INVASIVE PAIN MANAGEMENT TECHNIQUES

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Outline

- Defining interventional pain management procedures
- Different purposes of interventions (treatment, diagnostic): focus on low back pain
- Examples of treatments
- Status of Research: examples of study protocol in interventional pain management

Interventional Pain Management

- Discipline of medicine devoted to the **diagnosis** and treatment of pain and related disorders by the application of interventional techniques in managing subacute, chronic, persistent, and intractable pain, **independently or in conjunction** with other modalities of treatments

- Represented of minimally invasive procedures, such as needle placement of drugs in targeted areas, ablation of targeted nerves, and some surgical techniques, such as discectomy and the implantation of intrathecal infusion pumps and spinal cord stimulators

Multimodal Pain Management

- Drugs and Medications
- Physical Therapy
- Psychological support
- Interventional Procedures

- Anesthesiologist
- Rheumatologist
- Psychologist and Psychiatric
- Surgeon
- Radiologist
- General Practitioner
- Dedicated nurse
- Physiotherapist
- Social worker

Epidemiology of Interventional Pain Management Procedures: Spinal procedures

- IPM as an emerging specialty is growing significantly, attesting to the importance of managing chronic pain using existing, proven, and emerging technolology
- Overall Increase in performance of Spinal Intervention Procedures → 2000-2011, increase of 228% (annual increase of 11.4%)
- Increase of Chronic back pain prevalence
  - Reduced functioning
  - Opioids overuse → opioid prescriptions increase, along with related fatalities: 60% of the deaths from appropriate prescriptions for chronic pain compared to 40% due to abuse

Socioeconomic, psychological, behavioral , health influences

Looking for the Evidence

Injection therapy generally consists of a heterogeneous group of interventions with differences in:

- Target of the injection
- Technique and medications
- Dosages
- Indications (depending on the presumed underlying source of the pain)

To investigate the effects of injection therapy for low back pain in a systematic review, it should be realized that the content of this treatment method, as studied in randomized controlled trials (RCTs), may show a large degree of variation.

Injection Therapy for Subacute and Chronic Low Back Pain

An Updated Cochrane Review

- **Interventions**: injections on facet joints, epidural space, local sites (paraspinal muscles)
- **Outcome**: reduction in pain perception (mean), Percentage of patients with pain relief, grade of disability or functionality
- **Comparisons**: epidural corticosteroids vs placebo (n=2), epidural injections vs other treatments (n=3), epidural with local anesthetics vs other treatments (n=2), facet joint injections with corticosteroids vs placebo injections (n=2), and facet joint injections with corticosteroids vs other treatments (n=4)

SPINE Volume 34, Number 1, pp 49–59

Results: Low evidence in Spine Procedures

- The studies were too heterogeneous to allow statistical pooling.
- Prevalent methodological limitations:
  - lack of clarity regarding randomization
  - no reporting of co-interventions
  - no reporting of an intention-to-treat analysis
- Only 6 of the 18 trials showed significant results for at least 1 outcome (pain, disability, or generic health status) in favor of one of the treatments
- Only 4 studies reported effects that could be considered clinically important. No clear pattern emerged from these 6 trials.

Diagnosis of low back pain

Distribution of pain

- AXIAL (pain localized to the low back area)
  - Facet-joints
  - Sacroiliac joint
  - Vertebral compression fractures
  - Paraspinal muscles
  - Discogenic

- RADICULAR (pain radiating to the lower extremities in a dermatomal distribution with or without accompanying LBP)
  - Spinal stenosis
  - Discogenic
  - Intervertebral foramina stenosis

