RSNA 2018 TOMORROW'S RADIOLOGY TODAY

Love All Serve All

Evaluation of a low dose technique for the performance of CT guided lumbar foraminal nerve blocks

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INTRODUCTION

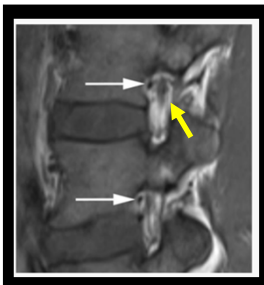
CT Guided Lumbar Foraminal Nerve Blocks

→Epidural steroid injections are a cornerstone of conservative treatment for radiculopathy.

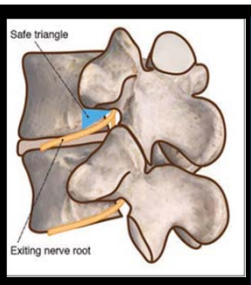
→The three main techniques for performing epidural steroid injections in the lumbar spine include transforaminal, interlaminar, and caudal approach.

→Transforaminal approach, the focus of this project, has ability to deliver therapeutic agents as close as possible to the source of the pain.

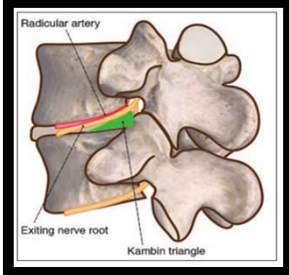
→There are three types approach for transforaminal injection:
1. Safe triangle approach
2. Posterolateral approach
3. Kambin triangle approach



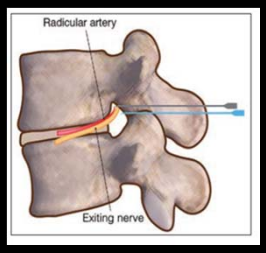
Normal anatomy:
White arrow – Radicular artery
Yellow arrow - Nerve



Safe triangle approach-
Subpedicular or supraneural Approach
-Not safe (artery and nerve injury)



Kambin triangle approach:
- Infraneural approach
- Safe approach



Posterolateral approach:
-Modification of the safe triangle approach with the needle tip remaining in the posterior portion of the neural foramen

Reference: Mandell JC, Czuczman GJ, Gaviola GC, Ghazikhanian V, Cho CH. The lumbar neural foramen and transforaminal epidural steroid injections: an anatomic review with key safety considerations in planning the percutaneous approach. Am J Roentgenol. 2017;209(1):W26–35

Complications

Spinal ischemia:
→Unintentional intraarterial injection of steroid into a radiculomedullary artery

→ More likely with particulate steroids, No cases reported with use of Dexamethasone (non particulate)

→Direct vascular trauma or vasospasm have also been suggested as factors possibly contributing to distal ischemic insult

Lower limb paresis:
→ With respect to position of injection in neural foramen – only 18 cases reported in literature – due to Superior portion (77.7%), midzone (22.2%); no cases were identified with injection in the inferior portion of neural foramen

Reference: Mandell JC, Czuczman GJ, Gaviola GC, Ghazikhanian V, Cho CH. The lumbar neural foramen and transforaminal epidural steroid injections: an anatomic review with key safety considerations in planning the percutaneous approach. Am J Roentgenol. 2017;209(1):W26–35

CT Guided Lumbar Foraminal Nerve Blocks

AIM OF PROJECT:

To evaluate performance of low-dose technique CT guided nerve block in terms of percentage dose reduction and degree of pain alleviation in comparison to routine protocol

MATERIALS

→All scans were performed on the GE HD 750 Discovery 128 slice 64 detector-row CT scanner.

→ Scan parameters for the routine spine protocol were 120 kVp and automated mAs for scannogram followed by 100 kVp and 80 mAs for the following scans. Scan parameters for the low-dose protocol were; 80 kVp and 40 mAs for all scans.

→ For both protocols – Kambin triangle approach and non particulate Dexamethasone steroid injection was given.

→ Both protocols – 22G spinal needle nerve block after adequate local anaesthesia. Iohexol 0.5 ml contrast mixed with 1.5ml sterile water upto 2ml (1:3 dilution) and injected through spinal needle to look for epidural and lateral spill.

→ 1ml Bupivacaine and 1ml Dexamethasone mixed and injected through spinal needle.

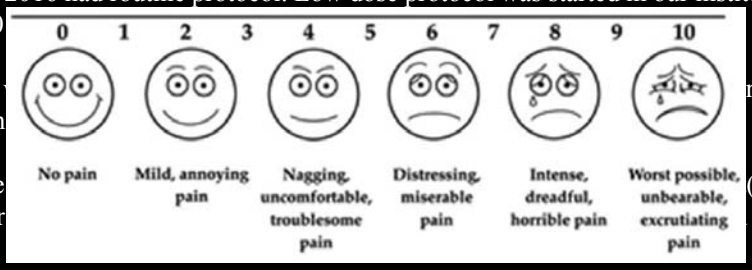
Methods:

→Retrospective study for a period of 2 years, from 2016 to 2017.

