



# Minimally Invasive Foot and Ankle Surgery

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# Minimally Invasive Surgery

- ▶ Minimally invasive foot and ankle surgery ( MIS ) is a method that allows interventions causing minimal trauma to surrounding tissue through smaller incisions and with or without direct exposure of surgical planes
- ▶ Include – Arthroscopic surgeries , Small incision non arthroscopic surgeries under x-ray guidance , percutaneous procedures.



# Minimally Invasive Surgery - Advantages

- ▶ Reduction in tissues trauma
- ▶ Reduced surgical time
- ▶ Less post operative adhesions/  
fibrosis
- ▶ Minimal external scars
- ▶ Reduced joint stiffness
- ▶ Day case surgery
- ▶ Faster recovery
- ▶ Quicker return to daily activities

# Minimally Invasive Surgery - Challenges

- ▶ Requires special training
- ▶ Steep learning curve
- ▶ Requirement of specialized instruments
- ▶ Requires intricate anatomy knowledge
- ▶ Cadaveric course training if possible

# Ankle Arthroscopy - History

- ▶ 1931 - Burman used 4.0mm sheath without distraction
- ▶ 1939 - Tagaki developed a 2.7mm arthroscope.
- ▶ 1972 - Watanabe developed a self-focusing 1.7mm arthroscope
- ▶ 1988 - Guhl used a skeletal distractor for the ankle
- ▶ 1988 - Yates developed a non-invasive distraction technique.

# Ankle Arthroscopy - Indications

- ▶ Diagnostic and Therapeutic
- ▶ Osteochondritis desiccans
- ▶ Arthrofibrosis
- ▶ Ankle Impingement (Anterior and Posterior)
- ▶ Synovitis
- ▶ Loose bodies
- ▶ Infections
- ▶ Ankle fractures
- ▶ Lateral ligament instability
- ▶ Ankle arthrodesis

# Ankle Arthroscopy - Contraindications

- ▶ Local soft-tissue infection
- ▶ Poor vascularity
- ▶ Severe edema
- ▶ Lymphoedema

# Ankle Arthroscopy - Technique

- ▶ 30 degree wide angle - 2.7 mm arthroscope
- ▶ pump set for a pressure of 50 mm;
- ▶ mechanical distraction device
- ▶ High ankle block
- ▶ Portals –commonly used - antero-medial , antero-lateral , postero-lateral
- ▶ Sequential examination ( 21 point)
- ▶ Arthroscopic debridement , micro-fracture , repair as per the pathology

# Ankle Arthroscopy – Complications

- ▶ Neurovascular damage
- ▶ Chronic regional pain syndrome
- ▶ Infection
- ▶ DVT/ PE
- ▶ Stiffness
- ▶ Damage to articular surface

# Subtalar Arthroscopy

- ▶ Indications - subtalar impingement, chondromalacia, osteophytes, arthrofibrosis, synovectomy ,removal of loose bodies , coalition , os trigonum ,subtalar fusion
- ▶ Contraindications - advanced degenerative joint disease , poor vascularity , soft tissue infection

# Subtalar Arthroscopy - Technique

- ▶ Three standard portals – anterior , middle and posterior portal
- ▶ Inspect from anterior portal -sinus tarsi, the anterior process of the calcaneus, and anterior joint , postero-lateral gutter
- ▶ From posterior portal - central talo-calcaneal joint, interosseous ligament , postero-lateral recess, posterior gutter and posterior-lateral corner of the talus
- ▶ Joint debridement , removal of scar tissue, sub talar joint fusion etc , other procedures as required .



# Sub talar arthroscopy

# Subtalar Arthroscopy-Complications

- ▶ Sural nerve and superficial peroneal nerve injury
- ▶ Infection
- ▶ Articular cartilage damage
- ▶ Damage to articular surface