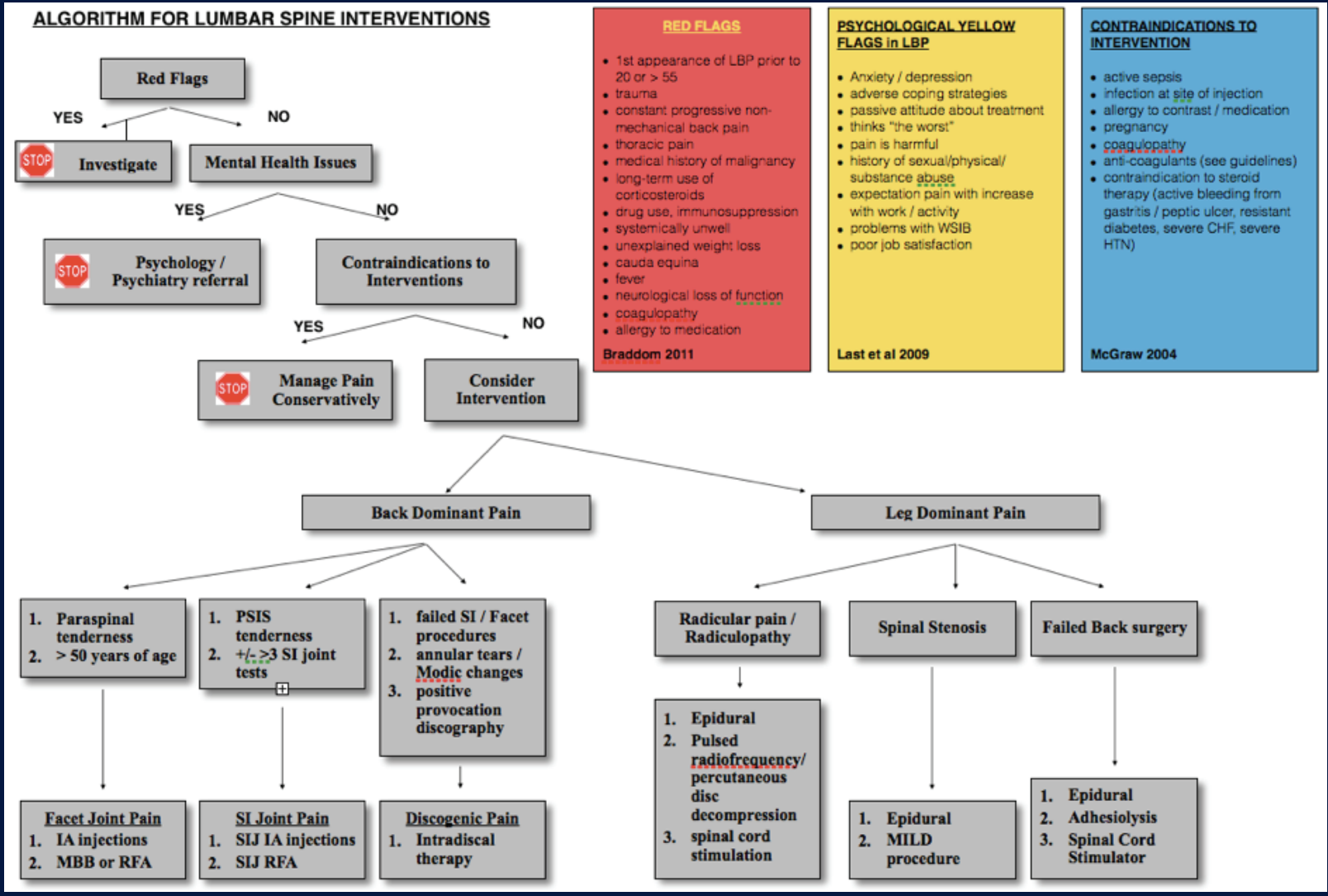
Diagnostic Injections

- Confirm a putative diagnosis
- identify patients who may be candidates for further interventional treatments.

Facet joints and sacroiliac joint block (intra- and extra-articular) → Distinguish patients with axial LBP who may be candidates for percutaneous radiofrequency denervation procedures

Discography → Establish a relationship between disc pathology and symptoms: can predict outcome for vertebral fusion surgery

Transforaminal Epidural (Nerve root block) → Selective nerve root blocks can be considered when imaging, physical examination, or electrodiagnostic studies are inconsistent or noncorroborative



