

Spinal Cord Stimulation (SCS) Therapy



Dr Mohammad Al-Olama, MD, MSc
Department of Neurosurgery
Rashid Hospital
Dubai Health Authority, UAE.

Introduction to SCS

- SCS is **electrotherapy for chronic pain by stimulation of the spinal cord - neuromodulation**
- SCS as treatment for pain conditions was first introduced in 1967 (Norman Shealy) – gate control theory for pain modulation
- SCS is the most commonly used invasive neuromodulation technique today with estimated >40,000 stimulators implanted annually worldwide

Introduction to SCS

Use of SCS reflects a transition away from destructive procedures towards reversible neuromodulation for treatment of chronic pain.

Pain types treated with SCS

- Pain particularly suitable for SCS include:
 - **Neuropathic pain:** Failed Back Surgery Syndrome (FBSS); posttraumatic peripheral nerve pain
 - **Complex regional pain syndrome (CRPS)** type I (reflex sympathetic dystrophy) and II (kausalgia)
 - **Ischaemic pain:** peripheral vascular disease and intractable angina pectoris

Selection criteria for SCS

- Confirmed diagnosis of pain responsive to SCS
 - Chronic (>6 months)
 - Unresponsive to conventional surgical and/or medical treatment (i.e. failure of first/second line treatment or unacceptable side-effects)

Evolving SCS technology

Previously: one SCS manufacturer
(Medtronic)

Today: Four major SCS manufacturers

Evolving SCS technology

**Competition promotes technical evolution
and improves therapy outcomes!!**

Evolving SCS technology



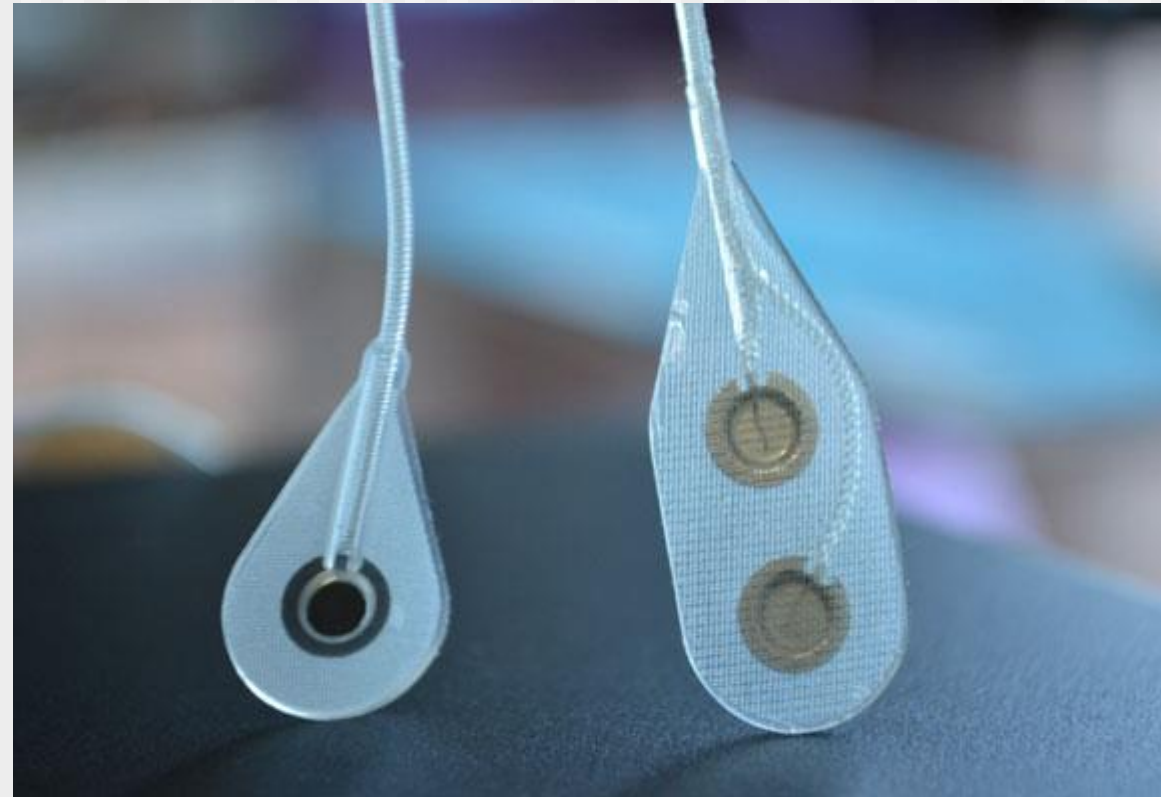
Evolving SCS technology

- Leads
 - Percutaneous lead insertion techniques – minimally invasive
 - Multi-contact leads
 - Less fracturable

