

# Introduction to Minimally Invasive Procedures

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# Management of Chronic Pain

- **General Principles:**
  - Is challenging
  - Partial pain relief is considered a good result
  - Drugs are only part of the plan
  - QoL and function

# Management of Chronic Pain



← Opioid Calculator

Opioids

**Total Morphine oral ~ 110 mg/day**

ORAL

mg/day	—	<b>200</b>	+
Tramadol			
Morphine: 40 mg/day			

SUBLINGUAL

mcg/day	—		+
Buprenorphine			

TRANSDERMAL

mcg/hr	—	<b>20</b>	+
Buprenorphine			
Morphine: 40 mg/day			

mcg/hr	—		+
Fentanyl			

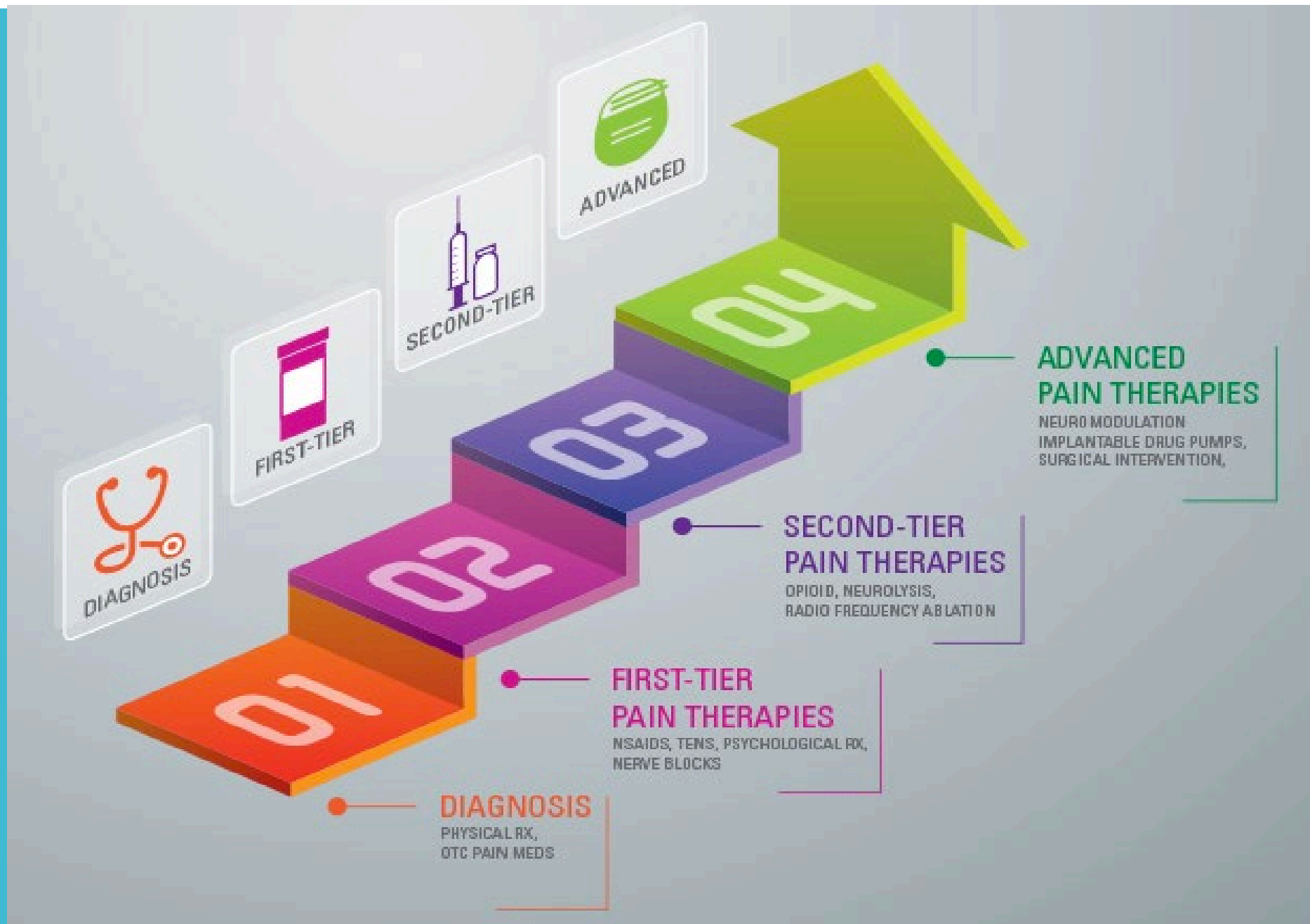
PARENTERAL

mg/day	—	<b>120</b>	+
Codeine			
Morphine: 30 mg/day			

mcg/day	—		+
Fentanyl			

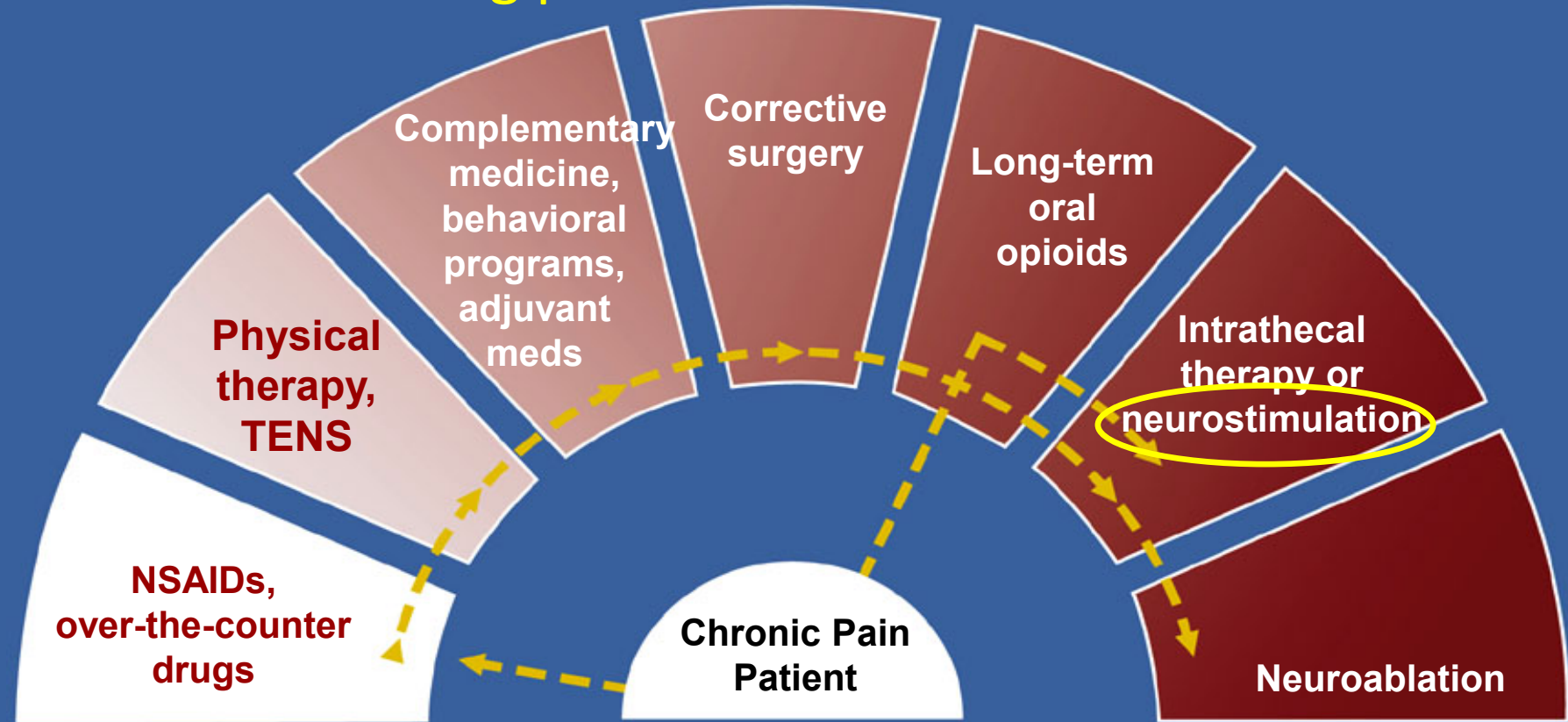
- Faculty of Pain Medicine Position Statement on the use of opioids:
  - **Acute:** Avoid Sustained Release (implied to use partial opioids)
  - **Chronic:** Avoid Immediate Release
  - **OMEDD:** Ceiling of 40 mg/day
- Download the FPM opioid conversion app
  - Useful for OMEDD
  - (Oral morphine equivalent daily dosing)

