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Selective Nerve Root Blocks and Caudal Lysis of Adhesions

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Conflicts of Interest

- None

History

- Selective nerve root block (SNRB) was introduced by Macnab et al in 1971 as a treatment for lower leg radicular pain (LLRP) .
- Recently, SNRB has become popular as a minimally invasive treatment option for LLRP.
- So, it is important to recognize pain caused by nerve-root compression and to identify the affected spinal nerve root.

Indications

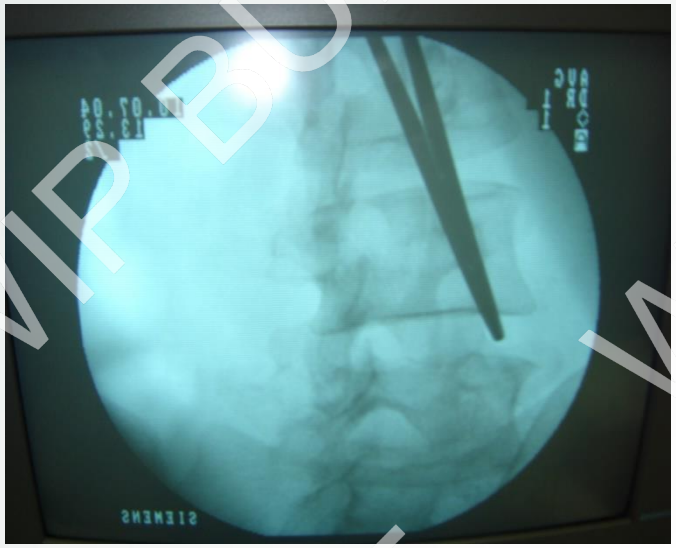
1. Diagnostic block for radiculopathy
2. Analgesia for cancer invasion of a nerve root
3. Acute herpetic neuralgia
4. Postherpetic neuralgia
5. Vertebral fracture
6. Discogenic pain
7. Segmental neuralgia

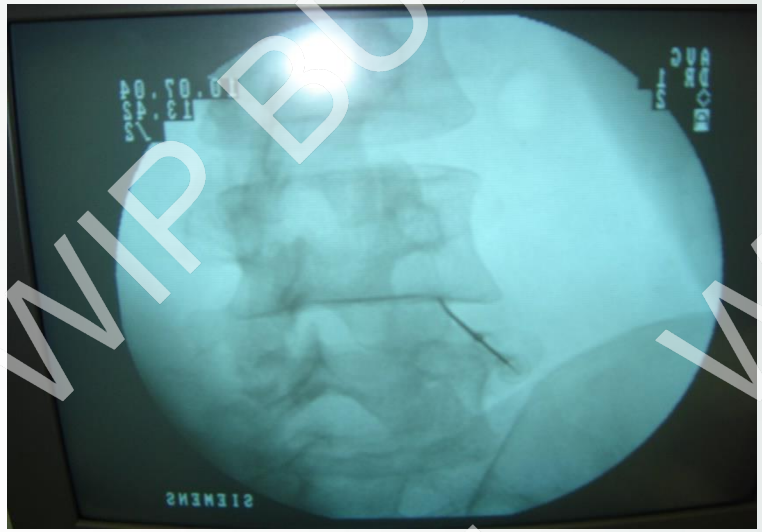
Technique

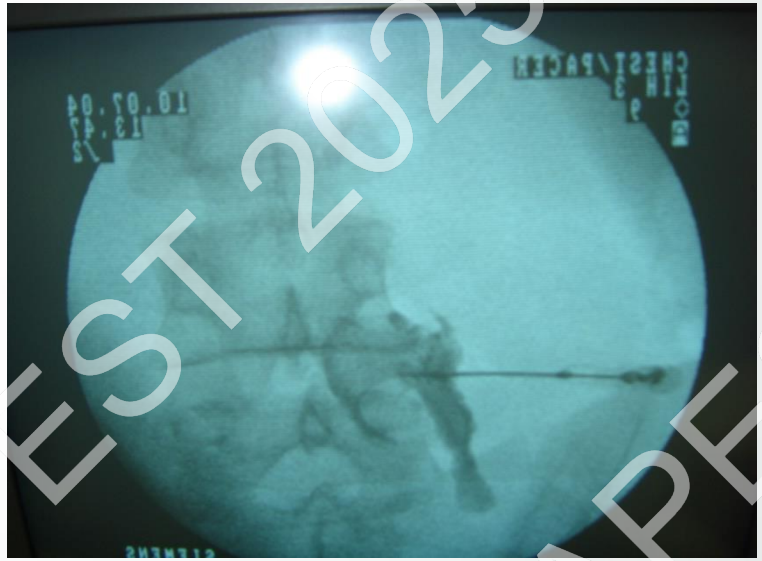
- The procedure can be done under fluoroscopic guidance.
- Under intermittent fluoroscopic guidance, needle is advanced toward the targeted nerve root.
- When a lumbar nerve root is the target, the needle tip should be located below the pedicle, aimed at the lateral inferior corner of the vertebral body.

- Needle tip is located adjacent to the junction of the nerve root and the dorsal root ganglion.

- The needle tip should always be located lateral to the medial border of the pedicle, avoiding the intrathecal portion of the nerve root.







Med Sci Monit. 2024 Jun 21:30:e943634. doi: 10.12659/MSM.943634.

Functional Outcomes of Therapeutic Selective Nerve Root Block for Single-Segment Lumbar Spinal Stenosis: A Retrospective Study

Shiqian Xiao [1], Shan Zhu [2], Binggang Guan [3], Jianlan Zhao [4]

Therapeutic SNRB was an effective treatment for alleviating LSS within at least 6 months. Changing sedentary habits with appropriate exercise and controlling weight with a healthy diet can improve the effectiveness of SNRB, especially in patients for whom conservative treatment is ineffective and who are unsuitable for surgical treatment.

Malaysian Orthopaedic Journal 2015 Vol 9 No 3
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The Outcomes of Selective Nerve Root Block for Disc Induced Lumbar Radiculopathy

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CONCLUSION

The effect is typically short acting in majority of patients yet it gains a valuable interval period of reduced pain in those patients with mild and moderate pathology. This procedure can be effectively used as an intermediate procedure before going for surgery in those patients with inconclusive radiological indication for surgery. It does not alter the prognosis in those with severe disease where surgery is well indicated.

Spine
SURGERY
OPEN
SPINE Volume 47, Number 9, pp 666–671

Pain Relief After Selective Nerve Root Block as a Predictor of Postoperative Functional Outcome in Patients with Degenerative Lumbar Spinal Stenosis Patients Undergoing Decompressive Surgery

Sangbong Ko, MD,[a] ChungMu Jun, MD,[a] Woo-Kie Min, MD,[b] Eunseok Son, MD,[c] Sukjoong Lee, MD,[c] Gun Woo Lee, MD,[d] and Hyunseung Yoo, MD[e], Daegu Spine Study Group (DGSSG)

Conclusion. The degree of improvement in symptoms 6 hours after SNRB can predict the degree of improvement in LLRP at 12 months after surgery. However, symptomatic improvement after SNRB does not predict postoperative functional outcome or quality of life.

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| Original Article |
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https://doi.org/10.3344/kjp.2019.32.3.215

The efficacy of selective nerve root block for the long-term outcome of postherpetic neuralgia

A Ram Doo[1,2], Jin-Wook Choi[1], Ju-Hyung Lee[3], Ye Sull Kim[1], Min-Jong Ki[1], Young Jin Han[1,2], and Ji-Seon Son[1,2]

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In conclusion, that application of early SNRB during the acute stage of HZ (within 14 days) appears to decrease the incidence and shorten the duration of PHN, with a median of 5.0 years of follow-up after the initial diagnosis of HZ.

Sci Rep. 2024 Feb 8;14(1):3235. doi: 10.1038/s41598-024-53809-3.

Ultrasound-guided versus fluoroscopy-guided lumbar selective nerve root block: a retrospective comparative study

Bowen Wang [#] [1] [2], Yang Sun [#] [2], Jitao Zhang [2], Hailan Meng [2], Hong Zhang [3], Lequn Shan [4]

significant ($P < 0.05$). There was no significant difference between the two groups ($P > 0.05$). The accuracy of ultrasound-guided selective nerve root block and the degree of pain relief of patients were similar to those of fluoroscopy guidance, but the operation time and needle angle adjustment times were significantly less than that of fluoroscopy, and could effectively reduce radiation exposure. Therefore, it can be used as a better way to guide for choice.

Complications

1. Nerve root damage
2. Epidural/intrathecal injection
3. Intravascular injection
4. Paralysis
5. Bowel/bladder incontinence

Conclusion

- Selective spinal nerve block is a useful tool in today's multidisciplinary approach to the diagnosis and treatment of low back pain.

- If the technique is performed properly selective spinal nerve block may prove helpful, especially for patients from whom diagnostic information is inadequate.

Caudal Lysis

- As our population ages and the rate of spine surgery continues to rise, the use epidural lysis of adhesions has emerged as a popular treatment to treat spinal stenosis and failed back surgery syndrome.

- There is moderate evidence that **percutaneous lysis of adhesions is more effective** than conventional ESI for both failed back surgery syndrome, spinal stenosis, and lumbar radiculopathy.

History

- Dr. Gabor Racz in 1989, described a technique for lysis of epidural adhesions to treat lumbosacral radicular and/or low back pain. Since then, it has been used worldwide.

