



Therapy for complex fractures of the hand

Salisbury NHS Foundation Trust

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What makes a hand injury complex for a therapist?

- Mechanism of injury ie crush, avulsion, explosion
- Combined injuries ie many bones or soft tissues
- Anatomy injured ie particularly complex anatomy
- Psychological factors
- Comorbidities

At SDH we see a lot of farming, industrial, RTA, blast/war injury.

- “Post operative care is at least as important as the operation itself”

“Hand fractures: current treatment strategies”, Meals and Meals, 2013, J Hand Surg 38A 1021-1031

What are we trying to achieve?



The hand

Manipulation

Information

Protection

Strength

- **Restore stability**
- **Restore range of motion**
- **Restore function**

● **Restore stability**

- Fixed unit of the hand
- Bone healing
- Joints aligned and in place
- Ligaments intact
- Stabilising muscles ie.agonist/antagonist

Restoring stability allows the power and balance for the hand to move

- **Restore range of motion**

“The greater the complexity of associated soft tissue injury, the more complex the rehabilitation plan and the greater the need to ensure that therapy begins early to try to prevent secondary complications associated with immobilisation”

Rehabilitation of the hand and upper extremity 2014

- **Restore function**

“The consequences of a hand injury for an individual include pain and suffering immediately, possible loss of function, and earning capacity for the rest of one’s life and reduced potential to live one’s life to its full potential. The burden for society is therefore in the form of a drain on financial resources, along with the loss of contributions from its most active and capable segment”

Tahseen Cheema 2014

Tight rope picture!

healing & protection v movement & function

This talk

1. General principles

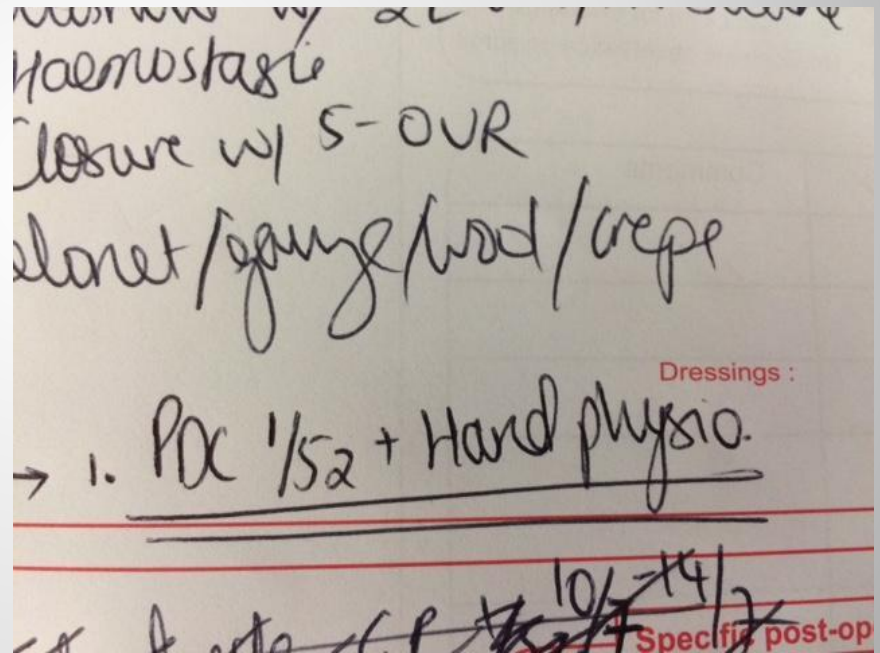
2. Therapy in the early phase of injury

3. The soft tissue structures in complex fractures

4. The surgeon and therapist combined approach

1. General principles

- **1. Communication with the team:**
- location
- visits to theatres
- surgical op notes



- **Early involvement of Therapist**
- **Diagnosis of full extent of injury**
- **Understanding of healing times for the various structures of the hand:**

