TYPES OF PAIN

SOMATIC NEUROPATHIC VISCERAL

This newsletter is sponsored through an independent grant in the interests of continuous medical education.

Edition 4 - January/February 2018
Potent Efficacy
Potent, effective relief of pain and inflammation

Comparable Safety
Comparable tolerability and safety profile with balanced COX-1/COX-2 inhibition

Multiple Solutions
Range of formulations for flexible dosing to suit patient needs

References:
Greetings to all of you and welcome to our 4th edition of Nociceptive Views. This edition has our first ethics article by Ms Ulundi Behrtel. She highlights the big problem we all have when treating complicated pain patients. On the one side we have the increased deaths due to opioid overdose and on the other side we have the right of the patient for his pain to be treated.

Being the doctor who will treat the pain implies that you will be the one to make the decision if a patient should be on opioids or not. You will also need to know the ethical rules of prescribing these type of drugs. There is no way of always making the right decisions, but I think the golden rule is regular follow-up visits of the patient. Once a strong opioid is started, this should be monitored and managed.

This same concept is emphasised by the “cannabis frenzy” that is grabbing our country at the moment. I see patients taking all forms of cannabis every day in an attempt to control their pain. Dr Ernest Buitendag shares his excellent knowledge on this topic in the second part of his review on cannabis. What is great about this article is that it gives us practical information and informative pictures on how these substances look and which ones are presumed for medical use.

As Dr Buitendag states, while the rules of cannabis control are so strong, we cannot do research. The only people who can do ‘research’ are the people that are illegally growing and selling this plant. He also mentions that this has all been done before and that we should look towards the Canadian model.

The previous two topics tie in nicely with Dr Tarin Penberthys’s article. She gives us a practical, useful review of when to refer a patient to a pain clinic. This is all good and well, but the problem is that there are very few of these multidisciplinary pain clinics around. The complicated patient on multiple opioids and various substances, including cannabis, is the ideal patient for a pain clinic. A pain clinic is not some magical dumping ground. If patients could not be sorted out by a single physician, the pain clinic doctor will probably also not manage to do this. The strength of a well functioning pain clinic lies in the multidisciplinary setup thereof. This implies more than one physician and other health care professionals to share the burden and to put their minds together.

An example of how a simple symptom could be more complex, is heel pain. Dr Andries Oberholzer highlights the complicated anatomy of the heel’s nerve supply. Everything is not simply plantar fasciitis, like I thought.

This issue reminds me of the continuous education we all need as doctors. To be a good doctor, you can truly never stop reading and refreshing. Thank you to all our wonderful authors who provided us with such an opportunity.

Therefore, read on and enjoy and be amazed at the complexity of it all!

Pauline
The origin of modern multidisciplinary pain clinics has been attributed largely to Bonica, an anaesthetist working at an army hospital in the USA following World War II. Bonica noted that some patients responded well to his nerve blocks, whilst others did not. As per standard practice, he referred these non-responders to colleagues from other specialties for second opinions. He found this mode of operating slow and inefficient, so he started to arrange regular meetings with these colleagues to discuss the patients they had in common. Together, they reached a degree of consensus on their diagnoses and composed a treatment plan. Bonica found this multidisciplinary mode of operating much more effective and efficient in the treatment of these complex cases than the previous ‘serial referral’ approach. He began to promote this concept more widely.

In this article, I would like to elaborate on the role and value of multidisciplinary pain clinics. Particular attention will be paid to the optimal time to refer to a pain clinic, as well as which patients will benefit the most from such a referral. Some definitions

Bonica defined chronic pain as “pain which persists past the normal time of healing”. According to the International Association for the Study of Pain (IASP), ‘this may be less than one month, or more often, more than six months. With nonmalignant pain, three months is the most convenient point of division between acute and chronic pain, but for research purposes six months will often be preferred’.

Chronic pain is multidimensional consisting of biological, psychological and social (biopsychosocial) factors. The collaboration of these factors lead to the patient’s own unique pain experience.

The American Board of Pain Medicine defines the specialty of Pain Medicine as a discipline within the field of medicine that is concerned with the prevention of pain and the evaluation, treatment, and rehabilitation of persons in pain. They describe pain specialists as physicians who use a broad-based approach to treat all pain disorders, ranging from pain as a symptom of disease to pain as the primary disease. They go on to say that the pain physician serves as a consultant to other physicians or more often as the principal treating physician (as distinguished from the primary care physician) who may provide care at various levels.

According to the IASP, a multidisciplinary pain clinic is a health care delivery facility staffed by physicians of different specialties and other non-physician health care providers (HCPs) who specialise in the diagnosis and management of patients with chronic pain. Non-physician HCPs include nurses, psychologists, physiotherapists, occupational and vocational therapists and dieticians. Therefore, in addition to the medications prescribed, the pain management programme incorporates the biopsychosocial aspects of the patient.

When do you refer to a pain clinic?
Referral should be done once a work up has been completed. Either an established medical diagnosis has been made or where the diagnosis is unclear or non-specific, serious conditions such as neoplasms or spinal cord injuries should have been excluded (see red flags below).

The most appropriate time may vary according to the patient’s condition. For Complex Regional Pain Syndrome and other neuropathic pain conditions, the earlier the referral, the better. For conditions such a non-specific chronic low back pain, referral is generally later after traditional treatments have proven unsuccessful.