Scott Cook, Gaurav Gupta 2016

Interventional Procedures on Spine

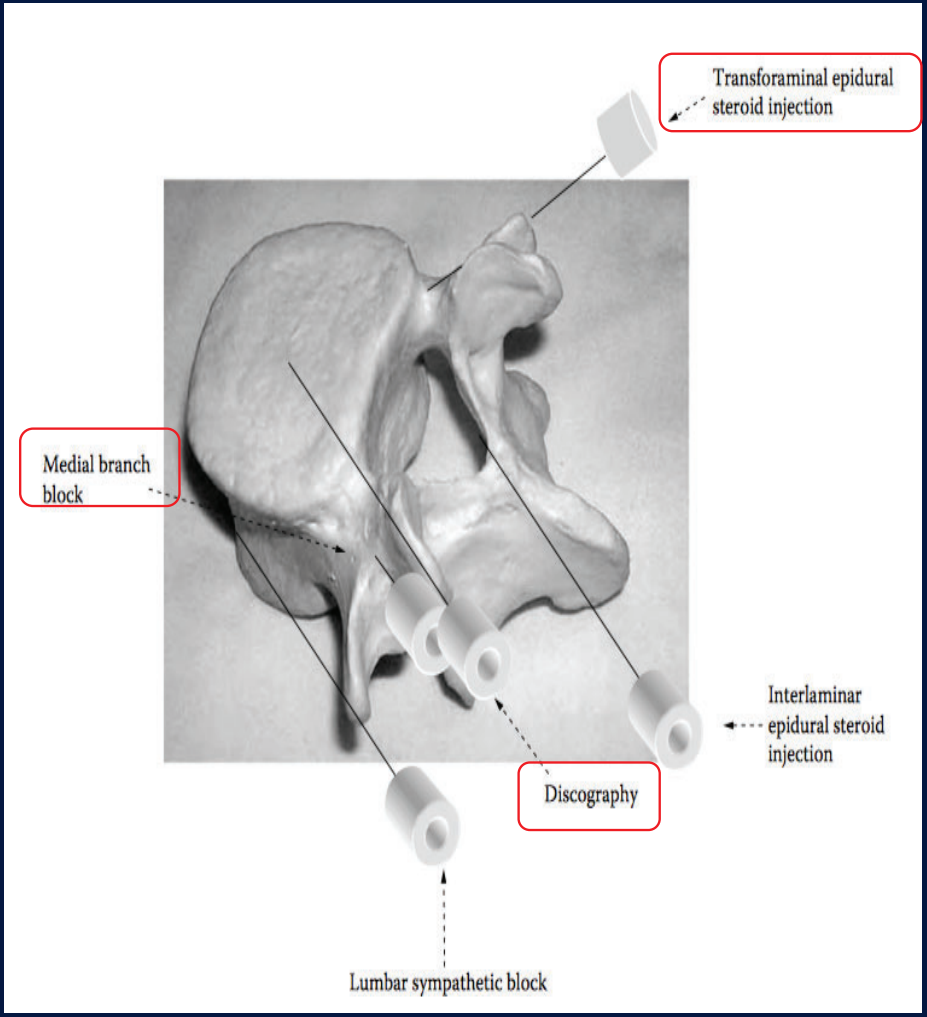
- CT-Guided
- Fluoroscopy-Guided
  - Facet Joint Block
  - Epidural (interlaminar, parasagittal)
  - Epidurolysis
  - Nerve Root Block (Transforaminal Epidural)
  - Sympathetic Ganglion Block
- Ultrasound-Guided

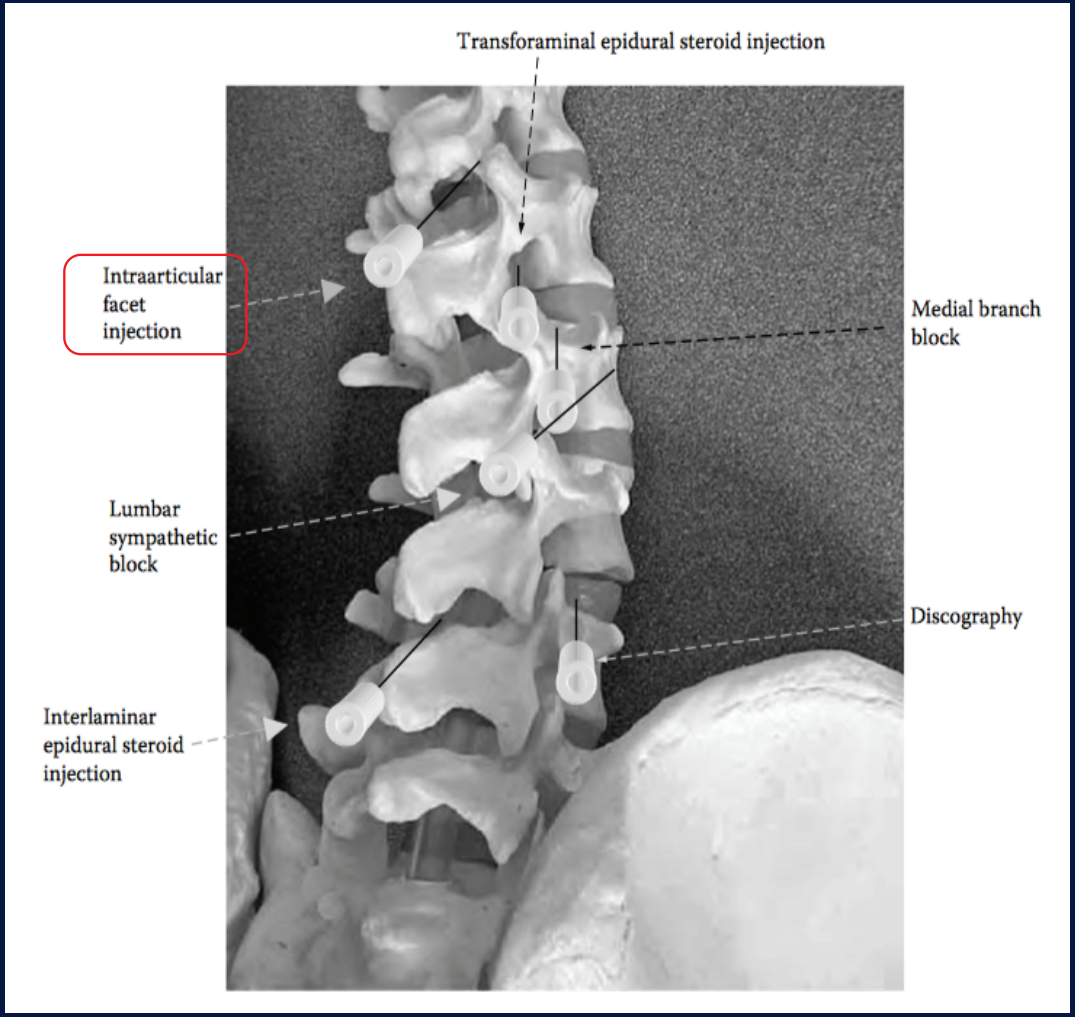
Fluoroscopy-guided Spine interventional procedures