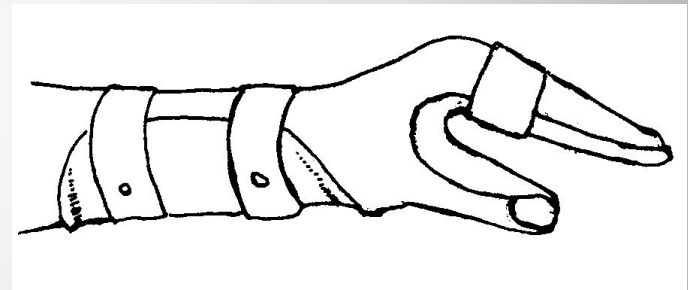
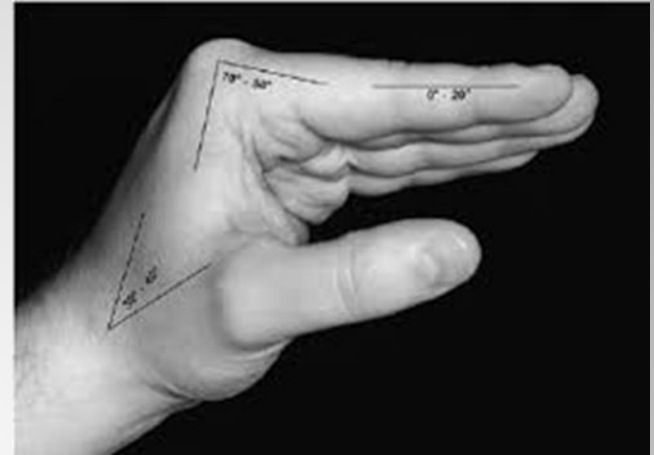
Skin → Muscle → Nerve & Artery → Bone → Tendon & Lig

Assessment of structures and healing...

2. Therapy in the early phases of injury

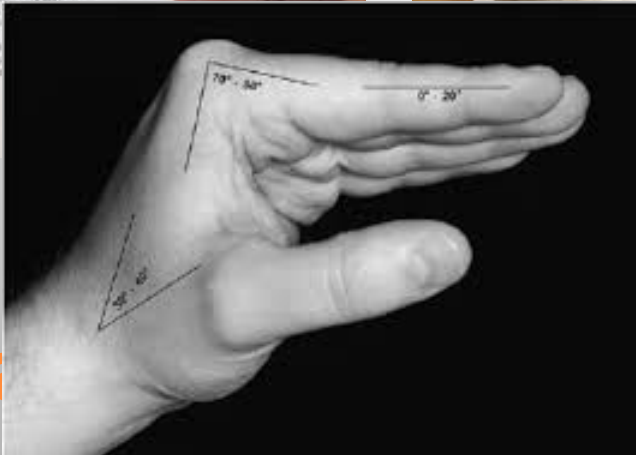
From Day One

- Informing and involving the patient
- Positioning - POSI
- Protect the injured structures ie bones, tendons flaps, skin grafts, nerves
- Oedema management
- Maintaining strength and range of movement where possible, plus function
- Prevent CRPS including pain management



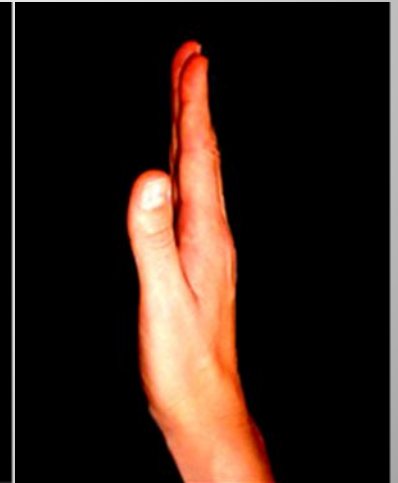
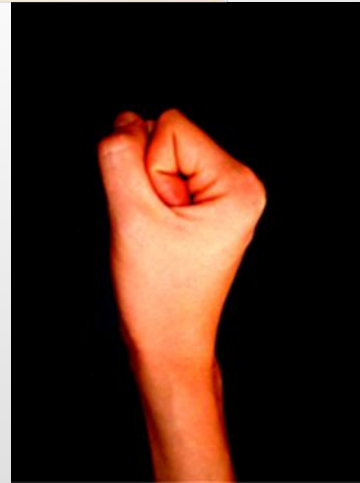
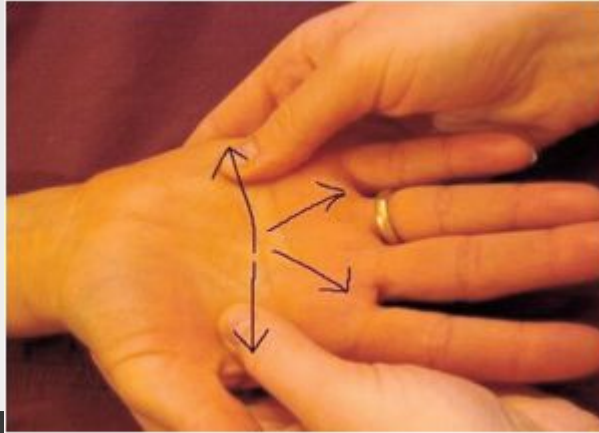
POSI position