However, if a referral is made many years after the onset of pain, this usually results in poorer outcomes of the multidisciplinary pain management programme, due to the fact that the biopsychosocial and environmental sequelae have already become thoroughly ingrained. Another confounding factor is concern about the potential for reinforcement of the disability role when patients have been for multiple, and often unnecessary, investigations. These patients have generally overlooked opportunities to accept their condition and develop more of a self-management approach. There is some evidence that early recognition of, and intervention in, the biopsychosocial and environmental factors may prevent the development of a secondary disability.

Reasons for referral can be related to advice on ongoing management options, symptom control measures, assistance with the final diagnosis and management of the patient or to request for assessment for the suitability for interventional procedures (see section below).
Who do you refer to a pain clinic?

Pain clinics offer an opportunity for a fresh, comprehensive review of a patient. Symptom control rather than curative treatment is the normal expectation of a chronic pain clinic.

The following types of patients would benefit from being referred to a pain specialist:

1. Patients at high risk of poor outcomes are those with a history of comorbidities such as:
   - Mental health problems (including depression, anxiety, personality disorder, post-traumatic stress disorder)
   - Cognitive impairment
   - Substance misuse
   - Pregnancy
   - Polypharmacy
   - Significant renal or hepatic impairment
   - Presence of yellow flags which are biopsychosocial indicators suggesting increased risk of progression to long-term distress, disability and pain

2. Patients who show a slower than expected progress include those with:
   - Intolerable side effects to the medications
   - Preference for a self management rather than a medical approach
   - Patients claiming from a 3rd Party

3. Another reason for referring patients to a pain clinic for advice on whether interventional pain procedures may help the patient. The procedures are mainly used in conjunction with medications and multidisciplinary management or rarely to provide an alternative to medications. The aim of these interventions is to ease pain severity (and often sleep and distress) with the expectation that this will enable the patient to have a better quality of life.

4. Patients needing high dose opioids or tertiary drugs are often best handled by a Pain Specialist. Opioids pose their own challenges, including abuse, addiction, diversion, adverse effects and fears of regulatory scrutiny. These challenges may be overcome by adherence to the local guidelines, signing opioid agreements, the use of random urine drug screening, monitoring for aberrant behaviours, and anticipating adverse effects. When psychiatric comorbidities are present, risk of substance abuse is high and pain management may require specialised treatment or consultation. Another reason patients need referral are those needing tertiary drugs such as Ketamine or Capsaicin 8% (only available via a section 21 through the Medicine Control Council in South Africa).

Tips for referral to a pain clinic

- Ensure that the patient is aware that the pain management programme will be a multimodal based treatment. It is important that the patient understands the likely composition of the multidisciplinary team and is willing to participate in the relevant therapies offered.
- It is critical that the patient does not think that the referral represents disbelief or abandonment by the referring doctor. To avoid this, patients need to be counselled about the reason for referral with emphasis on the potential value of the referral.

Red Flags

Red Flags are features, signs and symptoms that indicate serious spinal pathology. Red Flags must be excluded at every consultation and the patient is to be referred immediately to a spinal or neuro surgeon or to an emergency department should any Red Flags be present as it may indicate the development of a cauda equina syndrome or spinal compression, which are both medical emergencies.

Features
- Previous history of malignancy (however long ago)
- Age 16< or >50 with NEW onset pain
- Weight loss (unexplained)
- Previous longstanding steroid use, drug use
- Patients that are immunosuppressed
- Recent serious illness
- Recent significant infection

Symptoms
- Non-mechanical pain (worse at rest)
- Thoracic pain
- Fevers/rigors
- General malaise
- Urinary retention
**Signs**
- Saddle anaesthesia
- Reduced anal tone
- Hip or knee weakness
- Generalised neurological deficit
- Progressive spinal deformity
- Urinary retention

It is important to have a high index of suspicion when any of the above are present and the majority of information is in the history with a simple examination.

**Conclusion**
As Mayer et al have argued, the rationale for referral to such tertiary rehabilitation is that accurate assessment of the many interrelated factors of chronic disability and pain, linked to skilful implementation of multifaceted treatment programmes, can usually enable recovery or at least reduce the degree of permanent disability.

It is important to note that not every chronic pain patient needs a referral to a pain specialist to help manage their pain. However, when a patient’s pain is not controlled, not following a typical pattern, or just beyond a practitioner’s comfort level, it may be time to refer to a specialist. Having the correct diagnosis can greatly change a patient’s therapy and future prognosis.

This review has suggested that the decision of when to refer to a multidisciplinary pain clinic should be based on the identification of a need for comprehensive, multidisciplinary assessment, especially when progress is stalled or not proceeding as expected.