# Chronic Pain Treatment Options



## Approach to Pain Management

- Different time frames
- Multiple therapies at one time
- Different starting points



# Interventions

- Injections
  - Local anaesthetic/Steroid
  - Platelet Rich Plasma
  - Botulinum toxin/Etanercept/Other
- Radiofrequency Denervation/Ablative Therapies
  - Any nerve in the body!
  - Thermal RF/Pulsed RF/ Cooled RF
- Neuromodulation
  - *"technology that acts directly upon nerves... it is the alteration or modulation of nerve activity by delivering electrical or pharmaceutical agents directly to a target area"*
  - 'Stimulators' & "Pumps"

# Injectons

## “Basic” Interventions

- **Diagnostic Purposes:**
  - Is the site the source of the pain?
    - e.g. injecting the hip joint vs the SIJ
- **Therapeutic Purposes:**
  - Administration of steroid to reduce inflammatory pain
    - e.g. acute subacromial bursitis
- **Prognostic Purposes:**
  - Determine whether the patient is a candidate for “intermediate” level pain therapies
    - e.g. medial branch blocks to ascertain whether patient is a candidate for Radiofrequency ablation



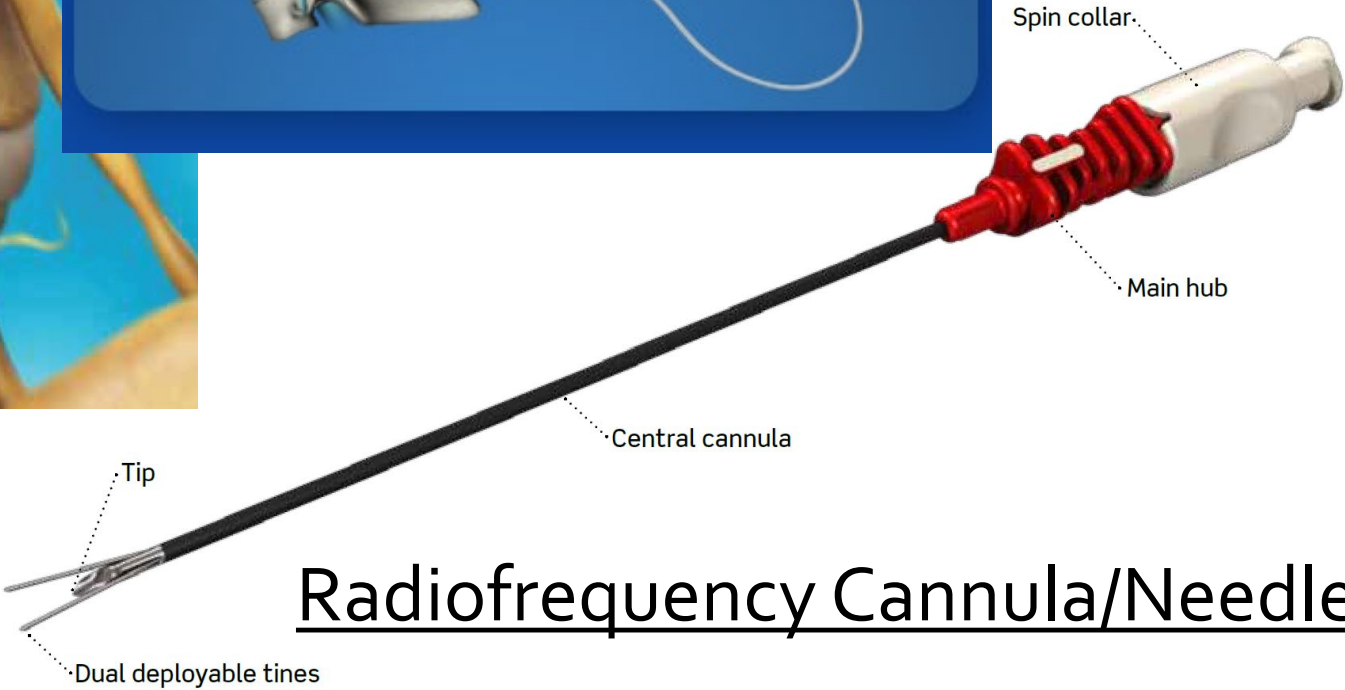
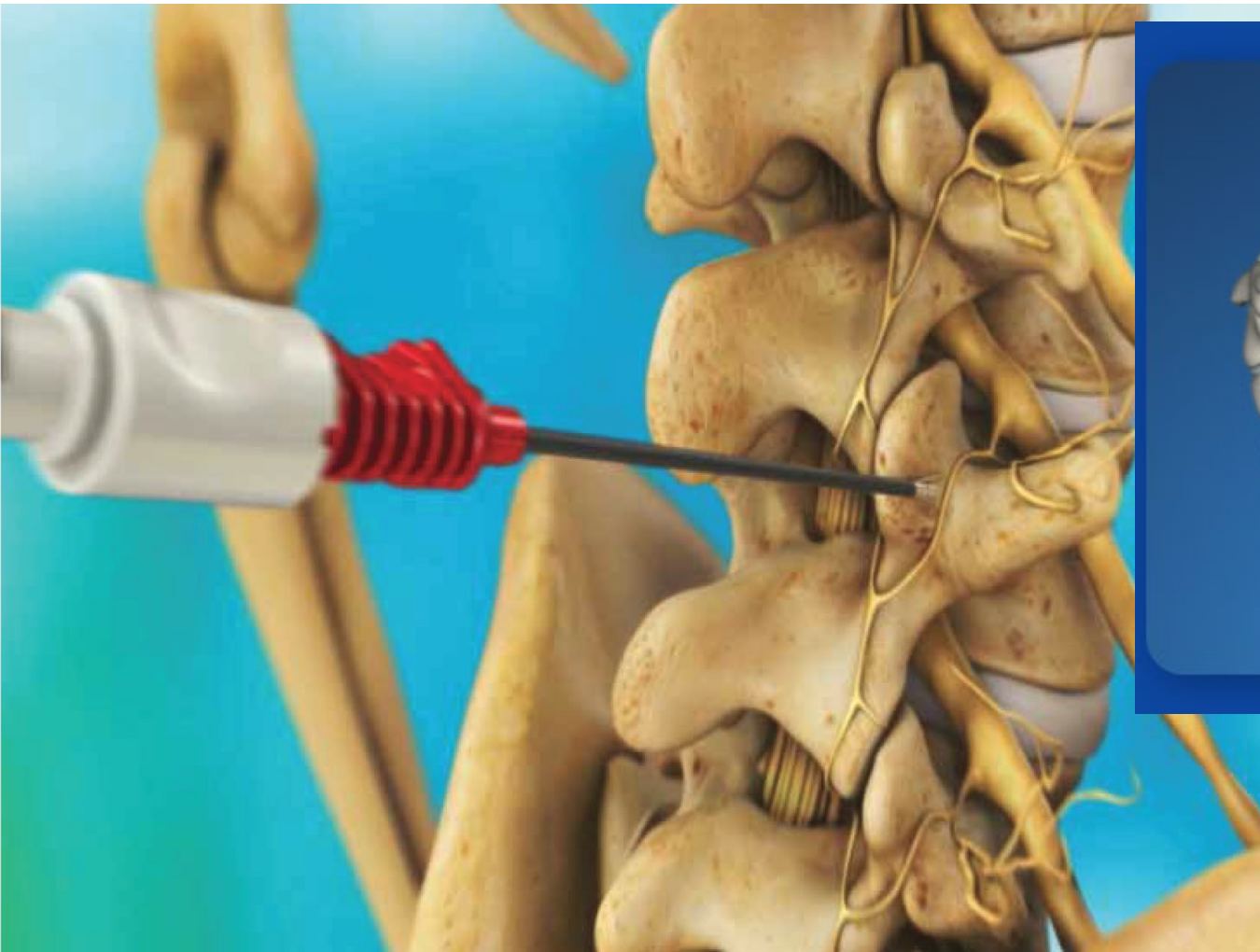
# Radiofrequency Ablation

