

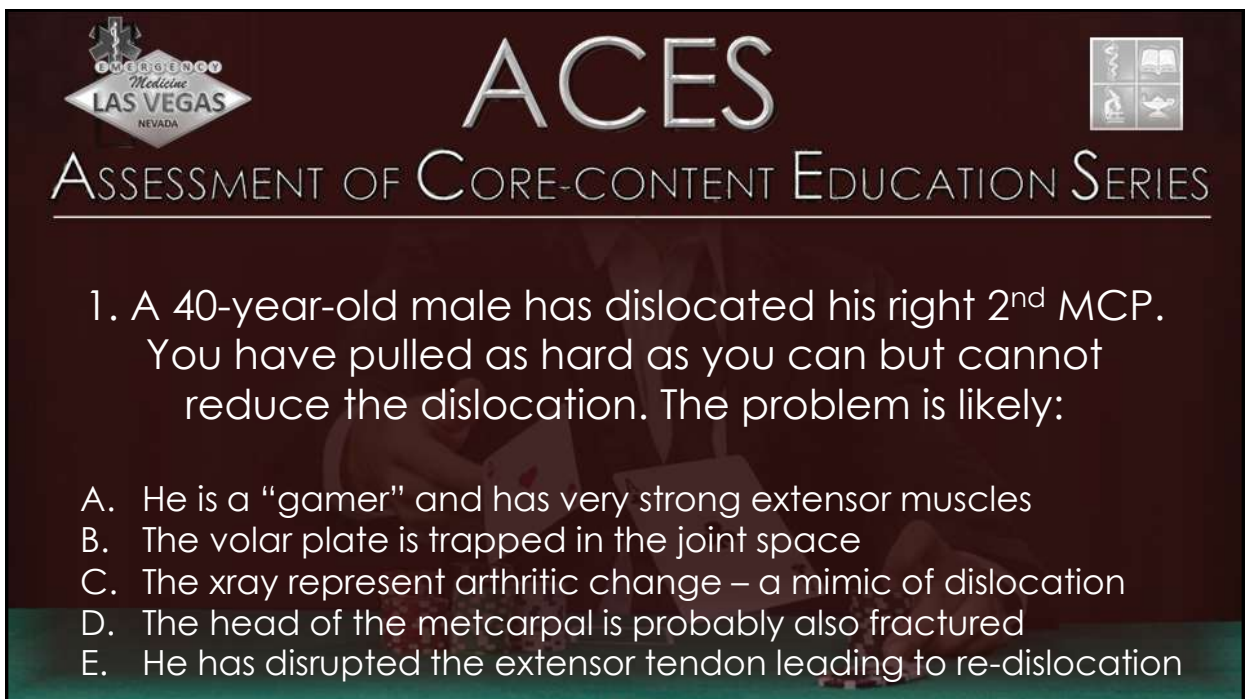


The image shows a man in a dark suit and tie sitting at a green poker table. He is holding two cards, the Ace of Hearts and the Ace of Clubs, and is pointing towards the camera. There are several stacks of colorful chips (red, green, blue, black) on the table. The background is dark with the ACES logo and text.

**ACES**  
ASSESSMENT OF CORE-CONTENT EDUCATION SERIES

CHAPTER 50 HAND

2 OCTOBER 2013



The image shows a man in a dark suit and tie sitting at a green poker table, similar to the previous image. He is holding two cards, the Ace of Hearts and the Ace of Clubs, and is pointing towards the camera. There are several stacks of colorful chips (red, green, blue, black) on the table. The background is dark with the ACES logo and text.

**ACES**  
ASSESSMENT OF CORE-CONTENT EDUCATION SERIES

1. A 40-year-old male has dislocated his right 2<sup>nd</sup> MCP. You have pulled as hard as you can but cannot reduce the dislocation. The problem is likely:

- A. He is a “gamer” and has very strong extensor muscles
- B. The volar plate is trapped in the joint space
- C. The xray represent arthritic change – a mimic of dislocation
- D. The head of the metcarpal is probably also fractured
- E. He has disrupted the extensor tendon leading to re-dislocation



