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The Impact of Physiotherapy on a patient with Ankylosing Spondylitis Following Bilateral Total Hip Replacement: A Case Study

Mohit kumar[1], Sandeep kumar[2], Smati sambyal[3]
[1] MPT (orthopedics), University College of Physiotherapy, Baba Farid University of Health Sciences, Faridkot, India
[2,3] Lecturer, University College of Physiotherapy, Baba Farid University of Health Sciences, Faridkot, India

ABSTRACT: Ankylosing spondylitis (AS) is a chronic, progressive inflammatory disorder primarily affecting the axial skeleton, with a prevalence of approximately 0.25% in India, predominantly in males. This case study explores the physiotherapeutic management of a 35-year-old male patient underwent bilateral Total Hip Replacement and presented with primary complaint of progressive stiffness in the back and neck region along with pain in his right hip joint. Outcome measures included Bath Ankylosing Spondylitis Functional Index (BASFI), Bath Ankylosing Spondylitis Disease Activity Index (BASDAI), Visual Analog Scale (VAS), and Hip disability and Osteoarthritis Outcome Score for Joint Replacement (HOOS, JR) with significant improvements observed over 12 weeks: BASFI improved from 7 to 2, BASDAI from 8.1 to 3.8, VAS pain from 8 to 3, and HOOS, JR score from 40 to 60. The results demonstrate that AS-specific exercises combined with a home-based exercise protocol can significantly enhance pain management, functional capacity, disease activity and hip disability in AS patients.

KEYWORDS: Ankylosing spondylitis, BASDAI, BASFI, Home-Based Exercise Protocol

INTRODUCTION

Ankylosing spondylitis (AS) is a chronic, progressive inflammatory disorder that primarily affects the axial skeleton, causing aseptic inflammation in the synovial tissue, spinal ligaments, intervertebral discs and facet joints (Dagfinrud et al., 2008). In India, approximately 0.25% of the population is estimated to be affected by AS, with seven cases per 10,000 people (Khuman, R. P., 2018). Males are more frequently affected than females, with a ratio of approximately 3:1 (Markowiak et al., 2014). The progression of AS is most intense during the first 10 years, but the disease clearly remains active for many more decades.

Clinically, it is characterized by pain and stiffness in the back and sacroiliac joints and is often associated with peripheral arthritis, enthesitis and acute anterior uveitis (Gioglou, G et al., 2023). As the disease progresses, the spinal joints of AS patients may deteriorate and in severe cases, spinal deformities may develop, significantly limiting the patient's physical activities (Luo, Y et al., 2014). Involvement of the hip joint in AS often leads to severe deformities and can adversely affect activities related to spinal mobility. The combination of a stiff spine and hip can result in significant disability for patients. Hip involvement occurs in 25-50% of AS patients, with 47-90% of those cases affecting both hips (Guan M et al., 2013).

The management of AS aims to enhance and maintain spinal flexibility and normal posture, alleviate symptoms, reduce functional limitations and minimize. The significant impact of AS on overall health and activity suggests that psychological factors might influence disease status and outcomes. The primary pharmacological treatments include non-steroidal anti-inflammatory drugs (NSAIDs) and TNF-α inhibitors (TNFis) (Gravaldi et al., 2022; Durmus, D. et al., 2009). Despite advancements in pharmacological therapy, physiotherapy is still considered an essential component of the comprehensive management of AS. There is a lack of published literature on the effects of physiotherapy on hip involvement in AS hips (Guan M et al., 2013). Therefore, this case study primarily focused on the physiotherapeutic management of musculoskeletal manifestations in an AS patient who had undergone bilateral total hip replacement (THR).

CASE REPORT

In March 2024, 35-year-old male presented with primary complaint of progressive stiffness in the back and neck region along with pain in his right hip joint. The stiffness experienced in the lower back and neck peaks in the morning and gradually diminishes with movement. He reported experiencing limitations in his routine physical activities due to pain, stiffness which was more in the lower back than in the neck, easily fatigued and disturbed sleep.