Treatment goals focus on improving the quality of life while decreasing, but not necessarily curing, the pain of the patient. This is done by improving the social, occupational, psychological, interpersonal, and physical disabilities that are affected by the chronic pain, which adversely affect the patient’s quality of life.10

**Take-home message**
- Referral to be done once the patient had been worked up and Red Flags excluded
- The treatment of chronic pain has to be multidisciplinary in nature
- Not all chronic pain patients need referral to a pain clinic
- Optional time for referral varies:
  - Neuropathic pain as early as possible
  - Nociceptive pain after other treatments have proven unsuccessful
- Be careful not to refer too late either, as this can result in poorer outcomes
- Symptom control, rather than curative treatment is the normal expectations of a pain clinic

**References**
Cannabis - more than just THC! (Part 2)
(If you missed part 1, it is available electronically at www.mpconsulting.co.za)

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Recreational vs medicinal, dosing and effects

**Strains**
- **Sativa** – Tall, laxly leaved, grows in warm lowlands. Myrcene < 0.5% = More uplifting, vibrant effect.
- **Indica** – Short, bushier, grows in cooler mountains. Myrcene > 0.5% = “couch locked” – stoned effect.
- **Ruderalis** – Non-psychoactive, not recognised by all.
- **Hybrids** - Mixtures of above or a wild type.
- **Hemp** – Grown for fibre and medicinal properties

Most cannabinoids and terpenes are contained in trichomes, on the female plant’s flowers.
- **Kief** – Powder rich in trichomes. Consume the powder or compress to form hashish
- **Hashish** – Concentrated resin cake. Consumed orally, smoked or vaped
- **Tincture** – Extracted cannabinoids using preferably >190% proof grain alcohol
- **Hash oil** – Obtained by solvent extraction – Butane or supercritical CO2. Hard or viscous mass. Potentially the most potent due to a high level of psychoactive component per volume.
- **Solvents** – Plant material mixed with various non-volatile solvents.

**Types of cannabis oils**
- **Rick Simpson Oil (RSO)** – Crude, dark colour, simple hydrocarbon/alcohol solvent extraction. High in cannabinoids and associated compounds (Fig 1).
- **Butane Honey Oil (BHO)** – Extracted using butane. Mainly recreational use. High in THC and flavour (Fig 2).
- **Supercritical CO2 oil** – Extraction via carbon dioxide at extremely high pressure. Provides medicinal grade oil and most likely the safest option (Fig 3).
- **Rosin** – Resin extract using heat and pressure. Mostly recreational (Fig 4).
- **Tinctures** – Use solvents or oils to produce concentrated liquid with small amounts of alcohol to allow for rapid oral absorption. Packaged in drop bottles to allow easy and precise dosing (Fig 5).
- **Natural Oils** (Fig 6).
- **Balsms and creams** (Fig 7).
Dosing Guideline

There is a very large inter-personal variability with no “one dose fits all”. It is important to start low and go slow until the ‘therapeutic window’ is reached. Experimentation is required, too little and there will be minimal beneficial effect, too much and you could experience uncomfortable sensations. The route of administration and the type of product also plays a significant role.

1 Joint = 0.5g to 1g
3g = 3 to 6 joints or 10 to 12 vaporisations/day
Dry - oral ingestion (bake, tea) will require 2.5 x the amount. Depending on the manufacturing, product and ratios: 1g dry/day ~ 1ml oil/day

The average use as per:
- Health Canada = 1 to 1.25g /day
- Netherlands = 0.68 g /day
- Israel = 1.5g / day

**Effective medicinal dosing range is 0.05 – 25mg/kg/day**

As mentioned before the THC:CBD ratio is important. A Canadian Medical Cannabis company (CanniMed) offers the following product ratios as an example:

<table>
<thead>
<tr>
<th>Table 2. Product ratio examples</th>
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<tbody>
<tr>
<td>THC % : CBD %</td>
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<tr>
<td><strong>Dry</strong></td>
</tr>
<tr>
<td>1:13</td>
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<tr>
<td>4:10</td>
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<tr>
<td>9:9</td>
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<tr>
<td>12:0</td>
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<tr>
<td>15:5</td>
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<tr>
<td>17:1</td>
</tr>
<tr>
<td>22:1</td>
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<tr>
<td><strong>Oil</strong></td>
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<tr>
<td>18.0</td>
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<tr>
<td>10.10</td>
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<td>1.20</td>
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Health Risks

Medicinal cannabis is non-toxic and non-lethal. In monkeys 9000mg/kg orally caused no fatalities. In a longitudinal study in chronic, heavy users the only significant medical finding was in poor peridontal health.10

Drug Interactions

Opioids

- Synergistic effect
- Very few cannabinoid receptors in the brainstem, thus no cardiorespiratory depression.
- Minimal pharmacokinetic interaction with morphine or oxycodone
  - In pre-clinical work on animals there was decreased development of opioid tolerance, retention of the

CBC = cannabichromene, CBD = cannabidiol, CBG = cannabigerol, CBN = Cannabinol, THC = delta 9-tetrahydrocannabinol, THCa = tetrahydrocannabinolic acid, THCv = tetrahydrocannabivarin
Going beyond the pain threshold

Continuing Medical Education

anti-nociceptive effect and up-regulation of opioid receptors in the spinal cord.

Alcohol and Benzodiazepines
• Potentiates sedation

NSAIDS especially Indomethacin can antagonise the effects of THC.

Anticholinergic
• May have an increase in the psychoactive effects.

Adverse Effects
A distinction has to be made between high, regular, recreational use in conjunction with nicotine, alcohol, cocaine and heroin abuse versus low dose, controlled, medicinal use.

Naive users are prone to more adverse events until some tolerance has been built up i.e.:
• Euphoria, altered consciousness
• Acute panic or paranoid reactions
• Altered motivation
• Impaired attention, memory and psychomotor performance
• Tachycardia and orthostatic hypotension
• Xerostomia
• Increased appetite

Gastrointestinal tract
• THC can aggravate liver fibrosis if present, while CBD exerts an anti-fibrotic effect and is hepatoprotective.
• Hyper-emesis syndrome is associated with heavy regular use of high concentration THC preparations. Usually diagnosed with a history of high use and improves with a hot bath. This settles with abstinence.

