CARPECTOMY
PROF U MENNEN

WRIST ARTHRODESIS (WA)

Definition: WA is one of the most important surgical procedures on the wrist in the management of intra- and extra carpal pathology with the aim to relieve pain and produce stability by fusing radius to the basis of metacarpal II and III vica scaphoid, lunate, capitate and trapezoid. The functional result is improved grip power and increased confidence in hand function. Ely first described WA in the treatment of tuberculosis (Surg Gyn Obstr 10:561-72, 1910) and Steindler for poliomyelitis and spastic conditions (JAMA 71: 1288-1291, 1918).

Indications

1. **Intra-carpal pathology**
   - 1.1 Rheumatoid arthritis
   - 1.2 Osteoarthrosis, e g post-traumatic, gout
   - 1.3 Proximal row pathology, e g
     - chronic scapho-lunate dissociation
     - Kienböck's disease
     - scaphoid non-union
   - 1.4 Chronic wrist instabilities
   - 1.5 Infective destruction, e g septic, TB
   - 1.6 Neoplastic pathology, e g
     - destruction distal radius
     - or carpal bones
   - 1.7 Failed wrist arthroplasty

2. **Extra-carpal pathology**
   - 2.1 Wrist contractures e g polio, CP, spastic hemiplegia
   - 2.2 Paralysis of wrist and/or hand muscles, e g brachial plexus injury
   - 2.3 Skin conditions e g burns

Contra-indications

1. Growing radius i e "open": physis (absolute)
2. Tetraplegia (relative <C5 level) (absolute >C5 level)
3. Brachial plexus injury (relative)
4. Cerebral palsy (athetoid type) (absolute)
5. Spastic unbalanced wrist (absolute)
6. Established congenital deformities of the wrist (relative)
7. Active infection (relative)

Advantages

1. Pain relieve
2. Stability
3. Improved grip, pinch and grab power
4. Permanent solution with no late complications

Disadvantage

Immobile wrist thus restraining wrist manipulative ability

Pre-requisite

1. Patients should be aware of the permanency of the procedure
2. Functioning shoulder, elbow and pro- and supination
3. Certainty of position of fusion of wrist
4. Stability of neurological conditions eg no further improvement of neurological lesions
5. Balanced peri-articular forces

Surgical Technique

1. Methods described

    1.1 Ulnar approach (Smith-Petersen)
    1.2 Radial approach (Haddad and Riordan)
    1.3 Inlay technique
    1.4 Staples
    1.5 Plates and screws e g AO compression plate
    1.6 Compression wire fixation
    1.7 Autogenous fibula grafts
    1.8 Intramedullary rods
    1.9 Cross Kirschner wire stabilization
    1.10 External fixator stabilization

2. **Author's preferred method**

2.1 Mid-dorsal longitudinal skin incision

2.2 Enlarge interval between EDC and EPL tendons

2.3 Transverse incision in dorsal capsule leaving proximal and distal attachment

2.4 Denude articular surfaces between lunate and radius, lunate and capitate, scaphoid and radius, scaphoid and capitate, capitate and trapezoid, capitate and base second and third metacarpal, the joint between metacarpal II and III and the dorsal surface of these mentioned bones

2.5 Crossed retrograde inserted 2-3mm diameter Kirschner wires are placed between radius and metacarpal II and III, stabilizing the wrist in the desired position, usually 30° of dorsiflexion and metacarpal III in line with the radius

2.6 Freshly harvested cancellous bone graft from the ileum is firmly packed into the denuded spaces and dorsally

2.7 The capsule is closed over the bone graft. The wound is closed in layers and a volar POP slab is applied

2.8 The slab is removed after 1-2 weeks to allow swelling to subside and replaced with an artificial circular below-elbow cast until evidence of bone healing is noticed on x-rays (3-4 months). The K-wires are removed and the patient is encouraged to use his hand fully

2.9 The advantages of this method are a simple uncomplicated and quick technique

2.10 The disadvantage is prolonged cast immobilization

Discussion

1. Post-operative swelling of the wrist and fingers is often marked, especially when the denuding is done with hammer and chisel or vibrating instruments

2. Failure of the arthrodesis is often seen at the carpo-metacarpal junction. This joint lies oblique and needs to be cleaned meticulously and thoroughly packed with bone graft