- Protect the injured structures



Leaving free to move
that doesn't need immobilising

- **Oedema management**
- Elevation and pumping
- Movement
- K-tape
- MEM
- Compression



- **Maintain strength and range where possible**



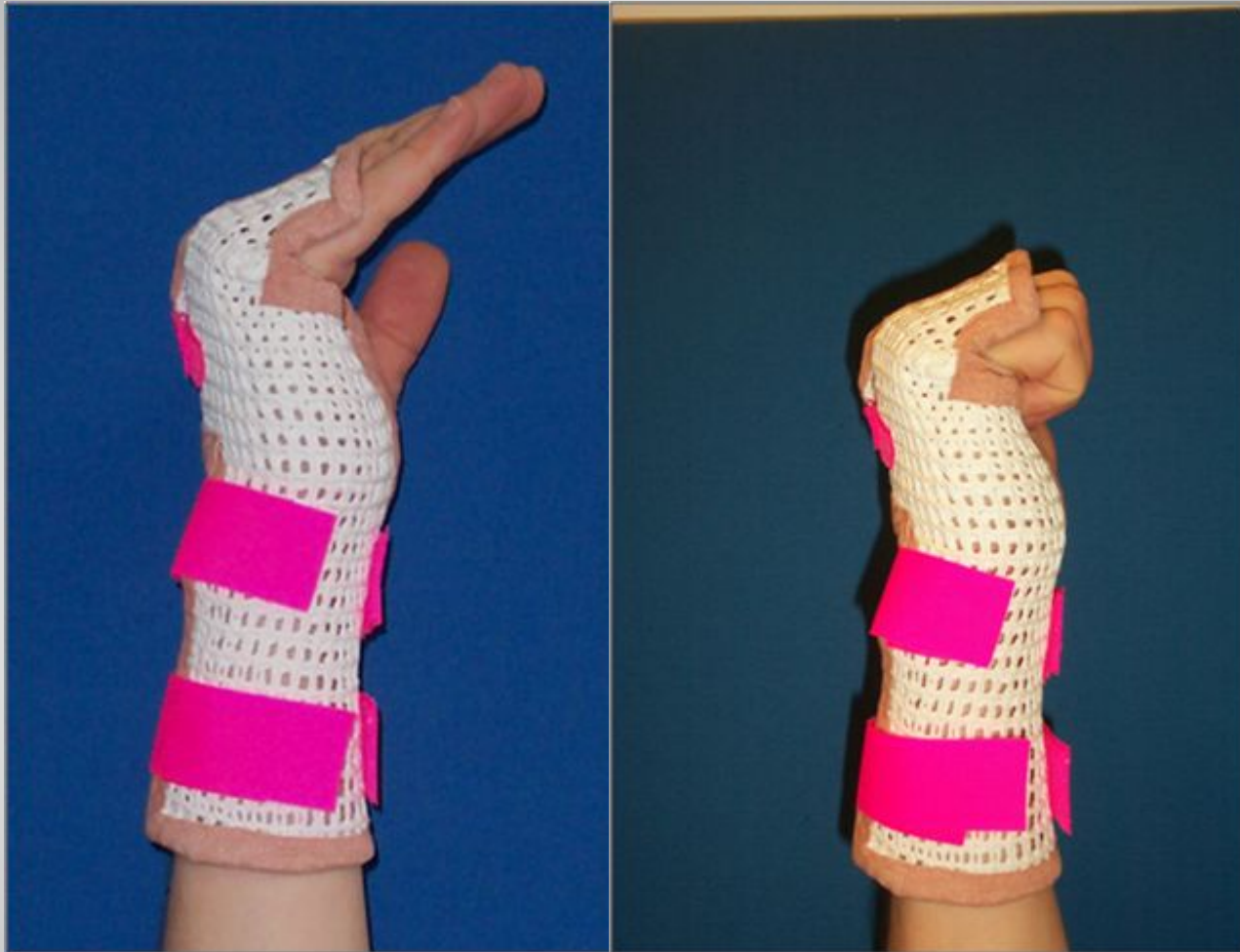
- Pt info leaflets
- Exercising splints
- Leave uninjured digits free
- Use objects!