Weight gain
• Although using cannabis can lead to an increase in appetite, the general finding is that there are improved metabolic markers i.e. lower weight, less insulin resistance, lower blood sugar and higher HDL cholesterol.

Mental health
• Elevated levels of CB1 receptors in a hippocampus exposed to high concentration THC, leads to increased memory loss and lower memorising ability. The effect is similar to alcohol misuse.
• High, regular use of cannabis in pre-adolescence leads to a lower IQ by age 38. Use after adolescence or early discontinuation has no effect on IQ in the long term.
• In people predisposed to schizophrenia and psychosis using cannabis may trigger or aggravate the symptoms. No causal effect has ever been proven. In countries where cannabis is legal, there has been no increase in the incidence of schizophrenia.

Tolerance
• Tolerance to the effects of cannabis can happen over time. This requires “resetting” i.e. stop using for 48 to 72 hours, allowing the receptors to up-regulate.

Dependence
• Similar to caffeine. If you don’t get your daily fix you become irritable, impatient, develop headaches and sleep disturbance.

Addiction - Dependence liability or risk for habitual use
• Caffeine = 7%
• Cannabis = 9%
• Alcohol = 20%
• Nicotine = 30%
  – The addiction cannot be equated with that of cocaine, heroin, opioids or alcohol. Withdrawal is mild and short-lived, with no serious consequences unless there is a underlying medical condition.

Overdose
• There is no documented evidence of a pure cannabis overdose (Numerous OTC and prescription drugs with FDA approval are dangerous and deadly if abused or misused).

South African Legal Aspect
In June 2016, the Central Drug Authority (CDA) advised that the Government should shift to a middle ground approach between criminalisation and legalisation → decriminalisation.

Based on the fact that the law as it stands now, has not changed the pattern of marijuana use. But, until more evidence is available it should not be legalised either.

In March 2017, the Medicine Control Council (MCC) put forth a document: Draft Guidelines for production and manufacturing of Medicinal marijuana in South Africa.
• Anybody can apply for a permit.
• You have to get permission from the MCC and the Director General of Health.
• You have to undergo a suitability test i.e. Intentions, prior conduct etc.
• If planning agricultural growth you have to ensure:
  − Security
  − Account for all product before and after production
• Medicinal marijuana can only be obtained under the supervision of an approved medical practitioner.
FUN, NO PERMITS ARE BEING ISSUED CURRENTLY, UNTIL THE CURRENT LAW HAS BEEN AMENDED.
  − Specifically the Medicines and Related Substance Act of 2015 and the Draft guideline must be accepted into law.
“Recently the court ruled that current legislation did not pass Constitutional Court muster and that parliament had two years to rectify the law” (Extract from the Citizen newspaper, April 2017).

Effectively, it is still illegal until the law changes. But, you can use cannabis in the privacy of your own home. If legal action is brought against you for having cannabis for personal consumption in your own home then you may use “Bridge of Privacy” as your defence.

On the 31st July 2017, Myrtle Clarke and Julian Stubbs aka, the “Dagga Couple”, are putting the marijuana plant on trial in the Pretoria High Court (19 court days have been allocated to the trial). The question that they are posing to the court is: “How come this benign, useful, non-lethal plant has led to the persecution of so many people, in so many countries for so long?”

This case is going to be far more comprehensive than the previously mentioned court case, and more significant for cannabis rights activists worldwide as they feel it is their constitutional right to use cannabis freely.

**Conclusion**

The endocannabinoid system ensures homeostasis in the human body. In medical literature and education it has been largely overlooked.

There are vast quantities of pre-clinical work on the interaction between cannabis and the endocannabinoid system with some exciting results.

Anecdotal evidence of the benefits of cannabis makes it difficult to ignore.

Worldwide there is a trend to decriminalise and even legalise the use of cannabis. This will help with furthering the research, that has been sorely missed in humans.

**Take-home message**

- Potentially very useful
- But being illegal makes research near impossible
- A good recommendation would be to re-schedule and decriminalize cannabis (plant and phytocannabinoids).
- Provide education to doctors who are willing to prescribe
- Ensure it is cultivated and sold in a controlled state. We don’t have to reinvent the wheel. We can just follow the Canadian model.
- There is always a case to be made for legalization . As adults we should be able to decide for ourselves whether to use or not to use
- If the sale of cannabis is taxed it could go a long way to help the GDP.

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5. Neuropsychpharmacology advanced online publication 15/02/2017. Singular location and signaling profile of Adenosine A2A- Cannabinoid CB1 receptor heteromers in dorsal striatum
8. www.profopot.com
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Chronic heel pain

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Heel pain is a very common problem in general practice. The majority of patients feels pain either under the foot (plantar fasciitis) or just behind it (Achilles tendinitis).