# ACES



## ASSESSMENT OF CORE-CONTENT EDUCATION SERIES

2. An 18-year-old male with anger issues punches a wall, fracturing his 5<sup>th</sup> metacarpal neck. Which is true?

- A. Up to 15 degrees of rotational deformity is acceptable
- B. Nonunion is common in this type of fracture
- C. Up to 45 degrees of angulation is acceptable
- D. Apex-volar angulation is the most common
- E. The PIP and DIP joints must be immobilized also



# ACES



## ASSESSMENT OF CORE-CONTENT EDUCATION SERIES

3. A 17-year-old female "jams" her finger in volleyball. There is deformity of the PIP joint Which is true?

- A. DIP dislocations are more common than PIP dislocations
- B. Volar plate injury is common in lateral dislocations
- C. Fractures are rare in this age group, Xray can be skipped
- D. Even partial tears of the collateral ligaments require repair
- E. Intra-articular anesthesia is the best way to treat pain



# ACES



## ASSESSMENT OF CORE-CONTENT EDUCATION SERIES

4. A 23-year-old suicidal female has cut her volar wrist. Which of the following confirms an intact median nerve?

- A. She can fully flex her wrist
- B. She can pronate her hand
- C. She can feel skin over the hypothenar eminence
- D. She can spread all of her fingers apart
- E. She can make the "OK" sign



# ACES



## ASSESSMENT OF CORE-CONTENT EDUCATION SERIES

5. A 32-year-old female falls while skiing. She has pain at the base of her thumb. Which is true?

- A. She probably tore the radial-collateral ligament
- B. This may be a "game-keeper's thumb" injury
- C. A Bennett's fracture rarely requires surgery
- D. A Rolando fracture rarely requires surgery
- E. Her injury is the result of forced flexion/adduction



# ACES



## ASSESSMENT OF CORE-CONTENT EDUCATION SERIES

### 6. Regarding infections of the hand:

- A. Topical acyclovir is the treatment of choice for herpetic whitlow
- B. Flexor tenosynovitis is a common dangerous complication of paronychia
- C. Inability
- D. Felons rarely need to be drained
- E. Inability to flex the finger suggests a septic joint



# ACES



## ASSESSMENT OF CORE-CONTENT EDUCATION SERIES

### 7. A metal fabricator suffers a high-pressure injection injury to his third finger with paint thinner. You should:

- A. Avoid elevation which can cause proximal extension
- B. Perform a digital block for pain control
- C. Warn the patient that amputation is likely
- D. Ask hand surgery to see the pt in the AM when damage will be more obvious
- E. Encourage range-of-motion exercises





# ACES



## ASSESSMENT OF CORE-CONTENT EDUCATION SERIES

### 8. Regarding tendon injuries of the hand:

- A. Never test motion against resistance – it may cause partial tendon rupture to fully rupture
- B. Extensor tendon injury over the MCP is a Zone I injury
- C. Flexor tendon injuries are more common than extensor
- D. Boutonniere deformity is the result of injury to the *central* slip of an *flexor* tendon
- E. Swan neck deformity results from poorly managed mallet finger



# ACES



## ASSESSMENT OF CORE-CONTENT EDUCATION SERIES

### 9. Given the following ABG, you suspect: pH 7.41 / $\text{HCO}_3^-$ 13 / $\text{PaCO}_2$ 19 / $\text{PaO}_2$ 100

- A. Methanol ingestion
- B. Anxiety-induced hyperventilation
- C. Profuse diarrhea
- D. Aspirin overdose
- E. Persistent vomiting



# ACES



## ASSESSMENT OF CORE-CONTENT EDUCATION SERIES

10. A 12kg 3-year-old has been vomiting for a week. He is listless with HR of 180 and delayed capillary refill. Serum sodium is 115. The appropriate fluids orders is:

- A. Isotonic saline infusion at 20mL/hr
- B. D5/half-normal saline at 250mL/hr
- C. 3% sodium infusion at 20mL/hr
- D. Isotonic saline bolus at 20mL/kg
- E. Hypertonic saline bolus at 20mL/kg