3. Arthrodesis bilaterally need careful consideration re position. Pre-operative trial cast or splint immobilization in the planned position (i e slight flexion and slight dorsiflexion) is helpful

4. Patients with pre-op pain, usually are very grateful and pleased with the "new" painless, strong wrist

5. Lack of wrist flexion e g mechanics or some technicians may prove frustrating, but adaption or change in handedness helped by an Occupational Therapist often solves the problem

LIMITED INTERCARPAL ARTHRODESIS (LIA)

LIA involves fusion between any two or more bones comprising the wrist joint. The aim is to correct biomechanical abnormality after injury or pathology and to relieve localised wrist pain while maintaining wrist motion. Many types have been described of which the STT (scaphoid-trapezium-trapezoid) fusion is one of the most popular procedures for conditions ranging from STT OA, scapho-lunate ligament tears and Kienböck's disease. The results are variable and longterm effect is still undetermined.

PROXIMAL ROW CARPECTOMY (PRC)

Definition: PRC is the surgical removal of the proximal carpal row (scaphoid, lunate and triquetrum) of the wrist to manage intra- and extra carpal pathology with the aim to retain wrist mobility. PRC was first described by Stamm in 1944 (Proc R Soc Med 38: 74, 1944).

Indications

1. **Intra-carpal pathology**
   - 1.1 Rheumatoid arthritis
   - 1.2 Osteoarthrosis
   - 1.3 Kienböck's Disease (advanced degree)
   - 1.4 Chronic scapho-lunate dissociation (chronic pain)
   - 1.5 Failed wrist arthroplasty
   - 1.6 Scaphoid pathology e g non-union (chronic pain)

2. **Extra-carpal pathology**
   - 2.1 Wrist flexion/extension contracture, e g RA, burns
   - 2.2 Spastic contractures, e g CP, CVA
   - 2.3 Congenital deformities, eg Arthrogryposis Multiplex Congenita

Advantages

1. Retains wrist mobility
2. Relieves wrist pain
3. Simple procedure with few complications
4. Allows indirect release of congenital or acquired contractures

Disadvantages

1. Pain relieve may only be temporary
2. Mobility may be limited
3. May not be adequate to release contractures
4. Impingement pain between radial styloid and trapezium may occur

Pre-requisites

Intact articular cartilage between radius and capitate is advantageous for better results

Surgical Technique

1. Dorsal skin incision which is deepened between the extensor digitorum communis and extensor pollicis longus tendons
2. Transverse incision in the dorsal capsule leaving a proximal and distal attachment
3. Remove entire proximal row i e scaphoid, lunate and triquetrum
4. Position capitate in lunate fossa of radius. If unstable, fix position with 1,4mm Kirschner wire
5. Overlap capsule attachments and suture securely. Close wound
6. Post-op cast splint for 6 weeks
7. Mobilization and strengthening exercises, especially to improve power grip and properception
8. Protective, removable splint for 2-3 months

Discussion

1. PRC is a useful procedure to maintain mobility of the wrist when motion is essential (eg RA)
2. Since the biomechanic of this pre-operative type of wrist is usually disturbed anyway, the functional post-operative outcome is often unpredictable
3. Patients should be warned that PRC may be a temporary solution, but may have to be revised to either total carpectomy, arthroplasty or arthrodesis
4. In an undemanding wrist, the longterm results may be surprisingly satisfactory

WRIST DENERVATION
DR R BOOME

DEFINITION

Pain relief in stable wrist by division of the terminal branches of nerves supplying the wrist joint capsule without in anyway interfering with the sensory supply to the skin of the hand.

INDICATIONS

1. Stable wrist

2. Chronic pain with no diagnosable cause or pathology

3. End stage osteoartritis where the next procedure may be an arthrodesis

4. Only the specific denervation procedures for the pain experienced should be performed

RADIAL SENSORY

1. Longitudinal radial volar incision on line of radial artery ± 6cm long.

   The skin is lifted with skin hooks only and a plane developed around the radial side of the wrist on the deep fascia as far as the extensor carpi radialis brevis tendon dorsally.

   The radial sensory branches are all protected but any small branches entering the joint are divided and careful haemostasis is maintained.

2. One branch running with the radial artery is also divided after opening up the deep fascia to identify the radial artery.

