Ankle Arthroscopy the Present and the Future

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Abstract

Ankle arthroscopy evolved from 1939 Tagaki of Tokyo, but it was after the 1980’s there was a surge in understanding of ankle arthroscopy with extensions of indications commenced. Surgical instruments and techniques evolved over period and still evolving. The 2.7mm and 1.9mm arthroscopes with 30 degrees obliquity become standard. supine, lateral and prone positions are used with distraction of the joint achieved by invasive or non-invasive methods depending on the indications. Arthroscopy pumps are now mandatory in arthroscopy assisted fusions in order to maintain the hemostasis and better visualization. The general anesthesia and regional anesthesia in combination helps the patient for better post-operative pain control and early rehabilitation. Off late understanding of arthroscopy of smaller joints like subtalar joints, endoscopy of Tarsal tunnel and plantar fascia for the release respectively as well tendoscopy of tendons like Achilles, posteriortibial, flexor hallucis longus and peronei are gaining popularity which are aimed at minimizing the morbidity and enhancing the rehabilitation. Steep learning curve and experience in the technique by the surgeon are challenges for wider practice of this technique.

Keywords: Ankle distractors, Ankle arthroscopic portals, subtalar arthroscopy, tendoscopy, endoscopy around Ankle

Introduction

It was Takagi from Tokyo, in 1918 first used a cystoscope to look into the interior of the knee [1]. Eventually, in 1939 he developed a standard method of arthroscopic examination of the ankle, which got published in Journal of Japanese Orthopaedic Association. Watanabe [2] in 1972 reported 28 ankle arthroscopies, performed with the newly developed fiberoptic arthroscope. After 1980, there was a surge in the knowledge of ankle arthroscopy, and now it is an important tool for diagnosing and treating foot and ankle disorder involving the pathological conditions of cartilage, ligaments, bones and joints with an added advantage of decreased patient discomfort and early rehabilitation.

Indications and Contraindications of Ankle Arthroscopy (Table 1)

Contraindications

Contraindications can be absolute or relative

Absolute contraindications include:

- Localized soft tissue infection
- Severe degenerative joint disease.

Relative contraindications include:

- Moderate degenerative joint disease with a restricted range of motion
  - A significantly reduced joint space
  - Severe edema
  - Tenuous vascular status
  - Complex regional pain syndrome (RSD).

Surgical technique

Equipments (Fig 1)

Arthroscope

- The 1.9 and 2.7mm arthroscopes with 30° obliquity are used for ankle arthroscopy
- The 4mm arthroscope used rarely but not recommended because of cartilage damage on maneuvering the scope
- The 2.7 and 4mm arthroscopes with 70° obliquity have certain advantage of seeing over medial and lateral domes of talus and considering the gutters as well identifying the osteochondral lesions of talus, but the disadvantage is its central blind plot, making it challenging to introduce into the joint without causing damage to articular cartilage [3].

The disadvantage of using smaller 1.9 and 2.7mm scopes, as they are delicate in nature results in bending and breaking if it is not handled with care.

Interchangeable cannula system

Regardless of the arthroscope used it is
important to use the interchangeable cannula to switch the portals from viewing to working without constant instrumentation. The cannula size for the 2.7mm arthroscope is 2.9mm, and for the 1.9mm arthroscope, it is 2.1mm.

**Instruments**

- Shavers and burr of the size 2.0,2.9,and 3.5 mm
- Ring and cup curettes of the size 3.5 and 4.5mm
- Probes of the size 1.5mm
- Graspers and basket forceps of the size 2.9and 3.5mm
- Osteotomes, microfracture picks, pituitary rongeur and banana blades of the size 2.9mm[14].

**Ankle distractors (Fig 2)**

Improves the visualization of the interior of the ankle joint by increasing the space between tibia and talus. Two types of distractors exist. Namely, invasive (mechanical through skeletal pins through talus/calcaneum) and non-invasive (through ankle straps). The type of Distraction depends on the surgeon's preference but usually dictated by indications.

Dowdy et al. [4] have recommended a limit for distraction force of 30 pounds <1 h duration while using non-invasive distraction. Contraindication for distraction is RSD, open epiphysis, and pyoarthrosis[14].

**Positioning (Fig 3,4)**

Almost all procedures are performed in supine position. Lateral decubitus and prone are the other positions useful in Achilles tendoscopy for Haglund deformity and retrocalcaneal bursitis, posterior ankle impingement, Flexor hallucis longus tenosynovitis.

**Prone positioning [14]**

Thigh holders are used as in knee arthroscopy are commonly used in ankle scopy too to flex at knee to 90°over the end of the table. Moreover, the patient rotated internally to align the knee and ankle face straight up[4], the nonoperative extremity placed in a fully extended well-paddedtable. Surgeon can stand or sit during the surgery.

**Arthroscopy pump**

It is critical for ankle arthroscopy to have high inflow and outflow as well, the ways by which it can be accomplished with gravity drainage.
through posterolateral portal of ankle. When high fluid pressure is in need, arthroscopy pumps help in maintain high set pressure constantly for the desired period for improved visualization and maintain hemostasis. If pump pressures are not carefully monitored, then the risk of compartment syndrome is high.

**Anesthesia**

General anesthesia with ultrasound-guided regional blocks at popliteal offers excellent per operative as well as post-operative analgesia.

**Arthroscopy OT setup [14] (Fig. 5)**

**Arthroscopic portals**

**Ankle arthroscopy portals are broadly divided into:**

1. Anterior
   a. Anteromedial
   b. Anterolateral
   c. Anterocentral
2. Medial midline
3. Posterior
   a. Posterolateral
   b. Posterocentral(tansachilles)
   c. Posteromedial.
4. Transmalleolar
5. Transtalar.