# ACES



## ASSESSMENT OF CORE-CONTENT EDUCATION SERIES





# ACES



## ASSESSMENT OF CORE-CONTENT EDUCATION SERIES

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# ACES



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# ACES



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# ACES



## ASSESSMENT OF CORE-CONTENT EDUCATION SERIES

6. Regarding infections of the hand:

- A. Topical acyclovir is the treatment of choice for herpetic whitlow
- B. Flexor tenosynovitis (FTS) is a common dangerous complication of paronychia
- C. Swelling isolated to the volar finger indicates FTS
- D. Felons rarely need to be drained
- ◆ E. Pain with axial loading suggests a septic joint



# ACES



## ASSESSMENT OF CORE-CONTENT EDUCATION SERIES

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# ACES



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# ACES



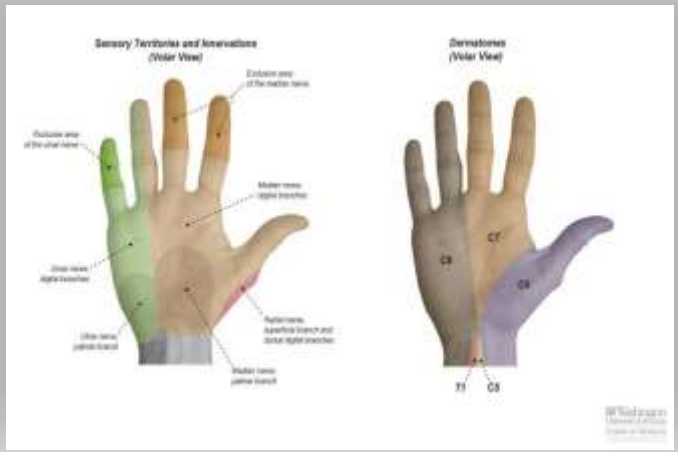
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## SENSORY INNERVATION



CONTENT TOPICS

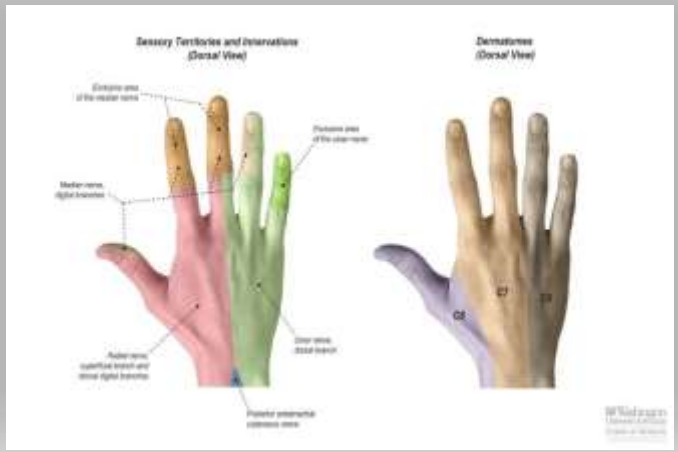
**NERVES**

Sensory  
Motor  
Recurrent  
Palsies

VESSELS  
BONES  
INFECTIONS  
MISC



## SENSORY INNERVATION



CONTENT TOPICS

**NERVES**

Sensory  
Motor  
Recurrent  
Palsies

VESSELS  
BONES  
INFECTIONS  
MISC





## MOTOR INNERVATION

**Table 1. Basic Nerve Functions and Exams<sup>11,12</sup>**

NERVE	MOTOR	CLINICAL EXAM	SENSORY	CLINICAL EXAM
<b>Radial</b>	Wrist extensors	Extension of wrist, fingers, and thumb against resistance	Radial aspect of the dorsum of the hand, thumb, index finger, long finger, radial half of the ring finger proximal to the distal interphalangeal joints	Sensation of dorsal web space between thumb and index finger
<b>Median</b>	Muscles involving fine precision and pinch function of the hand, thenar muscles, index and long finger flexor tendons	Opposition of the thumb to the fifth finger while watching the thenar muscles contract	Thumb, index, long, and radial side of the ring finger	Sensation at the volar tip of the index finger
<b>Ulnar</b>	Muscles involving grasping function, hypothenar muscles, interossei, adductor pollicis, ulnar flexor tendons (two), deep head of flexor pollicis brevis	Abduction of fingers against resistance	Ulnar portion of dorsum of hand, fifth digit, and ulnar aspect of ring finger, hypothenar eminence	Sensation at the volar tip of the fifth digit

Photo © J. B. Williams, M.D.