Fast facts about the heel
- It is usually felt either under the heel or just behind it.
- Heel pain has a prevalence of 3.6%.
- US studies estimate that 7% of older adults report tenderness under the heel.
- Plantar fasciitis is estimated to account for 8% of all running related injuries.
- There are 26 bones in the human foot, of which the heel is the largest.
- Pain typically comes on gradually with no injury to the affected area. It is often triggered by wearing flat shoes.
- In most cases the pain is under the foot, towards the front of the heel.
- The majority of patients recover with conservative treatment within 3-4 weeks.
- Home care such as rest, ice, proper fitting footwear and foot supports are often enough to ease heel pain.
- To reduce heel pain, it is recommended to reduce the stress on that part of the body.

Anatomy of the heel
- Bones
- Muscles
- Nerves
- Plantar aponeurosis (Plantar fascia)

Bones of the foot
- Tarsal bones (7)
- Metatarsals (5)
- Phalanges (14)
- Talus
- Calcaneus
- Cuneiform ×3
- Navicular
- Cuboid

Muscles of the foot

Extrinsic muscles
- Arise from the anterior, posterior and lateral compartments of the leg.
- Responsible for actions such as:
  - Eversion
  - Inversion
  - Plantar flexion
  - Dorsi flexion

Intrinsic muscles
- Located within the foot
- Responsible for fine motor actions of the foot, for example movement of individual digits
- Can be divided in:
  - Dorsal muscles
  - Plantar muscles
    - 10 intrinsic muscles located within the sole of the foot
    - Act collectively to stabilise the arches of the foot and individually to control movement of the digits.
    - The muscles of the plantar aspect are described in 4 layers (superficial to deep)

First layer
- Located immediately underneath the plantar fascia
- 3 Muscles:
  - Abductor hallucis (MPN)
  - Flexor digitorum brevis (MPN)
  - Abductor digiti minimi (LPN)
  (MPN = medial plantar nerve, LPN = Lateral plantar nerve)

Figure 1. Bones of the foot
Second layer

- 2 Muscles
  - Quadratus plantae (LPN)
  - Lumbricalus (most medial MPN, remaining 3 LPN)

Third layer

- 3 Muscles
  - Flexor hallucis brevis (MPN)
  - Abductor hallucis (deep branch of LPN)
  - Flexor digiti minimi brevis (superficial branch of LPN)

Fourth layer

- Plantar interossei (LPN)
- Dorsal interossei (LPN)

Nerve supply of the ankle and foot

Anatomy

- The terminal branches of the sciatic and femoral nerve supply the ankle joint.
- The sciatic nerve divides into the tibial nerve and common peroneal or fibular nerve.
- Branches of the tibial and common peroneal nerve form the sural nerve.
- The only branch of the femoral nerve which contributes to sensory innervation below the knee is the saphenous nerve.
- The saphenous nerve supplies the skin on the medial aspect of the ankle joint.

Tibial nerve

- The tibial nerve descends though the middle of the popliteal fossa, posterior to the popliteal vein and artery (when scanning from behind it is more superficial compared to the blood vessels).
- In the leg it is accompanied by the posterior tibial artery.
- The tibial nerve leaves the posterior compartment of the leg by passing deep to the flexor retinaculum between the medial malleolus and calcaneum.
- The tibial nerve lies between the posterior tibial vessels and the tendon of the flexor hallucis longus.
- The tibial nerve divides into the medial and lateral plantar nerves.

Common peroneal nerve

The common peroneal nerve is one of the terminal branches of the sciatic nerve. It begins in the popliteal fossa and runs along the medial border of the biceps femoris muscle. It exits the popliteal fossa by passing over the lateral head of the gastrocnemius muscle. The common fibular nerve then goes around the neck of the fibula under the peroneus longus muscle and then divides into the superficial and deep peroneal nerves.

Deep peroneal nerve

The deep peroneal nerve begins deep to the peroneus (fibularis) longus muscle and then passes under the extensor digitorum longus. It pierces this to lie anterior to the interosseous membrane. It then accompanies the anterior tibial artery between the extensor hallucis longus and tibialis anterior muscles.
Superficial peroneal nerve
- This nerve begins between the peroneus longus muscle and the fibula. It then passes anterolateral to the fibula between the peroneus longus muscles and the extensor digitorum longus which it supplies along with peroneous brevis.
- It pierces the deep fascia at the lower third of the leg.
- It passes the superficial fascia to supply the skin on the distal part of the anterior surface of the leg, nearly all the dorsum of the foot and most of the digits.

Sural nerve
This is formed from a contribution by the tibial (the medial sural cutaneous nerve) and the common peroneal nerve (sural communicating branch). This nerve supplies the skin of the posterolateral side of the inferior third of the leg and the lateral side of the foot. The sural nerve lies behind the lateral malleolus along with the short saphenous vein. It supplies the posterior part of the sole, the back of the lower leg, the posterior heel and lateral side of the foot.

Saphenous nerve
The saphenous nerve is the only sensory contribution of the femoral nerve below the knee joint. It arises from the femoral nerve in the femoral triangle and descends through it on the lateral side of the femoral vessels to enter the adductor canal behind its aponeurotic covering.

At the lower part of adductor magnus it separates from the artery behind the sartorius muscle. On the medial side of the knee it emerges by piercing the fascia lata between sartorius and gracilis to lie in the subcutaneous plane. In the leg the saphenous nerve follows the great saphenous vein.

Sensory innervation of the ankle
There is normally a considerable overlap between the nerves. (Figure 6)

Plantar aponeurosis (Plantar fascia)
- The plantar aponeurosis also known as the plantar facia is a strong layer of white fibrous tissue located beneath the skin of the foot.

