

THE USE OF BISPHOSPHONATES IN THE MANAGEMENT OF PUBIC OVERLOAD IN AN ENGLISH PREMIER LEAGUE FOOTBALLER - A CASE REPORT

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Introduction

Hip and groin pain is a major cause of time loss within elite football environments,¹ with the location being reported as representing 14% of all time loss injuries in the sport². Since the publication of the Doha Consensus³ there has been a better understanding and classification of injuries sustained within this area. There is however still a complexity to achieving a correct diagnosis, with multiple different pathologies commonly existing alongside each other.⁴

This case report looks specifically at a complex case of hip and groin pain, before discussing the successful management outcomes achieved through the use of bisphosphonates.

Case Presentation

This case report relates to a twenty-one-year-old professional footballer who was playing in the top division of English football. The player had suffered from an eighteen-month history of intermittent lower abdominal and pubic pain before undergoing surgical repair of bilateral inguinal wall.

Following this surgical procedure the player underwent a six-week period of rehabilitation, but intermittent symptoms still presented with progression to high level football actions. These symptoms presented as being related to bone pathology, with no immediate provocative within the outdoor session, but a twenty-four-hour pattern whereby the player suffered night pains approximately twelve hours after the session finished. Acute exacerbations would last for approximately twelve hours and could be significantly improved through the administration of anti-inflammatory medication.

In order to assist in clinical decision making, MRI imaging was completed (Figure 1) which demonstrated severe diffuse pubic overload extending bilaterally into the superior and inferior pubic rami

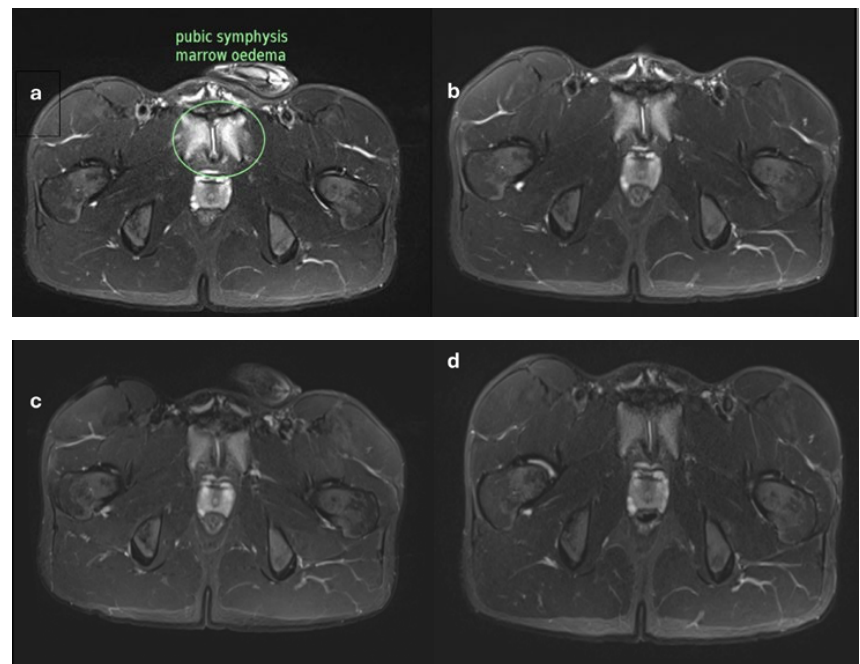
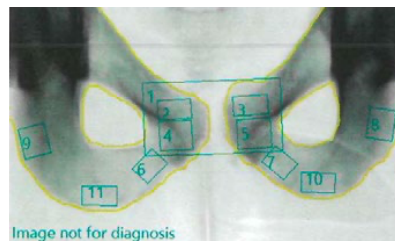


Figure 1: Repeat MRI Imaging demonstrating pubic symphysis oedema at a) Baseline b) 31 days post-infusion c) 47 days post-infusion d) 59 days post-infusion

Left Femur Custom Results



Region	BMD (g/cm ²)	BMC (g)	Area (cm ²)
1	0.956	13.35	13.96
2	0.986	1.16	1.18
3	0.939	1.11	1.18
4	1.056	1.85	1.75
5	1.257	2.20	1.75
6	0.506	0.55	1.08
7	0.583	0.63	1.08
8	1.212	1.76	1.45
9	1.215	1.76	1.45
10	0.665	0.78	1.18
11	0.514	0.61	1.18

Figure 2: DEXA Small Field of View Imaging to determine bone mineral density of the Pubis

with adjacent soft tissue inflammation. Adjacent soft tissue inflammation has previously been highlighted as a poor prognostic factor in professional footballers' rehabilitation outcomes.⁷

Further diagnostic tools utilised within this case were small field of view DEXA imaging which revealed that the bone mineral density around the pubis was 0.96g/cm³ which was below the target value of 1.3g/cm³ (Figure 2). Blood tests were also taken to review Ferritin and Iron levels, but these results showed levels within desired ranges.