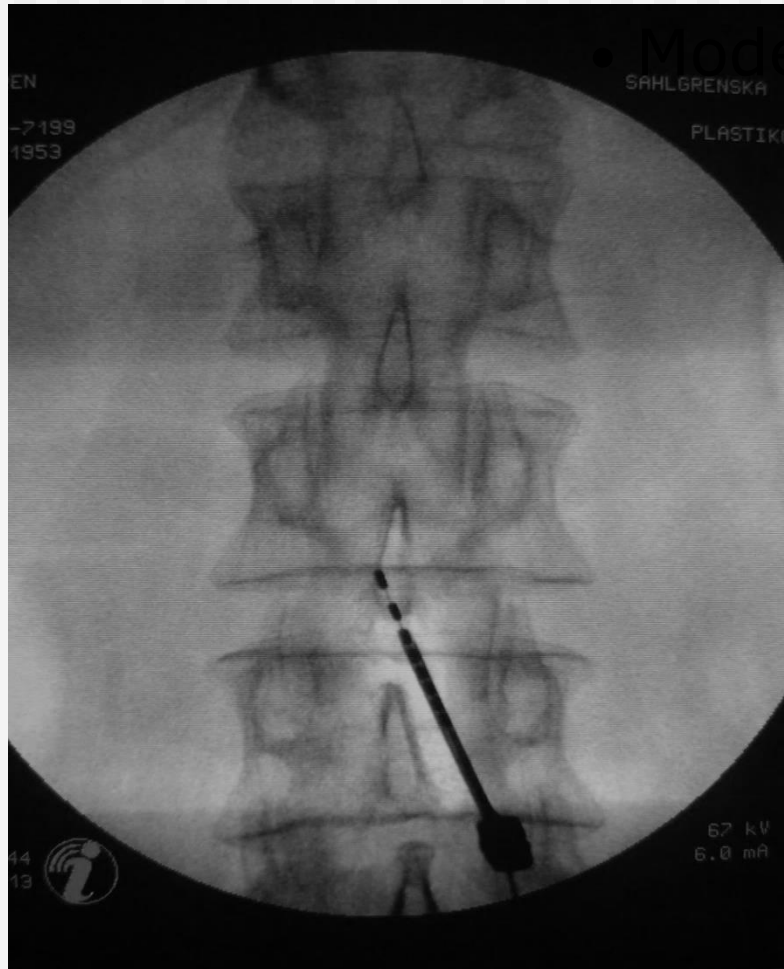
Evolving SCS technology

Old type one/two contact surgical plate leads

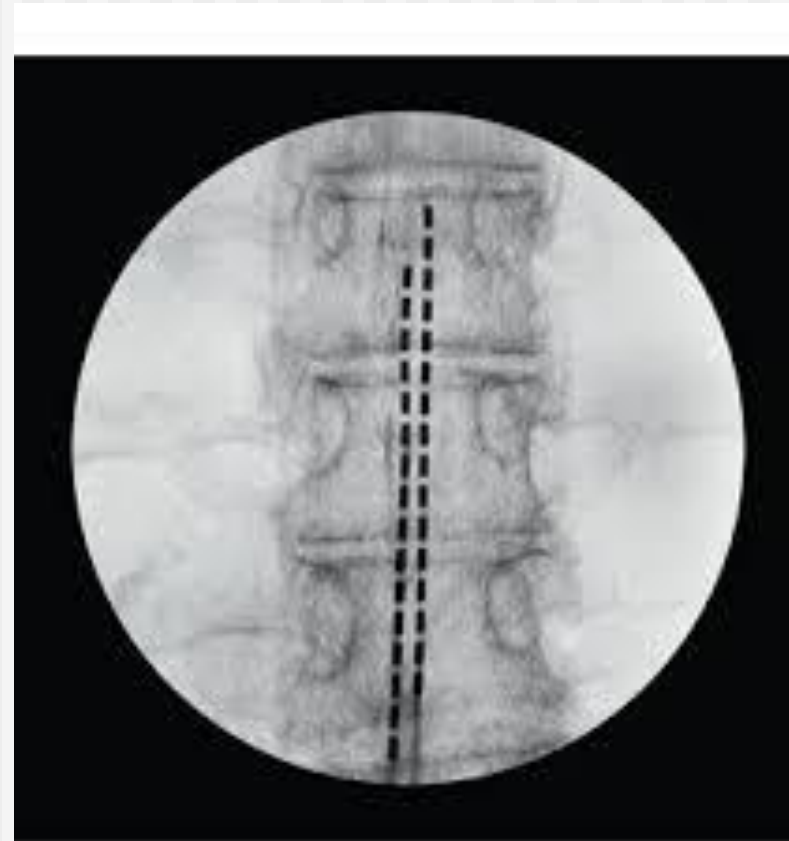
Modern type surgical leads contain up to 32 contacts



Evolving SCS technology



Modern percutaneous leads, 8-16 contacts



Evolving SCS technology

- Neurostimulators
 - Multi-programmable
 - Smaller
 - Rechargeable
 - Use new stimulation platforms and programming algorithms

Evolving SCS technology

MRI compatible leads and pulse generators (1.5 T)
– whole body MRI scan

SCS treatment challenges today

- Better targeting (focal and back pain)
- Improve effect of stimulation - more treatment modalities
- Eliminate unpleasant or motion sensitive stimulation
- Retrieve pain relief if it has been lost with time

Evolving SCS technology

- New intraspinal targets for stimulation – dorsal root ganglion (DRG) - focal pain
- New stimulation paradigms (paresthesia free stimulation): High frequency (10kHz) and burst stimulation – back pain, less motion sensitive
- Peripheral nerve and nerve field stimulation (subcutaneous leads) – focal and back pain

The future

- Automatic, position-adaptive stimulation
- Pulse generator (battery) built into the electrode - minimize stimulation device
- MRI-compatibility for 3-T scanners

The future

- Telemetry for remote adjustment of stimulation
- Objective data collection of activity level – evaluate therapy
- Global registries for quality control of SCS therapy
 - Implantation technique
 - Efficacy
 - Complications
- New indications for SCS

“If at first the idea is not absurd,
then there is no hope for it.”

Albert Einstein

Thank you!