“Intermediate”  
level  
Intervention

- **Known as:** Ablation/Neurotomy/Denervation
- Performed to treat pain arising from **joints**:
  - facet joint pain, sacroiliac joint pain, hip and knee.
- Involves the delivery of **alternating electrical current** to the pain generating nerve via an electrode that is **contained within a needle**.
  - **generates heat** (above 60°C) at the tip of the needle.
  - **alters the nerve** in order to provide pain relief.
  - usually preceded by a diagnostic block/injection
- **Pain relief for 9 – 18 months**, after which the nerve will regenerate and the pain may return.

# Medial Branch RFA

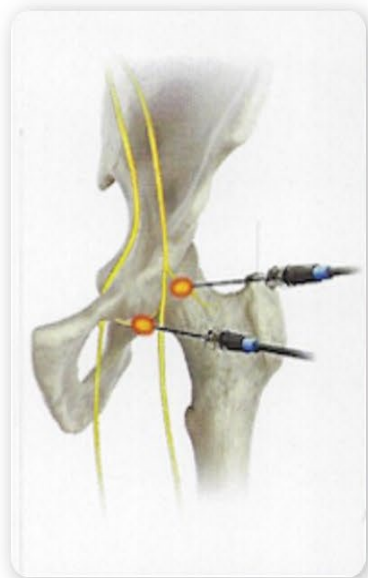
# Radiofrequency Generator



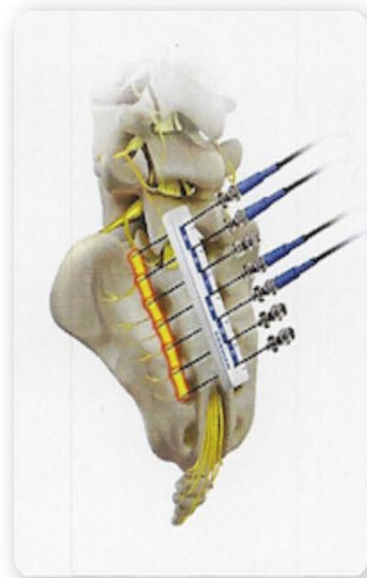
# Radiofrequency Cannula/Needle



Knee Joint



Hip Joint



Sacroiliac Joint



Facet Joint

# Medial Branch RFA



Figure 13 - Down the beam approach lumbar medial branch neurotomy.

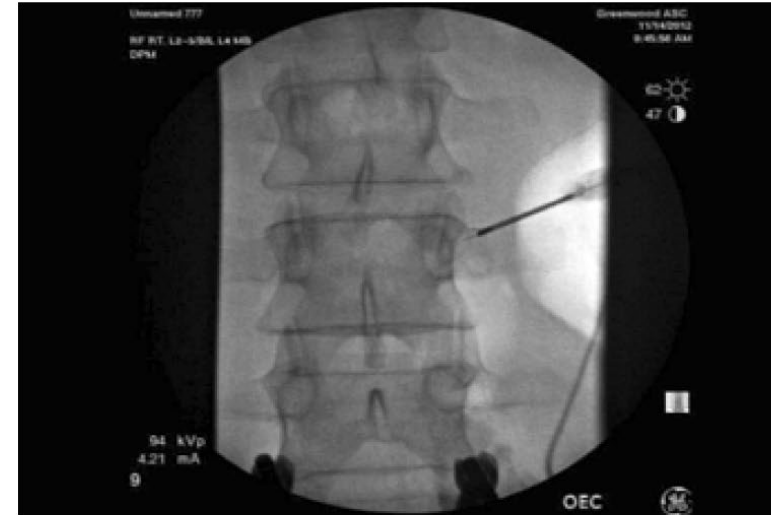


Figure 14 - AD view confirming active tip placement at medial aspect of transverse process.