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Inquiry into his previous history revealed that in 2011, the patient had a road traffic accident and complained of severe pain in his left hip, for which he had received medical treatment. The degenerative changes in left hip started, leading to the restricted range of motion, which was ultimately affecting his daily physical activities. Despite being on medication, the degeneration continued to progress, eventually making it impossible for him to bend his left leg and causing severe difficulty in walking. In 2018, due to severe degenerative changes and pain, he underwent left Total Hip Replacement (THR). Subsequently, radiographic evaluation indicated that the right hip also began to erode, leading to joint space narrowing. Due to the patient's relatively young age, another THR i.e, on right side is particularly challenging. The patient was primarily treated long-term with medication, including nonsteroidal anti-inflammatory drugs (NSAIDs) .The right THR was planned for a later date and was ultimately performed in 2023.

During this time frame, in 2012, he experienced back pain radiating bilaterally to his legs, along with spinal stiffness. MRI findings indicated bilateral sacroiliitis, for which he was hospitalized for few days and treated with medication. The spinal stiffness further progressed, starting to affect his neck as well. He had frequent episodes of back and neck pain and in 2014, he was diagnosed with ankylosing spondylitis with negative human leucocyte HLA-B27 antigen.

Musculoskeletal examination revealed that patient having forward head posture, retracted shoulders and kyphosis along with straightening of lumbar spine. The patient has decreased spinal range of motion along with right hip joint. Palpation reveals that patient have tenderness over bilateral sacroiliac joints, upper trapezius and spinous process of cervical region. Paraspinal muscle spasm was noted in both cervical and lumbar region.

Figure 1. AP view of lumbar spine x-ray showing syndesmophyte

Figure 2. AP view of hip x-ray showing bilateral THR

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Radiographic characteristics include bilateral sacroiliac joint ankyloses and marginal syndesmophytes from L1 to L5 (Figure 1) and C2 to C6, resembling a "bamboo spine" along with x-ray of hip (Figure 2) showing bilateral THR confirmed the diagnosis of AS. Different outcome measures were used to evaluate the patient's condition, which includes Bath Ankylosing Spondylitis Functional Index (BASFI), which assesses the functional capacity of patient to perform daily activities, with a recorded score of 7 out of 10. The Bath Ankylosing Spondylitis Disease Activity Index (BASDAI), which assess disease activity in AS patient, with a recorded score of 8.2 out of 10. Additionally Visual Analog Scale (VAS) was used to access pain in his right hip joint and was reported as 8 out of 10 and Hip disability and Osteoarthritis Outcome Score for Joint Replacement (HOOS, JR) was used to assess hip disability, with a recorded score of 40 out of 100.

INTERVENTION

The intervention for Ankylosing spondylitis was divided into AS-specific exercises for musculoskeletal involvement and secondary consequences (cardiorespiratory and balance) and a home-based exercise protocol for right hip which underwent recent THR. The AS specific exercise regimen consisted of 6 sessions per week over a 12-week period, with each session lasting 45-60 minutes. The exercises mainly focused on the strengthening and stretching of spinal musculature, along with spinal mobility exercises and stretches of hip musculature. The exercises also focus on balance as well as cardiorespiratory functioning of patient. Theraband, dumbbells and sandbags were utilized as modes of resistance. (Table 1) (Millner, J. R. et al., 2016)