The basic steps of a fluoroscopy-guided spinal injection are:

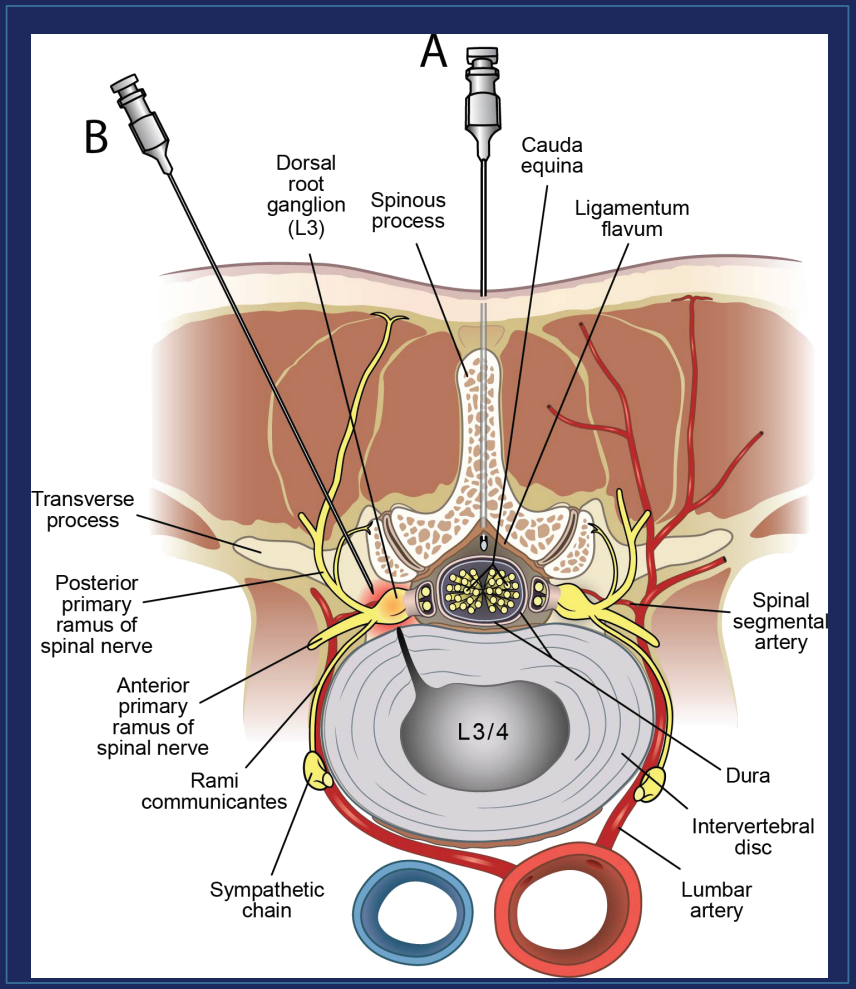
1. Identifying a target point in the area of the spine or the pelvis
2. Obtaining fluoroscopic images
3. Inserting a needle
4. Verifying correct needle placement by using the fluoroscopic images
5. Injecting the appropriate medication into the target area

