A CT classification for lumbosacral segment abnormalities.

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Introduction

- Lumbosacral segment abnormalities (LSSA) are common with a reported incidence of 4 – 30%.
- They are classically described as being best imaged on Ferguson radiographs.
- Given its superior spatial resolution, CT should be considered the best imaging technique for characterisation of these abnormalities.
- **The purpose of this study is to describe and validate a CT based classification of lumbosacral segment abnormalities.**

Method

- 400 (194 M:206 F) continuous CT scans were retrospectively reviewed
- Patients had undergone the scan for further investigation of spinal or abdominal pathology
- A classification was devised and has been validated for intra and inter observer error
- The incidence of LSSA's is also presented for our population

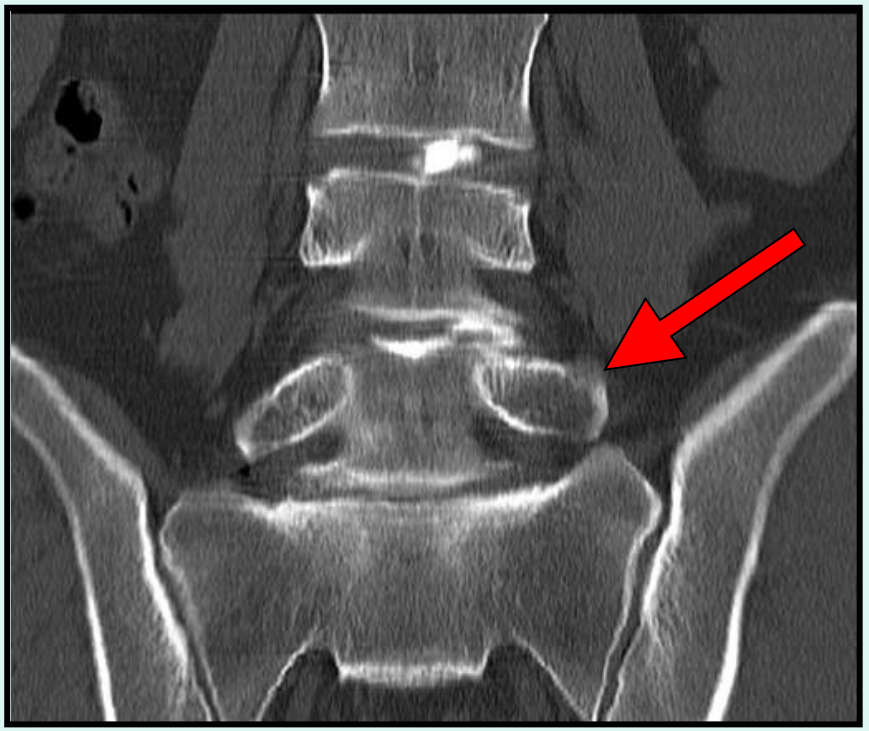
Classification

5 types of abnormality were identified

Type 0 is normal anatomy

Type 1 describes an asymmetrical shortening of the iliolumbar ligament

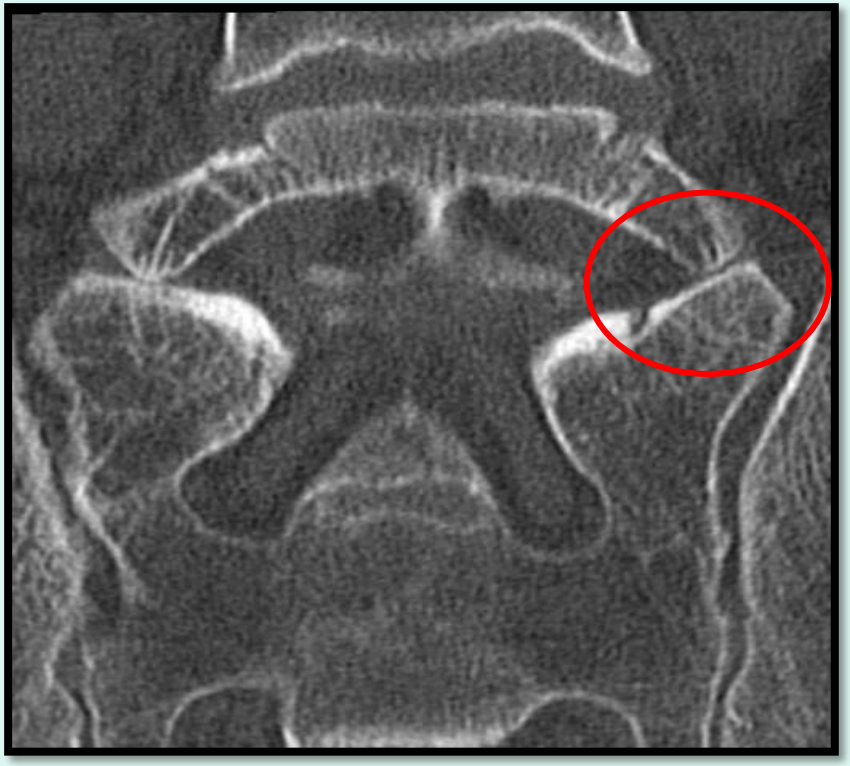
Type 2 have the transverse process of L5 within 2 mm of the sacrum but not forming a joint