→Total of 554 lumbar foraminal nerve blocks were performed. All procedures were performed by 3 radiologists of 2 year experience during their rotational postings.

→ Procedures done using the low-dose interventional protocol were compared with matched controls who underwent the procedure using the routine spine intervention protocol. These patients were matched for BMI and degree of degenerative changes in the spine.

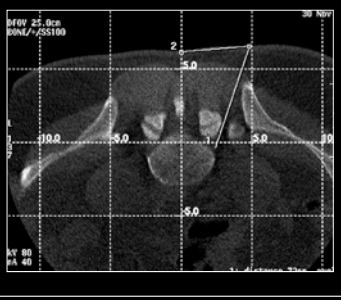
→Patients in year 2016 had routine protocol. Low dose protocol was started in our institute from 2017, hence all patients in year 20

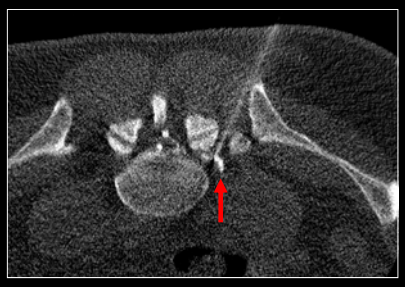


→ Obese patients r intervention, procedure was done in routin

→ The scans were (DLP), the number of scans required for lateral spill into the spinal canal

→Pre injection, post injection 1 hour and follow up 1 month – Pain was quantified with "Wong Baker pain scale"





Exam Description: CT GUIDED NERVE BLOCK

Dose Report

Series	Type	Scan Range (mm)	CTDIvol (mGy)	DLP (mGy-cm)	Phantom cm
1	Scout	-	-	-	-
2	Helical	S30.500-I22.000	0.84	7.87	Body 32
2	Axial	S13.000-S3.000	0.74	0.92	Body 32
2	Axial	S13.000-S3.000	0.74	0.92	Body 32
2	Axial	S13.000-S3.000	0.74	0.92	Body 32
2	Axial	S13.000-S3.000	0.74	0.92	Body 32
2	Axial	S13.000-S3.000	0.74	0.92	Body 32
2	Axial	S13.000-S3.000	0.74	0.92	Body 32
			Total Exam DLP:	13.38	

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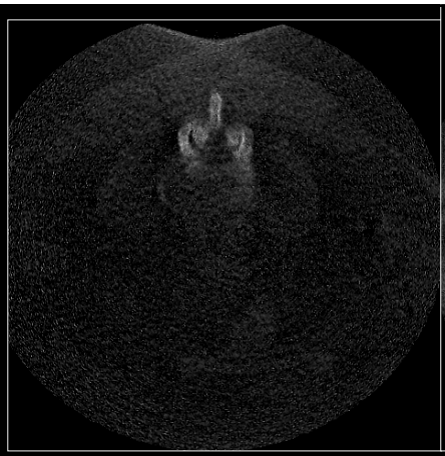
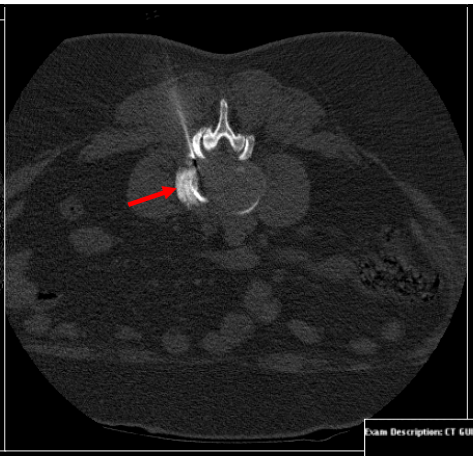
Low dose protocol with lateral (red arrow) and epidural spill (yellow arrow)
Number of scans for needle positioning – 6 scans
DLP 13.3 mGy-cm