Figure 15 - Caudal decline view to visualize active tip in succus.

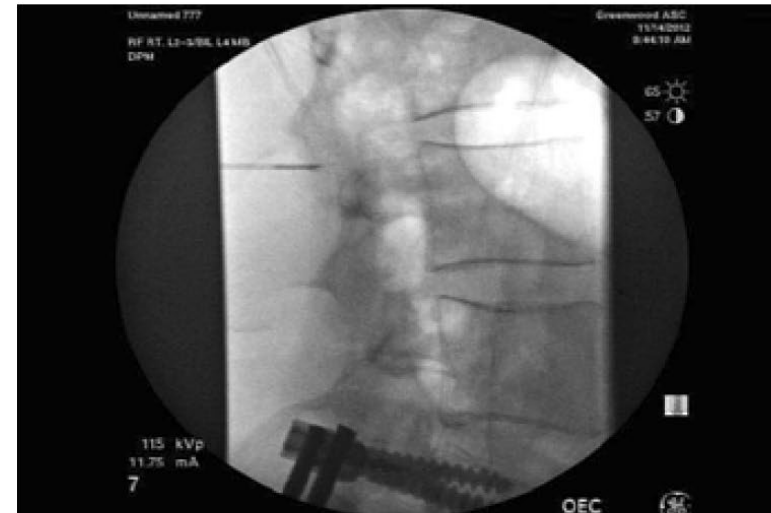


Figure 16 - Lateral view, tines deployed - posterior to neural foramen.

# “Pulsed” Radiofrequency ablation

## “Intermediate” level Intervention

- **What is “Pulsed” Radiofrequency Neurotomy?**
- Modified version of traditional radiofrequency
- Short bursts of electrical current are applied
- The nerve is stunned, not destroyed (unlike traditional radiofrequency neurotomy), which provides pain relief.
- Usually used to target nerves with large sensory or motor component e.g common peroneal nerve, suprascapular nerve or spinal nerve root.



# Genicular Nerve RFA



Figure 46- Lateral view of electrodes optimally positioned over genicular targets.



Figure 47 - AP view of electrode optimally positioned over genicular targets.

## Spinal Cord Stimulation

### “Advanced” level Intervention

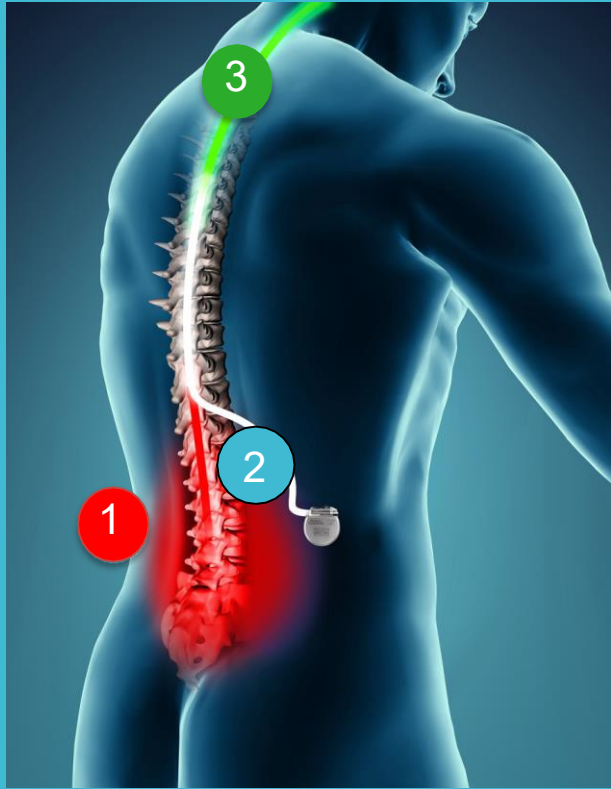
- Advanced pain treatment modality
- Can be effective in treating neuropathic pain
- Can be trialled first!
- Minimally invasive
- Procedure analogous to a cardiac pacemaker being “married” to a labour epidural
- Small electrodes in epidural space that modulates nerve transmission and reduces sensation of pain
- Technology has advanced rapidly in the last 7 years