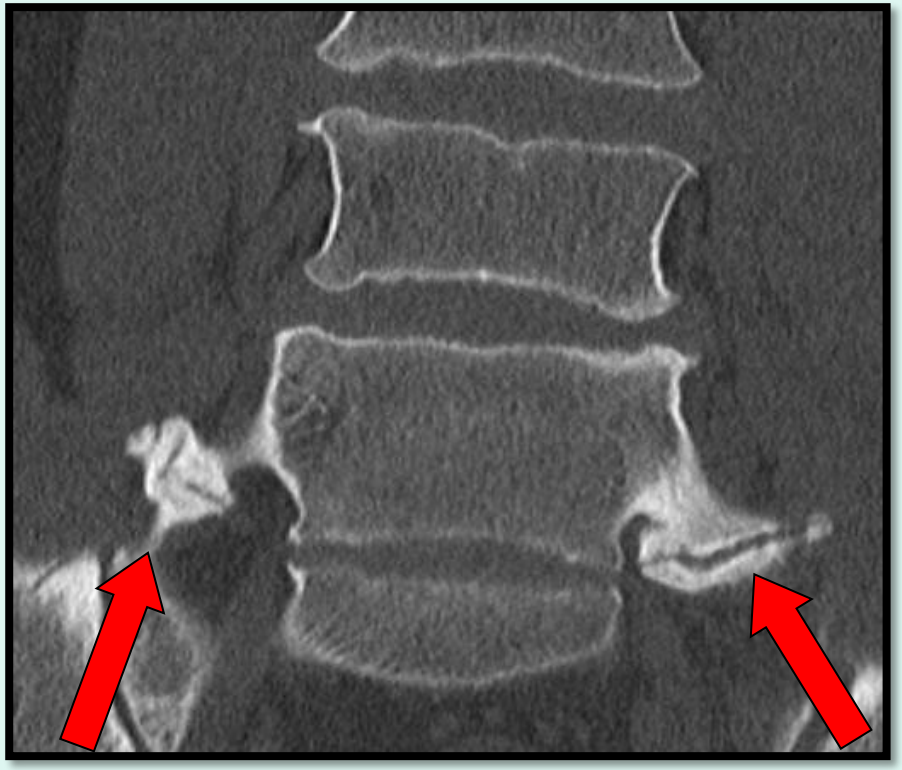


Classification

Type 3a have formed an abnormal joint between the transverse process of L5 and the sacrum

