

Clinic-Based Multimodal Approach for Hindfoot Problems

인제의대 이 홍 재

Contents

- Physical Therapy
 - Foot Orthotics and Therapeutic Shoes
 - Therapeutic Ex and Manual Therapy
- Taping
- Injection
- ESWT
- Medication

후족부 통증에 쓰이는 물리치료

1. 냉치료

- 발목 손상 급성기에 필요
 - Acute sprain, contusion, swelling, inflammation
- Cold pack, ice massage, ice water, cold spray
- 5~15 min every 1~ 2 hr

- 효과

- 혈관 수축 → 염증반응, 부종, 출혈 감소
- 운동 및 감각 신경의 전도 속도 감소, 근방추
체 firing rate 감소, stretch reflex 반응도 감소
→ pain, muscle spasm 감소
- 세포 대사량 감소

- Contraindication

- Vascular insufficiency
- Cold hypersensitivity

온열 치료

- 효과
 - 통증 감소
 - 콜라겐 조직의 이완성 증가
 - Muscle spasm 감소
 - 혈류량 증가
 - 세포 대사량 증가
- Indication
 - 만성 통증과 만성 부종
 - 근경직
- Contraindication
 - 급성기 손상. 특히 첫 24시간
 - Vascular insufficiency
 - 감각 저하 부위
 - Heat hypersensitivity

적용 방법

1. Superficial heat

1. H/P : 70-80도, 20분 정도
2. Heat bath, Whirlpool
 1. 손, 발 : 45도 내외
 2. 전신 : 38-39도
3. Infrared lamp: 주로 피부에만 열 올림
4. Paraffin bath

2. Deep Heat

◆ Ultrasound

- Freq 0.8~1.0 MHz, Intensity 0.5-2.0/cm²
- Thermal effect 위해서는 연속 모드
- Non-thermal effect 위해서는 단속 모드
 - 조직 재생을 자극
- 초음파 투과 깊이
 - 근육 : 2~4 cm
- Stroking method (문지르기)
 - Shortwave, microwave

3. 교대욕 (contrast bath)

- 온열과 냉치료를 교대
- 38~40도 온수와 13~16도 냉수
- 방법
 - 처음에는 10분간 온수에 담그고,
 - 이후, 1~4분간 냉수
 - 다시 4~6분간 온수
 - 4 주기 반복
 - 끝에 냉수로 마무리
- 효과 : 만성통증, 부종, CRPS, neuropathic conditions, RA

전기 치료

- TENS (transcutaneous electrical nerve sti.)
 1. High freq TENS
 - Conventional method for pain relief
 - Mechanism ; Gait Control Theory
 - 즉각적 진통, 단시간 효과
 2. Low Freq. high intensity TENS
 - Acupuncture-like stimuli
 - CNS에서 endorphin 분비
 - 장시간 진통 효과

- ICT (interferential current therapy)
 - 두 개의 교류 전류를 주파수, 강도, cycle 을 달리하여 치료 부위에 다양한 형태의 파형이 전달되게 한다.
 - 4천 ~ 5천 Hz 중주파 전류 사용하므로 피부 저항이 낮아 좀 더 쉽게 조직으로 침투하는 장점.
 - 통증 조절 기전: TENS 와 동일
 - 전극 배열, 파라미터 세팅에 따라 TENS 보다 좀 더 넓은 부위를 치료

Iontophoresis (이온삼투법)

- 전기장을 이용하여 charged particle을 조직내로 침투시키는 방법
- Lidocaine,
- dexamethasone, methylprednisolone
- 근골격계 염증 치료에 이용

LOW DYE STRAP

(CAMPBELL'S REST STRAP + HEEL LOCK)