Encourage the hand to be used where possible

“The most common complications post hand fracture are not delayed union or nonunion but rather reduced tendon gliding and tethering”

Rehabilitation of the hand and upper extremity 2014



Maintaining and regaining movement



Using objects... increased flexion as moves down the cone

● **Prevent CRPS**

- Neural rehabilitation day 1-2
- Encourage use of hand
- Manage oedema
- Inform and involve the patient
- Balance of rest and movement
- Manage pain effectively

*** Time * Information leaflets * Functional activities and ADLs * Access to medication and prescriptions**

Prevention is better than cure!



Splint just to PIPJ's to allow movement of joints and tendon glides, plus thumb free to allow movement

3. Managing the Soft Tissue Structures

“Early mobilization of the fractured hand is emphasized because soft tissue recovery may be more problematic than that of bone.”

Meals and Meals, 2013 JHS

Restoration of moving structures

‘One wound one scar’ principle (Peacock)

Tahseen Cheema (Editor) “Complex injuries of the hand” 2014

- **Limit quantity of scar tissue**

- Debride
- Non-traumatic surgical technique
- Antibiotics
- Short inflammation phase
- Healthy surrounding tissue

- **Restore gliding function**

- Early mobilisation

- **Delay repairs** – if poor conditions for healing, second stage repairs

- **Cover/closure of wounds**

**“Stiffening of small joints one of the most common sequelae of major hand injuries”
(Cheema, 2014)**

Therapists input

- Compression



- Gliding and movement of structures
- Protection to allow healing of structures

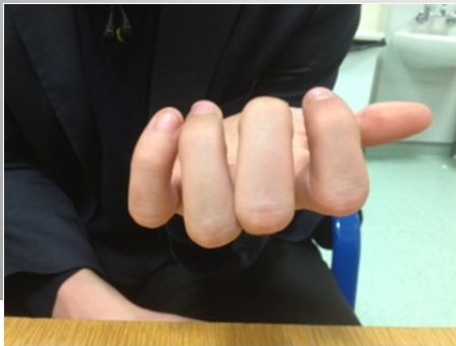
- **When** can I start moving the injured hand?
- How could I **damage** the fractures?
- What is **safe movement** for this injury?
- How should I **prioritise** certain movements?

**Some questions to ask yourself
before jumping in...**

- **Avoid more damage**

Look out for at
tendons and lig
fragments

How will the ac
and tendons af



- **Be specific**



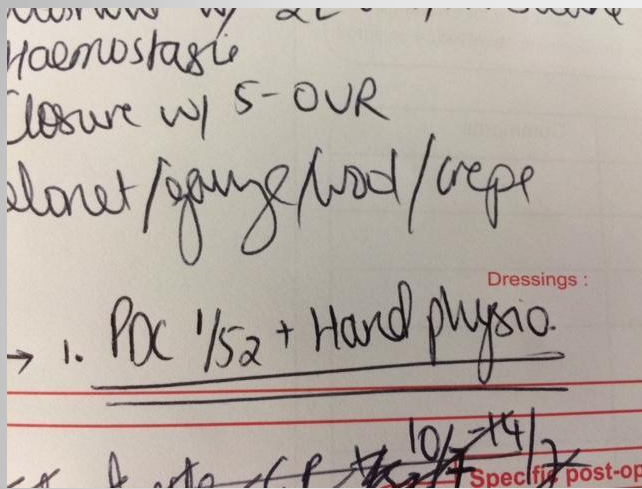
- **Reduce oedema aggressively and early**