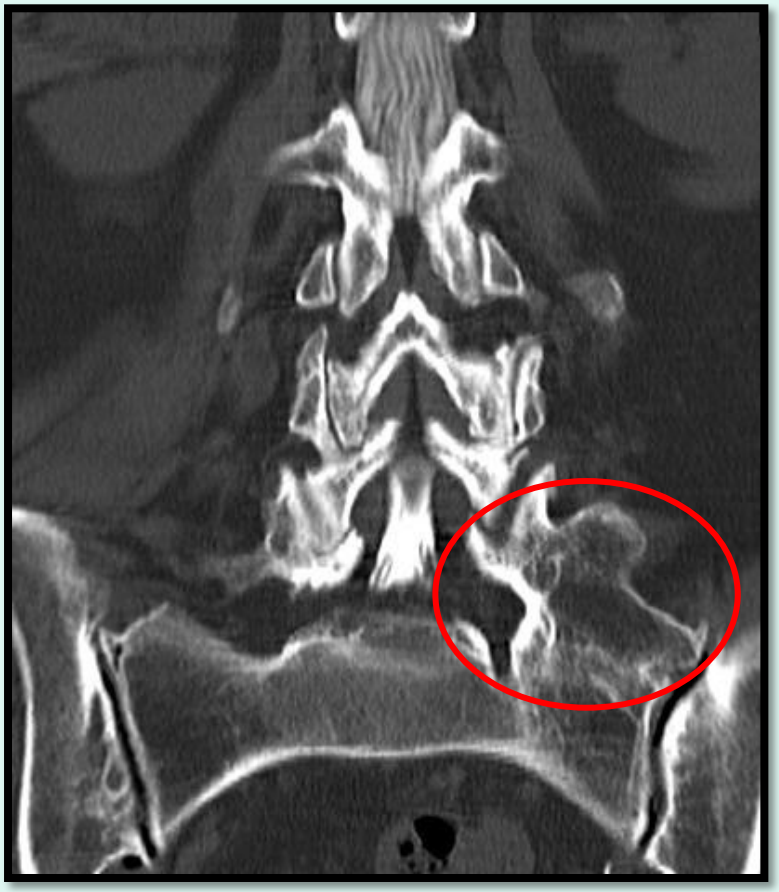
Type 3b demonstrate radiological evidence of degeneration in this joint





Classification

Type 4 have a fused transverse process and sacrum



Type 5 shows involvement of L4

Validation process

- Independent statistician *
- 40 scans were selected for validation (inclusive of all subtypes)
- 4 independent observers classified each scan on 2 separate occasions, 2 weeks apart.
- Kappa values were calculated

* Special thanks to Ms Alison Smith, Orthopaedic Research Department, North Bristol NHS Trust, for assistance with the statistical analysis.

Intra-observer Rating

2 sessions, 2 weeks apart

Observer	Agreement	Expected Agreement	Kappa	Std Error
1	90%	19%	**0.8765**	0.1006
2	85%	19%	**0.8148**	0.1004
3	90%	19.5%	**0.8758**	0.1028
4	75%	19.5%	**0.6894**	0.0993

K-Interpretation

Poor agreement = <0, Slight agreement = 0 -0.2, Fair agreement = 0.21 - 0.4, Moderate agreement = 0.41 – 0.6, **Substantial agreement = 0.61 – 0.8**, **Almost perfect agreement = 0.81 – 1.0**.

Landis and Koch (1977)

Inter-observer Rating

4 observers per rating

Session 1

Classification	Kappa
Type 0	0.9179
Type 1	0.7079
Type 2	0.4519
Type 3a	0.4444
Type 3b	0.7802
Type 4	0.7222
Type 5	1.0
Combined	**0.7178**

Session 2

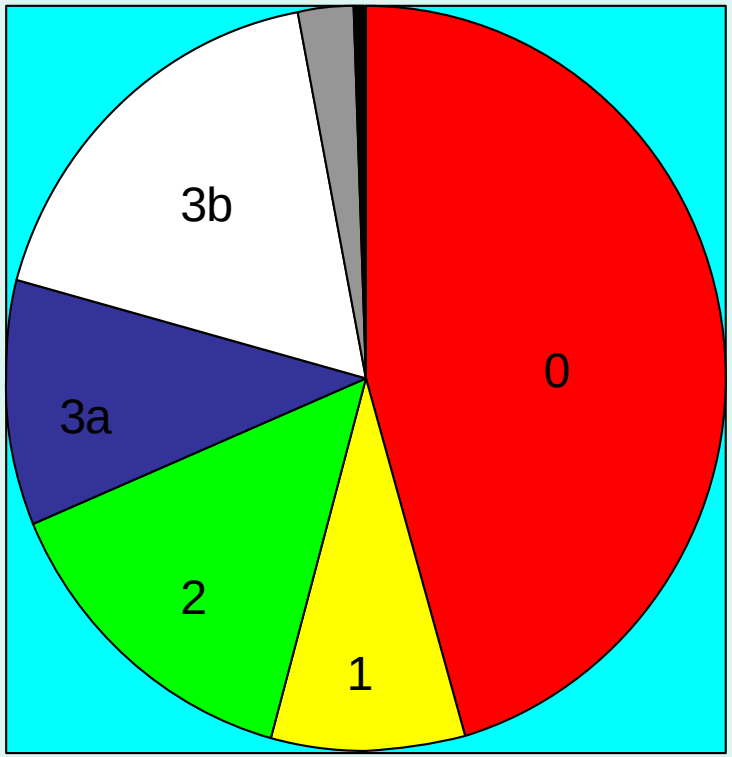
Classification	Kappa
Type 0	0.8438
Type 1	0.7714
Type 2	0.4260
Type 3a	0.4667
Type 3b	0.7867
Type 4	1.0
Type 5	1.0
Combined	**0.7534**

K-Interpretation

Poor agreement = <0, Slight agreement = 0 -0.2, Fair agreement = 0.21 - 0.4, Moderate agreement = 0.41 – 0.6, **Substantial agreement = 0.61 – 0.8**, **Almost perfect agreement = 0.81 – 1.0**.