- The technique is
  - minimally invasive
  - relatively easy to perform

Indications

- Failed back surgery syndrome
- Epidural adhesions , epidural fibrosis
- Spinal stenosis
- Vertebral body compression fracture
- Disc disruption
- Radiculopathy
- Resistant multilevel degenerative arthritis
- Pain unresponsive to spinal cord stimulation and spinal opioids

Contraindications

Absolute

- Sepsis
- Coagulopathy
- Local infection at the side of the procedure
- Patient refusal
- Syrinx formation
- Chronic infection

Relative

- Cauda equina syndrome
- Hydrocephaly
- Unstable angina
- Obstruction of the sacral canal
- Spinal dysraphism affecting area
- Inability to maintain position
- Allergy
- Severe stenosis
- Arachnoiditis

Technique

- The technique is based are that adhesions are present in the epidural cavity of patients with low back pain and/or radicular pain.

- The adhesions prevent epidurally injected medication from reaching intended targets.

- The adhesions contribute to the pathogenesis of pain by immobilizing nerve roots.

- Pain relief can be obtained by removing barriers that prevent drugs from reaching the target site and prevent the free movement of nerve roots.

Technique

- The technique involves

  - performing an epidurogram to identify filling defects indicative of epidural scarring

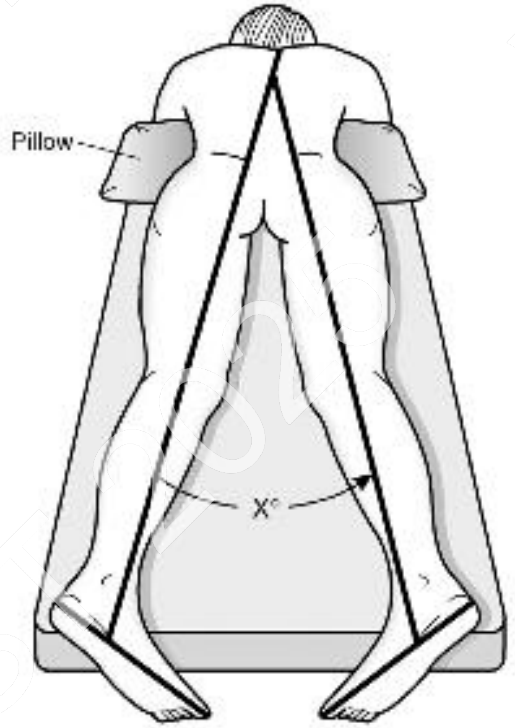
  - advancing a catheter in the anterolateral epidural space into the adhesions

  - injecting hyaluronidase to facilitate adhesiolysis and normal saline to hydraulically separate adhesions and wash out epidural proinflammatory cytokines

  - injecting anti-inflammatory and analgesic drugs and hypertonic saline to treat pain, inflammation and edema.

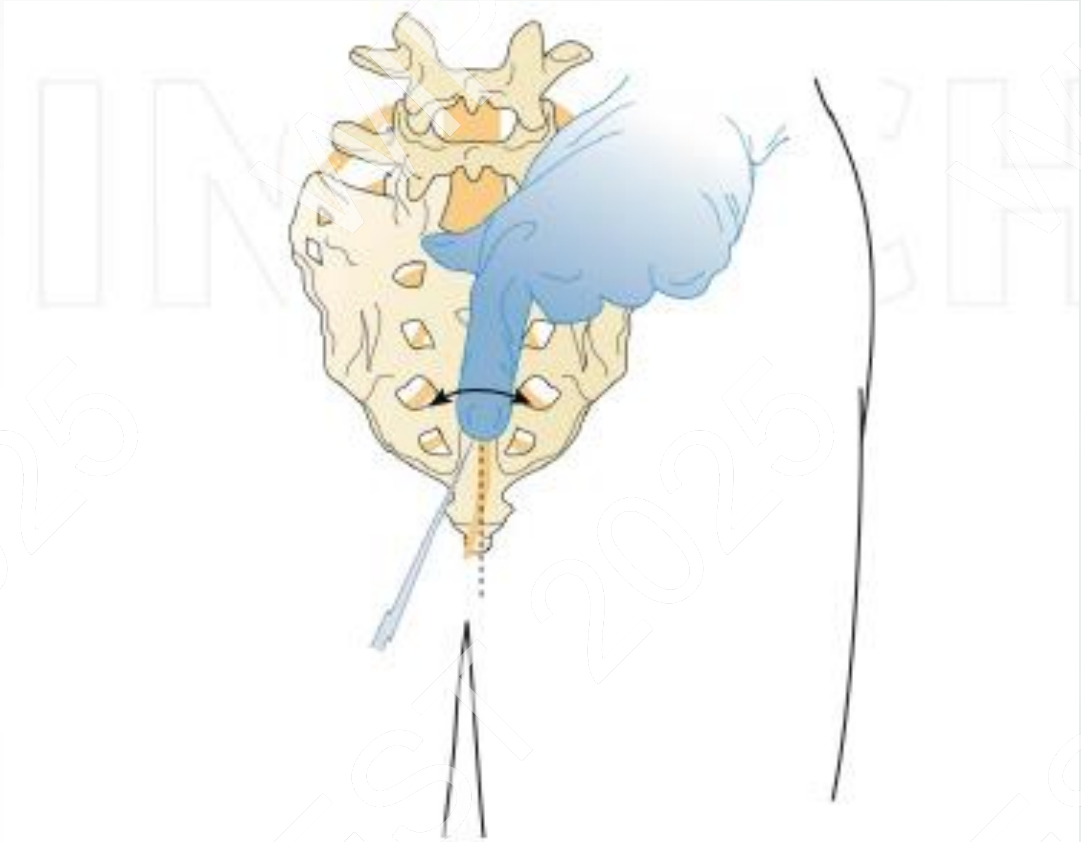
Technique

- **Prone position**
- **Pillow under abdomen**
- **C-arm required for confirmation of accurate needle and catheter placement**



Technique

The lysis procedure can be performed using a caudal, sacral or transforaminal approach.

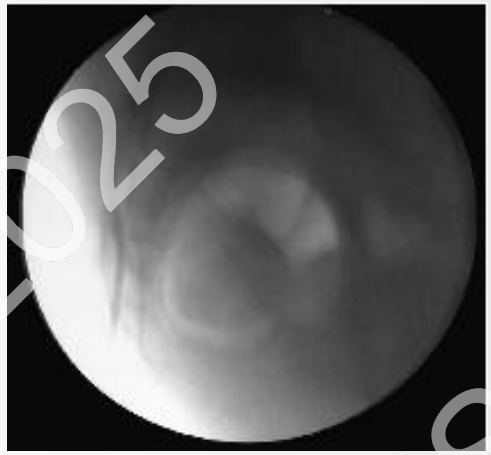


igure 9. Roll palpating index finger to identify the sacral cornu and thus the target sacral hiatus.

Technique

16 gauge RK needle is placed onto the sacral canal via the sacral hiatus under fluoroscopic guidance .

Figure 11. The needle is placed through the sacral hiatus into the sacral canal and rotated in the direction of the target. Do not advance beyond the S3 foramen.



Technique

Figure 12. The Epimed Racz catheter is marked for the location of the bend, or use the thumb as reference for the 15-degree angle bend.

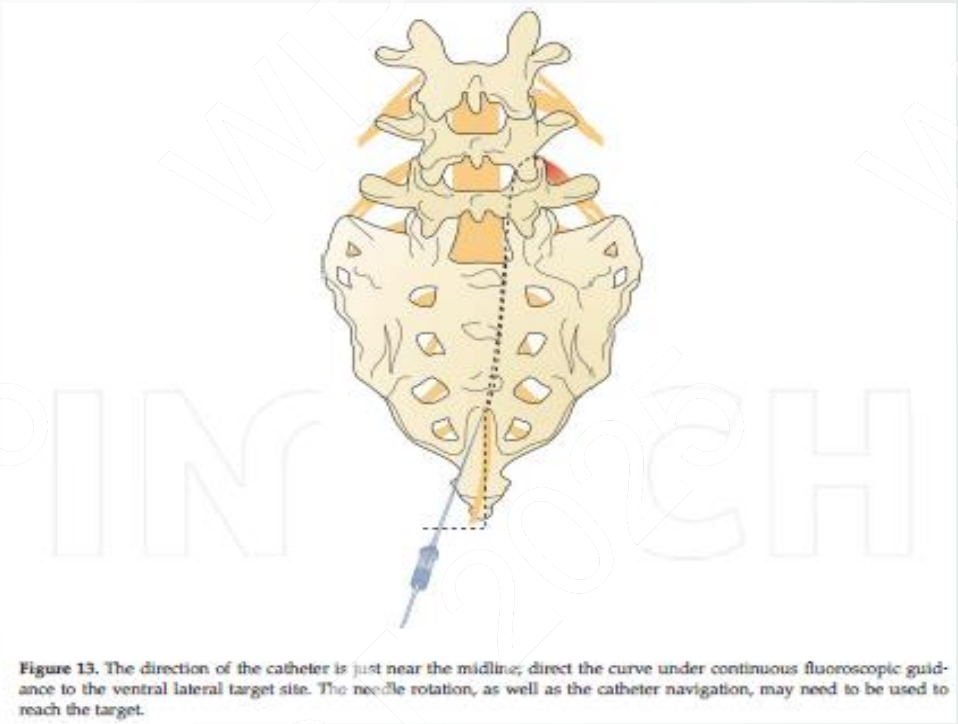


Figure 13. The direction of the catheter is just near the midline; direct the curve under continuous fluoroscopic guidance to the ventral lateral target site. The needle rotation, as well as the catheter navigation, may need to be used to reach the target.