# What kind of Stimulators?

- **Spinal Cord Stimulation**
  - Cervical/Thoracic/Sacral
  - DRG (Dorsal Root Ganglion)
- **Peripheral Nerve Stimulation** (also known as PNS)
  - Occipital nerve stimulation
  - Cluneal nerve stimulation
- **Subcutaneous stimulation/'Field stimulation'**
- **Motor Cortex and Deep Brain Stimulation** (need a brain surgeon)
- **Outside of pain management:**
  - Parkinson's Disease
  - Gastrointestinal disorders e.g. dysmotility, gastroparesis
  - Urinary & Faecal incontinence
  - Research into other fields e.g. psychiatry, sleep apnoea, Alzheimer's; especially with new tech.



# The Basics!



- **“IPG”**

- Implanted pulse generator
- Houses both battery and electronics in a single unit
- Battery is usually rechargeable

- **Leads**

- 4-16 ‘electrodes’ on a wire
- Percutaneous or surgical
- Up to 4 per patient

- **Programming**

- Patient & clinician
- Setting the electrode stimulating configuration and adjusting amplitude, pulse width and frequency of electrical pulses

- **Charger**

1

Pain signal

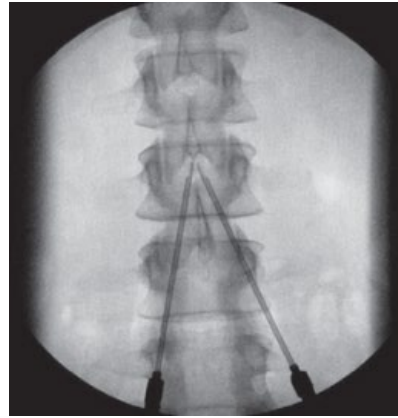
2

Device sends electrical impulses to mask the pain signals

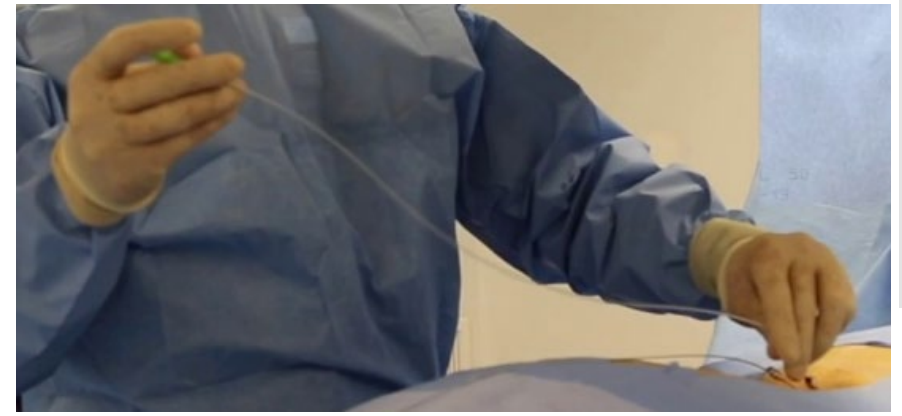
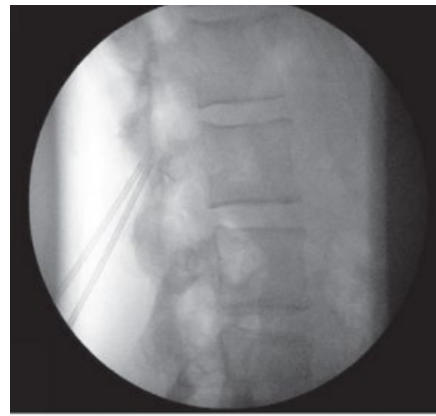
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The pain signals, now masked as a smooth tingling sensation, travel to brain

