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"Lumbar Facet Joint Cysts: Investigating Demographics and Evaluating Management Within CVUHB – A Retrospective Case Series".

Ethical Approval: *Not Required*

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ABSTRACT

INTRODUCTION: Lumbar facet joint cysts are a rare cause of back and radicular pain with increasing significance in modern spinal orthopaedics. Their rarity leaves information in the literature extremely limited and their optimum management largely in contention. This study aimed to look at facet joint cyst characteristics and their management in a patient case series within the Cardiff and Vale University Health Board. This was to assess whether the patient management followed the current literature consensus and ultimately whether the recommended treatment regimen produces favourable outcomes.

MATERIALS AND METHODS: This study looked at a series of 87 patients with facet joint cysts, diagnosed via an MRI within CVUHB over a 5-year time span - between 1st January 2013 and 31st December 2017. Each patients MRI was reviewed and the characteristics of the cyst and coexistent spinal pathologies noted. Clinical correspondence created via outpatient and inpatient hospital visits was then analysed to determine cyst symptomatology and treatment received.

RESULTS: Lumbar facet joint cysts had an incidence of 87 patients (0.39%) in 22,292 MRI Spine Lumbar and Sacrum scans performed within CVUHB within the time frame of interest. The patients identified had a mean age of 61.2 and were split 35:52 male to female respectively. 7 (8.05%) of the patients had 2 visible facet joint cysts on their MRI. 59 (62.8%) out of the 94 cysts recorded appeared to be causing neural compromise on the scan, with the left L5 nerve root being most commonly affected. L4-L5 was the most common site for cyst formation (50%) with L3-L4 being the second most common (26.2%). Maximum mean cyst diameter was 7.39mm and the maximum mean cyst surface area calculated to be 45.24mm^2. 46/87 (52.9%) patients had lumbar degenerative spondylolisthesis and 28 (60.9%) of these had cysts at the slip level. 61/87 (70.1%) patients were symptomatic and the remaining 26 (29.9%) were asymptomatic incidental findings. 38 patients (43.7%) were noted to have had a hospital intervention (surgery or injection), with a mean duration from MRI to date of intervention of 9.68 months. 34 out of 38 (89.5%) had a facet joint injection +/- nerve root block, of which 15 went on to have surgical treatment – 4 (10.5%) had surgery without a prior injection. 54.8% of the patients that received an injection stated they received no benefit at the 3-month follow up appointment. 14/14 (100%) of those whom had surgery described positive outcomes at 6-week follow up. 3/14 (21.4%) then went on to have further treatment at a later date.

CONCLUSIONS: Injections provide roughly 50% of patients with short-term symptomatic relief. Surgical treatment resulted in satisfactory outcomes. Due to the risks involved with spinal surgery, injections should be offered as first line treatment in symptomatic patients.

INTRODUCTION

Lumbar facet joint cysts represent a rare but important cause of lower back pain and radiculopathy, occurring as a result of zygapophyseal joint degenerative arthritis[1]. As the facet joint degenerates, herniation of synovial fluid through a defect in the joint capsule creates a 'cyst'; this characteristically exhibits a continuation of the facet joint synovium on imaging[2]. Although facet cysts, like osteoarthritis, can affect any spinal level, they are most commonly observed in the lumbar spine, notably at L4-L5 - the most mobile vertebral segment[3]. Facet cysts in the literature have also been linked to an increased incidence of concurrent spondylosis and spondylolisthesis at their vertebral level[4]. In many individuals, these facet cysts are asymptomatic incidental findings with no neural compromise, however those that compress nerves can display an array of symptomatology that will require treatment[5]. This includes case reports that acknowledge cysts as a cause of cauda equina syndrome[6]. Management of symptomatic cysts can involve conservative approaches utilising analgesia, physiotherapy and facet joint cyst injections. These injections attempt to either aspirate, rupture or decrease the cyst size. If conservative avenues fail then surgical decompression is an option. The optimal management for symptomatic cysts is yet to be defined, but the majority of the literature proposes an initial conservative approach with surgery as 2nd line. However, some papers outline surgery as the preferential first choice due to the disappointing results that conservative management can yield[1,7]. With facet cyst management largely in contention, the purpose of this study is to investigate patient outcomes within one health board following treatment. This will identify whether treatment not only matched the current recommendations in the literature but more importantly whether it was effective. This study will also shed light on the demographics of facet cysts, a field with limited information due to their rarity.