Table 1. Ankylosis Spondylitis specific exercise Protocol

Interventions	Intensity	Frequency
Moist heat (cervical and upper back)	10 min	All sessions
MET for upper trapezius (bilateral)	5 reps,10 s hold, 2 set each side	Alternate session
Positional stretching in supine position with thin pillow	5 min	All sessions
Suboccipital, levator scapulae, lumbar erectors, hamstring, hip flexors and piriformis stretching	3 reps of 30 s stretch	All sessions
Pectoral tendon mobilization	3 reps of 10 oscillation, 2 set	All sessions
Low impact active spinal mobility exercise on gym ball (all planes)	2 sets of 10 reps in each direction	All sessions
Progressive strength training for spinal extensor, scapular stabilizer, deep neck flexors	2 sets of 10 reps each muscle	All sessions
Balance exercise in star excursion balance test grid (8 direction)	2 sets of 3 reps each direction	All sessions
Bicycle ergometer	40-65% targeted heart rate for 10 min	All sessions

Muscle Energy Technique (MET), Minutes (min), Seconds (s)

Another home-based exercise protocol was provided to the patient primarily focusing on the recently operated right hip that underwent THR. This protocol consisted of 5 sessions per week for 12 weeks. The program included strengthening and walking exercises aimed at increasing muscle force and functionality. The exercises comprised movements that trained the abductors, flexors, and extensors of the affected hip. The program consisted of 12 levels, with the aim of increasing the difficulty level each week. To ensure exercise adherence, exercises were taught at the beginning of every week and feedback was collected at the end of the week. (Table 2) (Wijnen, A. et al., 2020).

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Table 2: Home- Based Exercise Protocol for THR

Strengthening exercises	**Walking/step exercises**		
Day 1,3,6	Day 2,5		
Level 1			
Exercise	Intensity	Exercise	Intensity
Sitting knee extensions (affected leg)	2 x 10 reps	walking	3 x 5 min
Heel and toe raises	same		
Standing knee raise (affected leg)	same		
Hip extension (affected leg)	same		
Hip abduction (affected leg)	same		
Level 2			
Sitting knee extensions (affected leg)	3 x 10 reps	walking	2 x 10 min
Standing knee raise (affected leg)	same		
Hip abduction (affected leg	same		
Hip extension (affected leg)	same		
Heel and toe raises	same		
Bilateral mini-squat behind a chair	2 x 10 reps		
Level 3			
Heel and toe raises	3 x 10 reps	Walking	2x 10 min
Sitting knee extensions (affected leg)	same		
Standing knee raise (affected leg)	same	Step	2x 10 reps
Hip extension (affected leg)	same		
Hip abduction (affected leg)	same		
Bilateral mini-squat behind a chair	3 x 10 reps		
Level 4			
Heel and toe raises	3 x 10 reps	Walking	3x 10 min
Sitting knee extensions (affected leg)	2 x 10 reps + ankle weight (1/2 kg)		
Standing knee raise (affected leg)	same	Step	2x 10 reps
Hip extension (affected leg)	Same		
Hip abduction (affected leg)	same		
Bilateral mini-squat behind a chair	3 x 10 reps		
Level 5			
Heel and toe raises	3 x 10 reps	Walking	3x 10 min
Sitting knee extensions (affected leg)	3 x 10 reps + ankle weight (1/2 kg)		
Standing knee raise (affected leg)	same	Step	3x 10 reps
Hip extension (affected leg)	same		
Hip abduction (affected leg)	same		
Bilateral mini-squat behind a chair	3 x 10 reps		
Level 6			
Tandem stance, one hand for support	2 x 10 sec	Walking	2x 15 min
Heel and toe raises	3 x 10 reps		
Chair rise/sit to stand	2 x 5 reps	Step	3x 10 reps
Standing knee raise (affected leg)	3 x 10 reps + ankle weight (1/2 kg)		
Hip extension (affected leg)	same		
Hip abduction (affected leg)	same		
Level 7			
Tandem stance, one hand for support	2 x 15 sec	Walking	2x 15 min
Heel and toe raises	3 x 10 reps		
Chair rise/sit to stand	3 x 5 reps	Step	2x 15 reps
Standing knee raise (affected leg)	3 x 10 reps + ankle weight (1/2 kg)		
Hip extension (affected leg)	same		
Hip abduction (affected leg)	same		
Hip abduction (non- affected leg)	same		
Level 8			
Tandem stance, one hand for support	2 x 15 sec	Walking	2x 20 min