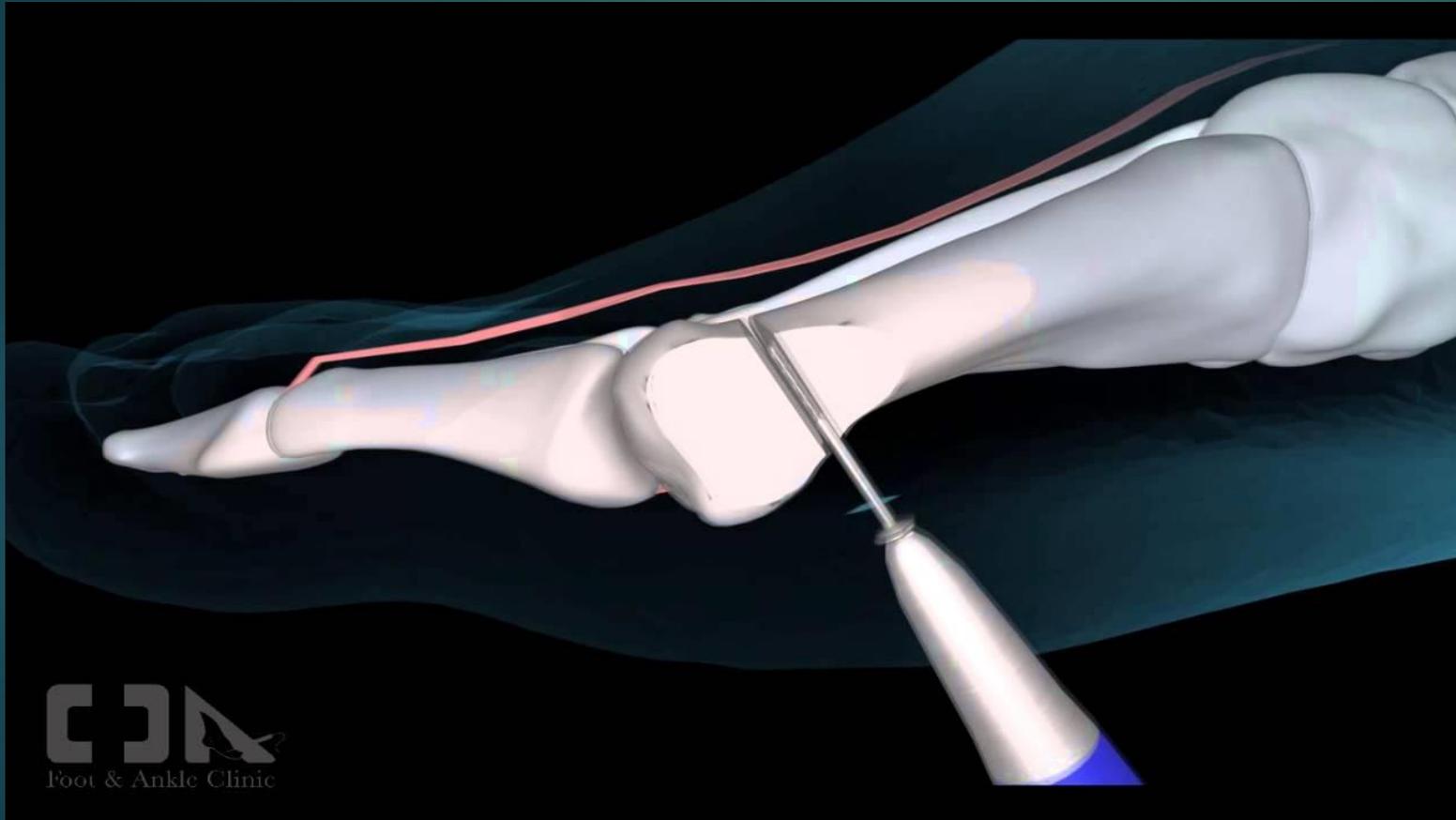
# Minimally Invasive Hallux Correction

- ▶ Multiple small stab incisions unlike the traditional large incision .
- ▶ percutaneous release of the fibular sesamoid ligaments and conjoined tendon of the adductor hallucis under image intensifier.
- ▶ Chevron osteotomy through a small stab incision with a burr
- ▶ Frequent use of image intensifier.
- ▶ Cannulated screws for osteotomy fixation.
- ▶ Various techniques described - SCOT (percutaneous) technique, Bösch technique, Isham technique

# Bunion procedures

- ▶ With similar technique using small incision and use of burr following osteotomies can performed as well
  - ▶ Akins osteotomy
  - ▶ Basal osteotomy
  - ▶ Simple bunionectomy