Anatomical Considerations for lumbar spine



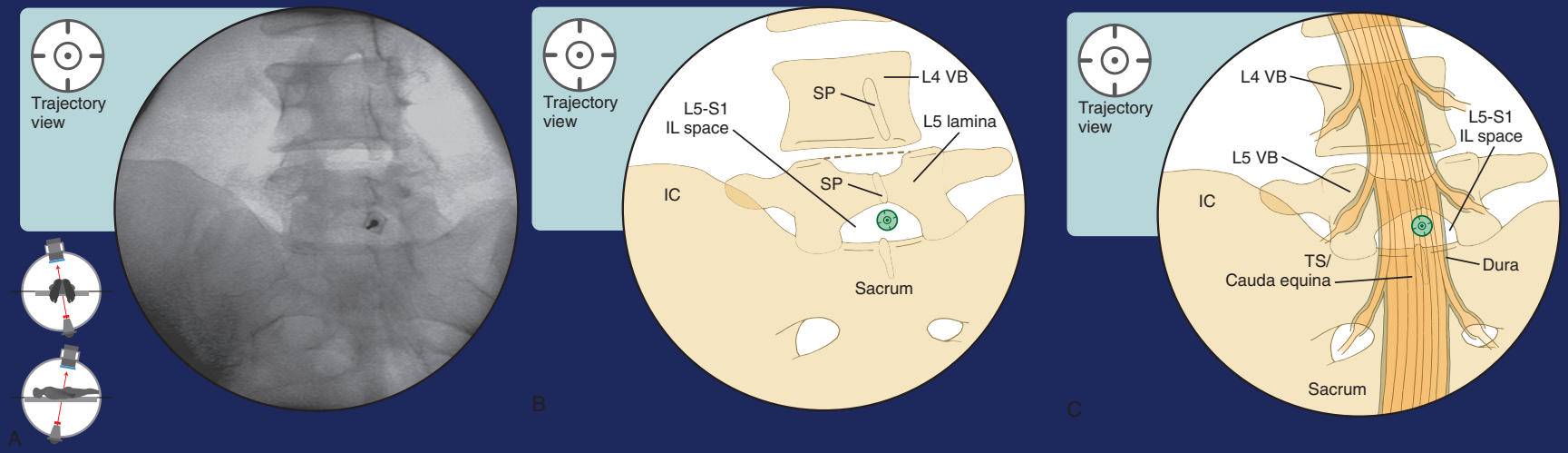


Interlaminar and Transforaminal Epidural



Cohen et. Al, RAPM 2013

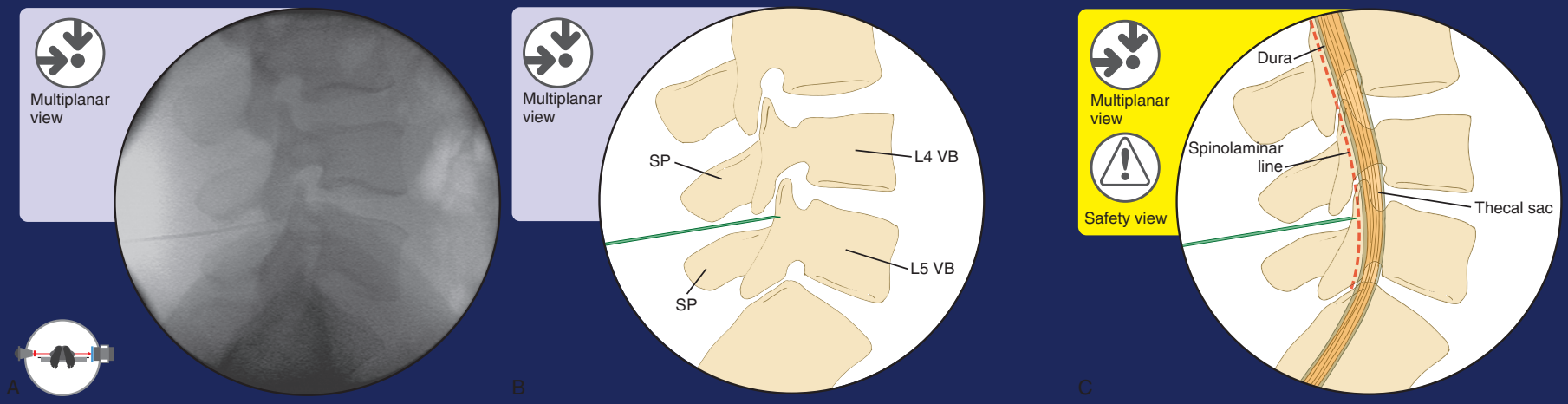
Lumbar Interlaminar Epidural Steroid Injection, Paramedian Approach



- specifically indicated for radicular symptoms with or without axial pain.