CONTENT TOPICS

**NERVES**

Sensory  
Motor  
Recurrent  
Palsies

VESSELS  
BONES  
INFECTIONS  
MISC



## RECURRENT BRANCH OF THE MEDIAN

"The million dollar nerve."



Opposes thumb, abducts thumb and helps to flex thumb. Purely motor.

CONTENT TOPICS

**NERVES**

Sensory  
Motor  
Recurrent  
Palsies

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BONES  
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MISC



## NERVE PALSIES

- Wrist drop – radial nerve palsy
- “Ape hand” – median nerve palsy
- Claw / “Bishop’s hand” – ulnar nerve palsy



CONTENT TOPICS

**NERVES**

**Sensory**

**Motor**

**Recurrent**

**Palsies**

VESSELS

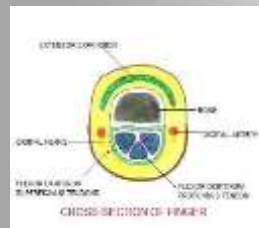
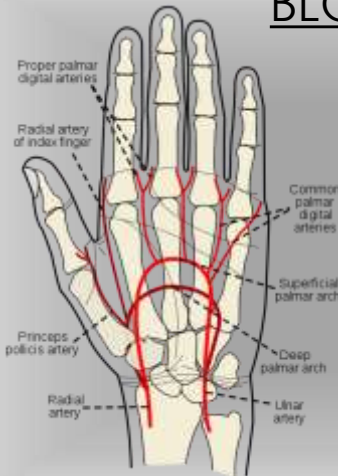
BONES

INFECTIONS

MISC



## BLOOD SUPPLY



CONTENT TOPICS

NERVES

**VESSELS**

**Arteries**

**Allen’s Test**

BONES

INFECTIONS

MISC



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## ALLEN'S TEST

- Clench fist → compress artery → relax hand
- If positive, good collateral flow from opposite side is nto present
- Perform prior to ABG, etc.

### CONTENT TOPICS

NERVES  
**VESSELS**

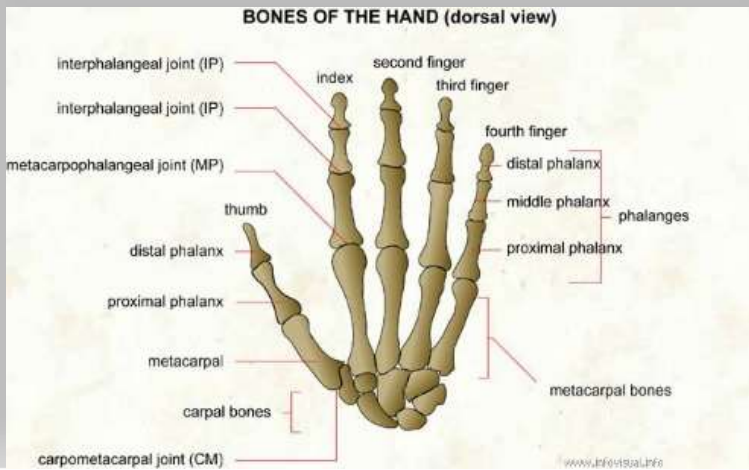
**Arteries**  
**Allen's Test**  
 BONES  
 INFECTIONS  
 MISC



# ACES ASSESSMENT OF CORE-CONTENT EDUCATION SERIES




## BONES



### CONTENT TOPICS


NERVES  
 VESSELS  
**BONES**

**M-C Neck**  
**M-C Shaft**  
**M-C Head**  
**Thumb**  
**Dislocation**  
 INFECTIONS  
 MISC



# ACES

ASSESSMENT OF CORE-CONTENT  
EDUCATION SERIES



## METACARPAL NECK FRACTURE

- The most common hand fractures
- Boxer's fracture: fracture of the neck of 5<sup>th</sup> m-c
- All have volar angulation
- Ring & 5<sup>th</sup> mc tolerate greater angulation
  - Ring < 35° , 5<sup>th</sup> < 45°
- Index and middle fingers
  - Less mobility, tolerate less angulation (<15° )
  - Radial gutter splint