AIMS AND OBJECTIVES

To determine whether facet cysts were managed in concordance with literature recommendations, investigate patient outcomes post-treatment and document the features of the lumbar facet cysts in a CVUHB patient cohort.

MATERIALS AND METHODS

SELECTION CRITERIA AND PARAMETERS

Selection criteria involved a radiological database search that identified every patient where the term 'facet joint cyst' had been noted in the report for their MRI Spine Lumbar and Sacrum (MRI SLS). The parameters of this search were any individual over the age of 18 years old that had had an MRI SLS within the Cardiff and Vale University Health Board (CVUHB) between 1st January 2013 and 31st December 2017 –generating a list of 87 patients. Each patients MRI SLS was then reviewed using Impax software and all of their clinic letters accessed via Clinical Portal.

IMAGING EVALUATION

The spinal level of the cyst for each patient was recorded. Using Impax, each cyst was measured in the axial plane in mm at its largest diameter – black arrow on Figure 1. On the same axial slice, the cysts total surface area in mm^2 was then measured. Through measuring the area of free space in the canal, not including any cyst tissue, and dividing it by the area of the spinal canal including cyst tissue, the level of spinal canal compromise was calculated in percent. The grade of spinal canal stenosis for each patient was assessed at the vertebral level of the cyst. This grading was according to the criteria proposed by Schizas *et al.* (Figure 2). From the radiologists report, any evidence of cyst induced nerve compression was noted and if so, it was documented which nerve(s) were affected. Any mention of coexistent spondylolisthesis, spondylosis, and facet joint osteoarthritis in the radiology report was also logged, along with the spinal levels they affected. Finally, any previous spinal surgery the patient had received and the levels involved were noted.

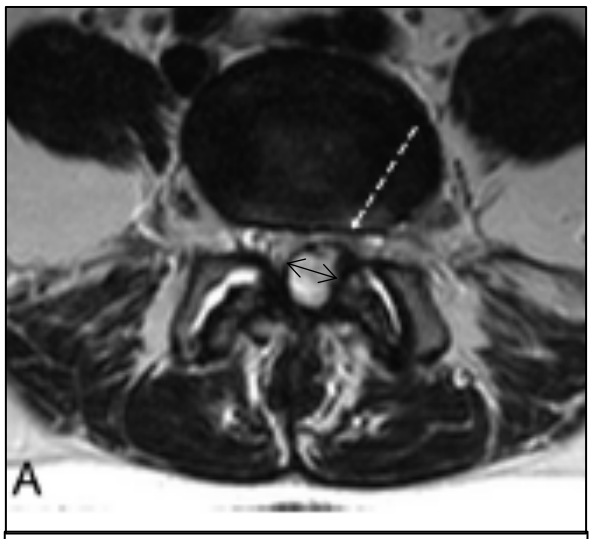

Fig. 1. Lumbar facet joint cyst with diameter measurement (black arrow) (taken from Cambron, *et al.*[8]).