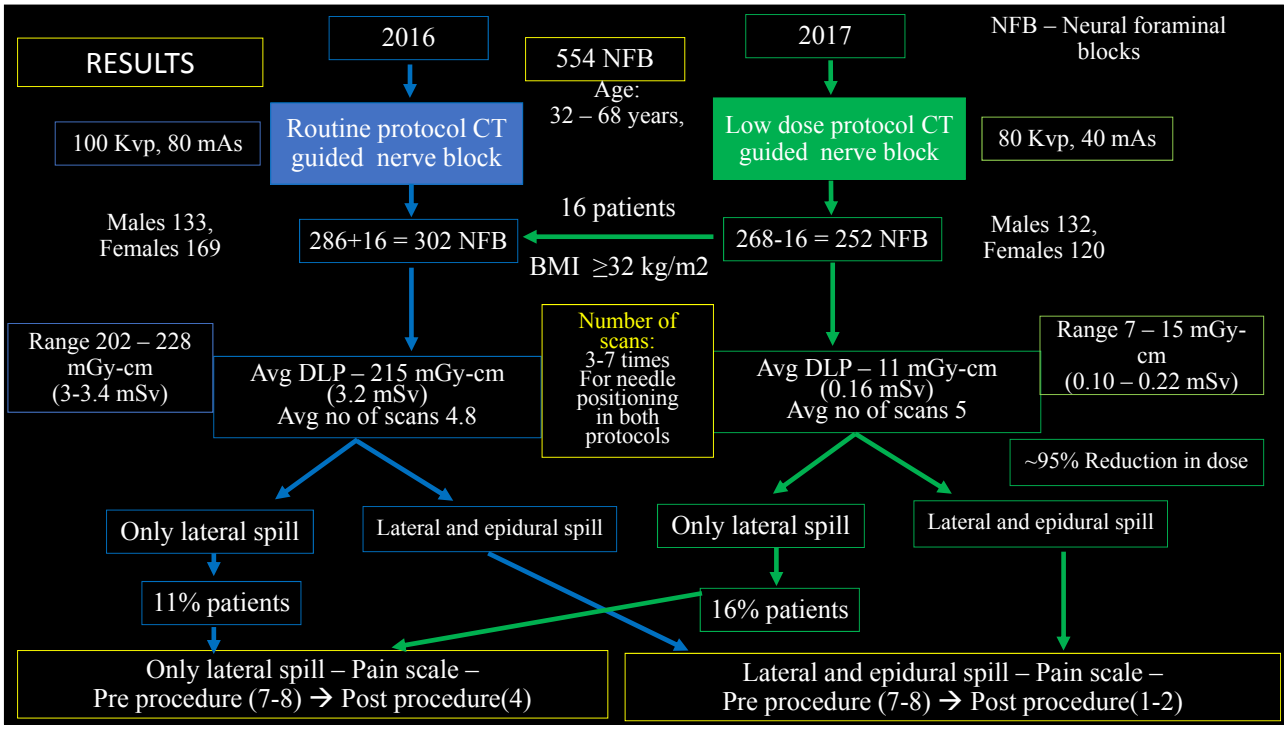
42 year old female of BMI 32 kg/m2 low dose protocol was selected, pre procedure planning images were suboptimal and procedure was done with routine spine intervention protocol. Lateral spill seen (red arrow), no epidural spill

Number of scans for needle positioning – 6 scans
DLP - 237 mGy-cm

Exam Description: CT GUIDED NERVE BLOCK

Dose Report

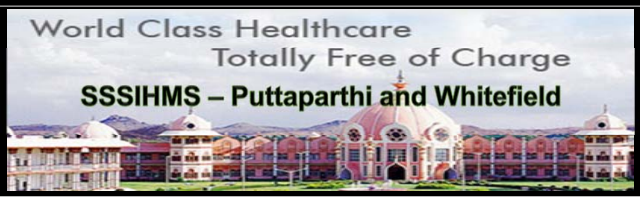
Series	Type	Scan Range (mm)	CTDIvol (mGy)	DLP (mGy-cm)	Phantom cm
1	Scout	-	-	-	-
2	Helical	S26.750-I20.750	0.84	7.45	Body 32
4	Helical	S20.750-I21.750	23.55	196.91	Body 32
4	Axial	S10.700-S0.700	6.88	8.60	Body 32
4	Axial	I1.800-I1.800	6.88	1.72	Body 32
4	Axial	I4.300-I4.300	6.88	1.72	Body 32
4	Axial	S13.200-S0.700	6.88	10.32	Body 32
4	Axial	I1.800-I1.800	6.88	1.72	Body 32
4	Axial	S10.000-S0.000	6.88	8.60	Body 32
			Total Exam DLP:	237.04	



CONCLUSION

- Reduction by ~95% dose in low dose protocol (Avg: 0.16 mSv) in comparison to dose in routine spine protocol (Avg: 3.2mSv). Quality improvement factor - High degree of dose reduction with similar post procedure results.
- No significant difference in number of scans for positioning of needle between low dose and routine spine protocol
- No significant difference in pain scale rating in lateral spill and lateral with epidural spill between low dose and routine spine protocol.
- Low dose protocol is not possible with BMI ≥32 kg/m2
- Patients with lateral and epidural spill had better pain alleviation in comparison to patients with only lateral spill.
- No post procedure complications

Thank You…



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