# MIS Bunion correction



# Minimally Invasive Hallux Correction - Complications

- ▶ Mal-alignment
- ▶ Recurrence of deformity
- ▶ Nonunion/Mal-union of osteotomy
- ▶ Infection
- ▶ Post operative stiffness

# Other MIS

- ▶ Percutaneous Arthrodesis of Inter-phalangeal Joints of the Lesser Rays –
  - ▶ Dorsal approach
  - ▶ 2-3 mm arthrotomy
  - ▶ Micromotorised Lindemann bone cutter
  - ▶ Intramedullary K wire

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- ▶ Percutaneous Distal Osteotomy of the Fifth Metatarsal (Bunionette)
    - ▶ Ankle block
    - ▶ Percutaneous 2 mm k wire in paraosteal position
    - ▶ Osteotomy with Lindemann bone cutter
    - ▶ Osteotomy stabilized by k wire.

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- ▶ Percutaneous Osteotomy of Lesser Metatarsal Bones
    - ▶ oblique extra-articular osteotomy of the metatarsal neck using a Lindemann bone cutter,
    - ▶ 45 degree inclination on the axis of the metatarsal bone, from distal-dorsal to plantar-proximal,

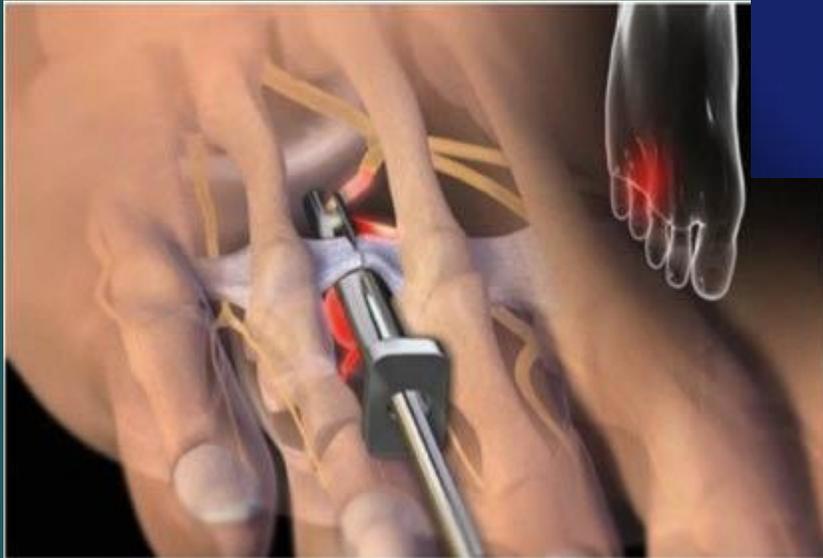
# Lesser metatarsal MIS



# Mortons Neuroma- endoscopic

- ▶ Percutaneous Alcoholization for Interdigital Neuritis (Morton's Neuroma)
  - ▶ Endoscopic decompression of the intermetatarsal nerve entrapment.
  - ▶ Alcoholization with phenol or ethanol by a percutaneous approach - dorsal intermetatarsal approach , the nervous branch is localized by an electrostimulator or sonography; using an electrode-needle of 2 ml. amount of 5 percent concentration phenol or 90 percent concentration ethanol is injected