Racz katheter is inserted through the epidural needle and advanced to the antero-lateral area of the filling defect. 10 mL of radiopaque contrast material is injected to confirm epidural placement and identify any filling defects suggestive of epidural adhesions.

Typical Infusion Volumes for Epidural Adhesiolysis

	Contrast	Hyaluronidase and Normal Saline	Local Anesthetic and Steriod	10% Hypertonic Saline Infusion
Caudal	10 mL	10 mL	10 mL	10 mL
Caudal and transforaminal	5 mL in each catheter	5 mL in each catheter	5 mL in each catheter	8 mL in caudal catheter and 4 mL in transforaminal catheter
Thoracic	8 mL	8 mL	8 mL	8 mL
Cervical	5 mL	6 mL	6 mL	5 mL

Neural flossing

- Neural flossing exercises is designed to mobilize nerve roots by "sliding" them in and out of the foramen.
- This breaks up weakened scar tissue from the procedure and prevents further scar tissue deposition.
- If these exercises are done effectively three to four times per day for a few months after the procedure, the formation of scar tissue will be severely restricted.

Systematic Review

Percutaneous and Endoscopic Adhesiolysis in Managing Low Back and Lower Extremity Pain: A Systematic Review and Meta-analysis

Standiford Helm, MD[1], Gabor B. Racz, MD[2], Ludger Gerdesmeyer, MD[3], Rafael Justiz, MD[4], Salim M. Hayek, MD[5], Eugene D. Kaplan, MD[6], Mohamed Ahamed El Terany, MD[7], and Nebojsa Nick Knezevic, MD, PhD[8]

Percutaneous adhesiolysis of epidural adhesions to treat refractory low back and lower extremity pain is a technique whose efficacy has been documented by multiple RCTs.

It is a safe and effective procedure, with minimal complications when performed by trained practitioners.

PSS ADHESIOLYSIS EVIDENCE

Study Study Characteristic Methodological Quality Scoring	Number of Patients & Selection Criteria	Interventions/ Control	Outcome measures	Time of Measurement	Results	Weaknesses	Strengths	Conclusions
Chun-jing et al 2012 (63) Randomized, active control Cochrane 12/13 IPM-QRB 34/48	92 patients with pain and radiculopathy 6 months after surgery for disc herniation 76 patients were evaluated	Catheter with guidewire was passed to ventral epidural space. 50-90 mL and 10 mg of dexamethasone were injected in the treatment group. Control group received 10 mg dexamethasone only	VAS, Opioid use; MacNab criteria	1 week, one month,6 months	3.24 mean decrease in VAS at 6 months in treated group, vs .82 in control. Patients in treated group who did not have improvement in dye flow did not have clinical improvement	Lateral views only were obtained; no measure of function	High quality study	Adhesiolysis is effective using the vascular catheter with ventral placement of the catheter. Improvements in dye flow are necessary for good clinical outcomes.
Manchikanti et al 2009 (64) Randomized Active Control Cochrane 12/13 IPM-QRB 42/48	120 Post lumbar surgery syndrome	Adhesiolysis with 10% saline vs S3 caudal injection with 0.9% saline	NRS, ODI, employment status, opioid use	3, 6 and 12 months	~70% of adhesiolysis procedures had >50% relief and also >40% ODI improvement at 12 months, vs ~12% of caudal. Average of 3.5 adhesiolysis procedures vs. 2.2 caudal injection	33 of 60 in the control group were lost to follow up at 12 months, vs 2 in the adhesiolysis. 43 control were unblinded prematurely vs 2 in the control	High quality equivalency study.	Adhesiolysis, one day, repeated up to 4 times a year, is effective in providing decreased pain and increased function in the post lumbar surgery population.
Heavner et al 1999 (66) Randomized active control Cochrane 10/13 IPM-QRB 23/48	83	Adhesiolysis in four groups, 0.9% saline, 10% saline, with or without hyaluronidase	VAS, McGill Pain Questionnaire	3, 6, 12 months	No significant difference between the four groups. Adhesiolysis did provide pain relief in about 50% of subjects. Most subjects require more than one procedure	Successful pain relief was 10/100 reduction in VAS. 24 of 83 patients were removed from study	Showed only moderate additional benefit from either 10% saline or hyaluronidase	Moderate quality study comparing 4 treatment options. Reduced additional procedures
Manchikanti et al 2004 (69) Randomized active control Cochrane 12/13 IPM-QRB 37/48	75	One-day adhesiolysis with either 0.9% or 10% saline vs epidural steroid injection.	VAS, ODI, work status, opioid intake, range of motion measurement, and P-3	3, 6, 12 months	72% of adhesiolysis and hypertonic neurolysis and 60% of 0.9% saline adhesiolysis compared to 0% of epidural group had >50% relief at12-months	18 of the ESI group were unblinded by 6 months. Repeat procedures allowed based upon response to previous procedures, rather than examining one injection only.	Comparison of hypertonic and normal saline vs epidural steroid injection	High quality RCT showing that adhesiolysis provides significant relief regardless of whether normal saline or hypertonic saline is used.

Pain Physician: July/August 2019: 22:307-322

EVIDENCE OF PERCUTANEOUS ADHESIOLYSIS IN THE LUMBAR SPINE

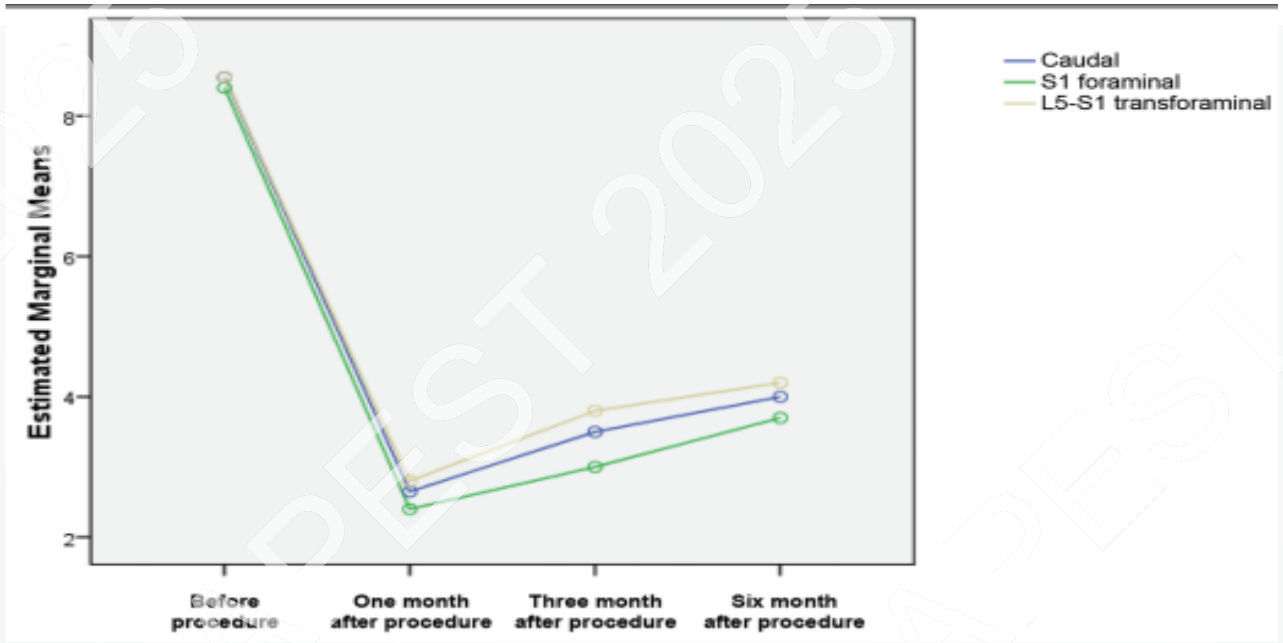
	EVIDENCE	Systematic Review Guidelines
Post-Surgery Syndrome	LEVEL I	Manchikanti et al. 2019
Central Spinal Stenosis	LEVEL II	Manchikanti et al. 2013 Helm et al.2016
Disc Herniation Radiculitis	LEVEL II	Manchikanti et al. 2013 Helm et al. 2016

Case-Control Study

Comparison of 3 Approaches to Percutaneous Epidural Adhesiolysis and Neuroplasty in Post Lumbar Surgery Syndrome

Mert Akbas, MD[1], Abdel Reheem Elawamy, MD[2], Haitham Hamdy Salem, MD[3], Ahmed Zaghloul Fouad, MD[4], Nisreen Adel Abbas, MD[5], and Gozde Dagistan, MD[1]

Conclusion: The 3 anatomical approaches (caudal, S1 foraminal, and L5-S1 transforaminal) result in the same outcome with regard to pain relief and complication rate.



The Factors Affect The Efficacy

- Epidurography patterns ?
- Conrast run off ?
- Catheter tip position ?
- Duration of the procedure ?