Modified Low Dye Taping

1. **Anchor taping** around MT heads, 테이프 양 끝이 서로 닿지 않게
2. **Horizontal taping**: from 1st MT head, circling around heel (calcaneal prominence 아래로 지나게), ending on 5th MT head ; 2겹
3. **Diagonal taping**
 - 1) Single X taping: Starting from just proximal to the 1st MT head, → diagonally beneath the foot → CC joint → around heel → sustentaculum tali → finishing just proximal to the 5th MTPJ
 - 2) Double X taping (tear drop shape taping): 첫째 테이핑은 1st MT head 기점으로 출발하여 뒤꿈치 감은 후 다시 1st MT head로, 둘째 테이핑은 5th MT head에서 출발하여 뒤꿈치 감은 후 다시 5th MT head로.

4. Coronal taping

- Starting from just proximal to MT head
- Apply the tape by overlapping half just distal to heel

5. Closing tape on the MT dorsum after partial weight bearing

Ankle taping

- for lateral ankle sprain

REVERSE J STRAP

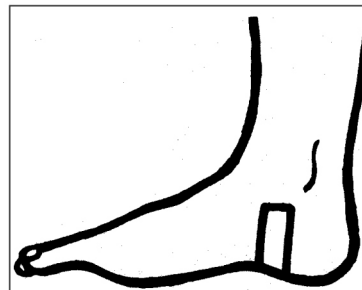


Figure 1.

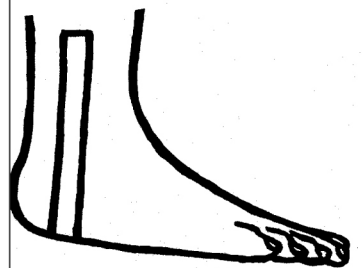
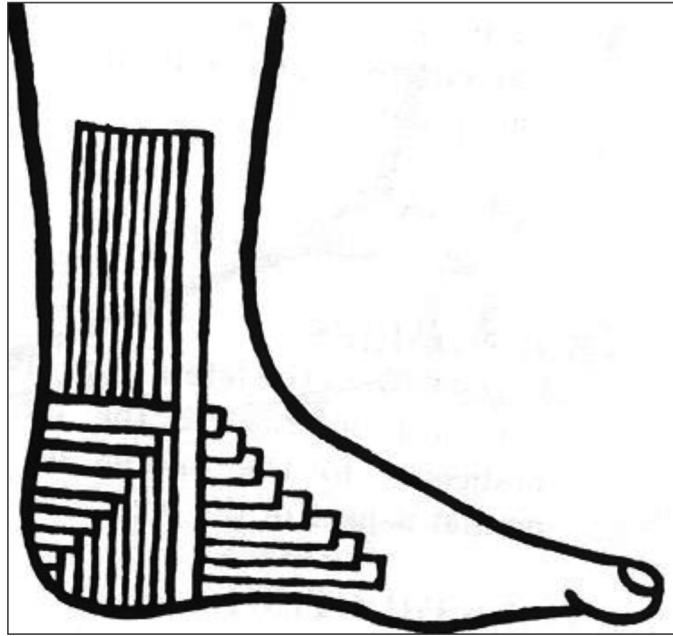


Figure 2.

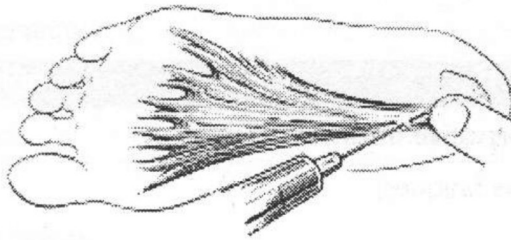
GIBNEY ANKLE STRAP (BASKETWEAVE)