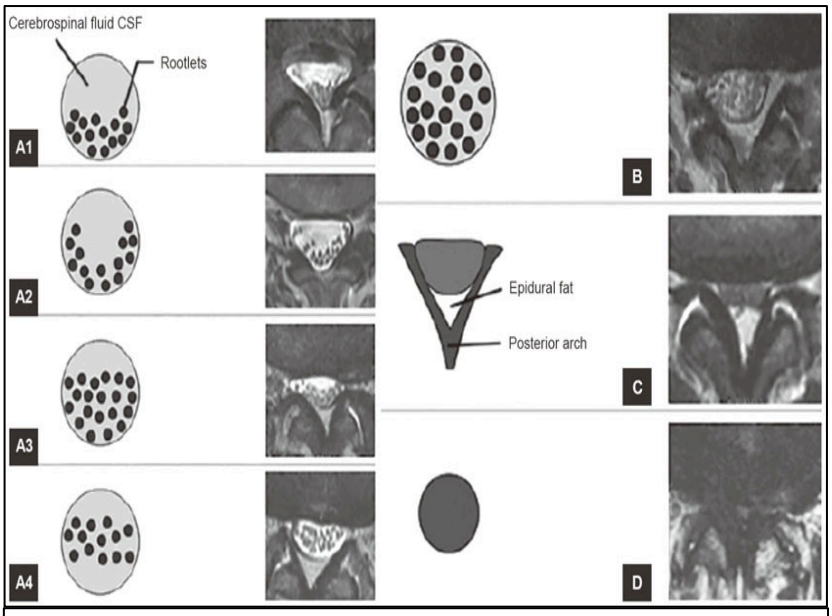

Fig. 2. MRI stenosis grading (Schizas, *et al.*[9]).

PATIENT CHARACTERISTICS AND PROFESSIONAL CORRESPONDENCE

All patients were investigated using the Clinical Portal application to access their hospital notes. The clinic letter correspondence between the Orthopaedic Surgical Department, the Spinal Physiotherapy Team, the Chronic Pain Management Team and the patients GP was investigated. Patients were grouped into symptomatic and asymptomatic (incidental) facet cysts. It was noted whether the patient had presented to the CVUHB Spinal Orthopaedic Surgery Team and whether this presentation had been cyst related. Cyst symptomatology was categorised in terms of back and/or radicular pain; if radicular pain was present, then the limbs affected were recorded.

The initial management (either prescribed or self-administered) for symptom control was collated. This was defined as anything given to help treat the symptoms of the cyst that didn't include an injection or surgical intervention. With regards to treatment received, for each patient the duration between their MRI date and the date of their first hospital intervention was recorded. A hospital intervention was defined as a facet joint injection +/- a nerve root block or surgery that acted as treatment for the facet cyst.

Through clinic letter correspondence, the outcomes after treatment at the 3-month follow up appointment for injections and 6-week follow up appointments for surgery were noted. Subsequent follow up appointments were also looked at.

Clinic letters were used to assess whether the patients whom had injections then went on to require either further rounds of injections or progressed to needing surgery. Those that received surgery first line or eventually required it were investigated for post-surgical outcomes and any further treatments they may have needed. Surgical complications were also noted. If a patient received an injection and then required surgery, the duration between their first injection set and the date of their surgery was recorded.

DATA COLLECTION

All the information collated was stored into a single encrypted Microsoft Office Excel 2011 database used for analysis and data interpretation.

STATISTICAL ANALYSIS

Statistical analysis was conducted through IBM SPSS Software Version 23. This involved a T Test for the relationship between percentage of canal compromise caused by the cyst and the trend to need spinal injections and surgery. A T Test for the difference in percentage of canal compromise between the symptomatic and asymptomatic groups of patients was also undertaken.

RESULTS

PATIENTS

22,292 MRI SLS were carried out within CVUHB during the time parameters of this study. Of those, lumbar facet joint cysts were identified in 87 different patients (crude incidence = 0.39% MRI SLS scans) as having a visible facet joint cyst on the scan. The mean age of the patients included was 61.2 (range 27-94, standard deviation 14.3). The patients were comprised of 35 males and 52 females.

CYSTS

Seven of the 87 patients had 2 lumbar facet joint cysts. Of the total 94 facet joint cysts, 46 were identified to be right sided and 48 were left sided. 59 of the cysts were identified to be compressing a nerve, which accounted for 57 of the 87 patients. The proportions of the nerve roots that were compressed by the 59 cysts can be seen on the bar chart in Figure 3.

The maximum cyst diameter in the axial plane measured a mean of 7.39mm (standard deviation 3.23, 95% CI 0.65). The maximum mean cyst surface area in the axial plane measured 45.24mm^2 (standard deviation 28.6, 95% CI 5.79). The mean percentage of canal compromise caused by the cyst was 13.84% (standard deviation 13.04, 95% CI 3.30). However, when looking at the mean percentage of canal compromise for the symptomatic patients, it was 16.70% (standard deviation 13.15, 95% CI 3.33). The increased percentage of canal compromise in the symptomatic patient group compared to the asymptomatic group was found to be significant on statistical analysis (Figure 4). The spinal levels of each cyst were: 5 at L2-L3, 22 at L3-L4, 47 at L4-L5 and 20 at L5-S1 (Figure 5).