ROTATIONAL DEFORMITY UNACCEPTABLE

CONTENT TOPICS

---

NERVES

VESSELS

BONES

M-C Neck

M-C Shaft


M-C Head

Thumb

Dislocation


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# ACES

ASSESSMENT OF CORE-CONTENT  
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## METACARPAL NECK FRACTURE



BOXER'S  
FRACTURE

CONTENT TOPICS

---

NERVES

VESSELS

BONES

M-C Neck

M-C Shaft

M-C Head

Thumb

Dislocation

INFECTIONS

MISC





## METACARPAL SHAFT FRACTURE

- Angulation rarely acceptable for 2<sup>nd</sup> and 3<sup>rd</sup>
- Angulation amounts that are acceptable:  
Index 10° Long 20° Ring 30° Small 40°
- Operative fixation is often required for 2<sup>nd</sup> and 3<sup>rd</sup> metacarpals
- Ulnar gutter splints usually fail to maintain any significant correction of angulation
- Short-arm casting with "outriggers" do work

**ROTATIONAL DEFORMITY UNACCEPTABLE**



### CONTENT TOPICS

NERVES  
VESSELS

**BONES**

**M-C Neck**

**M-C Shaft**

**M-C Head**

**Thumb**

**Dislocation**

INFECTIONS

MISC



## METACARPAL HEAD FRACTURE

- Intra-articular fractures
- Direct trauma or crush
- Laceration over MCP → suspect human bite
- Any displacement gives poor outcome
- All require hand referral



### CONTENT TOPICS

NERVES  
VESSELS

**BONES**

**M-C Neck**

**M-C Shaft**


**M-C Head**

**Thumb**

**Dislocation**


INFECTIONS

MISC



# ACES

ASSESSMENT OF CORE-CONTENT  
EDUCATION SERIES



## THUMB FRACTURE

**Bennett's Fracture**

- Axial load with hand closed
- Ulnar aspect of base of thumb at metacarpal joint
- Intra-articular with disloc/sublux at the CMC joint
- Anatomical reduction required, ORIF


**Rolando Fracture**

- Comminuted intra-articular, requires ORIF
- No subluxation dislocation of CMC joint
- Worse prognosis

CONTENT TOPICS


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NERVES  
VESSELS  
**BONES**  
M-C Neck  
M-C Shaft  
M-C Head  
Thumb  
Dislocation  
INFECTIONS  
MISC




# ACES

ASSESSMENT OF CORE-CONTENT  
EDUCATION SERIES




## THUMB FRACTURE

**BENNETT**



**ROLANDO**



**THUMB SPICA AND EMERGENT ORTHO/HAND REFERRAL**

CONTENT TOPICS

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NERVES  
VESSELS  
**BONES**  
M-C Neck  
M-C Shaft  
M-C Head  
Thumb  
Dislocation  
INFECTIONS  
MISC



## GAMEKEEPER'S (SKIER'S) THUMB

- Ulnar collateral ligament (UCL) of thumb MCP joint
- UCL critical for pinch and grasp
- Forced radial abduction MCP joint
- Assoc avulsion fracture is common
- Treatment
  - Partial tear: thumb spica splint
  - Complete tear: surgery
- Complication: chronic instability
- Bull rider's thumb = RCL injury



### CONTENT TOPICS

NERVES  
VESSELS

**BONES**

**M-C Neck**

**M-C Shaft**

**M-C Head**

**Thumb**

**Dislocation**

INFECTIONS

MISC



## DISLOCATIONS

- DIP dislocation - uncommon
- PIP dislocation - common
  - Dorsal dislocation very common (rupture of volar plate, ulnar deviation 2° RCL rupture)
  - Reduction: dig block → distraction → slight hyperextension → relocate → splint
  - Can't reduce?? → volar plate entrapment
- MCP
  - Less common than PIP dislocation
  - Hyperextension, rupture of volar plate, dorsal dislocation
  - Volar plate is commonly entrapped