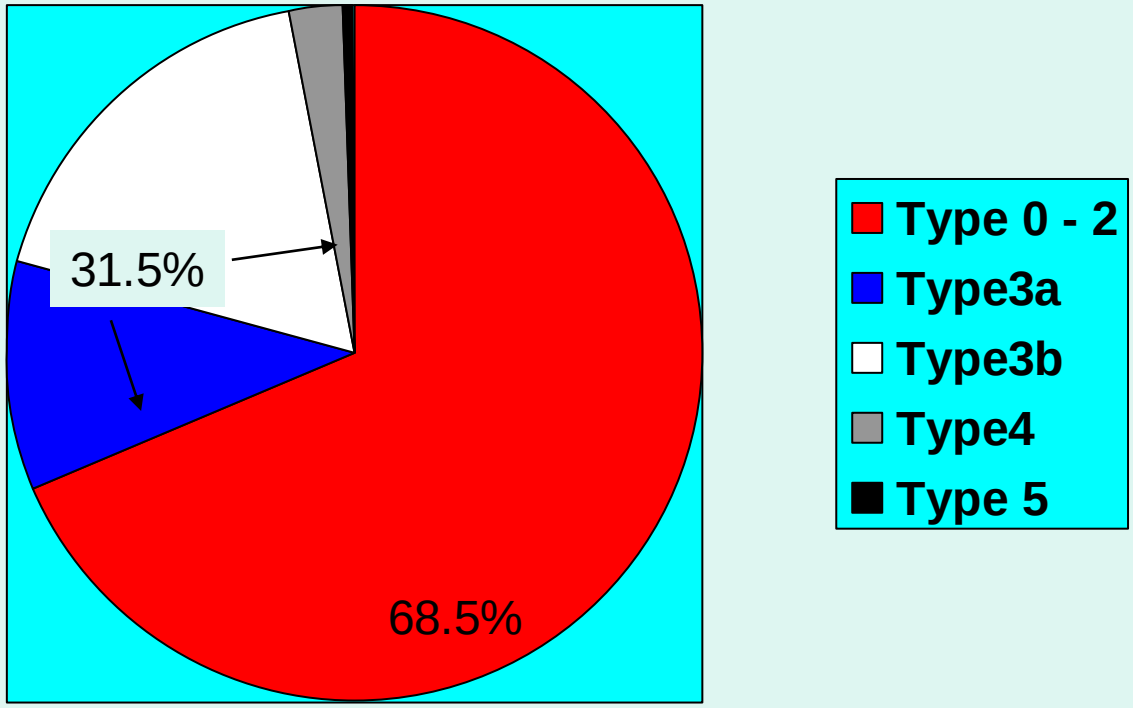
Incidence

Classification	Frequency	Percentage
Type 0	**182**	**45.5%**
Type 1	35	8.7%
Type 2	57	14.25%
Type 3a	43	10.75%
Type 3b	71	17.75%
Type 4	10	2.5%
Type 5	2	0.5%
Combined	**218**	**54.5%**



The incidence of LSSA is higher in our population of CT scans compared to previous published series using plain radiographs:-
54.5% vs. 4-30%

Incidence



If one considers shortening of the lumbosacral ligament (type 1 and 2) as being of no clinical significance, described as a *"forme fruste"* by Castellvi*, the incidence in our population is still over 30%

* Lumbosacral transitional vertebrae and their relationship with lumbar extradural defects. Castellvi AE et al. *Spine 1984.*

Conclusions

- A validated CT classification that can be used in future research on the topic
- By using CT scans, the incidence of LSSA would appear to be higher than previously thought.

Ongoing work

Studying the clinical relevance of these LSSA's as:

- 1) a pain source
- 2) a potential deforming force in the lumbar spine

There are no conflicts of interest or disclosures that need to be made regarding this research project.