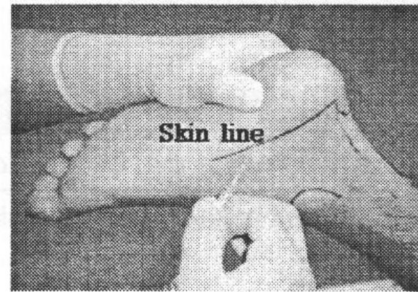
Injection

주사 치료

Plantar fasciitis

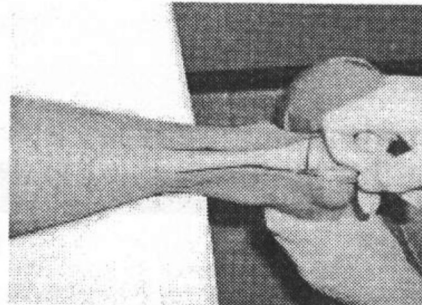
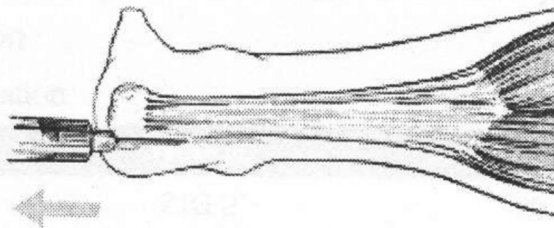


1. Sole approach

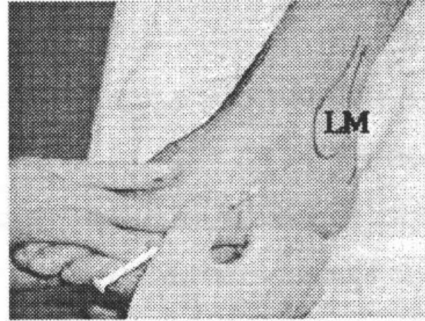
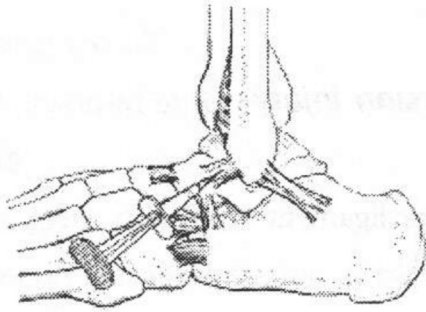


2. medial heel approach

Achilles tendonitis

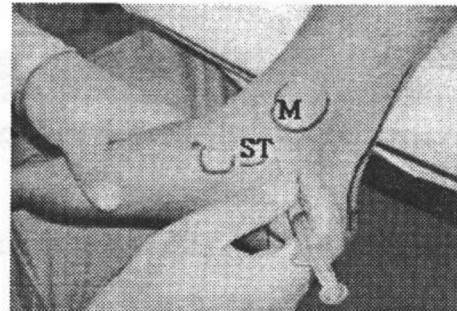
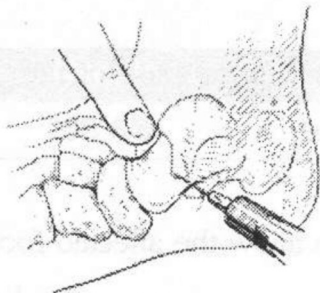


ATFL



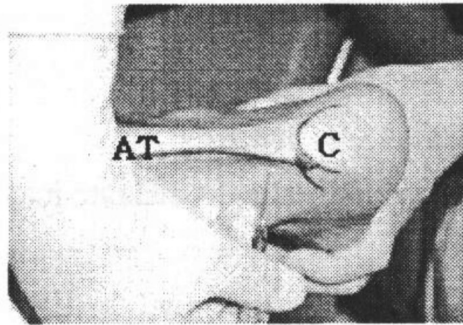
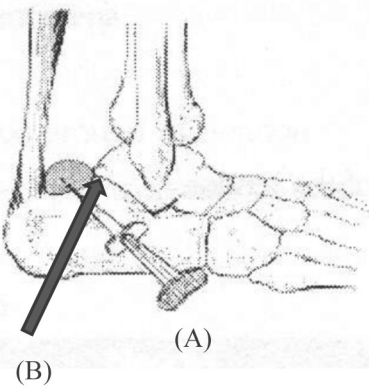
STJ medial side