- Improves range of motion
- Prevents increased adhesions



Use as many if not all the techniques you know...

- **Protect any repairs or surgery performed**



Op notes
or...



Know the treatment protocols/guidelines
Is it worth the risk?

33 yr old RHD male

Delivery driver

Father of disabled son

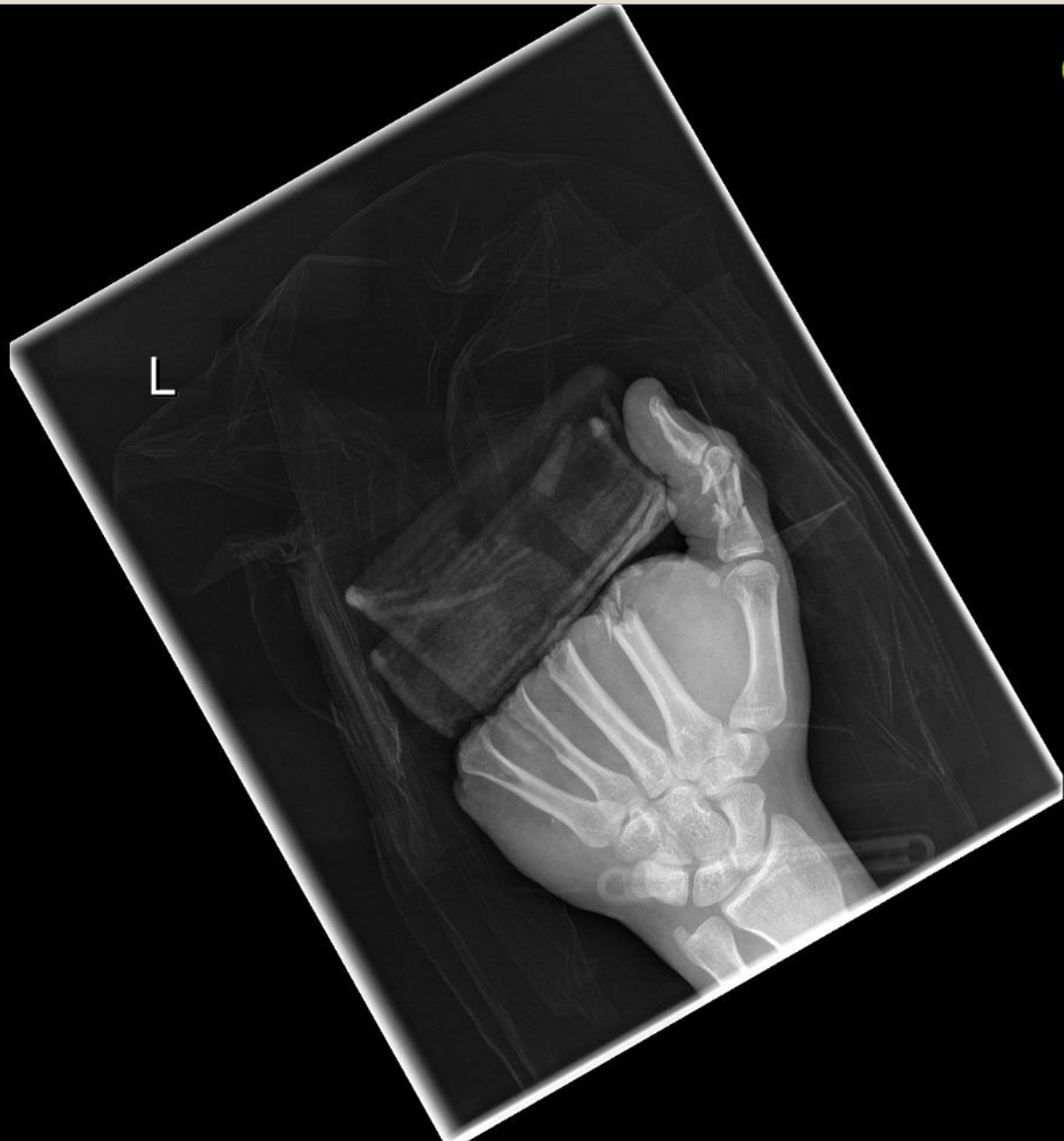
Recently bereaved

- Circular saw cutting wood and slipped (18.00hrs)
- Amputation of hand at distal palmar crease
- Air ambulance to SDH arrived ED (19.20hrs)
- Surgery to replant distal hand (overnight)

L



W Hand,dp



W Hand,dp



W Hand Obl

Complete amputation at DPC

- Fractures of 4 metacarpal heads plus bone loss (up to 2cm)
- Fracture of proximal phalanx Thumb
- Loss of intrinsic muscles
- Flexor and Extensor tendon complete disruption including Thumb EPL
- Nerve injury
- Blood vessel injury
- Skin injury
- Psycho-social impact of injury

Surgical Procedure

- Wound edges, necrotic muscle and bone fragments excised
- Bone fixation of II-V metacarpals with interosseous wire loops radially and PDS suture ulnarly
- Extensors repaired with 2 strand core
- FDP's repaired with 2 strand core
- CDA's repaired
- CDN's repaired
- Small skin graft to dorsal wound as unable to close
- Thumb # washout, K-wire fix and EPL repair

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Early therapy intervention

- **Seen day 1** – introduced self, checked elevation and discussed injury and Psyc (declined at present)
- **Seen day 2** - psych referral made, start gentle active RoM: Wrist, fingers through range, thumb MCPJ, neural rehab basics
- **Seen day 4** - In theatre for COD. Seen under GA and splint made to rest in POSI (letter-box style made due to grafts and wounds)