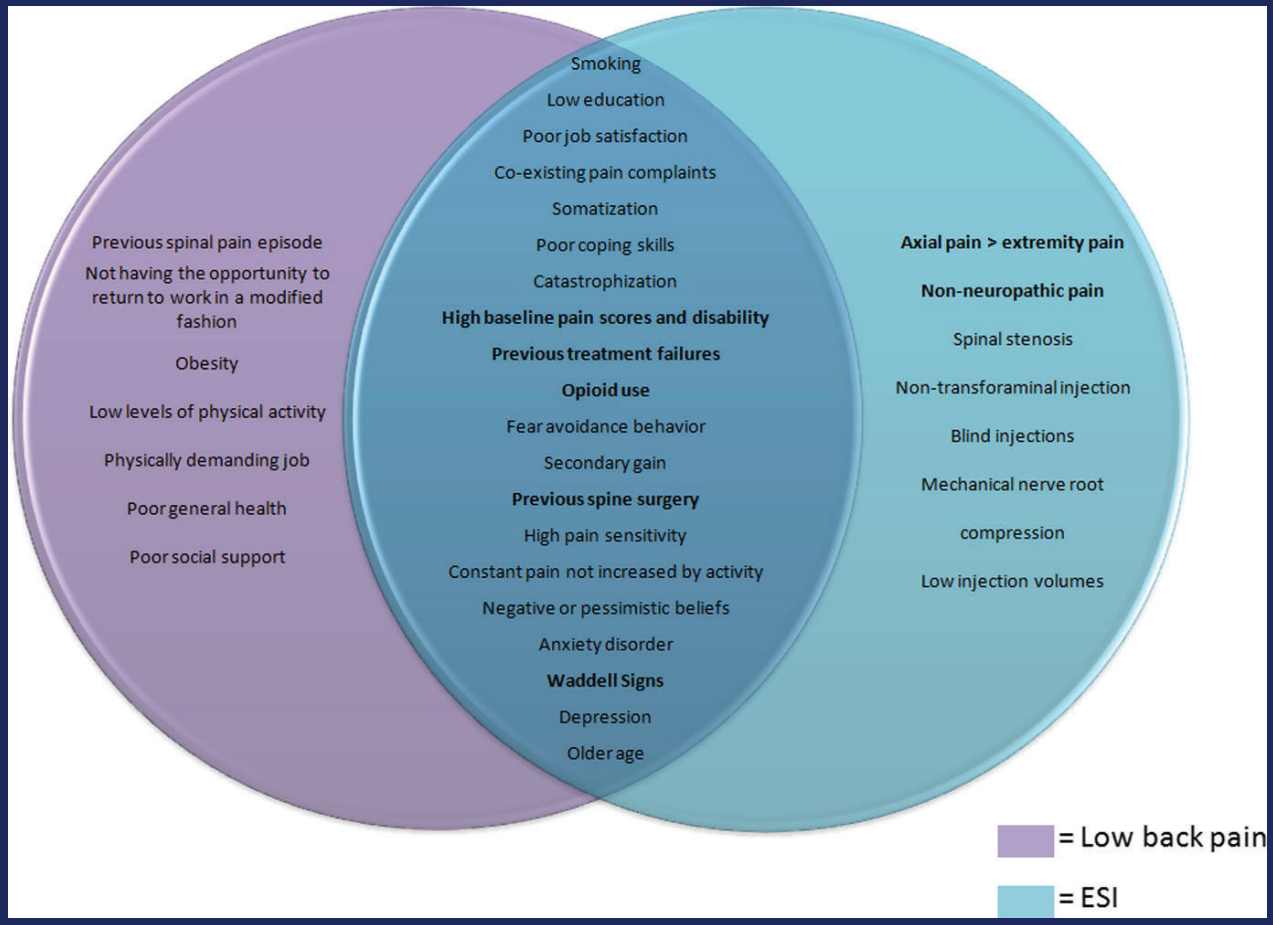
- The injectate disperses over a larger area than a transforaminal injection → used for bilateral or multilevel symptoms.

Lumbar Interlaminar Epidural Steroid Injection, Paramedian Approach



- When the needle is approaching the midline target as evidenced by both the trajectory view and the anteroposterior view, a lateral image is obtained.

Poor Outcome Predictors for Success of ESI



Research in Pain Management

- Improvement in quality of studies
- Need for RCTs
- Defining better outcomes
- Extend interventional pain techniques to perioperative medicine

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Functional outcome and postoperative analgesia following total knee arthroplasty: Randomized double-blind comparison between continuous adductor canal block and preoperative radiofrequency of saphenous and genicular nerves

- Over one million Total Knee Arthroplasties (TKA) are preformed every year in USA.
- High risk to develop severe acute postoperative and chronic pain, possibly slowing patients' recovery.
- Radiofrequency (RF) could be useful in non-operative knee and hip painful osteoarthritis (OA).
- Prolonged analgesia and improvement of functional recovery in patients receiving preoperative RF have not been tested for TKA.

Inacio MCS, Paxton EW, Graves SE, Namba RS, Nemes S. Projected increase in total knee arthroplasty in the United States - an alternative projection model. Osteoarthritis Cartilage. 2017 Aug 8

Carli F, Chora D, Awasthi R, Asenjo JF, Ingelmo P. Preoperative pulse and thermal radiofrequency facilitates prehabilitation and subsequent rehabilitation of a patient scheduled for total knee arthroplasty. Can J Anaesth 2015 Dec;62(12):1355sthi

Choi W-J, Hwang S-J, Song J-G, Leem J-G, Kang Y-U, Park P-H, et al. Radiofrequency treatment relieves chronic knee osteoarthritis pain: a double-blind randomized controlled trial. Pain. 2011 Mar;152(3):481