Bisphosphonate Intervention

The player underwent an intravenous (IV) infusion of 4mg Zoledronic acid given within a 90mls saline solution over a period of 90 minutes. This IV infusion volume was given based upon World Anti-Doping Association (WADA)⁸ rules which restrict the administration of greater than 100ml of fluid within a 12-hour period.

Calcium supplementation was commenced for a period of twelve days from four days prior to the administration of the Bisphosphonate. This took the form of

Calcichew 500mg chewable tablets which were consumed once per day for this twelve-day period.

Results

Adductor Squeeze Monitoring

Due to this particular patient's pattern of symptoms the mid-range adductor squeeze with the hips positioned in 60 degrees of hip flexion was utilised as a daily monitoring tool. This test appeared to be sensitive to player symptoms and allowed for longitudinal tracking of both pain provocation and subsequently maximal strength scores.

Each day the player was present for rehabilitation they completed an adductor squeeze test where they were instructed to perform hip adduction against a fixed frame force dynamometer. The instructions provided to the player informed them to complete the squeeze test until they felt their symptoms within the groin, and if there were no symptoms then they were to perform the test maximally.

This data was plotted in graph form (Figure 3) each day to provide easy tracking of how aggravated the area was, or how strength

was developing through rehabilitation input. As can be seen from the graph, there was inconsistency in strength scores alongside a consistent awareness of pain upon performance of the test prior to utilisation of Bisphosphonates. Two days post-Bisphosphonate infusion there was a brief episode of awareness on the test which resulted in a lower strength score. However, from this point pain was no longer felt and strength scores continued to improve up until day seven post-infusion. These scores were then maintained without symptoms up to the point of review follow up on day forty-nine post injection.

Repeat Imaging

Due to the benefit of being able to perform repeat MRI imaging within an elite footballing setting this player underwent three post-intervention scans in order to provide longitudinal tracking of the bone and associated soft tissue oedema within the pubis which was proposed as the main driver of symptoms within this case (Figure One). Imaging was completed utilising the same 1.5T MRI scanner to ensure consistency in imaging to allow for genuine comparison.