ANTERIOR INTEROSSEOUS NERVE

1. Through the same incision as the radial sensory denervation, the pronator quadratus muscle is identified deep to all the flexors and the median nerve. Pronator quadratus is exposed up to the volar radial carpal joint line and then the soft tissues along the distal edge of the pronator quadratus are diathermised down to the bony surface transversely across the radius to divide the tiny nerve branch which cannot be seen easily.

POSTERIOR INTEROSSEOUS NERVE

1. Transverse dorsal incision about 6cm proximal to the wrist crease

2. Extensor compartment opened on the radial side and interosseous membrane viewed by retracting the tendons

3. On the interosseous membrane the terminal branch of the PIN (posterior interosseous nerve) is easily seen and about 1cm is excised

DORSAL ULNAR NERVE

1. Curved incision over distal ulna laterally

2. Dorsal ulna branch seen volar to the incision and subcutaneously

3. Branches are protected but all branches into the wrist joint excised from proximal volar to distal dorsal

MANAGEMENT OF WRIST PAIN

1. Radio-carpal pain:
   - exclude all instabilities of the carpal bone and
   - ensure that no other pathology is present
   - also in the terminal osteoarthritis of this area when no other procedure except an arthrodesis could help

In these chases a radial plus an anterior interosseous nerve denervation and possibly a posterior interosseous nerve denervation are indicated.

2. Distal radio-ulna pain
   - exclude instabilities of the distal radial ulnar joint or triangular cartilage pain
   - this procedure is done mainly for the distal radio-ulnar joint osteoarthritis
   - it is also done in injuries to the base of the 5th metacarpal giving pain when no particular pathology can be detected. This needs a more distal incision denervating the joint while protecting the dorsal sensory branches to the fingers

Pre-operative tests using a Marcaine block to any particularly at one of these nerves groupings can be used as a guide to diagnostically allow the patient to test the effect of the block by performing excessive sport stresses to this wrist for 2-3 hours after the injection.

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TENDON TRANSFER (TT) FOR MEDIAN NERVE LESIONS (MNL) : PROF U MENNEN

MNL - Introduction

- most serious nerve lesion because of sensory loss
- motor loss treatable by TT

MNL - Sensory loss

- restore sensation
- options: suture
  cable graft
  end-to-side (ulnar/radial)
  transfer (radial)

MNL - Motor loss

• high	arm	PT and PQ
	wrist	FCR & PL
	thumb	FPL & APB & FPB & OP
	fingers	FDP i/m & FDS i/m/r/p & L i/m
• low	thumb	APB & FPB & OP
	fingers	L i/m

MNL - TT

- principles of TT
- balance sheet

MNL - TT - high lesion

Loss	Function/Need	Available
PT		ECU
PQ		Biceps rerouted
FCR		BR
PL		ECRL
FPL	thumb flexion	EIP
APB		FDS r
(FPB)	Hypothenar	
OP	opposition	EPL rerouted
FDS i/m/r/p		
FDP i/m	DIP flexion	plicate FDP r/p
L i/m		

MNL - TT - low lesion

Loss	Function/Need	Available
APB		EIP
(FPB)	EDM	
OP	opposition	ECRL
		EPL rerouted
		FDS r
		PL
		Hypothenar
		ECU

MNL - Discussion

- tension (plication/opposition)
- pulleys for opponens transfer
- FPB innervation
- using EIP
- using EPL
- using BR (harvesting/immobilisation)
- 1st web space/C-MCJ and opposition
- insertion of opponens transfer
- trick pinch by EPL

Please refer to the "Hand Book, 2nd Edition", Chapter 8 - **Tendon Transfer** - for more detail and technical aspects.

TENDON TRANSFERS FOR RADIAL NERVE PALSY : DR LT (WIKUS) DE JAGER

INDICATIONS

1. Irreparable radial nerve injuries eg
   - a gap in the nerve
   - extensive scarring
   - if the patient presents later than 6 months after injury

Epineural nerve repair should be done in stead of tendon transfer, but tendon transfer is more predictable than nerve grafting.