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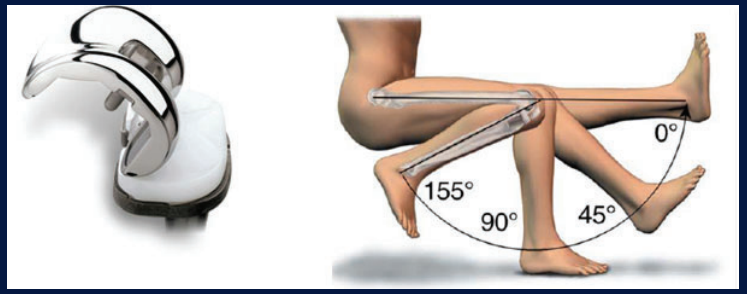
OBJECTIVE

To measure meaningful **functional outcomes (long-term effect)** and **postoperative analgesia** obtained with <u>preoperative</u> Pulsed RF (pRF) of the saphenous nerve and Continuous RF (cRF) of the genicular nerves, when compared to the conventional continuous adductor canal block (CACB)



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STUDY DESIGN

- Prospective randomized, double-blind trial
- Approved by the Research Ethics Board of the MUHC
- Written consent was obtained before participating

40 OA PATIENTS
Unilateral TKA

Inclusion/Exclusion Criteria

Control group (CACB)

RF group (PRF Saphenous N CRF Genicular N)

Primary outcomes:

Timed Up and Go (TUG) test and opioid consumption
✓measured at baseline, 24 hours, 48 hours and after 6 weeks of intervention.

Secondary outcomes:

Pain levels, six-minute walk test (6MWT), WOMAC index
✓measured at baseline and six-week follow-up.

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RESULTS

Patient Characteristics and Clinical Data

	RF Group (n=20)	Control Group (n=20)	P value
Sex, N (%) **Male** **Female**	 12(60%) 8(40%)	 6(30%) 14(70%)	0.38
Age (years), mean (SD)	67.3 (6.97)	68.1 (7.13)	0.72
BMI (kg/m^2) (SD)	31.86 (6.08)	30.92 (5.14)	0.60
ASA, N (%) **1** **2** **3**	 2 (10%) 18 (90%) 0 (0%)	 0 (0%) 20 (100%) 0 (0%)	0.22
Preoperative NRS pain score greater flexion, mean (SD)	5.37 (2.71)	5.7 (2.13)	0.67
Preoperative Degree of flexion, mean (SD)	95.26 (17.2)	86.05 (11.97)	0.05
Hospital stay (days), mean (SD)	2.73 (0.56)	4.15 (2.16)	0.0040

✓ Patients in the RF group were discharged 1.4 days earlier than the control group.

✓ At 6 weeks, the **WOMAC index was significantly better in the RF group** ($p<0.01$)

✓At 6 weeks, compared with its preoperative values, the **6MWT was already 20% better in the RF group** vs 12% worse in the control.

✓ Early analgesic requirements were similar.