Research Article

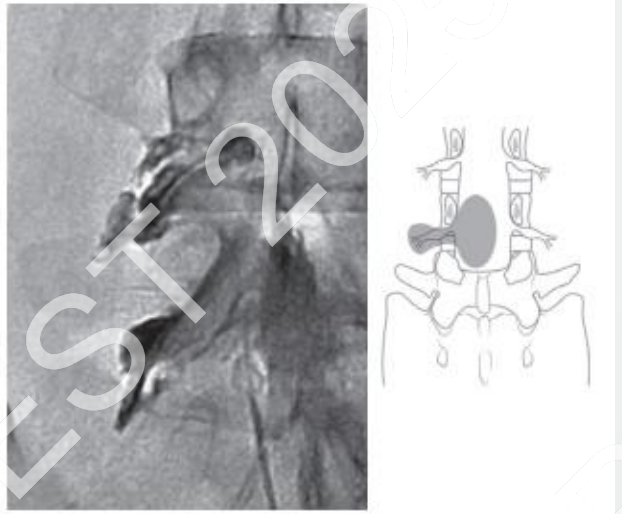
Clinical Significance of Epidurography Contrast Patterns after Adhesiolysis during Lumbar Percutaneous Epidural Neuroplasty

Sang-Hyuk Park,[1] Gyu Yeul Ji,[2] Pyung Goo Cho,[3] Dong Ah Shin,[2] Young Sul Yoon,[2] Keung Nyun Kim,[2] and Chang Hyun Oh[4]

Results. The VAS scores for back and leg pain, ODI score, and SF-12 score exhibited a significant improvement during the follow-up period ($P < 0.01$ versus preprocedural scores). At most follow-up time points, patients exhibiting extraforaminal contrast distribution ($n = 22$) on postadhesiolysis epidurograms exhibited a similar improvement in VAS scores and a significantly better improvement in ODI and SF-12 scores compared with patients exhibiting intracanal contrast distribution ($n = 56$). *Conclusion.* Extraforaminal contrast distribution during lumbar PEN may be associated with better functional outcomes.

- This study suggest that the contrast patterns on final epidurograms obtained after adhesiolysis are indicators of clinal outcomes.
- In conclusion they showed that extraforaminal contrast spread during PEN is associated with better functional outcomes.

Hindawi
Pain Research and Management
Volume 2018, Article ID 6268045, 8 pages
https://doi.org/10.1155/2018/6268045



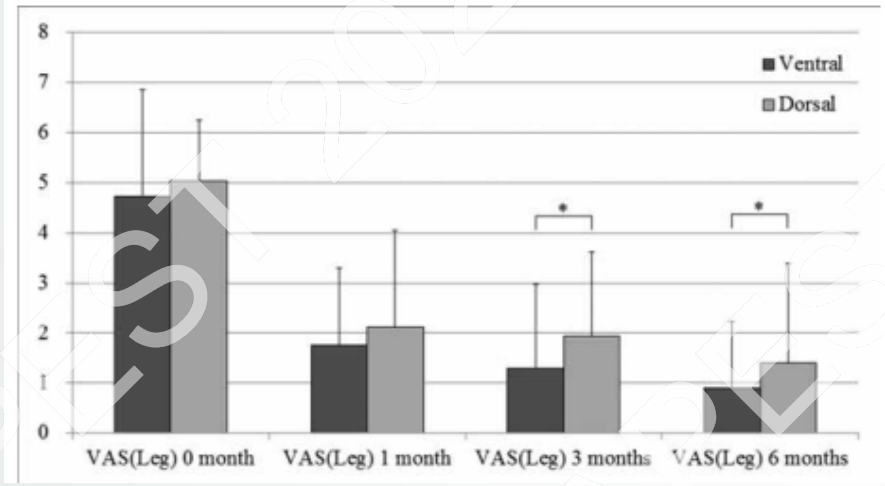
extraforaminal contrast spread

Retrospective Analysis

The Catheter Tip Position and Effects of Percutaneous Epidural Neuroplasty in Patients with Lumbar Disc Disease During 6-Months of Follow-up

Chang Hyun Oh, MD[1], Gyu Yeul Ji, MD[1,2,3], Pyung Goo Cho, MD[2], Won-Seok Choi, MD[1], Dong Ah Shin, MD, PhD[2,3], Keung Nyun Kim, MD, PhD[2,3], and Hyun-ah Kang, MS[1]

Conclusion: In this short-term follow-up study, the effects of lumbar PEN on VAS scores were different according to the position of the catheter tip in patients with single-level lumbar disc herniation. Better outcomes in the Ventral group may have been achieved by more localized treatment with a selective block in the epidural space closer to the dorsal root ganglion and ventral aspect of the nerve root.



Pain Physician 2014; 17:E599-E608

Epidural Lysis of Adhesions

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Frank Lee, David E. Jamison*, Robert W. Hurley†, and Steven P. Cohen†

Korean J Pain 2014 January; Vol. 27, No. 1: 3-15

Table 2. Evidence Supporting Different Components of Epidural LOA

Components	Evidence
Hyaluronidase	Conflicting [38,67,68]
Hypertonic saline	Moderately postive [38,42,43]
High volume	Strong evidence [24]
Mechanical disruption	None

Heavner JE, Racz GB, Raj P. Percutaneous epidural neuroplasty: prospective evaluation of 0.9% NaCl versus 10% NaCl with or without hyaluronidase. Reg Anesth Pain Med. 1999;24:202–207.

Kim SB, Lee KW, Lee JH, Kim MA, Kim BH. The additional effect of hyaluronidase in lumbar interlaminar epidural injection. Ann Rehabil Med. 2011;35:405–411.

Manchikanti L, Singh V, Cash KA, Pampati V, Datta S. A comparative effectiveness evaluation of percutaneous adhesiolysis and epidural steroid injections in managing lumbar post surgery syndrome: a randomized, equivalence controlled trial. Pain Physician. 2009;12:E355–E368.

Rabinovitch DL, Peliowski A, Furlan AD. Influence of lumbar epidural injection volume on pain relief for radicular leg pain and/or low back pain. Spine J. 2009;9:509–517.

Kim SB, Lee KW, Lee JH, Kim MA, An BW. The effect of hyaluronidase in interlaminar lumbar epidural injection for failed back surgery syndrome. Ann Rehabil Med. 2012;36:466–473.

Manchikanti L, Cash KA, McManus CD, Pampati V, Singh V, Benyamin R. The preliminary results of a comparative effectiveness evaluation of adhesiolysis and caudal epidural injections in managing chronic low back pain secondary to spinal stenosis: a randomized, equivalence controlled trial. Pain Physician. 2009;12:E341–E354.

Complications of Epidural Neuroplasty: A Retrospective Evaluation

Gul K. Talu, MD, ▪ Serdar Erdine, MD

Department of Algology, Medical Faculty of Istanbul, Istanbul University, Istanbul, Turkey

Complications	Cervical N, N/T,%	Lumber N, N/T,%	Total N, N/T,%
Bending of the tip of needle	1, 1/56, 1.7%	11, 11/194, 5.6%	12, 12/250, 4.8%
Tearing of the catheter	1, 1/56, 1.7%	2, 2/194, 1.0%	3, 3/250, 1.2%
Breaking of the catheter in epidural space	–	1, 1/194	1, 1/250, 0.4%
Blood aspiration in the epidural space	4, 4/56, 7.1%	35, 35/194, 18%	39, 39/250, 15.6%
Termination of procedure due to bleeding	–	10, 10/194, 5%	10, 10/250, 4%
Misplacement (Paravertebral space, vein, intradural)	2, 2/56, 3.5%	18, 18/194, 9.2%	20, 20/250, 8%
Problems of catheter withdrawal	1, 1/56, 1.7%	4, 4/194, 2.0%	5, 5/250, 2.0%
Blocking of the catheter	1, 1/56, 1.7%	5, 5/194, 2.5%	6, 6/250, 2.4%
Hypotension	4, 4/56, 7.1%	8, 8/194, 4.1%	12, 12/250, 4.8%
Respiratory depression	–	1, 1/194, 0.5%	1, 1/250 0.4%
Migration	–	3, 3/1941.5%	3, 3/250, 1.2%
Numbness			
Transient	4, 4/56, 7.1%	15, 15/194, 7.5%	19, 19/250, 7.6%
Prolonged	–	3, 3/194, 1.5%	3, 3/250, 1.2%
Bowel-bladder dysfunction	–	3, 3/194, 1.5%	3, 3/250, 1.2%
Sexual disjunction	–	1, 1/194, 0.5%	1, 1/250, 0.4%
Headache	–	1, 1/194, 0.5%	1, 1/250, 0.4%
Infection at entrance site	–	8, 8/194, 4.1%	8, 8/250, 3.2%
Epidural abscess	1, 1/56, 1.7%	2, 2/1941.0%	3, 3/250, 1.2%
Meningitis	–	1,1/194, 0.5%	1, 1/250, 0.4%

Neuromodulation, Volume 6, Number 4, 2003 237-247

Epidural Lysis of Adhesions

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Frank Lee, David E. Jamison*, Robert W. Hurley†, and Steven P. Cohen†

Table 3. Complication Rates for Epidural LOA

5%	
Intravascular injection [70]	11.6%
>1% and <5%	
Bent needle tip [71]	4.8%
Intrathecal placement of catheter [71]	4.4%
Transient nerve irritation [70]	1.9%
Durapuncture [70]	1.8%
Torn catheter during withdrawal [71]	1.2%
Epidural abscess [71]	1.2%
1%	
Profuse bleeding [70]	1.0%
Meningitis [71]	0.5%
Sheared catheter remnant [71]	0.4%
Post lumbar puncture headache [70]	0.12%

Korean J Pain 2014 January; Vol. 27, No. 1: 3-15

Complications

Most common complications:

- **Intravascular injection**
- **Dural puncture**
- **Catheter shearing**
- **Infection**

Talu G, Erdine S. Complications of epidural neuroplasty: a retrospective evaluation. *Neuromodulation*. 2003;6(4):237–247.