### CONTENT TOPICS

NERVES  
VESSELS

**BONES**

**M-C Neck**

**M-C Shaft**

**M-C Head**

**Thumb**

**Dislocation**

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CONTENT TOPICS

NERVES  
VESSELS

**BONES**

M-C Neck

M-C Shaft

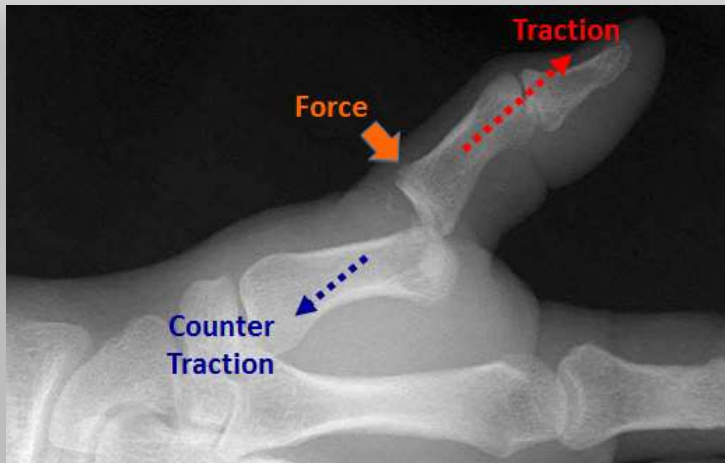
M-C Head

Thumb

Dislocation

INFECTIONS

MISC



TRACTION WITHOUT DORSAL FORCE = VOLAR PLATE ENTRAPPED


**ACES** ASSESSMENT OF CORE-CONTENT  
 EDUCATION SERIES



CONTENT TOPICS

NERVES  
VESSELS

BONES

**INFECTION**

Paronychia

Felon

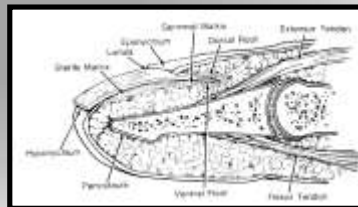
Abscess

FTS

MISC

## PARONYCHIA

- Acute nailbed infection – usually staph
- Chronic infection:
  - C. albicans, other fungi
  - Moist hands (dishwashers, bartenders)
- Treatment: I&D, soaks, ABX not indicated
- Consider osteo if not improv.
- Do not I&D herpetic whitlow
  - herpetic myositis








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PARONYCHIA



PARONYCHIA



WHITLOW

CONTENT TOPICS

NERVES  
VESSELS  
BONES

**INFECTION**

Paronychia  
Felon  
Abscess  
FTS

MISC



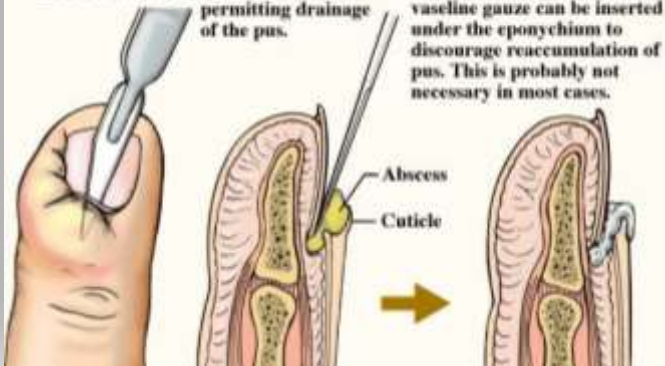

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PARONYCHIA

**Paronychia Drainage: Simple Paronychia**

1. Use a #11 scalpel blade to separate and lift the eponychium from the nail, permitting drainage of the pus.

2. (Optional) A small drainage wick or packing of Adaptec or vaseline gauze can be inserted under the eponychium to discourage reaccumulation of pus. This is probably not necessary in most cases.