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Figure 6. Sensory innervation of ankle

Figure 7. Plantar aponeurosis (Plantar fascia)
It runs from the medial tuberosity of the calcaneus forward to the heads of the metatarsal bones.

Towards the front of the foot at the mid tarsal level it divides into 5 sections, each extending in to a toe and straddling the flexor tendons.

It is divided into a medial, central and lateral section.

The central portion is the most important structurally and functionally and is attached at its origin to the medial calcaneal tuberosity.

The medial portion overlies muscles to the hallux (big toe) while the lateral portion overlies the muscles to the little toe.

It stabilises the arch of the foot and allows flexion of the first metatarsal, enabling it to carry the majority of the body weight. It also provides shock absorption when the foot hits the ground.

Inflammation or injury of the plantar aponeurosis is known as plantar fasciitis.

### Differential diagnosis of heel pain

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<th>Table 1. Differential Diagnosis of Pain</th>
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<td><strong>Plantar heel pain</strong></td>
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<tr>
<td>Plantar fasciitis</td>
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<tr>
<td>Plantar fascia tear</td>
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<tr>
<td>Heel pad atrophy</td>
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<tr>
<td>Tarsal Tunnel Syndrome - although the heel may be spared if the MCN origin is high</td>
</tr>
<tr>
<td>Inferior calcaneal nerve, entrapment, dysfunction or neuroma</td>
</tr>
<tr>
<td>Calcaneal stress fracture, calcaneal cyst tumour, osteomyelitis or oedema</td>
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<tr>
<td>Calcaneal apophysitis (Sever’s disease)</td>
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<tr>
<td>Heel spur</td>
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<tr>
<td>Vascular insufficiency, congestion or varicosities</td>
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### Most common conditions

- Plantar fasciitis
- Tarsal tunnel syndrome (TTS)
- Inferior calcaneal nerve entrapment (ICN)
- Medial calcaneal nerve entrapment (MCN)
- Medial planar nerve entrapment (MPN)
- Lateral plantar nerve entrapment (LPN)
- Plantar fascia tear (rupture)
- Atrophy of the plantar fat pad
- Calcaneal stress fracture
- Retro calcaneal bursitis
- Tenosynovitis
  - Flexor digitorum longus (FDL)
  - Flexor hallucis longus (FHL)
  - Tibialis posterior (TP)
- Auto immune diseases
  - Rheumatoid arthritis (RA)
  - Systemic lupus erythematosus (SLE)
  - Ankylosing spondylitis (AS)
  - Reiter’s syndrome (RS)

### Symptoms and signs

- Entrapment neuropathies often present as heel pain that mimics that of plantar fasciitis, so miss diagnosis is not uncommon.
- The presence of bilateral pain should trigger investigation into an inflammatory source and LS/S1 radiculopathy may be the cause in a patient with coexisting back pain.
- Coexisting small fiber peripheral neuropathy as in diabetes and other conditions may complicate the clinical picture.
- There is always a possibility of coexisting pathology anywhere along the course of the tibial nerve → “double crush” syndrome effect.

**Figure 8. Plantar Fasciitis**

**Plantar fasciitis (PF)**

- Plantar fasciitis is a degenerative process due to repetitive microtrauma of the plantar fascia together with the acute and chronic inflammation
- Pathogenesis
- Small tears in the plantar aponeurosis
- Causes:
  - Traumatic
  - Inflammatory
Going beyond the pain threshold

Continuing Medical Education

Plantar fasciitis

Influx of inflammatory mediators
↓
Fibrosis/Calcifications
↓
Thickening of the aponeurosis
↓
Decrease in blood supply
↓
Tissue ischaemia
↓
Plantar fasciosis

Degenerative
Metabolic
Neoplastic
Genetic

Lateral plantar nerve (LPN) entrapment
- Burning pain, paraesthesia and numbness in the lateral side of the side of the foot that can extend to the lateral toes
- Symptoms increased with activity and decrease with rest
- The LPN exits the TT posterior lateral to the MPN into the lateral plantar tunnel
- Divides into deep and superficial branches
- Tinel's sign +
- The plantar flexion/inversion/compression test is positive

Medial plantar nerve entrapment (internal plantar nerve)
- Burning pain, dysesthesias and aching in the medial arch of the feet and heel
- Symptoms increase with activity and may radiate to the plantar aspect of the first and second toes
- Tinel's test positive
- Plantar flexion/inversion/compression test is positive

Inferior calcaneal nerve entrapment (ICN)
- Baxter’s nerve, first branch of the lateral plantar nerve, deep calcaneal nerve, nerve to the abductor digiti minimi (quinti/muscle)
- 20% of heel pain
- Burning medial heel pain
- Radiates to the arch of the foot or ankle
- Worsens with standing or walking. Worse at night.
- Gradual onset without a specific turning event
- Segregate into two discrete groups:
  - Avid runners
  - Old people, often those with occupations that require a lot of standing
- Co-morbidities (diabetic neuropathy) may exist
- Gives sensory branches to the periosteum of the medial calcaneal tuberosity (MCT) and the long plantar ligament
- Tinel's signs often not positive
- The posterior and anterior branches of the inferior calcaneal nerve provide sensory innervation to the area where the plantar fascia originates from the calcaneus