- exercises progressed

- **Day 10**

- Oedema ++
- All tendons intact
- Tendon glide
- Loss of IPJ extension (due to intrinsic deficiency) – PIPJ's tight
- Passive flexion > active flexion at MCPJ's
- K-wires still in thumb

Pain management * Oedema management * Range of motion

2 weeks

- Pain a problem for patient – Pregabalin (50mg TDS) prescribed

4 weeks active RoM

Finger \ Joint	MCPJ	PIPJ	DIPJ
Index	0 / 20	34 / 70	24 / 60
Middle	0 / 16	42 / 68	46 / 72
Ring	0 / 18	42 / 60	42 / 60
Little	0 / 20	40 / 62	48 / 66

7 weeks: The thumb

- Removal of k-wires



7-12 weeks

- Patient frustrated – “thought he’d be back driving by 6 weeks”
- Pain continues to be a problem – Pregabalin dose increased
- Oedema continues
- Movement – RF weaker due to shortening of MC
- Tendons intact
- Scars softening

5 months active RoM

Finger \ Joint	MCPJ	PIPJ	DIPJ
Index	-4 / 34	32 / 104	16 / 96
Middle	8 / 56	42 / 74	32 / 78
Ring	-2 / 18	55 / 84	55 / 78
Little	-2 / 24	60 / 84	48 / 84

Thumb opposition = K6/7

NB....

Loss of intrinsic muscles

Loss of bone length in MC's

Significant scar tissue

Currently...

- Returned to driving and work
 - Making good progress functionally
 - Pain still a problem
 - Psychological element of injury ongoing
 - Good hook grip and Thumb-IF-MF pinch grip
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- **“Mobilisation is vital to support soft tissue healing, which is often more problematic than healing of underlying bone”**

4. The surgeon and therapist team.

A specialised team dedicated to the treatment of hands, working together with the patient will get the best outcomes.