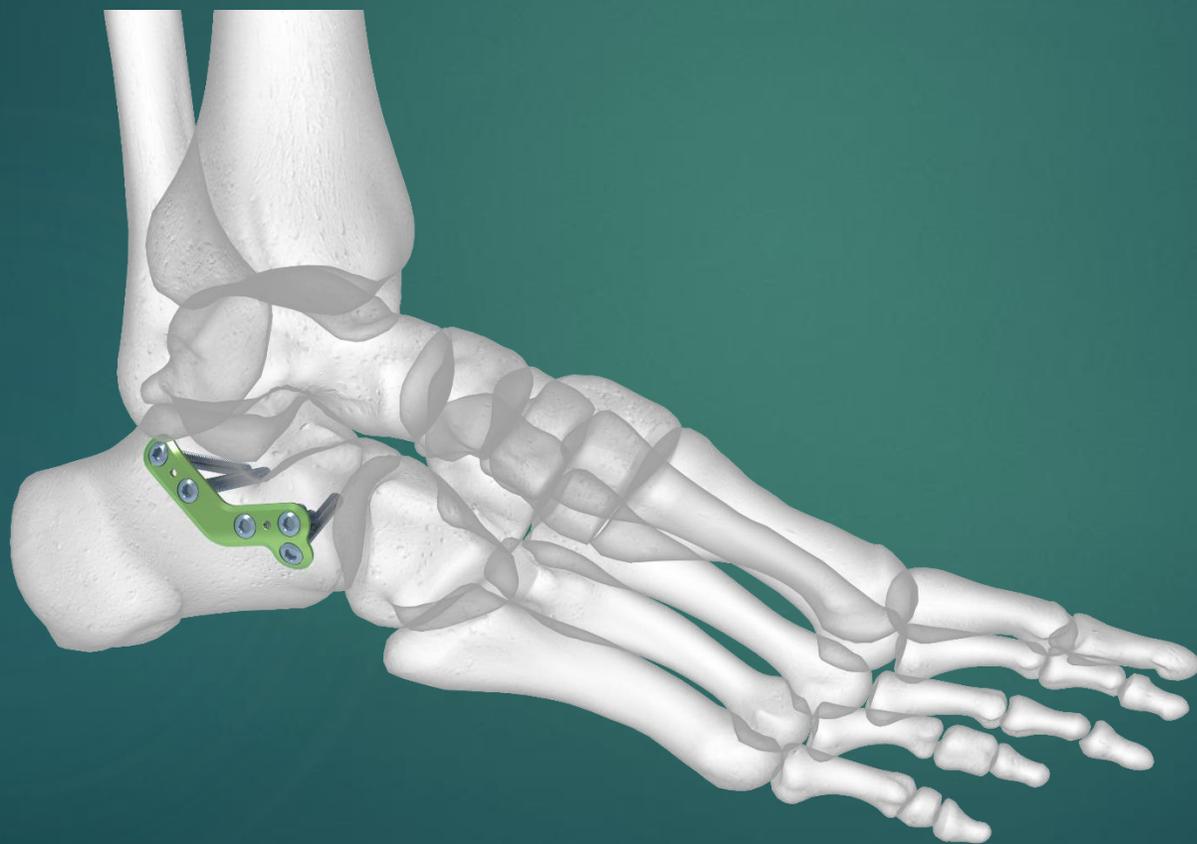
# Endoscopic mortons neuroma exicison



# Hindfoot MIS

- ▶ percutaneous calcaneal displacement osteotomy
  - ▶ Under fluoroscopic guidance the osteotomy is planned and marked on the skin
  - ▶ Three stab incisions made , subperiosteal tunnel created
  - ▶ Osteotomy performed with a small gigli saw passed under the tunnel
  - ▶ Correction made and osteotomy fixed with percutaneous cannulated screws

# Calcaneal osteotomy/ fixation



# Tendoscopy

- ▶ A type of minimally invasive procedure involving endoscopy of a tendon
- ▶ Stab incisions
- ▶ Tendon sheath expanded with fluid
- ▶ Scope is passed along the tendon sheath to examine the pathology



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- ▶ Tendoachillis tendoscopy – For tendon repair , treat tendinopathy ,tenotomy and tendon lengthening
  - ▶ Peroneal Tendoscopy -
    - ▶ Indications -peroneal adhesions,tenosynovitis , tendon rupture ,recurrent peroneal tendon subluxation, and intrasheath peroneal tendon subluxation.
    - ▶ tendoscopic synovectomy ,tendon suturing .
  - ▶ FHL Tendoscopy – Generally in conjunction with other procedures during hindfoot endoscopy . FHL can be harvested via tendoscopy . Tendoscopic tendon transfer of FHL , Tendoachilis augmentation

## Tibialis Posterior Tendoscopy –

- ▶ Indications - Dislocation, tenosynovitis, tendinopathy (insertional and non-insertional), and post-traumatic adhesions.
- ▶ Tendoscopy of the following tendons is less common-
  - ▶ Tibialis anterior
  - ▶ Ext hallucis longus
  - ▶ Ext digitorum longus

# Conclusion

- ▶ MIS techniques are reliable with comparable results to traditional open approaches.
- ▶ Surgical time and recovery time can be reduced as a result of less soft tissue injury
- ▶ Steep learning curve due to small operating field , difficult landmarks.
- ▶ Slowly and steadily progressing as the future of most of the foot and ankle surgeries.