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Heel and toe raises	3 x 10 reps		
Chair rise/sit to stand	3 x 5 reps	Step	2x 15 reps
Single-leg stance, one hand for support	2 x 10 sec		
Standing knee raise (affected leg)	3 x 15 reps + ankle weight (1/2 kg)		
Hip extension (affected leg)	same		
Hip abduction (non- affected leg)	same		
Hip abduction (affected leg)	same		
Level 9			
Tandem stance, one hand for support	2 x 20 sec	Walking	2x 20 min
Heel and toe raises	3 x 10 reps		
Chair rise/sit to stand	3 x 5 reps	Step	3x 15 reps
Single-leg stance, one hand for support	4 x 10 sec		
Standing knee raise (operated leg)	3 x 15 reps + ankle weight (1 kg)		
Hip abduction (non- affected leg)	same		
Hip abduction (affected leg)	same		
Hip extension (affected leg)	same		
Level 10			
Tandem stance, without hand support	2 x 20 sec	Walking	1x 25 min
Heel and toe raises	3 x 10 reps		
Chair rise/sit to stand	3 x 5 reps	Step	3x 15 reps
Single-leg stance, one hand for support	4 x 15 sec		
Standing knee raise (affected leg)	3 x 15 reps + ankle weight (1 kg)		
Hip abduction (non- affected leg)	same		
Hip abduction (affected leg)	same		
Hip extension (affected leg)	same		
Level 11			
Tandem stance, without hand support	2 x 25 sec	Walking	1x 25 min
Heel and toe raises	3 x 10 reps		
Chair rise/sit to stand	3 x 5 reps	Step	4x 15 reps
Single-leg stance, without hand support	4 x 15 sec		
Standing knee raise (operated leg)	4 x 15 reps + ankle weight (1 kg)		
Hip abduction (non- affected leg)	same		
Hip abduction (affected leg)	same		
Hip extension (affected leg)	same		
Level 12			
Tandem stance, without hand support	2 x 25 sec	Walking	1x 30 min
Heel and toe raises	3 x 10 reps		
Chair rise/sit to stand	4 x 5 reps	Step	4x 15 reps
Single-leg stance, without hand support	4 x 20 sec		
Standing knee raise (affected leg)	4 x 15 reps + ankle weight (1 kg)		
Hip abduction (non- affected leg)	same		
Hip abduction (affected leg)	same		
Hip extension (affected leg)	same		

minutes (min), seconds (sec), repetitions (reps)

RESULTS

The re-evaluation was conducted to measure the different outcome measures after 12 weeks of physiotherapeutic interventions. The baseline score for BASFI and BASDAI were 7 and 8.1 respectively. Post-intervention results showed a significant improvement in both scores, with score of 2 for BASFI indication improved functional capacity of patient to perform daily activities and 3.8 for BASDAI indicating improved disease activity. The pain was reduced from 8 on VAS to 3 and HOOS,JR score increased from 40 to 60 indicating improvement in hip disability. The findings were described in Table 2 and displayed in Figure 2 respectively.

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Table 3. Description of outcome measure at 0 week and 12 week.

