



Comparing the radiation dose for L1-S1 nerve root blocks between surgeons and radiologists in the private sector and NHS



No Conflicts of Interest

Background



- Nerve Root Blocks / Foraminal Epidural injections are frequently used for the management of pain secondary to radiculopathy and disc prolapses
- Fluoroscopy machines used for needle guidance – use ionising radiation
- Rough guidelines for radiation dose exposure levels follow the **"ALARA"** principles
- Current guidelines from UK Health Security Agency with proposed **"NDRLs"**
- Outlined that lumbar spine X-ray guided interventions exposure should be no more than **6 Gy.cm²**

Aim



- To investigate average radiation exposure between 5 clinicians in both NHS and Private practice
 - Separated into 2 groups – Spinal Consultants (including their trainees) and Radiologists
 - Specific to lumbar nerve root blocks L1- S1
- Null hypothesis : there is no difference between the Spinal Consultants' (SC) and the Radiologist's (RAD) radiation dose in the NHS and private practice

Methods



- 500 patients' data collected across 5-year period for 5 different clinicians, 3 RADs and 2 SCs
 - 50 patients per clinician per clinical context, NHS or Private Practice (PP)
- Radiation dose (Gy.cm²) from NHS radiology department at UHW and CRIS software at Cardiff Bay Hospital
- Inclusion criteria:
 - all lumbar nerve root block injections / foraminal epidurals ONLY
 - only L1-S1 levels
 - must have MRI report indicating the pathology

Statistics



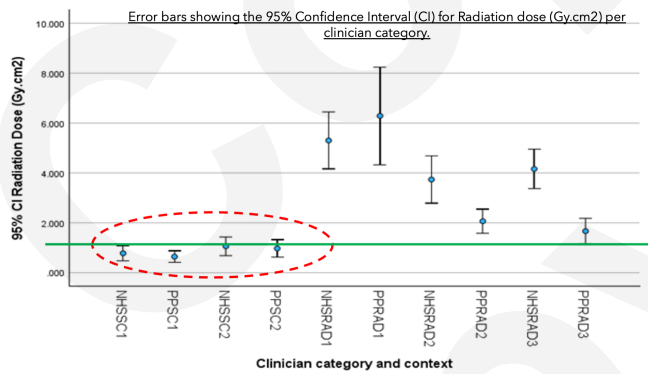
- SPSS used to compare proposed radiation dose reference levels and collected data for radiation dose – one-way T-test
- Welch's test used to compare radiation dose and screening times between SCs and RADs
- ***One-way ANOVA test used to see if there is a difference between the clinicians between themselves, and what context they were in, on the radiation***
- ANOVA two-way tests used to measure effect of pathology / lumbar level of injection on radiation dose
- All p values less than 0.05 (p < 0.05) were considered statistically significant

Results

- Average age 60.2 ± 16.5 years (17 - 97 years)
- 247 females (49.4%) and 253 males (50.6%).
- Average radiation dose for both groups in the NHS and PP was 2.66 Gy.cm2 - Welch's one tailed t-test showed that RADs' radiation dose were greater than the SCs' in both contexts ($p < 0.001$)

	N	Minimum	Maximum	Mean	Std. Deviation
Age at examination	500	17	97	60.17	16.511
Screening Time (s)	500	1.00	261.00	52.9485	47.33389
Radiation Dose (Gy.cm2)	500	0.0146	44.00	2.658373	3.6119538

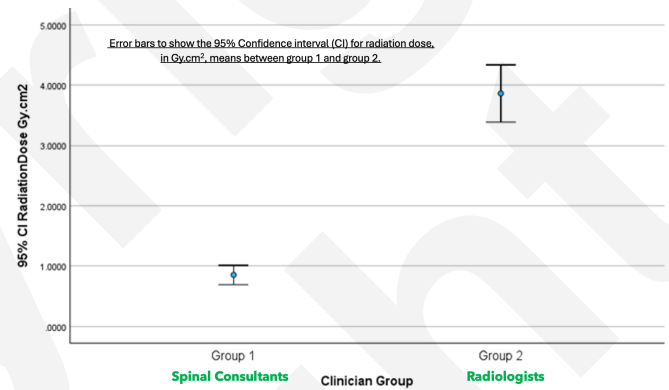
Table 1: Descriptive statistics for 500 patients in both the NHS and PP for both groups



Results

Clinician	NHSSC1	PPSC1	NHSSC2	PPSC2	NHSRAD1	PPRAD1	NHSRAD2	PPRAD2	NHSRAD3	PPRAD3
NHSSC1		1.00	1.00	1.00	<0.001	<0.001	<0.001	0.532	<0.001	0.912
PPSC1			1.00	1.00	<0.001	<0.001	<0.001	0.382	<0.001	0.815
NHSSC2				1.00	<0.001	<0.001	<0.001	0.831	<0.001	0.993
PPSC2					<0.001	<0.001	<0.001	0.747	<0.001	0.981
NHSRAD1						0.842	0.240	<0.001	0.692	<0.001
PPRAD1							0.001	<0.001	0.180	<0.001
NHSRAD2								0.164	1.00	0.027
PPRAD2									0.023	1.00
NHSRAD3										0.002
PPRAD3										

- Post hoc tests for one-way ANOVA showed no significant difference between SC's in either context ($p = 1.00$)
- There was significant difference between the majority of RAD's and SC's ($p < 0.001$).



- Table 1 -> only a significant effect on radiation dose by clinician ($p < 0.001$) but not from pathology ($p = 0.974$) or when it was pathology paired with the clinicians ($p = 0.916$).

- No further analysis whether a clinician had more of one pathology, and if this caused an effect on the radiation dose

no effect on the radiation, which could suggest that the differences are caused due to other factors, such as clinician technique and habit.

- The same results were observed between lumbar level and the effect on clinician's radiation dose where there was no significant difference ($p = 0.215$), as seen in table 2.

Source	df	mean square	F	Sig.
Clinician	1	311.293	27.66	<0.001
pathology	27	6.043	0.537	0.974
clinician*pathology	12	5.604	0.498	0.916
total	500			
corrected total	499			

Table 1: Clinician group and pathology effect on radiation dose using a Two-way ANOVA
Dependent variable: Radiation Dose Gy.cm2
where $p < 0.05$

Source	df	mean square	F	Sig.
Clinician	1	309.613	28.888	<0.001
Lumbar Level	9	14.329	1.337	0.215
clinician*lumbar level	8	17.216	1.606	0.12
total	500			
corrected total	499			

Table 2: Clinician group and lumbar level effect on radiation dose using a Two-way ANOVA
Dependent variable: Radiation Dose Gy.cm2
where $p < 0.05$

Technique Differences

- SCs do not use the machines ---> radiographers use machines
 - don't use continuous exposure - screening time is shorter
 - as soon as the injection is made imaging stops
 - single image and last image hold used
- RADs do both the procedure and operate the machines
 - continuous imaging
 - can use contrast + follow through the medicine one injected
 - pulse rate of machine could be possible factor

Conclusions

- The results suggested that a radiation dose lower than the proposed NDRL's 6 Gy.Cm2 can be achieved
- Where SCs' average radiation was significantly lower than RADs' radiation, it can be suggested that the use of the single image and last image hold techniques had an impact on lowering the radiation exposure

References

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