Medial calcaneal nerve entrapment (MCN)
(Calcanean nerve, anterior calcaneal nerve)
- Second most common nerve involved in plantar heel pain.
- Sharp neuralgic pain with burning or tingling.
- Worsens during the day, or the longer they stand or walk.
- Night pain (venous stasis)
- Compared to the ICN the MCN is posterior, more superficial and thicker.
- Divides into two branches:
  - Anterior branch
    - proximal AbH (motor)
    - Superficial, inferior heel
    - Medial aspect of the medial calcaneal tubercle

Tarsal tunnel syndrome (TTS)
- Burning pain and paraesthesia medial ankle
- Symptoms: (may vary depending on the specific branches involved)
  - Aggravated by activity/relieved by rest
  - Worsens at night (night pain the result of venous stasis)
  - Increases with dorsiflexion, eversion and pronation
- Tinel's sign + (distal tingling on percussion)
- Triple compression stress test (TCST) +
  - (Ankle in full plantar flexion, foot in inversion and constant digital pressure applied over the posterior tibial nerve)
  - Will provoke: Pain, tingling, numbness, burning
  - Sensitivity 85.9%
  - Specificity 100%

Lateral calcaneal nerve entrapment (Lateral calcaneal nerve, anterior calcaneal nerve)
- Second most common nerve involved in plantar heel pain.
- Sharp neuralgic pain with burning or tingling.
- Worsens during the day, or the longer they stand or walk.
- Night pain (venous stasis)
- Compared to the ICN the MCN is posterior, more superficial and thicker.
- Divides into two branches:
  - Anterior branch
    - proximal AbH (motor)
    - Superficial, inferior heel
    - Medial aspect of the medial calcaneal tubercle

Figure 9. Tarsal tunnel syndrome

Figure 10. Lateral plantar nerve (LPN) entrapment
- Posterior branch
  - Skin over the Achilles tendon, heel and plantar foot pad
- Arises sometimes from the LPN and not as usual from the main stem of the PTN.
- Innervation of the more medial aspects of the heel as well as the calcaneal bursa regions.
- Ablation of these nerves can reduce the deep heel pain associated with each of these areas.

**Calcaneal Fracture**

![Figure 11. Stress Fracture](image_url)

**Diagnostic investigations**

**Blood tests**
- FBC, CRP, ESR
- Autoimmune investigations
- Blood clotting profile

**Weight-bearing plain radiographs**
- Foot alignment
- Fractures
- Joint degeneration

**MRI**
- Masses
- Tendonitis
- Muscle denervation

**CT scan**

**Ultrasoundography**
- Masses
- Tendonitis
- Bursitis
- Nerve injuries

**Electro diagnostic testing**

**Nerve conduction velocity (NCV)**

**Needle EMG**
- Abnormalities of the QP, FDMB, AbH

**High resonance magnetic neurography**
- Nerve damage/diameter

**Pressure specified sensory device (PSSD)**

**Treatment**
- Oral treatment
- Physical therapy
- Stretching exercises of the heel
- Rolling massages of the heel (on an iced bottle)
- Arch supports
- Night splints
- Behaviour modifications
- Extra corporeal shock wave therapy
- Cortico steroid injections
  - Complications
    - Irreversible soft tissue atrophy
    - Prolo therapy/Platelet rich plasma
    - Topaz procedure
- Radio frequency neuro ablation (ultrasound guided)
- Partial surgical release of the plantar fascia/tarsal tunnel
  - Complications:
    - Collapse of the arch
    - Cuboid crush syndrome
    - Painful scar formation

**Outcome (evidence-based) radio frequency ablation**
- Liden and colleagues
  - 31 Feet
  - Decrease in pain score from 8/10 to 1/10
- Sollitto and co-workers
  - 39 Feet
  - 92% success rate
- Cozzarelli and colleagues
  - 82 patients, 12 years follow up
  - 89% Success rate

References available on request.

**Take-home message**

- Know the relevant anatomy.
- Start with conservative treatment for 2-4 weeks.
- The tendency in modern medicine is to treat more aggressively in the early stages of the illness.
- Radio frequency ablation of the medial and inferior calcaneal nerves is indicated if conservative treatment fails.
- Be informed about the latest evidence based treatment options.
- Refer the patient whenever in doubt.
In June 2017, opioid addiction was declared a national public health emergency in the United States of America (USA). The American National Institute on Drug Abuse estimates that more than 90 people die from an opioid overdose every day¹ and that approximately 3 million Americans become addicted to prescription pain relievers each year.² This alarming trend is, however, not unique to the USA. According to Dr David Bayever of South Africa’s Central Drug Authority, South Africa is among the top 10 in the world with regard to narcotics and alcohol abuse.³ In the July 2017 Update of the SACENDU⁴ Project,⁵ it was reported that for the period July to December 2016:

“The abuse of Over-The-Counter (OTC) and Prescription Medicines such as slimming tablets, analgesics, and benzodiazepines (e.g. diazepam and flunitrazepam) continues to be an issue across sites.”⁶

In the light of the above statistics, it is opportune to consider the legal and ethical duties of medical practitioners in treating patients with pain.