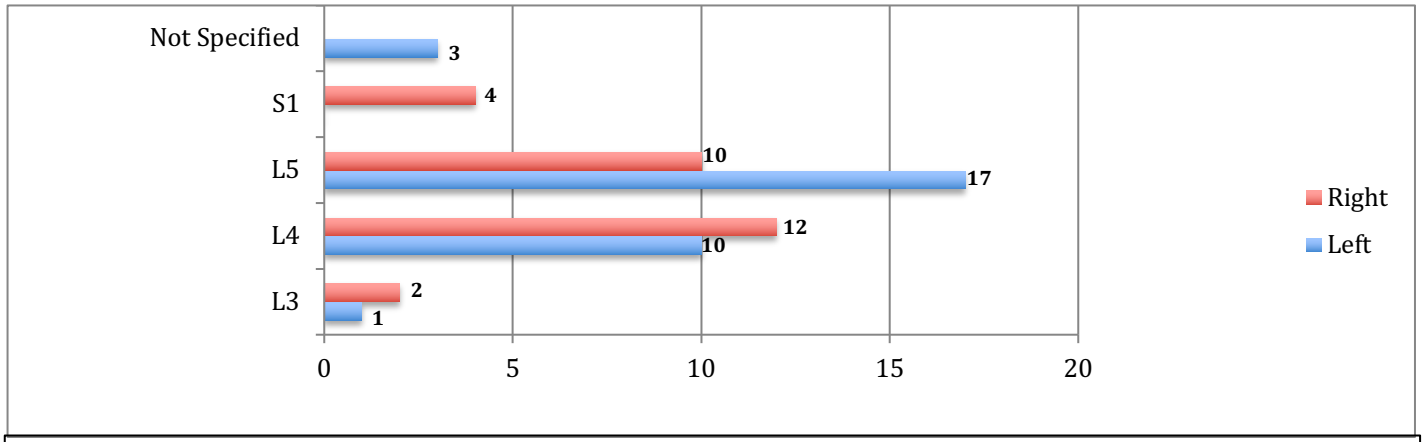

Fig 3. Bar chart depicting the proportions of nerve roots affected by the 59 cysts causing nerve root compression.

