CASE REPORT: Benefits of performing a Nuclear Medicine SPECT/CT Bone Scan prior to CT guided Facet Joint Steroidal Injection

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ABSTRACT

The role of Nuclear Medicine SPECT/CT Bone Imaging is well established, and the advantages of SPECT/CT in precisely locating and characterising spinal lesions is well known. This case provides insight into the specific role Bone SPECT/CT imaging plays in correctly localising facet joints as a cause of low back pain prior to imaged guided corticosteroid injections. This case is an excellent example of a patient that would have benefited from undergoing Bone SPECT/CT imaging prior to previous image guided corticosteroid injections.

Introduction

A 70-year-old female suffering from long-term lower back and buttock pain was referred to our department for a nuclear medicine bone scan. The clinical indication on the referral read; “ongoing lower back and buttock pain for investigation. Query right pelvic hypermetabolic activity to aid possible image guided corticosteroid injection”.

The patient’s symptoms and sub sequential imaging of this area began in 2007. Radiographs were performed of the lumbosacral spine and right hip in 2017/2018. No noted pathological cause was reported in the right hip x-ray. The lumbosacral spine reported a disc space narrowing at T12-L1, L1-2 and L4-5, whereby apophyseal joint degeneration was bilateral. Sacroiliac joint appeared normal. A CT guided facet joint corticosteroid injection was performed one month post these findings, whereby the right sided L5-S1 nerve root was treated. No relief was felt by the patient and sciatica continued to worsen.

Three months past the initial corticosteroid treatment a CT of the Lumbosacral spine was performed. L5-S1 demonstrated bilateral posterior facet hypertrophy, with adequate central spinal canal and neural exit foramina. L4-5 demonstrated bilateral moderate posterior facet hypertrophy, with bilateral compression to the exiting L4 nerve roots. Again, a CT guided corticosteroid injection into the right L5 nerve root was performed 3 weeks post these findings. The patient did not experience any relief.

One year later an ultrasound of the patient’s right hip and groin was ordered, no pathology was noted during the procedure. Finally, a Bone scan was ordered. Angiogram and blood pool images of the lumbar spine and pelvis was performed. Delayed planar images of the whole body, localised planar images of lower pelvis, hips and femora, and SPECT CT of neck, thorax, lumbar spine and pelvis, please refer to image 1-3. The results of this was symmetrical moderate focal osteoblastic abnormalities in bilateral L4-5 facet joints corresponding to facet OA on low dose and previous CT images. No SI joint finding of note. No significant osteoblastic findings in the bilateral hip protheses.

Discussion

The most common pain syndrome is low back pain (1). There are numerous factors that can potentially be a source of pain in the lumbar spine. The burden and associated cost this places on society is significant. In 15-45% of cases of low back pain the cause is associated with lumbar facet joint(s) involvement (1). The facet joint has been increasingly implicated as a potential source of lower back pain. Correctly identifying the facet(s) contributing to the cause of patient symptoms remains challenging, as there is a deficiency between the direct correlation of facet joint disease and clinical and radiological features (2).

Pathophysiology, Aetiology, Epidemiology

Pain can arise from any structure within the facet joint complex including the fibrous capsule, synovial membrane, hyaline cartilage and bone (3). A large study performed in over 5 years in the USA found that the L4-5 facet joints are most commonly affected, with L3-4 and L5-S1 often involved. (3).

Major cases of facet joint degeneration are attributed to low-grade trauma and repetitive stress often relative to age and intervertebral disc degeneration (3). Risk factors for developing facet joint pain include; structural change due to disc degeneration, spondylolysis, inflammatory joint disease eg rheumatoid and seronegative arthritis, synovial impingement, meniscoid entrapment, chondromalacia facetae, pseudogout, acute and chronic infection (2).

Diagnostic Imaging

Pain deriving from facet joints is challenging to diagnoses (4). Physical examinations, laboratory and imaging techniques either trade off on sensitivity or specificity. Often the standard criteria for diagnosing facet joint pain is through the reduction of symptoms by 50% or more post an injection of local anaesthetic into the suspected area (2).

When assessing disc and facet degeneration, interpreting structural changes in the joint can be subjective and result in poor diagnosis reliability (3). This is a major limitation of plain film radiographs, CT and MRI imaging (2). For this reason, Bone scans hold an advantage as it is the pathophysiological process of joint degeneration that is imaged (2).

A recent retrospective study that was undertaken following patients with chronic back pain that had inconclusive MRI/ CT scans showed that a SPECT/CT bone scan was able to positively and precisely localise symptomatic facet joint targets in 65% of these patients (2). SPECT/CT is an ideal modality for imaging facet joints as it can accurately localise the site of pain and differentiate between many spinal conditions (2).