**Pain treatment as a human right**

In the foreword to the latest South African Acute Pain Guidelines,⁷ Dr Milton Raff, chairperson of the World Federation of Societies of Anaesthesiologists Pain Relief Committee, reiterated his statement of six years ago when he said “acute pain management is not a luxury, it is a human right!”. This statement is consistent with section 27 of the Bill of Rights which states that everyone has the right of access to healthcare services. The management of acute or chronic pain as a symptom of disease or injury is an integral part of the practice of medicine. Medical practitioners, therefore, have a constitutional obligation to ensure that patients with pain have access to and receive timeous, adequate and appropriate treatment as part of the healthcare services offered.

In addition to section 27, other rights in the Bill of Rights are also relevant. Section 12 stipulates that everyone has the right to freedom and security of the person.⁸ This right includes the right to security in and control over their body, which underpins the legal and ethical duty of medical practitioners to obtain informed consent from patients. Section 6 of the National Health Act⁹ prescribes the requirements for valid informed consent. In terms of this section, medical practitioners must inform patients of their health status as well as the treatment options available for any health condition. Patients suffering from acute or chronic pain are, therefore, entitled to information about the management of their pain and to choose the treatment option best suited for them.

Section 10 of the Bill of Rights states that everyone has inherent dignity and the right to have their dignity respected and protected. This right is particularly relevant when it comes to the management of pain in terminally ill patients. Medical practitioners have a duty to respect a patient’s right to die a dignified death, free from pain and suffering.

**The Declaration of Montreal**

At the 13th World Congress on Pain held in Montreal during September 2010, the International Association for the Study of Pain (IASP)¹⁰ emphasised the inadequate management of pain care in patients worldwide. IASP accordingly created the Declaration of Montreal¹¹ in an attempt to address the lack of national policies on the management of pain and the inadequate knowledge of pain management techniques by many medical practitioners.

The Declaration states that:

“Recognizing the intrinsic dignity of all persons and that withholding of pain treatment is profoundly wrong, leading to unnecessary suffering which is harmful; we declare that the following human rights must be recognized throughout the world:

**Article 1.** The right of all people to have access to pain management without discrimination.

**Article 2.** The right of people in pain to acknowledgment of their pain and to be informed about how it can be assessed and managed.

**Article 3.** The right of all people with pain to have access to appropriate assessment and treatment of the pain by adequately trained health care professionals.”

In order to assure these rights, the Declaration places the following obligation on medical practitioners:

“...all health care professionals in a treatment relationship with a patient, within the scope of the legal limits of their professional practice and taking into account the treatment resources reasonably available,
to offer to a patient in pain the management that would be offered by a reasonably careful and competent health care professional in that field of practice. Failure to offer such management is a breach of the patient’s human rights.”

The obligation by medical practitioners to effectively and appropriately treat patients with pain must, however, be considered against the prevailing rules in the ETHICAL RULES OF CONDUCT FOR PRACTITIONERS REGISTERED UNDER THE HEALTH PROFESSIONS ACT, 197412 (“Ethical Rules”) as published by the Health Professions Council of South Africa (HPCSA).

HPCSA Ethical Rules
In terms of Ethical Rule 23(5), practitioners “may prescribe or supply medicine or a medical device to a patient: Provided that such practitioner has ascertained the diagnosis of the patient concerned through a personal examination of the patient or by virtue of a report by another practitioner under whose treatment the patient is or has been and such medicine or medical device is clinically indicated, taking into account the diagnosis and the individual prognosis of the patient, and affords the best possible care at a cost-effective rate compared to other available medicines or medical devices and the patient is informed of such other available medicines or medical devices.” This rule, however, does not apply in the case of a patient with a chronic disease.

Medical practitioners treating patients with chronic pain are reminded of the provisions of section 22A(6)(g) of the Medicines and Related Substances Act13 which stipulate that in the case of a schedule 5 substance, the prescription shall not be repeated for longer than six months. This means that patients must be examined and assessed by the treating medical practitioner before a new prescription for the relevant medicine is issued.

Another rule that medical practitioners must take note of, is Ethical Rule 17(2). This rule reads as follows:

“17. Issuing of prescriptions
(2) A practitioner authorized in terms of the Medicines and Related Substances Act, 1965 (Act No. 101 of 1965), to prescribe medicines shall issue handwritten prescriptions for medicine scheduled in Schedules 5, 6, 7 and 8 of the Medicines and Related Substances Act, 1965 (Act No. 101 of 1965), under his or her personal and original signature.” (underlined parts represent my emphasis)

Finally, medical practitioners must adhere to the fundamental principles of medical ethics,14 i.e. autonomy, beneficence, non-maleficence and justice. Based on these principles, read with Ethical Rule 27A,15 medical practitioners are required to at all times act in the best interests of their patients. This, ultimately, remains the most important duty of a medical practitioner regarding the treatment of patients with pain.

References

References 4-15 available on request.
#1 Prescribed by Paediatricians for pain and fever

- Effective relief from pain and fever
- Exact dose, every time
- No loss of efficacy due to vomiting
- Non-sedative
- Alternative to oral therapy
- Easy to use
- Two dosage strengths available (125 mg and 250 mg paracetamol)
- No sugar, colourants or preservatives

Effective relief from pain and fever

For use in infants from 3 months and in children up to 5 years of age
Potent Efficacy
Potent, effective relief of pain and inflammation

Comparable Safety
Comparable tolerability and safety profile with balanced COX-1/COX-2 inhibition

Multiple Solutions
Range of formulations for flexible dosing to suit patient needs

References:


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