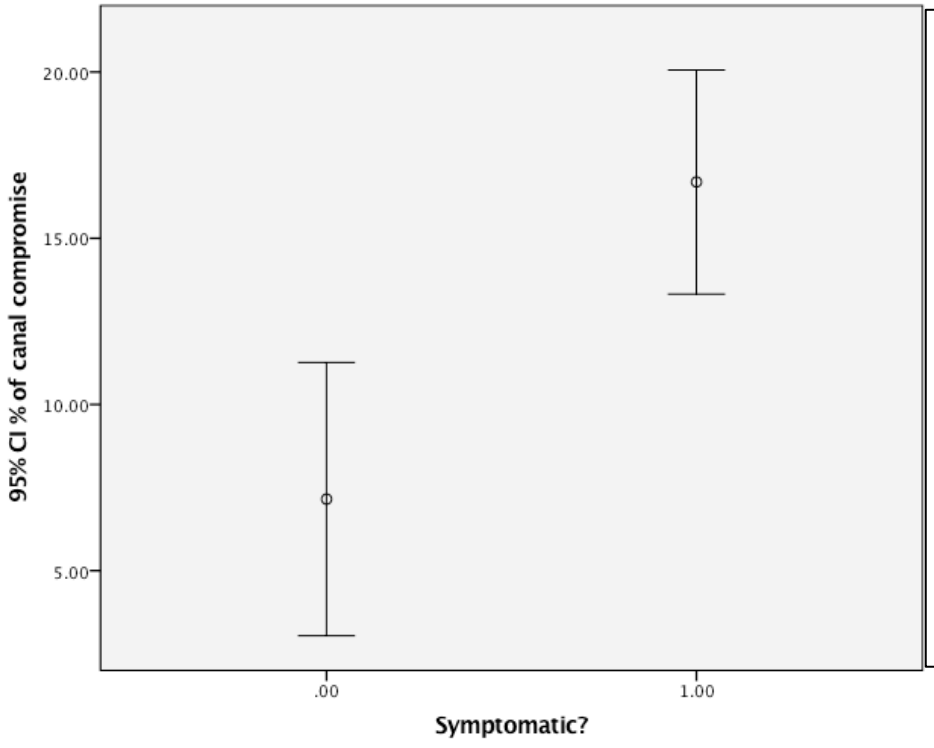

Fig 4. 95% CI Error Bars highlighting the difference in percentage of canal compromise between the symptomatic patients (1) and asymptomatic patients (0).

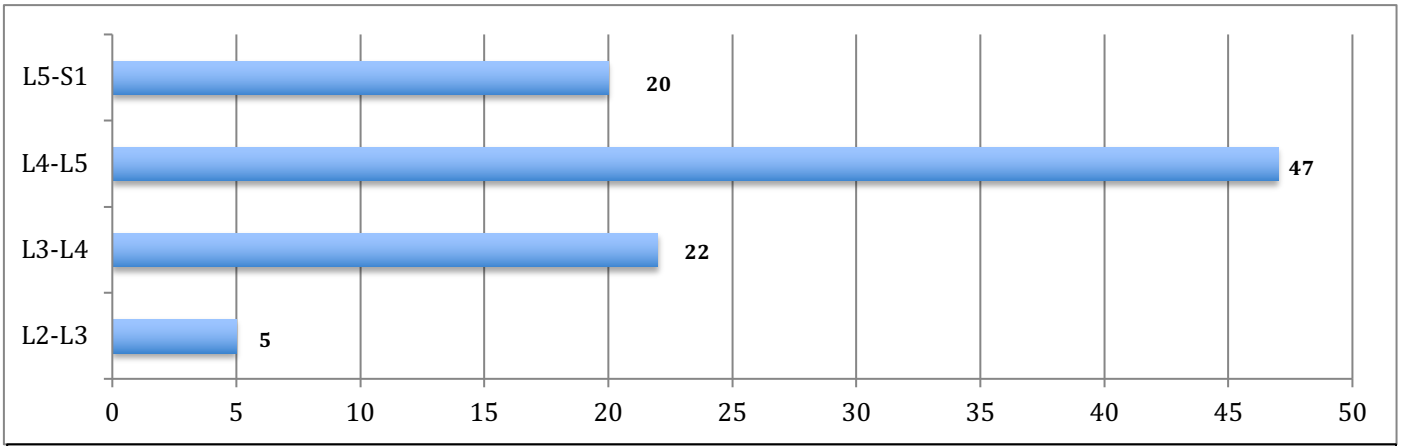

Fig 5. Bar chart that represents the number of facet cysts that were found at each vertebral level on MRI SLS.

COEXISTENT PATHOLOGY AND PREVIOUS SPINAL SURGERY

GRADE	ALL PATIENTS (n=87)	SYMPTOMATIC ONLY (n=61)
A	31 (36.5%)	23 (37.7%)
B	9 (10.3%)	7 (11.5%)
C	22 (25.35%)	18 (29.5%)
D	6 (6.9%)	4 (6.6%)
NO STENOSIS	19 (21.8%)	9 (14.8%)

Table 1. Proportions for each grade of stenosis.

The grading of spinal canal stenosis in all patients and symptomatic patients at the level of the cyst in accordance with the criteria proposed by Schizas, *et al.* can be seen in Table 1.

Out of the 87 patients, 46 were shown to have spondylolisthesis. 28 cysts (29.8%) were at the level of the spondylolisthesis. Table 2 highlights the frequency of vertebral levels affected by spondylolisthesis, spondylosis and facet joint osteoarthritis within the patient sample.