Therapy (Impact diagnosis has on patient management)

The management of back pain varies greatly and may be dependent on the severity of symptoms (4). Often management is based on a multi-disciplinary approach as multiple pain sources may exist (4). Image guided corticosteroid injections is a treatment option radiologist can utilise when dealing with spine pain relating to facet joints (2). Currently this outpatient procedure is the gold standard for identifying facet joints as the cause of pain (2). Some typically indications for a facet joint injection are; strong clinical suspicion for facet related pathology, low back pain with alternate explanation and tenderness over facet joint region (2). The physical degeneration of the facet joints results in irritation of facet innervations and muscles spasms. Imaged guided injections of local anaesthetic

and steroids into or around the facet joint aims to address this and thereby provide pain relief (4). A disadvantage of this technique is that therapeutical outcomes vary (4).

Bone SPECT/CT scintigraphy is currently being used to evaluate facet joint disease for spinal pain, and its usefulness in assessing complex structural anatomy is well documented (3). When alternate pathology isn't detected, areas of focal increased osteoblastic activity correlates to areas of mechanical stress and degenerative changes (3).

As previously the L5-S1 right sided facet joint had been treated twice with a corticosteroid injection with no symptomatic relief in this patient. The findings in the recent nuclear medicine bone scan highlight the advantages of performing this study prior to image guided corticosteroid injection(s). The bone scan precisely identified the facet joints (left and right L4-5) contributing to the patient's symptoms (not L5-S1). This significantly impacts the management of this patients care and overall health outcome as appropriate treatment can be applied to the correct area.

Another factor that is important to acknowledge is the cost associated with image guided corticosteroid injection(s). Currently at our practice pensioners are bulk billed but the out of pocket cost for a non-pensioner patient undergoing a L-spine corticosteroid injection is approximately $175 dollars. The out of pocket cost is even greater for C-spine injections, being approximately $210 dollars. In this case the cost associated with the patients previously unsuccessful procedures is significant. Highlighting another benefit of performing bone SPECT/CT scintigraphy prior, so accurate treatment can be provided improving health outcomes while minimising costs to the patient. Nuclear Medicine bone scans are bulk billed, so there is no out of pocket cost for this examination.

Figure 1. Whole body bone scintigraphy displaying the appendicular skeleton on the left and axial skeleton on the right. The image illustrates symmetrical moderate focal osteoblastic abnormalities in bilateral L4-5 facet joints.