METHOD IN RADIAL NERVE PALSY

1. PT to ECRB and
2. FCU/FCR to EDC and
3. PL to radially rerouted EPL

- Using FCR around the radial border of the forearm causes less ulnar deviation than FCU, but both give predictable, functional results. Passing FCR through the interosseous membrane (Tsuge) avoids any deviation, but the tendon is more liable to get stuck in scar

- If PL is absent, the ring finger FDS can be used. Using FCU or FCR as a motor for both EDC and EPL does not work well

- Both PT and FCU must be mobilised well proximally. PT must be dissected with a strip of periosteum to allow a strong weave

- TENSION: maximum with the wrist in 45° extension, MP joints at neutral and the thumb extended nearly fully. The wrist should remain at 30° extension at the end of the procedure; too much tension, rather than too little
- Immobilisation for 4 weeks in a cast, followed by 3 weeks in dynamic extension splint
- Wrist flexion will be permanently limited
- Power grip loss is nearly 30%

METHOD IN POSTERIOR INTEROSSEOUS NERVE PALSY

1. FCR to EDC and
2. PL to radially rerouted EPL

- Using FCU in PIN palsy will result in radial deviation more frequently, because ECRL is not paralysed, but ECU is mostly working, because its motor branch leaves more proximally

TENDON TRANSFERS FOR ULNAR PALSY
DR AJ WIENAND

After ulnar nerve suture intrinsic recovery is seldom achieved except in children and in very distant lesions.

After assessment in our hand programme to determine the needs of the patient, we usually do a complete intrinsic replacement and not only internal splintage as suggested by Omer.

Many different operations are described in the literature. The finter component stabilises the MP joint enabling the long extensors to extend the IP joints. The thumb component aims to improve pinch.

We believe that in the low lesion of long duration all the fingers will claw and for this reason substitution is done for all 4 fingers and not only the ulnar 2. We have shown that MP stabilisation of the thumb is preferable to IP arthrodesis, improving pinch and power grip.

We have compared the results of Zancolli's-, Lasso's- and Riordan's tenodesis and the Paul Brand substitution finding the first 2 the better operation with the Paul Brand a very poor third.

The technique of the operations will be demonstrated if time permits.

TENDON TRANSFER FOR PARALYSIS OF SHOULDER AND ELBOW : DR R BOOME

SHOULDER

1. **External Rotation**

   (a) Latissimus Dorsi and Teres Major Transfer

   If these are normal, they are released from their bony attachment and rerouted to the anterior humerus and screwed to give adduction and external rotation in stead of adduction and internal rotation. The deltoid should have good strength for a good result.

   (b) Levator Scapula Transfer

   When the shoulder abduction is also weak, the levator scapula is dissected off the medial border of the scapula and rerouted through the muscle and tendon of supraspinatus and screwed to the head of the humerus.

   This is a difficult dissection to do and the results are not quite predictable.

2. **Abduction**

   (a) Levator scapula transfer - as described

   (b) Advancement of trapezius insertion into the acromion to the humerus.

   This is not a very successful transfer and gives very poor power.

Pect Min → mid-border of scapula for ser. ant para

ELBOW

1. Flexion

(a) Lattisimus dorsi transfer

This can be done as a unipolar or bi-polar transfer.

The unipolar transfer is when the lateral part of the latissimus dorsi muscle is brought with its neurovascular bundle into the upper arm and inserted into the biceps tendon at the elbow.

A bi-polar transfer is when the proximal tendinous insertion into the humerus is advanced more proximally to the acromion.

This is the most powerful tendon transfer for elbow flexion.

(b) Pectoralis major transfer (Clarke)

The lower border of pectoralis major (C8) is dissected off the chest wall and brought into the upper arm and secured to the biceps tendon using the aponeurosis of the anterior abdominal wall for insertion.

This is done at the elbow as for the lattisimus dorsi.

This can also be done as a bi-polar transfer.

(c) Triceps transfer

This transfer sacrifices triceps function as an elbow extensor but gives good elbow flexion.

It is rerouted around the lateral aspect of the elbow to the biceps tendon.

(d) Steindler transfer

The forearm flexor muscles are detached with a small piece of the medial epicondyle from the whole of the forearm flexors. The whole flexor muscle mass is then mobilised and reattached with a screw to the distal third of the lateral humerus.

This is a fairly powerful transfer but leaves the patient with a 20° elbow flexion contracture.

2. **Elbow extension transfer**

The Moberg transfer uses the posterior deltoid muscle to motor the triceps via a tendon graft to the olecranon.

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ACKNOWLEDGEMENTS

We are grateful to the following companies for their sponsorship:

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