	SPONDYLOLISTHESIS	SPONDYLOSIS	FACET JOINT OA
L1-L2	2	22	14
L2-L3	9	27	26
L3-L4	11	40	57
L4-L5	31	52	70
L5-S1	11	48	61
TOTAL NUMBER OF LEVELS AFFECTED:	64	189	228

Table 2. Frequency of spondylolisthesis, spondylosis and facet joint osteoarthritis.

Fifteen out of the total patient cohort had had a previous spinal surgery prior to their MRI SLS date and 11 were symptomatic. Six patients had cysts at the level of the previous spinal surgery.

SYMPTOMS

Of the 57 patients where nerve root compression was identified on MRI, 55 were symptomatic. An additional 6 patients were symptomatic but did not demonstrate neuronal compression on MRI.

Of the 61 symptomatic patients, 9 had no accessible notes and so specific symptoms could not be identified. 45 out of the remaining 52 complained of lumbar back pain and 44 complained of suffering with radicular symptoms. 36 in total complained of suffering with both lumbar back pain and radiculopathy (Table 3).

	NO BACK PAIN:	BACK PAIN:	TOTAL:
NO RADICULOPATHY:	26	8	34
RADICULOPATHY:	7	37	44
TOTAL:	33	45	

Table 3. Analysis of symptoms exhibited.

Of the 61 symptomatic patients, 46 were referred to the orthopaedic spinal team and in all 46, the main reason for referral was the facet cyst.

TREATMENTS

All 52 symptomatic patients with notes available were initially managed with analgesia. 26 of 52 had physiotherapy, 2/52 received Chiropractor care, 1/52 underwent hydrotherapy, 1/52 had TENS and 2/52 had acupuncture.

38 out of the 52 patients went on to have a hospital intervention. The mean duration between the diagnostic MRI SLS and the intervention was 9.68 months (standard deviation 12.3, 95% CI 3.90). 2 of the 38 patients had private injections. One patient was still on the waiting list for their first intervention at the time of this study. These 3 patients were excluded from statistical analysis.

34 of the 38 patients whom received hospital intervention had at least 1 set of facet joint injections +/- nerve root block, with the remaining 4 having surgical treatment first without injection. Of the 34 that had injections, 9 received more than 1 set of injections due to symptom recurrence and 6 of these 9 then progressed to requiring surgery. Of the 34 total patients that received an injection, 15 went on to require surgical treatment at a later date due to symptom persistence. A total of 19/52 patients underwent surgery (Table 4).

	NO INJECTION	INJECTION
NO SURGERY	49	19
SURGERY	4	15

Table 4. Treatment summary.

5 of the 19 patients in the surgical category for treatment are still on the waiting list as of the date of this study.

Of the 14 patients that have undergone surgery, 2 had complications (episode of 2:1 heart block during surgery and epidural haematoma).

Of the 11 patients that had injection prior to surgery, the mean waiting from injection to surgery was 9.20 months (standard deviation 5.80, 95% CI 3.43).

OUTCOMES

When assessing the patient outcomes at 3-month follow up, 14/34 claimed that the injections had improved their symptoms (defined as back and/or radicular pain). However, 16/34 said they felt no benefit from the injections and their symptoms had remained unchanged. 1/34 stated that their symptoms were exacerbated by the injection and 3/34 were yet to have their 3–month follow up appointment.

When assessing the patient outcomes at the standard 6-week follow up appointments post-surgery, all patients described a subjective decrease in their symptoms with 2/14 describing a complete resolution of the pain.

REPEAT TREATMENTS POST SURGERY

At further follow, 3 of the 14 patients that had surgery required further surgery due to refractory symptoms, 2 of these were at the level of the cyst and 1 was at a different spinal level.

DISCUSSION

Facet joint cyst aetiology has been linked to hypermobility and instability in the spine secondary to degenerative processes. This is established due to their tendency to occur alongside intervertebral disc degeneration and degenerative spondylolisthesis, and is something further confirmed by their increased incidence at L4-L5 – the segment of the spine with most mobility[10,11]. Degenerative spondylolisthesis has been shown to have an incidence of 21.2% of MRI and CT scans in the normal population[12]. 52.9% of the patient cohort had visible degenerative spondylolisthesis on their MRI SLS and 60.9% of these were at the level of the cyst. Within the patient group, the vertebral level affected most frequently by spondylosis, facet joint OA and degenerative spondylolisthesis was

L4-L5. This supports the mechanical theory of increased mobility resulting in higher frequency of degenerative cascade changes including facet cyst formation.