Wagner KJ, Sprenger T, Pecho C, et al. Risks and complications of epidural neurolysis—a review with case report. *Anasthesiol Intensivmed Notfallmed Schmerzther. 2006;41(4):213–222.*

Perkins WJ, Davis DH, Huntoon MA, Horlocker TT. A retained Racz catheter fragment after epidural neurolysis: implications during magnetic resonance imaging. *Anesthesia & Analgesia*. 2003;96(6):1717–19.

Richter H. Is the so-called epidural neuroplasty (Racz catheter) a harmless procedure? In: Neurochirurgie DGf, ed. *Deutsche Gesellschaft Fur Neurochirurgie*. Strasbourg, Germany: Deutsche Gesellschaft fur Neurochirurgie; 2005. Literature surrounding adhesiolysis complications

Immediate complications

- Epidural space bleeding
- Needle damage
- Penetration of the dura
- Dural rent, intrathecal injection and attendant complications
- Shearing of the catheter
- Hypotension

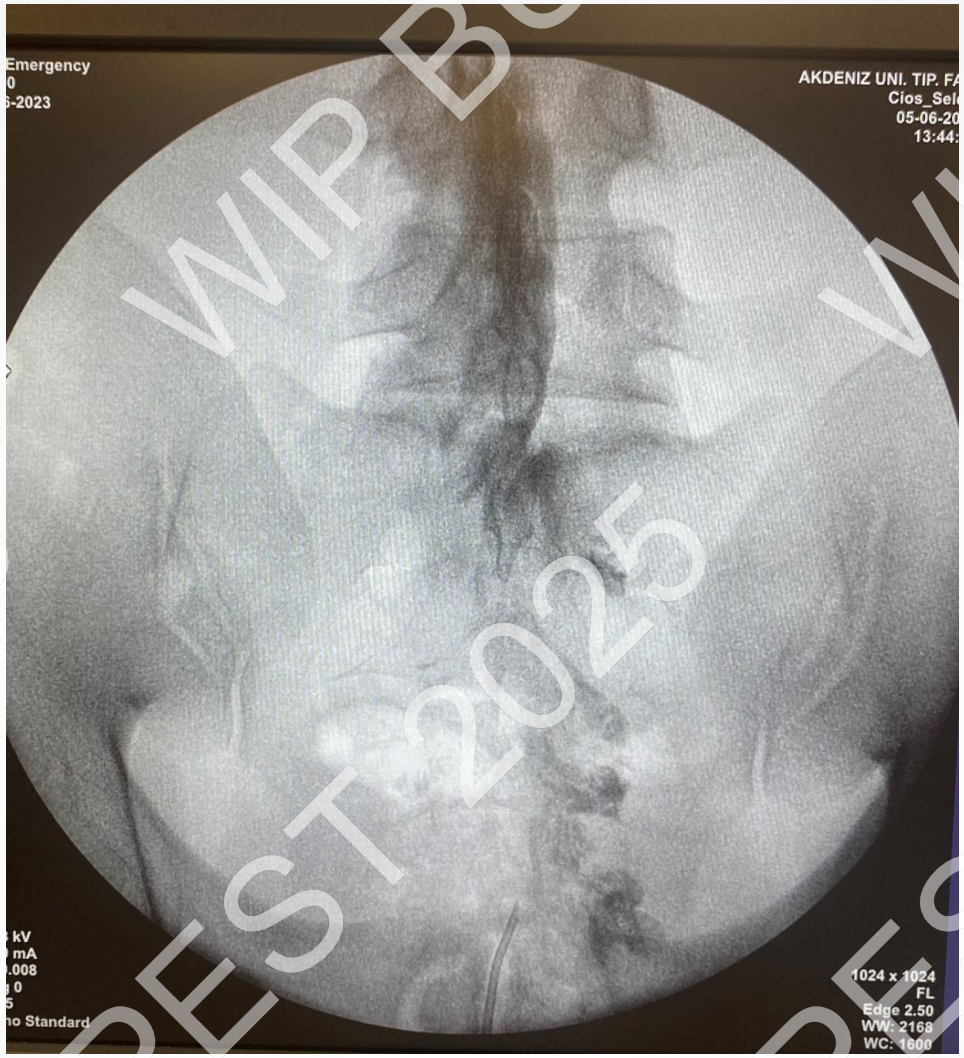
Late Complications

- Penetration of the dura
- Dermatomal sensory or motor loss
- Bowel and bladder dysfunction from damage to neural structures
- Sexual dysfunction
- Headache
- Infection at the site of penetration
- Epidural abscess and hematoma
- Arachnoiditis

Conclusion

- In conclusion, percutaneous epidural neuroplasty with the Racz catheter is effective for pain reduction and functional improvement in patients with chronic low back and lower extremity pain refractory to conservative treatment and decreases the need for surgical treatment.

Percutaneous adhesiolysis is a safe and effective treatment for chronic refractory low back and lower extremity pain.