CONTENT TOPICS

NERVES  
VESSELS  
BONES

**INFECTION**

Paronychia  
Felon  
Abscess  
FTS

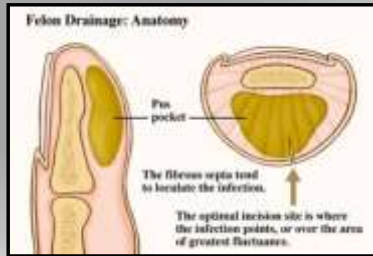
MISC

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FELON

- Acute pulp space infection
  - Usually staph
- Treatment: I&D and antibiotics



CONTENT TOPICS

NERVES  
VESSELS  
BONES

**INFECTION**

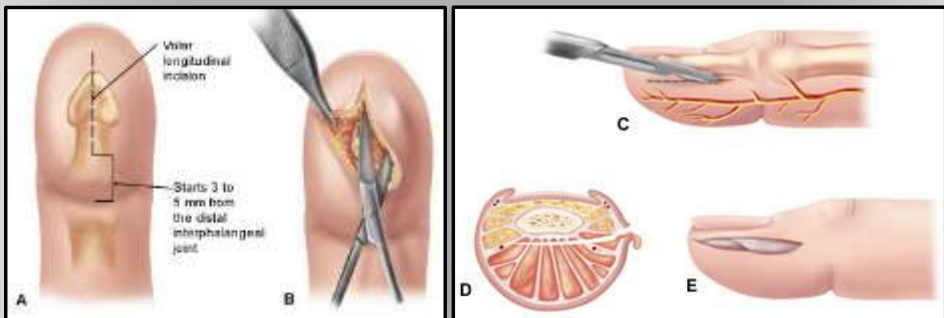
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**Felon**  
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**FTS**

MISC

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FELON



**FISH-MOUTH INCISION NOT RECOMMENDED**


CONTENT TOPICS

NERVES  
VESSELS  
BONES

**INFECTION**


**Paronychia**  
**Felon**  
**Abscess**  
**FTS**

MISC




# ACES

ASSESSMENT OF CORE-CONTENT  
EDUCATION SERIES



## COLLAR BUTTON ABSCESS

- Palmar aponeurosis prevents extension volarly
- Pus spreads between MC bones and erupts dorsally creating a hand abscess
- A volar and dorsal abscess connected by a tract
- Look for splinter/FB on the palm




### CONTENT TOPICS

NERVES  
VESSELS  
BONES

**INFECTION**


**Paronychia**  
**Felon**  
**Abscess**  
**FTS**

MISC






# ACES

ASSESSMENT OF CORE-CONTENT  
EDUCATION SERIES



## FLEXOR TENOSYNOVITIS

- Volar puncture wound or catbite
- Kanavel criteria:
  1. Circumferential/fusiform swelling - "sausage"
  2. Pain on palpation of proximal tendon sheath
  3. Pain on passive extension
  4. Flexed finger position at rest
- Treatment: splint, IV antibiotics, surgical I&D


### CONTENT TOPICS

NERVES  
VESSELS  
BONES

**INFECTION**


**Paronychia**  
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NERVES  
VESSELS  
BONES  
**INFECTION**  
**Paronychia**  
**Felon**  
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**FTS**

MISC





# ACES

ASSESSMENT OF CORE-CONTENT  
EDUCATION SERIES



## AMPUTATION CARE

- Plastic bag in ice water (not directly in water)
- Thumb has better outcome proximal to IP joint
- Distal third of fingertip doesn't need graft in small children

CONTENT TOPICS

---

NERVES  
VESSELS  
BONES  
INFECTIONS  
**MISC**  
**Amputation**  
**Mallet Finger**  
**Boutonniere**  
**Splinting**





# ACES ASSESSMENT OF CORE-CONTENT EDUCATION SERIES



## AMPUTATION CARE

- Indications for replantation
  - Multiple digits
  - Thumb
  - Single digit between PIP & DIP (distal to the superficialis insertion)
  - Metacarpal (palm)
  - Wrist, forearm
  - Almost any part in child

**CLEAN AND SHARP = BETTER OUTCOME**

### CONTENT TOPICS

NERVES  
VESSELS  
BONES  
INFECTIONS

MISC

**Amputation**  
**Mallet Finger**  
**Boutonniere**  
**Splinting**

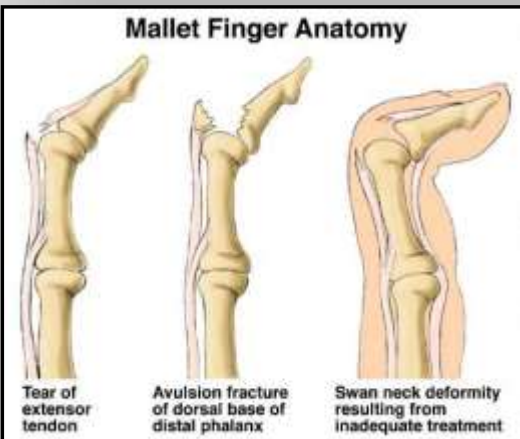


# ACES ASSESSMENT OF CORE-CONTENT EDUCATION SERIES



## MALLET FINGER

### Mallet Finger Anatomy



- Extensor tendon disruption
- Forced flexion against resistance (ball striking finger)
- Splint in extension