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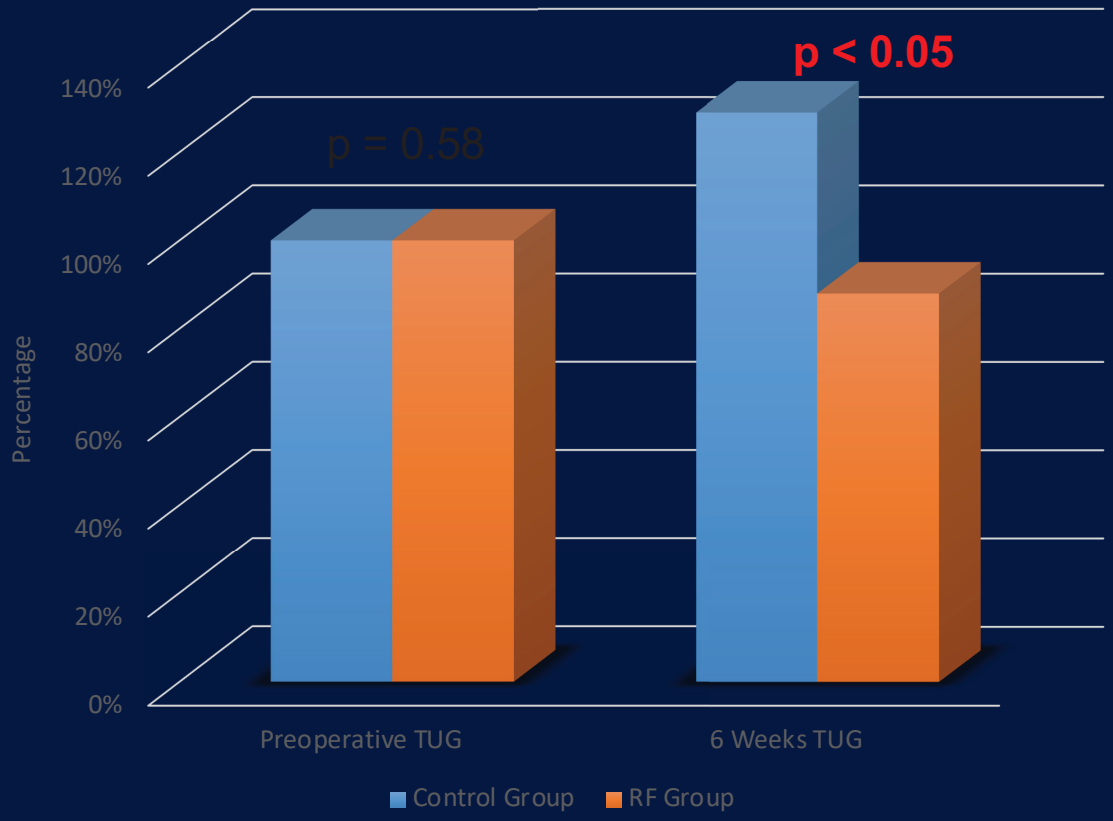
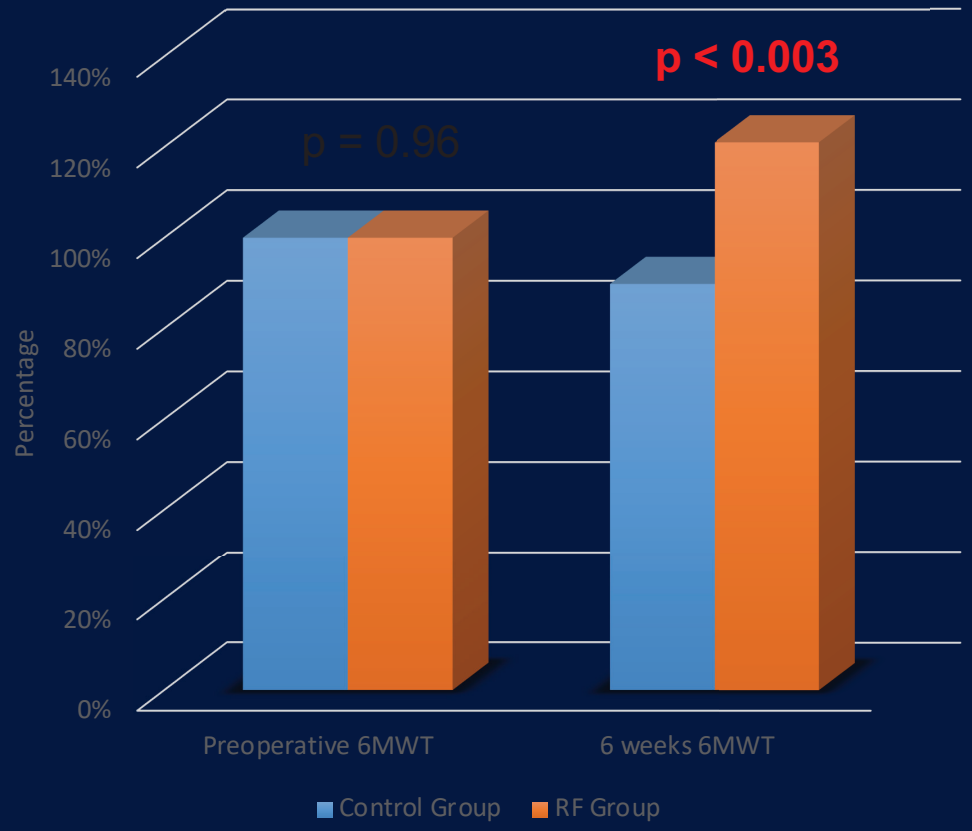
RESULTS

PRIMARY FUNCTIONAL OUTCOME: TUG (seconds)



SECONDARY FUNCTIONAL OUTCOME: 6MWT (meters)



DISCUSSION / CONCLUSION

- Our results show significant clinical improvements in all functional outcomes (TUG test, 6MWT and WOMAC index) **at 6 weeks in the RF group** after TKA.
- The delayed effect of the pRF could explain the lack of impact on the TUG at 48 hours compared to 6 weeks.
- This trial was based in Franco's et al paradigm for knee innervation and used well validated tools to assess the functional outcomes (TUG test, 6MWT and WOMAC index).
- The results of this first prospective randomized study of RF in TKA require further validation. If confirmed, may contribute greatly to improve the functional recovery of patients undergoing TKA.

Franco CD, Buvanendran A, Petersohn JD, Menzies RD, Menzies LP. Innervation of the Anterior Capsule of the Human Knee: Implications for Radiofrequency Ablation. Reg Anesth Pain Med. 2015 Aug;40(4):363–8.

Boonstra MC, De Waal Malefijt MC, Verdonschot N. How to quantify knee function after total knee arthroplasty? The Knee. 2008 Oct;15(5):39055.