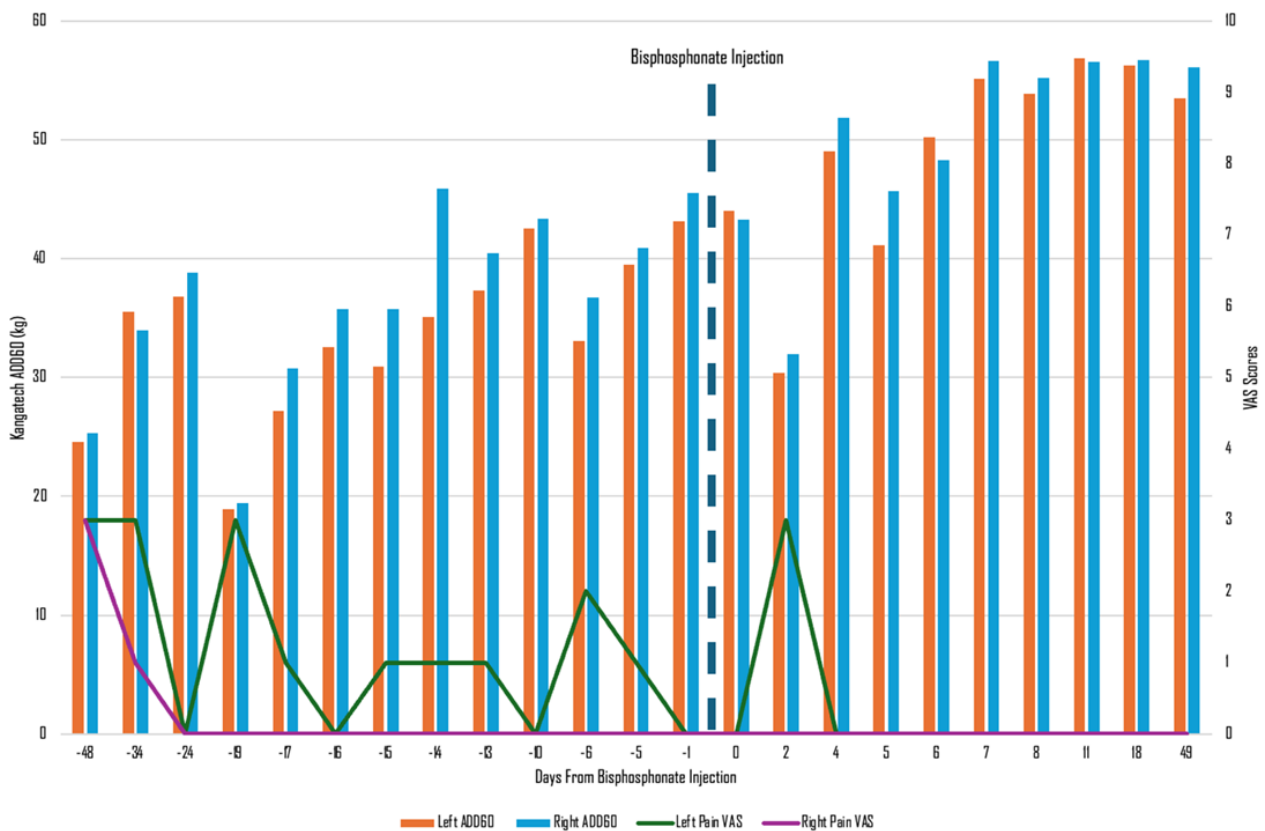


Figure 3: A graph demonstrating Adductor Strength Scores and Visual Analogue Pain Scores over the course of the rehabilitation

Figure 1 demonstrates that there was improvement within the intensity of the bone marrow oedema within the first month following infusion. There was still some very small amount of residual associated soft tissue inflammation. This soft tissue inflammation resolved by seven weeks after the infusion and remained absent on imaging at nine weeks.

What can be seen from these repeat imaging points is that residual bone oedema and soft tissue inflammation did not correlate specifically with symptoms experienced by the player in this case. They remained pain free from two days post-infusion, but some levels of soft tissue inflammation were still present at one-month post-infusion.

Discussion

Bone remodelling is a process which commences following the damage of bone tissue, initially through the release of osteoclasts which begin to break down the affected tissue.⁹ Following this initial resorption phase the process of new bone formation should commence through initiation of osteoblasts. The fact that bone formation is a longer process than resorption means that an increase in remodelling activity can result in a net loss of bone tissue in the affected area. It is proposed that within this case pain inhibition from concurrent pathology in the area meant that the player was unable to distribute and tolerate load through the

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region as they previously would have been able to. This will then have led to overload and trauma to the pubic bone, which would initiate the process of bone resorption. With the issue being chronic in nature, over time the process of bone resorption to formation became imbalanced, with the formation process unable to keep up with the process of resorption. This ultimately led to the decrease in bone mineral density identified on DEXA imaging.

In an attempt to restore balance to the bone reformation process, Bisphosphonates were prescribed. Bisphosphonates have a high affinity for bone mineral and are preferentially incorporated into sites where active bone remodelling is taking place. They act to inhibit osteoclasts through blocking the dissolution of calcium

phosphate, and therefore suppress the resorption of bone tissue. This allows the bone formation process to surpass the resorption process and subsequently increase the bone mineral density in the affected region,⁶ which in this case was the pubis.

A previous piece of research⁵ within high performance athletes suggested that Bisphosphonates were successful in quick reduction of symptoms as well as significant reduction in time lost to bone stress pathologies. This previous research utilised imaging at only two time points, whereas this case report looks to add to the previous research with more regular reimaging points over a greater period of time demonstrating a more comprehensive imaging timeline which demonstrates when improvements in bone oedema and associated soft tissue inflammation are achieved.

In a literature review on the topic of the use of bisphosphonates in the management of stress fractures in athletes¹⁰ it was highlighted that IV administration should be the delivery method of choice, as was utilised within this case. There is a much-improved bioavailability for uptake as well as less potential gastrointestinal side effects. Further side effects can be fever and flu-like symptoms, which were present in the patient in this case study. This led to 48-hours loss of rehabilitation whilst the athlete recovered from these symptoms, and this should be factored into the planning of optimal timing of Bisphosphonate administration in future rehabilitation cases. More severe side effects such as osteonecrosis of the jaw must also be considered when administering Bisphosphonates, and therefore the administration is contraindicated in any patient who have recently undergone invasive oral procedures or comorbidities such as diabetes.¹¹



This case report has limitations in the fact that it is only performed in one patient and therefore cannot necessarily be transferred into the wider population. This is a limitation that has been highlighted within previous research, however this report looks to build on previous case reports with longitudinal imaging to understand the different physiological responses at different time points through the rehabilitation process. Another limitation of the study is that a follow up DEXA scan was not completed and therefore there is not an objective value on the increased bone mineral density seen within the affected area. This would be an area of improvement if the case report were to be completed again, as would the addition of a long term follow up MRI scan to understand the longer-term adaptations that had taken place following bisphosphonate infusion. This was however not required due to the patient in this case remaining symptom-free.

Conclusion

In this case report there was quick resolution of clinical symptoms, with a delayed reduction of pubic oedema seen on imaging following the administration of the bisphosphonates. More importantly though there have been long-term benefits, with the player remaining asymptomatic up to this point, which is over twelve months. It is therefore suggested that Zoledronic acid is an appropriate addition to a well-rounded rehabilitation strategy for patients who present with bone stress oedema within their pubis on MRI imaging and decreased bone mineral density on DEXA scans.



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