- Just below Sustentaculum tali

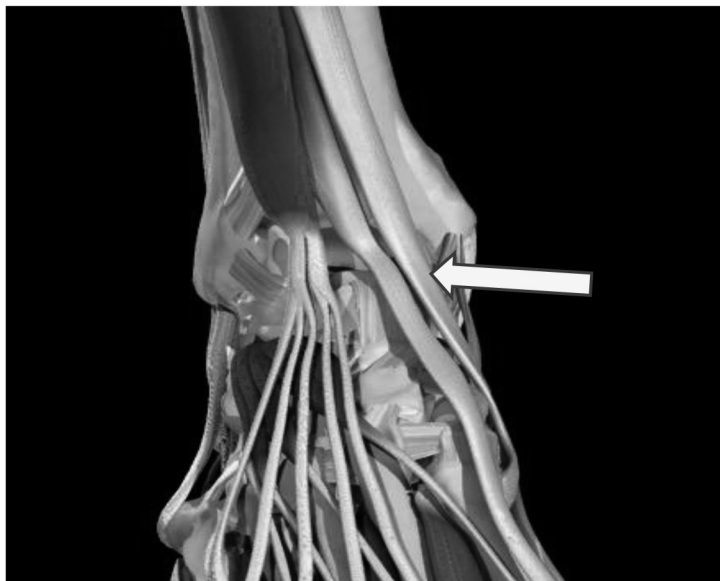


Retrocalcaneal bursa (A) and posterior periarticular injection (B)

- Lateral approach



Ankle joint Intraarticular Inj - Medial approach



실제 주사 장면 - Anterior talofibular ligament (ATFL)



Orthotics



Extracorporeal Shock Wave Therapy (ESWT)

Mechanism of shockwave therapy-1

- Not fully understood so far
- Microscopically to cause interstitial and extracellular responses leading to tissue regeneration

Mechanism of shockwave therapy-2

- Shockwave therapy for insertional tendinopathy in animal experiments
 - Significant increase of new capillary formation and muscularized vessel in dogs and rats
 - ↑ angiogenetic growth and proliferating factors : eNOS, VEGF, PCNA

Wang CJ, Yang KD, Wang FS, Huang CC, Yang LJ: Shock wave induces neovascularization at the tendon-bone junction. A study in rabbits. J Orthop Res 2003, 21:984–989.

- Chronic tendinopathy
 - Muroid and chondroid degeneration and formation of plump tenocytes and increased fibroblastic and myofibroblastic cells and absent inflammatory cells.
 - suggested pathogenesis
 - increased occurrence of sprouting nonvascular sensory, substance P-positive nerve fibers and decreased vascular sympathetic nerve fibers

Shockwave therapy in chronic tendinopathy

- Pain reduction, tendon healing
 - By induction of neovascularization and improvement of blood supply to the tissue
 - And, initiating repairs of the chronically inflamed tissues by tissue regeneration.

ESWT promote healing of collagenase-induced Achilles tendinitis and increase TGF- β 1 and IGF-I expression

(Journal of Orthopaedic Research 22 (2004) 854-861)

1. resolved edema, swelling, and inflammatory cell infiltration in injured tendons after ESW.
2. ESW $\Rightarrow$ intensive tenocyte proliferation,
neovascularization
progressive tendon tissue regeneration

3. strong proliferating cell nuclear antigen (PCNA) after ESW, newly formed tendon tissue coincided with intensive TGF- β I and IGF-I expression.

⇒ **TGF- β 1 and IGF-I** played important roles in mediating ESW-stimulated cell proliferation and tissue regeneration of tendon.