Facet joint cysts still remain a rare cause of back pain and radiculopathy, with a demonstrated incidence of 0.1-1% of radiological scans (CT and MRI)[13,15]. This statistic was applicable to the CVUHB statistics, with a crude incidence of 0.39%. Facet cysts mainly afflict the elderly population, with a mean age of 61.2 in our study and the trend of literature to suggest patients are most commonly in their 7th decade[14]. A female predominance is also often found[15], and although only slightly demonstrated in this study, there was a clear 40:60 male to female split in the patient cohort.

Within the patient group, the most common vertebral level for facet cyst formation was L4-L5 (50%), with the second most common level being L3-L4 (26.2%), which is similar to previous studies[8]. Having a mean cyst diameter of 7.39mm indicates the cysts present in this case series were relatively small when compared to cyst size seen in other case series[11].
When utilising the grading template, the most predominant grade of spinal canal stenosis was A. It was also evident that the symptomatic group of patients had a greater extent of stenosis than when compared to the overall values found in the cohort as a whole. Percentage of canal compromise was shown to be significantly greater in the symptomatic cohort than the asymptomatic, however it was shown to have no significant influence on a patient's likelihood to require an injection or surgery.

Back pain and radiculopathy appeared to be equally prominent symptoms within this patient series, having only 1 more patient complaining of back pain than complaints of radicular pain.
The average time from the MRI SLS diagnosing the facet joint cyst until their first hospital intervention was shown to be 9.68 months, a figure that may be suboptimal when considering the extent to which some patients were symptomatic. 4 patients underwent a surgical line of treatment prior to any injections which can be considered as not recommended when looking at the current literature, whereas the remaining 34 followed the currently accepted literature.

Although percutaneous spinal injections are all but the accepted first-line treatment for facet joint cysts, their efficacy demonstrates disappointment. With a meta-analysis of 29 studies by Shuang, *et al.* including 544 patients with symptomatic facet cysts finding a positive outcome rate post-injection of 55.8%, which is thought to be one of the highest values demonstrated in the literature[16]. Other studies display similar outcomes with Hsu *et al.* highlighting surgical benefit, with 8/8 patients reporting positive outcomes but only 2/4 reporting significant positive outcomes following facet corticosteroid injections[17]. Furthermore, Parlier, *et al.* followed 30 patients undergoing facet joint injections for lumbar facet cysts until 6 month follow up and found 18 had poor clinical outcomes and 14 then went on to require surgery[14].
Trends from the mentioned studies all suggest an injection success rate of around 50%. This was congruent with our study; with only 14 out of the 31

whom had had their 3-month follow up appointment describing a positive result. With 15 out of these 31 eventually requiring surgery due to refractory symptoms.
However, although statistically a patient is not very likely to find benefit from injections as highlighted by this study and the others cited, the risks posed by surgery make a less effective conservative avenue still much more attractive.

LIMITATIONS OF STUDY

The study was retrospective and relied upon the accuracy of the clinical correspondence documented within Clinical Portal. Additionally, several patients had accessible radiology but no available hospital notes to analyse, and so the symptomatology and treatments of these patients could not be included in the final results. Some of the patients included in the treatment statistics were yet to have had their follow up appointment to assess outcomes post-injection. Finally, many of the patients were receiving treatment for concomitant spinal pathologies before and after the cyst was diagnosed on the MRI SLS. Therefore, this made considering the treatment for the facet cyst in isolation difficult, and the presence of this confounding variable would have affected patient response to treatment, making them either more or less likely to have a positive outcome.

CONCLUSION

Although percutaneous management for facet joint cysts only yield positive outcomes in roughly 50% of patients, the significant risks posed by opting for a surgical treatment first line make doing so irrational. Therefore, as a patient can have a positive result from an injection, they should be offered prior to surgery as they involve very little risk.

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