Emergency
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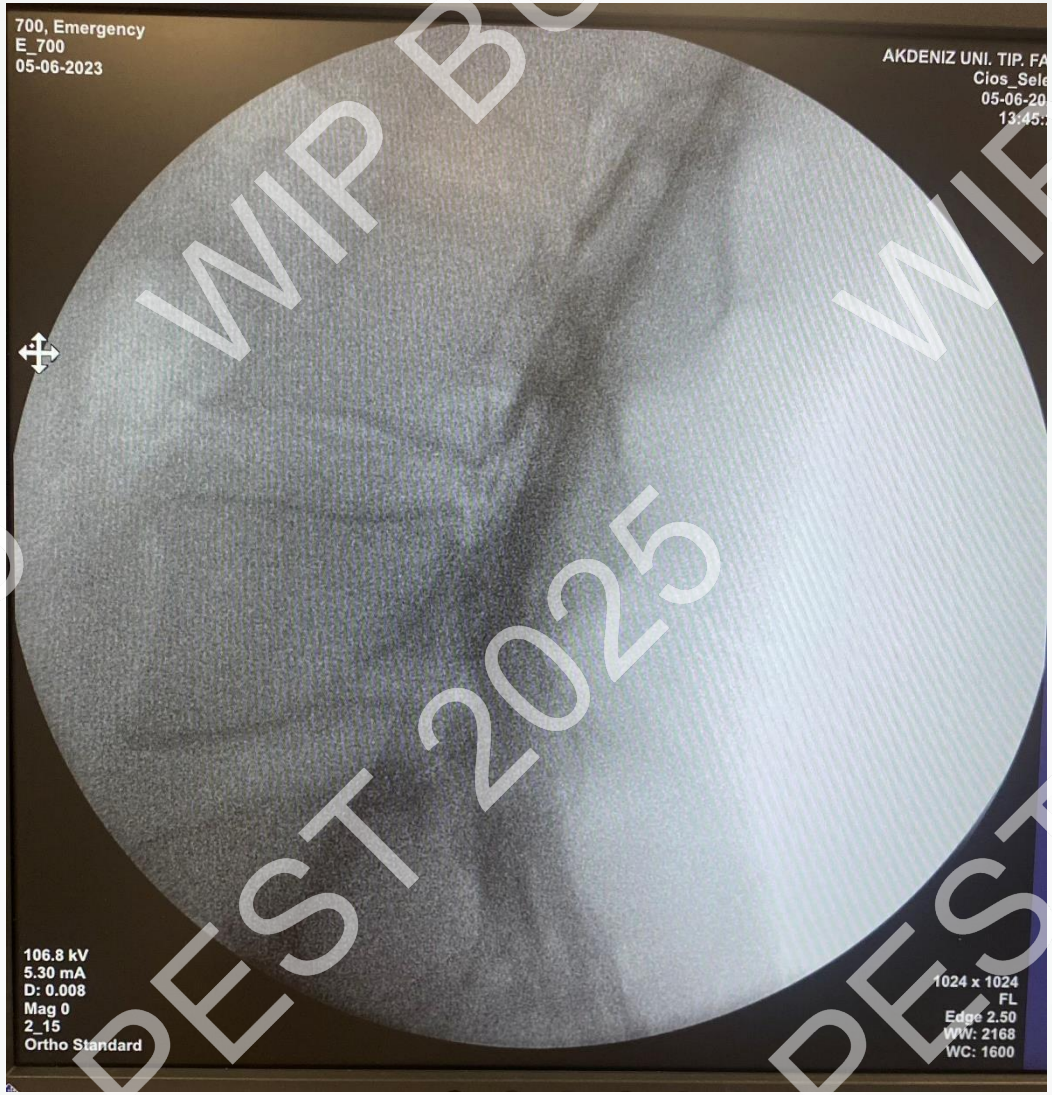
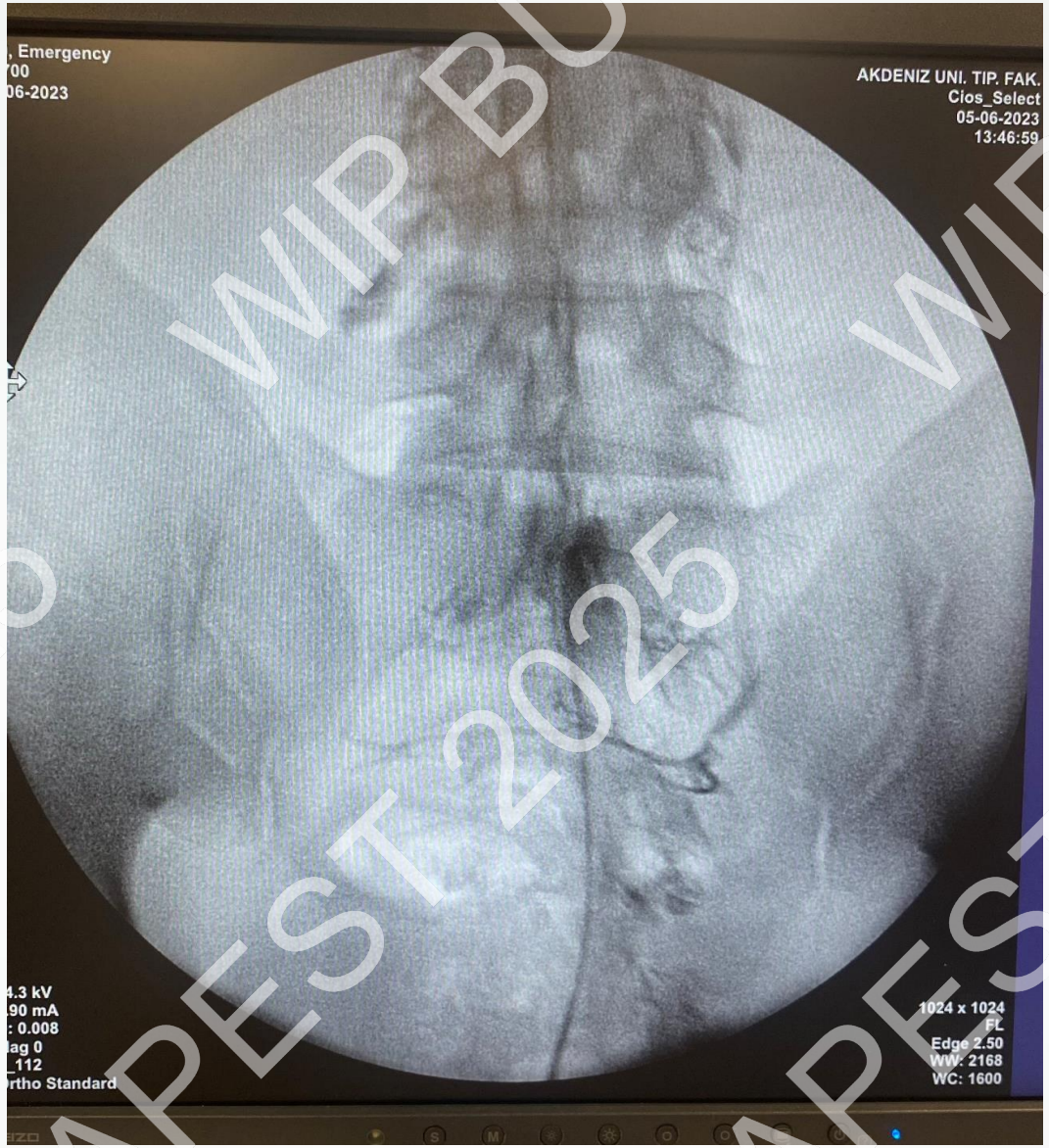