ESWT for plantar fasciitis

- reported success rate: 34% to 88%
 - Rompe et al(2002)
 - 112 cases, RCT
 - three weekly treatments with 1,000 impulses of low energy shockwave at 0.06 mJ/mm²,
- ➔ significant alleviation of pain and improvement in function

- Wang et al (2002)
- treated 79 patients (85 heels) with plantar fasciitis including 59 women and 20 men
- At one-year follow-up,
 - 75.3% complaint free,
 - 18.8% significantly better,
 - 5.9% slightly better and
 - none unchanged or worse.

**Shockwave therapy
for chronic Achilles tendinopathy**
A double-blind, randomized clinical trial of efficacy
(Sten R. et al, *Acta Orthopaedica* 2008; 79 (2): 249–256)

- Intervention Group (n=24) : active ESWT
 - 2,000 shots (0.12–0.51 mJ/mm², 50 Hz) of radial shock
- Placebo Group B (n=24) : sham ESWT – same at 0 mJ/mm²
- 측정항목:
 - American Orthopaedic Foot and Ankle Society (AOFAS) score,
 - function (50 points), pain (40 points), and alignment (10 points)),
 - VAS score
 - before & during Tx period, and at 4, 8, & 12 wks

Figure 2. AOFAS score (mean and scatter plot) before and after 4 weeks of treatment and during 12 weeks of follow-up. Blue: intervention group; red: control group.

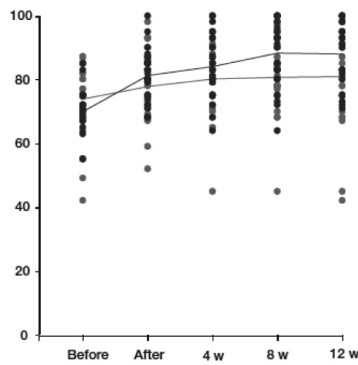


Figure 3. Individual improvement in AOFAS score in relation to pretreatment score. There was greater improvement in the intervention group (blue diamonds) than in the control group (red squares).

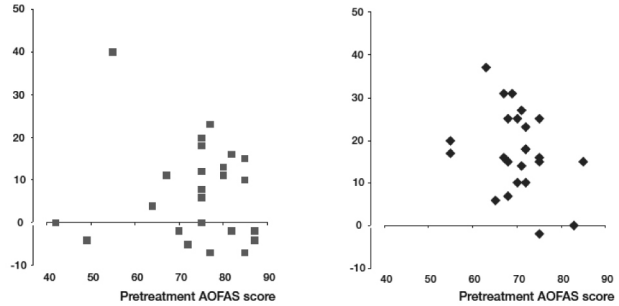
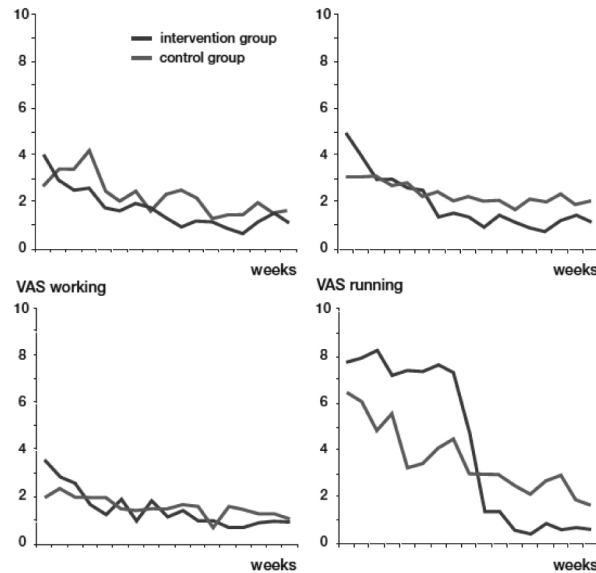


Figure 4. Weekly pain score (VAS) with walking, walking upstairs, working, and running. Blue: intervention group; red: control group.



저자 결론: ESWT appears to be a good supplement for the treatment of chronic Achilles tendinopathy