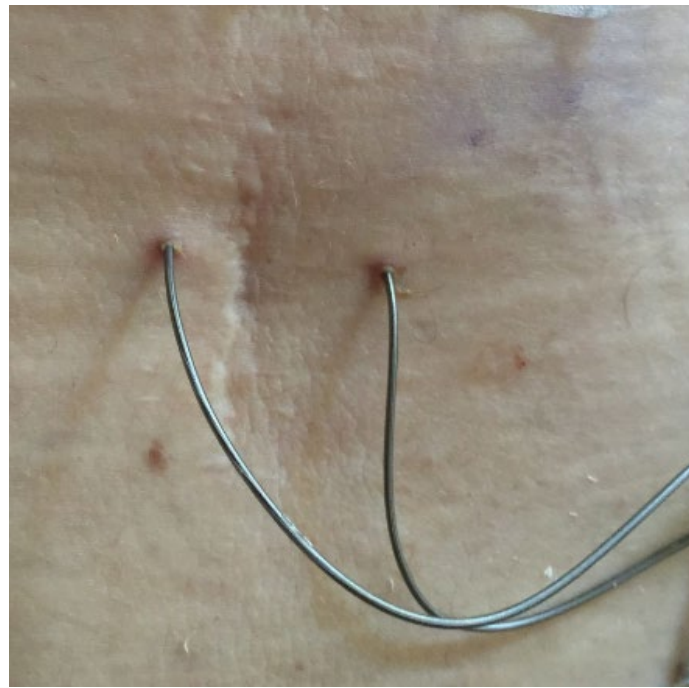
# The Trial Procedure



- Day procedure
- Strict Asepsis
- Mild sedation (need wake up test)
- Operating theatre/Cath lab
- Fluoroscopic Guidance
- Percutaneous Technique
- 14 Gauge Tuohy needle
- Epidural access
- Lead placement depends on location of pain
- On table testing



## The Trial Procedure



- Remove needle and leads remain externalised
- Connected to temporary battery
- Trial runs for 7-10 days
- Leads removed at end of trial
- Constant assessment and reprogramming throughout trial
- Positive trial = offer of permanent implant

# The Permanent Procedure

- **Almost identical to trial except:**
  - Small incisions made to anchor leads
  - Leads are tunnelled to the flank
  - Implantable pulse generator in flank wound
  - Overnight stay in hospital or Day procedure



# Indications

- Conditions *likely* to respond:
  - Failed Back Surgery Syndrome (FBSS)
  - Complex Regional Pain Syndrome (CRPS)
  - Neuropathic pain secondary to peripheral nerve damage
- Conditions that *may* respond:
  - Pain associated with peripheral vascular disease
  - Brachial plexopathy (partial not avulsion) or post irradiation
  - Axial pain following surgery
  - Intercostal neuralgia such as post thoracotomy
  - Other peripheral neuropathic pain syndromes, such as those following trauma
- Conditions that *rarely* respond:
  - Pain associated with spinal cord damage
  - Central pain of non-spinal pain origin
  - Perineal or anorectal pain

# Right Patient, Right Device, Right Trial

- **Poor results with:**
  - Depression
  - Fear avoidance behavior
  - Secondary gain
  - Ongoing demand for opioid prescription
  - Workers Compensation in active litigation
- Ideally need a **neuropathic condition.**
- **Less than 10 years pain**
- **Numerous devices to choose from** all with their pros and cons
- **Need >50% relief trial.**

# Complications

- Major complications are rare, but minor complications are common
- Complications could be considered **early or delayed**
- **Early may include:**
  - Lead migration (can occur at any time)
  - Complications of percutaneous insertion
  - Superficial infection (may require implant removal)
  - Epidural infection (rare but requires implant removal)
- **Delayed complication may include:**
  - Lead migration
  - Lead fracture
  - System malfunction
  - Delayed CSF leakage
  - Meningitis (rare)

## General Practice Considerations

1. ***Re LBP:*** if you are referring to a spine surgeon it means you think the patient should be fused?
2. ***Don't refer for injection based on Imaging reports:*** Age related changes do not equal symptomatic pathology.
3. ***Is there a comprehensive treatment plan?*** Is it opioid only?
4. ***Have we established what is driving the symptoms?*** Don't just label it chronic pain
5. ***What is the patient doing with their pain reduction period?*** Get them moving with active physio and not passive therapies.



Feel free to get  
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