**Radiography of the Lumbar Spine: Prone versus Supine?**

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**Introduction**

Historically, radiographs of the lumbar spine have been obtained with the patient in the supine position, the logic being that the lumbar spine is a posterior structure, and as such, magnification will be reduced and the image will be sharper in the supine position.

However, simply by considering how the X-Ray beam emerges from the tube housing, and basic anatomy, it is obvious that the natural lordosis of the spine will prevent the X-Ray beam passing the through the vertebral joint spaces. The sacro-iliac joints (SIJs) also lie in the “wrong position” to be visualised correctly with the patient in the supine position. Radiographs of the SIJs are obtained with the patient prone, and using a 15 degrees caudal angulation of the X-Ray tube.

If the patient were imaged prone, the diverging beam would pass through the vertebral joint spaces, and also be at such an angle to better visualise the SIJs.

If we cannot visualise either the lumbar spine or the SIJs properly, why do radiographers still continue to examine patients in the supine position?

![Patient Prone](image1.png)

![Patient Supine](image2.png)

*Figure 1*

Figure 1 clearly demonstrates how the X-Ray divergent beam passes through the joint spaces with the patient prone, compared to only passing through one joint space with the patient supine.
A literature search was conducted to ascertain if others imaged the lumbar spine in the prone position. It was discovered, that by using this technique, some Radiographers had claimed a patient dose reduction of up to 60%.

A pilot study was designed to compare lumbar spinal imaging in the supine and prone positions. No patient was imaged supine and prone as this was deemed unethical and in breach of ALARA principles.

**Method 1.**

The radiographers were asked to use the set lumbar spine exposure that is pre-programmed into the control panel. This is an exposure set at 80kV, 200mAs and central chamber on the A.E.C. For the purpose of standardisation, staff were asked not to alter these settings. If they did need to alter them, the patients’ film and dose was not to be included in the trial. Radiation doses were recorded via the L.B.D. mounted D.A.P. meter in uGym2.

Staff were asked to simply judge their patients’ size, and record the dose from either a supine or prone exposure in a simple table broken down into two basic categories, Medium or Large. The lateral exposure dose was NOT to be included. This was very subjective and a recognized limitation of this small pilot study.

**Results 1**

7 medium supine patients had an average dose of 317.047
15 medium prone patients had an average dose of 276.182
5 large supine patients had an average dose of 982.214
8 large prone patients had an average dose of 482.214

There did indeed seem to be a marked dose reduction when patients were imaged in the prone position, but what of image quality?

Two consultant radiologists had been asked to view the resultant radiographs produced and give feed back. Neither found any of the prone images were significantly magnified.

They both agreed that the spine and SIJs were visualised better in the prone position, and that there was a significant reduction in overlying bowel gas.

It was therefore decided that a further, more detailed analysis be undertaken.

**Method 2**

A table was drawn up with weight categories ranging from 45.1 Kg to 125Kg.

Each category went up in 4.9Kg increments, (e.g. 45.1-50Kg, 50.1-55Kg 55.1-60Kg etc).

It was decided that no account of a patients’ height, body habitus or BMI would be taken into account. It was thought that too many people would refuse to take part in the trial of asked for this information.

As in the pilot study, Radiographers were again asked not to change the pre-programmed settings, and only to record either the prone or supine dose.

Data were continuously collected until we had approximately 200 cases in the study.

**Results**

211 patients were included in the survey. The majority of these were between 55.1Kg and 105Kg. Very few were outside this range as seen in Figure 2.
In the top weight categories, all the patients were imaged in the prone position. As such, no AP doses are available for comparison. The average radiation dose per weight category are given in Figure 3.

Discussion

Both radiologist and radiographer opinions were sought on the prone view. Some of these comments are outlined below in Tables 1 and 2.

Radiologist Comments and Opinions

- There is no significant magnification on the prone view.
- Overlying bowel gas is significantly reduced.
- Excellent alignment
- The vertebral bodies are better visualised.
- Better visualisation of the inter-vertebral spaces.
- The entire SIJs can be visualised (a Rheumatology guidelines requirement).
- Sacral foramina are clear, shape and size can be assessed.
- Erosions, lytic areas are easily seen.
- Reduced patient radiation dose.
- For diagnostic accuracies, this is an ideal patient position.
- Better visualisation of T12
- As Dexa scans are obtained PA, baseline X-Rays should be obtained the same.

Table 1. Radiologist opinions on the prone view
Radiographers’ opinions and comments

- Not all patients can be imaged prone e.g. the elderly and trauma.
- “I prefer to do them supine as I have always done them that way”.
- The centering point needs to lower than in the supine position. You need to centre at the level of the iliac crest rather than at the lower costal margin.
- The spine can be felt, even on the larger patients, thus making for more accurate midline centering.
- The P.S.I.S. can be felt so making for better collimation width wise.
- Larger patients can tend to lie slightly oblique rather than in a true prone position.
- “Patient dignity can be an issue, especially in the larger patient, as the gown can tend to fall open”.
- “It’s easy to do, it just takes a bit of practice that’s all”.
- Obese patients do not complain when asked to lie in this position.

Table 2. Radiographers’ opinions and comments

Zettereg et al stated that since the introduction of Digital Radiography, they had found in a 2-hospital survey, a 46% increase in the irradiated field in Lumbar spine work.

Conclusion

With the patient in the prone position:

- By the patients own weight, soft tissues are compressed, thus the patient in effect is thinner.
- Better collimation is possible.
- Lower doses are achieved.
- There is better visualisation of the spine and SIJs.

- Overlying bowel gas shadow is reduced

From the Consultant Radiologists feedback on the images, and the considerable reduction in patient dose, there would seem to be little reason to X-Ray the lumbar spine in the supine position.

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