### CONTENT TOPICS

NERVES  
VESSELS  
BONES  
INFECTIONS

MISC

**Amputation**  
**Mallet Finger**  
**Boutonniere**  
**Splinting**



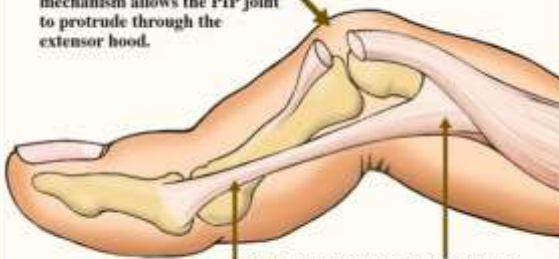
# ACES ASSESSMENT OF CORE-CONTENT EDUCATION SERIES



## BOUTONNIERE DEFORMITY

### Boutonniere Deformity: Anatomy

Disruption of the central extensor mechanism allows the PIP joint to protrude through the extensor hood.



Displaced intact lateral components of the extensor mechanism hold the DIP joint in extension while flexing the PIP joint.

- Central slip disruption at PIP
- Forced flexion at PIP against resistance
- Results in DIP extension PIP flexion
- Splint in extension

### CONTENT TOPICS

NERVES  
VESSELS  
BONES  
INFECTIONS

MISC

Amputation  
Mallet Finger  
Boutonniere  
Splinting



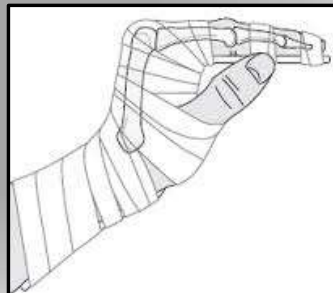
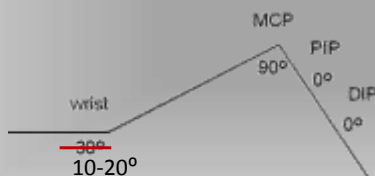
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## HAND SPLINTING

Intrinsic-plus – “Safe position”

- For metacarpal and unstable prox and mid phalanx fractures
- Decreases “freeze” at MCP
- Decreases “freeze” at PIP



### CONTENT TOPICS

NERVES  
VESSELS  
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MISC

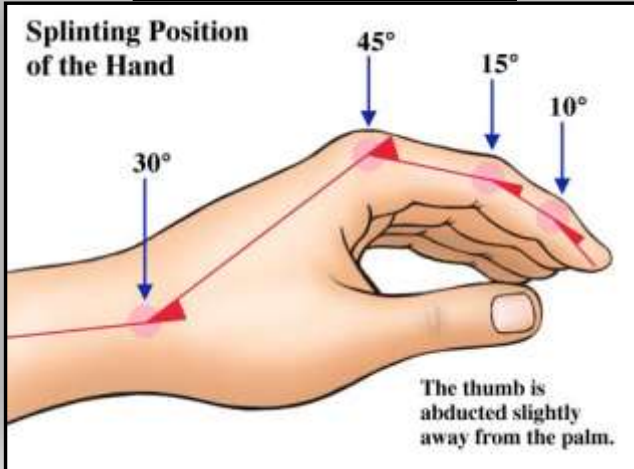
Amputation  
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## HAND SPLINTING



### CONTENT TOPICS

- NERVES
- VESSELS
- BONES
- INFECTIONS

### MISC

- Amputation
- Mallet Finger
- Boutonniere
- Splinting



# ACES



## ASSESSMENT OF CORE-CONTENT EDUCATION SERIES