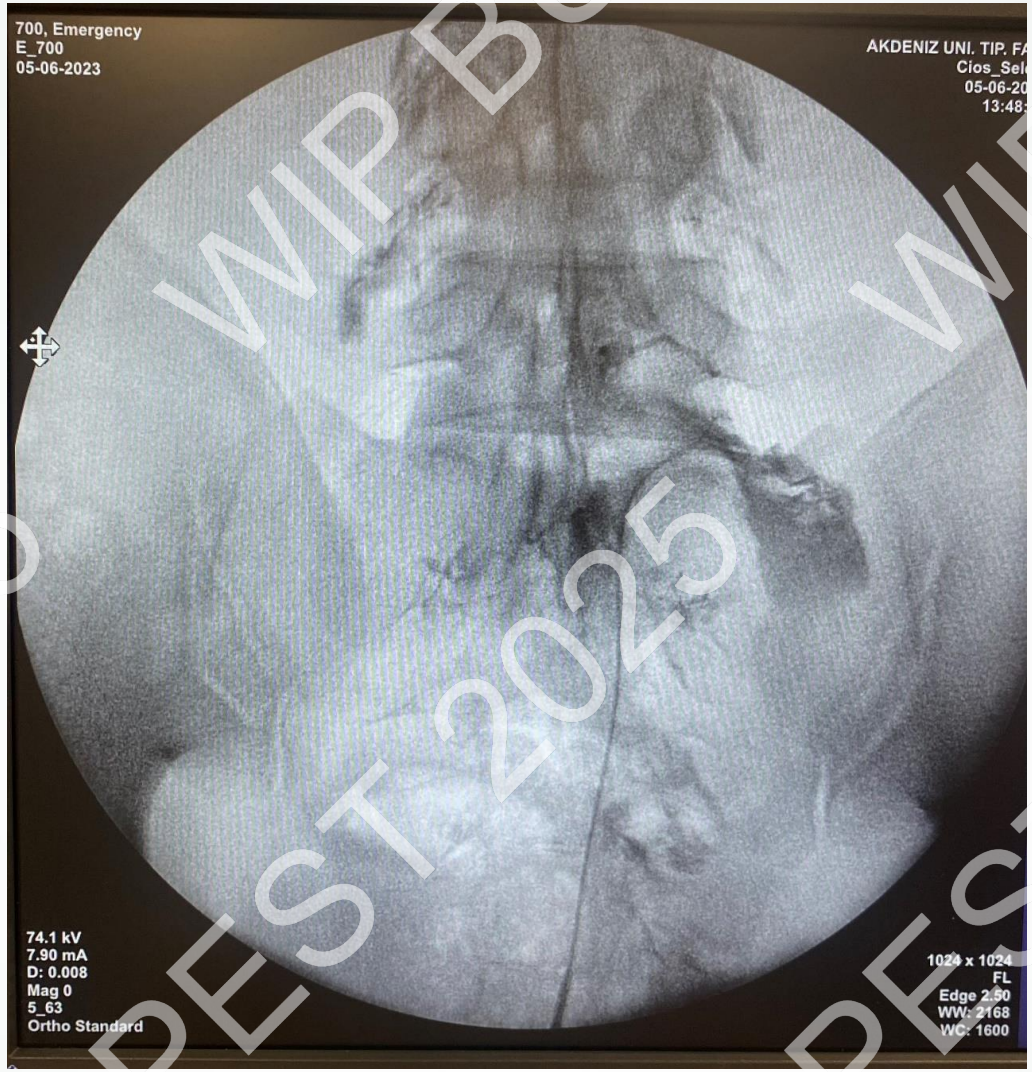
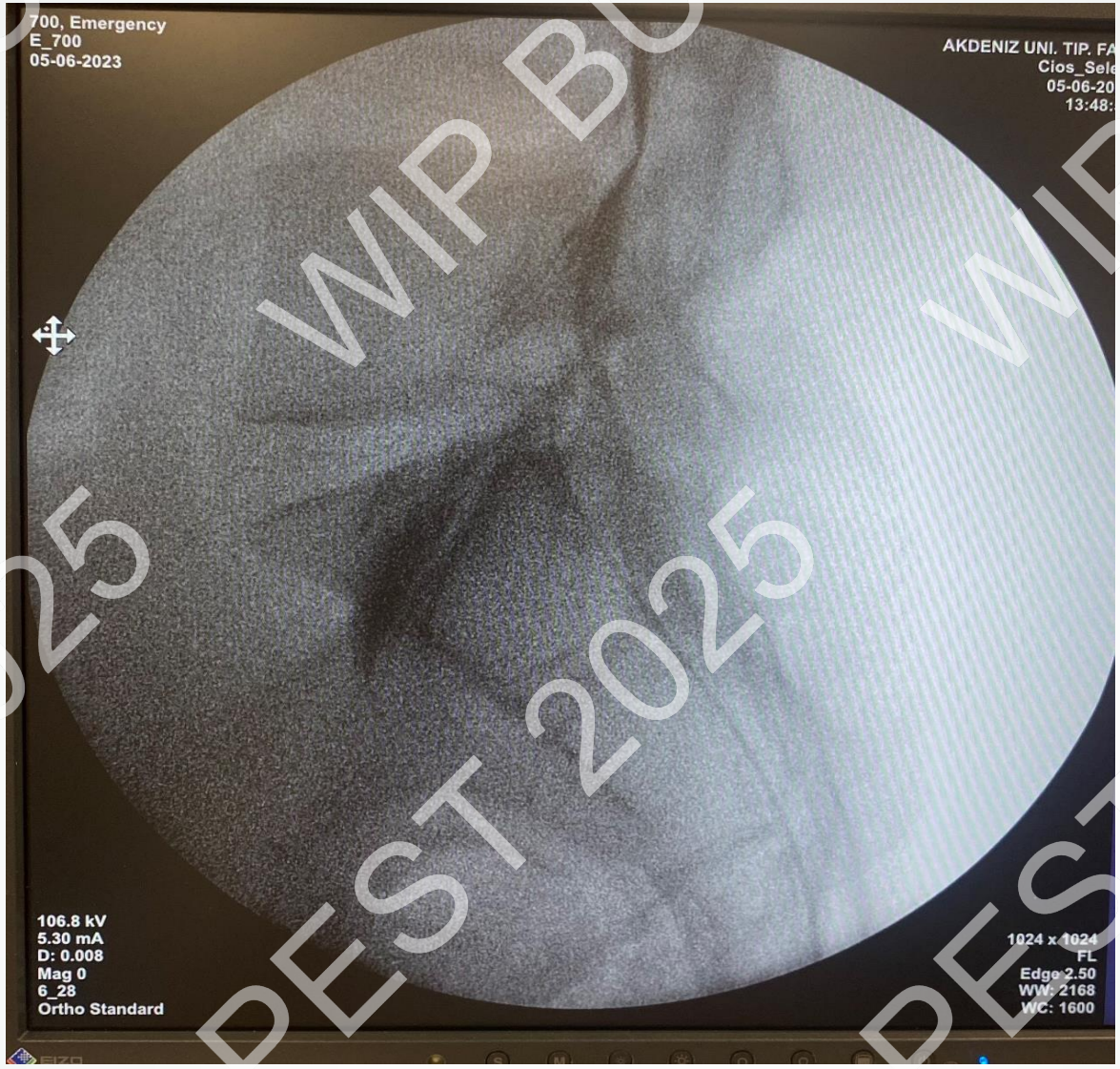
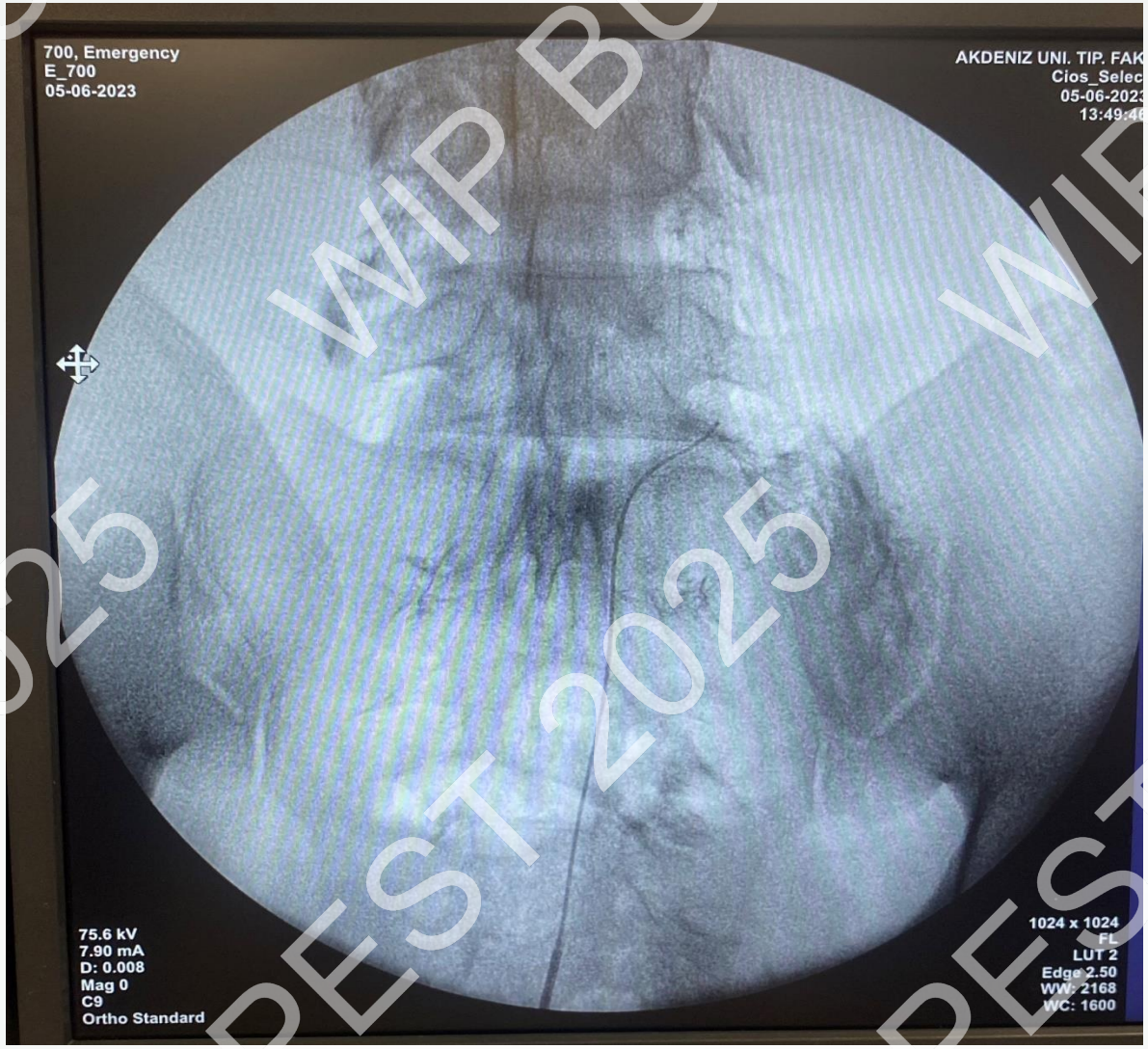
WC: 1600