**Preferred portals in ankle arthroscopy (Fig 6,7)**

1. Anterolateral
2. Anteromedial
3. Posterolateral.

The other portals which are used specifically for conditions of talus are Transmalleolar portals. These are established by drilling the Kirschner wires under fluoroscopic or endoscopic guidance through either tibia or fibula into the talar dome for establishing new vascularity in osteochondral lesions of talus[6]. One another portal for talus is Transtalar portal used for drilling and bone grafting the lesions in talus[7].

**Portal complications**

**Neurovascular injury**

All neurovascular injuries attributed to portal placement and distractor pin placement. Superficial peroneal nerve injury accounts for 49%, followed by sural, deep peroneal, and saphenous nerves. Posterior tibial artery and nerve are prone for injury while establishing posteromedial portal. These complications can be easily prevented by careful surgical technique, by usage of interchangeable cannula system, appropriate Portal closure by non absorbable vertical mattress sutures, application of compression bandage dressings and post-operative immobilization in padded splints.

**Diagnostic arthroscopy**

Chen described the interior
arthroscopic examination extensively[8].
Drez et al. [9] divided ankle joint into:
1. Anterior cavity
2. Central cavity
3. Posterior cavity.
Ferkel[10] devised 21 point arthroscopic examination (Table 2).

Arthroscopic examination of smaller joints of foot.
Arthroscopic examination of subtalar joint described by Parisien in 1986[9,10] (Fig,8,9,10,11).

Indications[14]
- Chondromalacia
- Osteophytes
- Arthrofibrosis
- Synovitis
- Loose bodies osteochondral lesions
- Painful os trigonum
- Arthrosis
- Flexor hallucis longus tendinopathy
- Arthroscopy-assisted fixation of calcaneal fractures.
There are three Primary Portals used namely, Anterolateral, Central and Posterolateral. A 13 point examination of subtalar joint allows the surgeon to document and treat the arthroscopic findings in a reproducible manner (Fig 12).

Great toe and lesser toes arthroscopy (Fig 13)
The arthroscopic examination of the great toe metatarsophalangeal joint was first described by Watanabe[11]. Bartlett[12] was first to describe the successful arthroscopic debridement of osteochondritis dissecans lesion in the first metatarsal head.

Pathologies involving great toe metatarsophalangeal joint where arthroscopy indicated include[14].
- Arthrofibrosis
- Chondromalacia
- Degenerative joint disease
- Osteochondral lesions
- Osteophytes
- Sesamoid pathology
- Synovitis.

Arthroscopic portals in great toe
- Dorsomedial portal placed just medial to tendon of extensor hallucis longus at the joint line
- Dorsolateral portal placed just lateral to the tendon of extensor hallucis longus at the joint line
- Straight medial portal is placed midway between the dorsal

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and plantar aspect of the joint, made under direct vision.

**Traction**
Traction is applied through a modified sterile finger trap device suspended with weights.

**Endoscopic procedures (Fig 14)**
Endoscopy is used in a number of new procedures related to foot and ankle pathologies include:
- Endoscopic tarsal tunnel release
- Endoscopic plantar fascia release.

The advantage being less morbid to the patient but the surgeon should be familiar with the technique and should be trained to perform it skillfully.

**Tendoscopy**
It is a relatively new branch of endoscopic procedure popularized by van Dijk. The potential benefits being less immobilization, faster recovery time, with few wound complications, and less scarring.
Flexor hallucis longus tendoscopy, Peroneal tendoscopy, posterior tibial tendoscopy, Achilles tendoscopy with haglund excision are the common procedures.

**Hindfoot arthroscopy in prone position (Fig 15)**
van Dijk in the year 2000, described a two-portal approach for chronic flexor hallucis longus tendinitis and posterior impingement syndrome caused by os trigonum in a professional ballet dancer [12].
The indications include excision of os trigonum, posterior ankle impingement syndrome, flexor hallucis longus tenosynovitis, osteochondral lesions of posterior talar dome, and intraosseous ganglion cyst of the talus.
The portals which are workhorse for the hindfoot arthroscopy include posterolateral viewing portal and posteromedial working portal, various other portals according to the need include accessory posterolateral and accessory posteromedial portals and trans achilles [14].

**Complications of Foot and Ankle Arthroscopy**
In the largest series published by Ferkel and Guhl [13], the overall complication rate was 9.8%.
The most common complication was neurologic (49%) others include,
- Superficial infection
- Deep infections
- Adhesions

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**Figure 8:** Eight point anterior ankle examination through arthroscope

**Figure 9:** Six point central ankle examination through arthroscope

**Figure 10:** Seven point posterior ankle examination through the arthroscope

**Figure 11:** Arthroscopic portals for examination of subtalar joint

**Figure 12:** 13 point examination of subtalar joint allows the surgeon to document and treat the arthroscopic findings in a reproducible manner
Systemic complications include:
- Deep vein thrombosis
- Myocardial infarction.
Overall, the incidence of complications has decreased as knowledge and experience with foot and ankle arthroscopy has improved.

Future Trends in Arthroscopy of Foot and Ankle

Advances in the equipment and Techniques of small joint arthroscopy as well endoscopy, makes it mandatory for a foot and Ankle surgeon to be familiar with open procedure around the small joints and tendons of foot and ankle and to develop a skill for endoscopy and arthroscopy of small joints around foot and ankle. The procedure for the future, where extensive research is on are
- Arthroscopically assisted First Metatarsophalangeal (1st MTP) Joint Arthrodesis
- Talonavicular-calcaneocuboid Arthroscopy
- Intermetatarsal neumra endoscopy
- Endoscopic gastrocnemius Recession.(14)

References