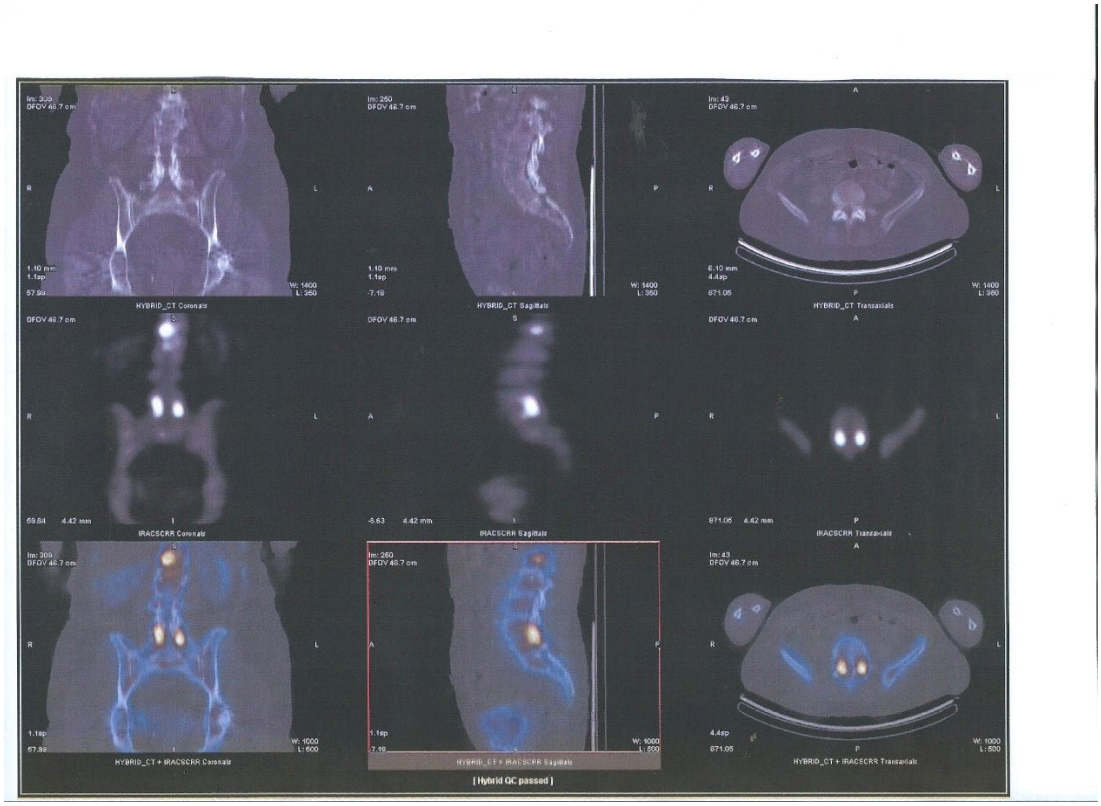

Figure 2. SPECT/CT bone scintigraphy depicting CT, SPECT and fused SPECT/CT images of the lumbar spine and pelvis. The image illustrates symmetrical moderate focal osteoblastic abnormalities in bilateral L4-5 facet joints.

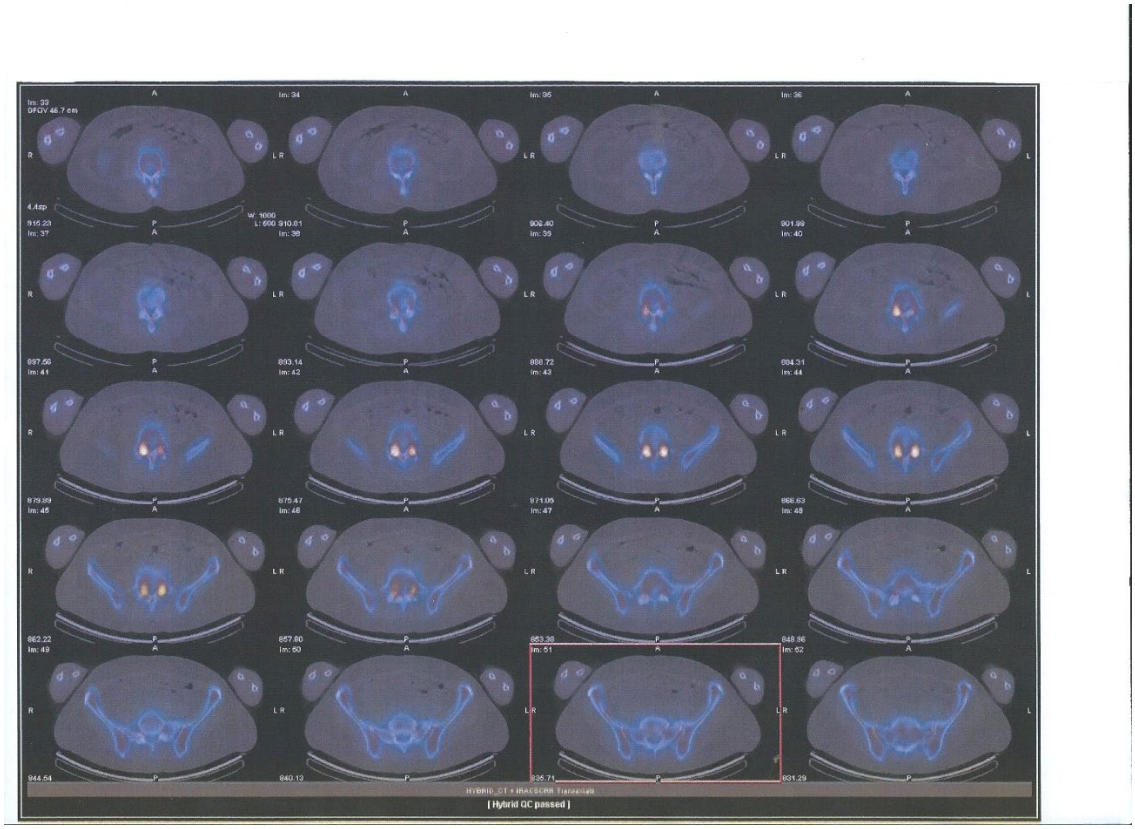

Figure 3. SPECT/CT scintigraphy displaying fused SPECT/CT transaxial slices of the L4-5 facet joint pathological uptake.

Conclusion

Medical imaging is a crucial aspect in identifying facet joint disease as a cause for lower back pain. The role of Bone SPECT /CT imaging in spinal lesions evaluation is well known and documented. While CT examinations are useful in ruling out other pathology due to the image's good anatomical delineation. This case study illustrates the advantage of SPECT/CT bone scintigraphy in improving accuracy of localising facet joint disease as a source of back pain due to pathophysiological information attained. This improved localisation aids image guided corticosteroid therapy, improving patient care and overall health outcomes.

References

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