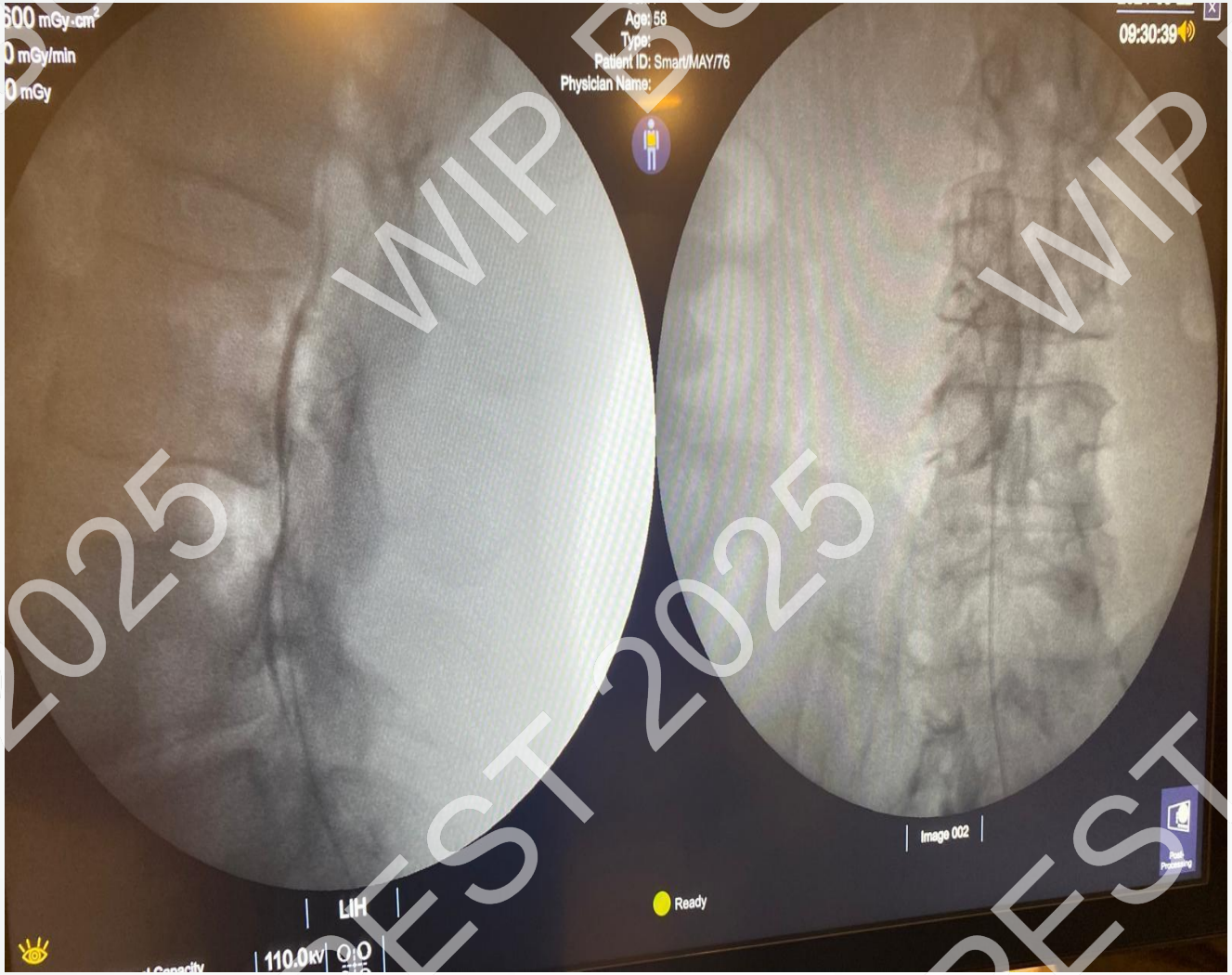


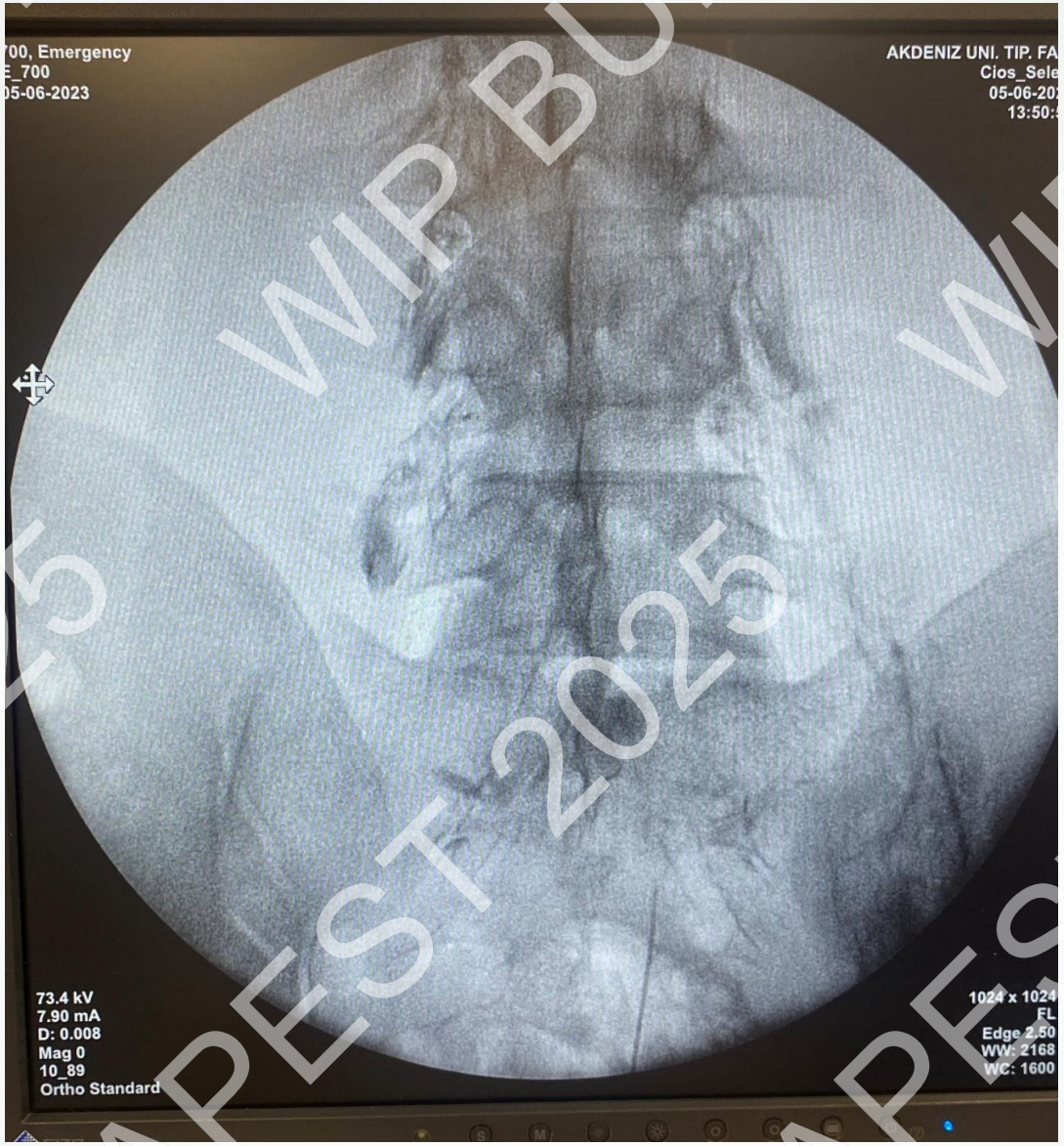


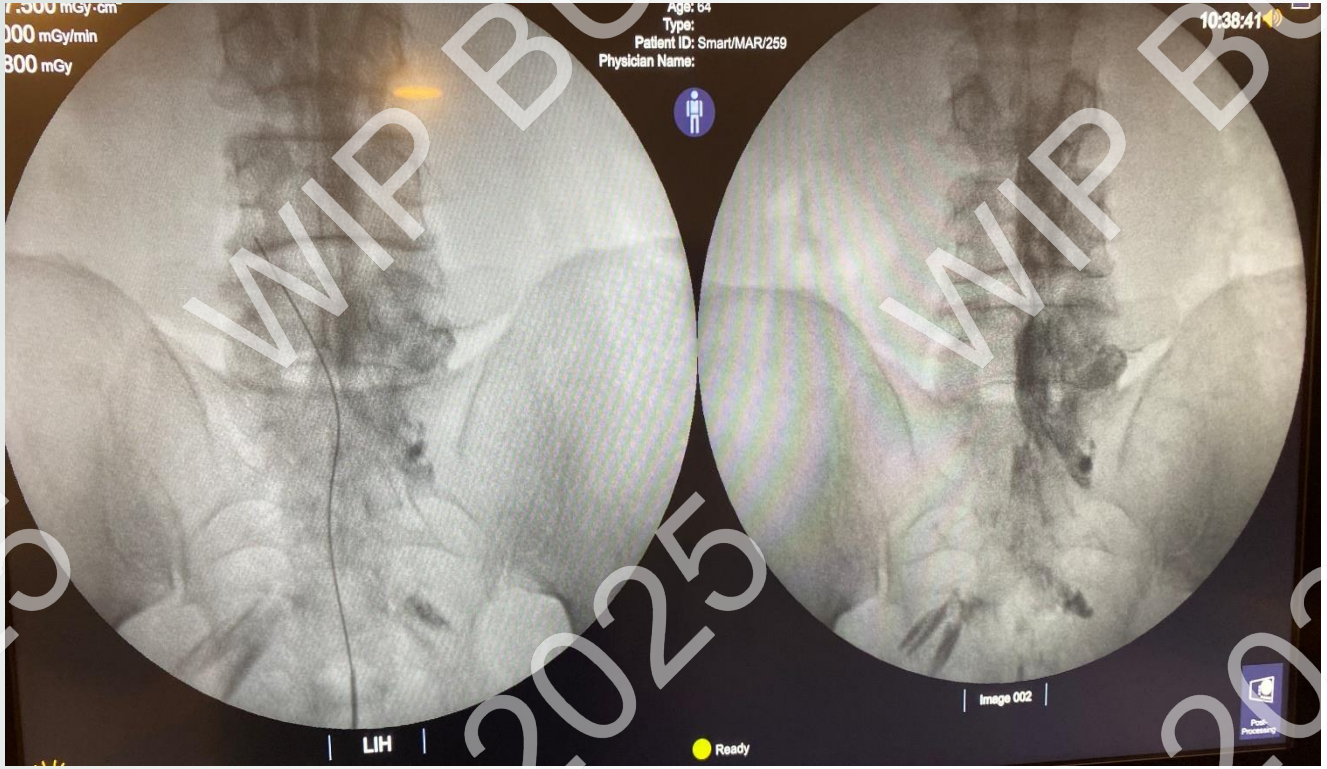


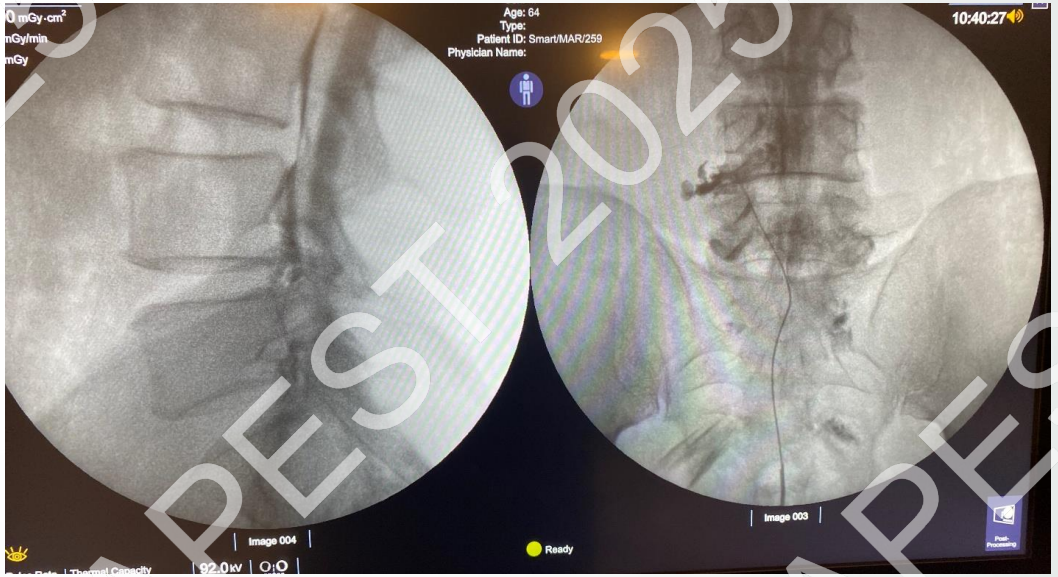












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