Outcome measures	Pre Interventional score (0 week)	Post Interventional score (12 week)
BASFI	7	2
BASDAI	8.1	3.8
VAS	8	3
HOOS,JR	40	60

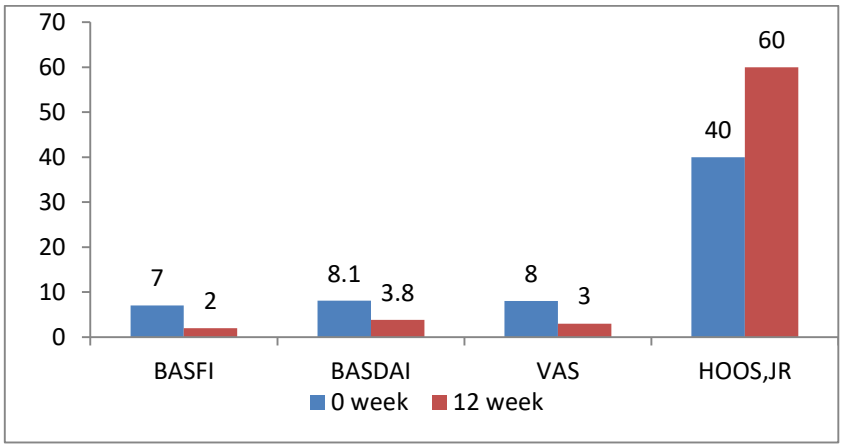

Figure 3. Graphical representation of outcome measure at 0 and 12th week

DISCUSSION

This case study aimed to highlight the effectiveness of physiotherapy in an AS patient who had undergone bilateral THR. Typically, in most cases of AS, symptoms start from the sacroiliac joint and progress to the entire spine. However, in this case study, the symptoms began with hip joint degeneration, followed by spinal involvement. Despite being diagnosed at an early age of 24, the patient did not attend regular or proper physiotherapy sessions due to a lack of knowledge.

In the present case, the patient's negative HLA-B27 test indicates that the diagnosis of AS is not solely based on HLA-B27 but also includes clinical and radiographic findings. This underscores the importance of a comprehensive diagnostic approach for Ankylosing Spondylitis.

The AS specific exercise protocol was designed to minimize or improve musculoskeletal complications such as pain, postural deformities, decreased mobility and muscle weakness, as well as secondary consequences including cardiorespiratory, balance issues and limitations in physical activities.

These exercises resulted in statistically significant improvements in the BASFI, BASDAI score after 12 weeks of physiotherapeutic intervention. This is consistent with the findings of Fabio Jennings et al., (2015) which concluded that 12 weeks of aerobic and stretching exercises resulted in statistically significant improvements in BASFI and BASDAI scores, indicating enhanced functional capacity and reduced disease activity in patients with AS.

Gunay et al., (2017), reported that balance exercises in water and on land could improve the benefits of physiotherapy. As in present case, balance training was performed using the Star Excursion Balance Test grid, which proved to be both beneficial and feasible for the AS patient.

Another study conducted by Manar A. Mady et. al, (2023) also supports the findings of present case and concluded that therapeutic exercises results in significant improvement in both BASFI and BADAI when administered for 8 weeks.

A home-based exercise protocol was provided for managing symptoms associated with the right hip joint and showed a statistical significant improvement in both pain and disability. This aligns with the findings of Benjamin Steinhilber et al. (2012), which report that an 8-week progressive home-based exercise protocol for individuals with hip osteoarthritis and/or total hip replacement results in decreased pain and improved hip musculature strength.

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The positive results from this case study highlight the critical role of targeted physiotherapy protocols in managing musculoskeletal consequences in Ankylosing Spondylitis, especially post-hip replacement.
This study has certain limitations that should be acknowledged. Firstly, it was based on the experience of a single individual, which limits its external validity and generalizability to a larger population. Further research involving larger sample sizes is necessary to validate the findings and draw more robust conclusions. Additionally, there is a lack of published literature on physiotherapeutic approaches for AS patients who have undergone THR.

CONCLUSION

In conclusion, this case study highlights the positive impact of physiotherapy on the musculoskeletal consequences in an AS patient who underwent bilateral THR. The findings indicate that the implementation of Ankylosis Spondylitis specific exercise along with home-based exercise protocols for patients with AS results in significant improvements in various aspects such as pain, functional capacity, disease activity and hip disability.

DECLARATION

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Conflict of Interest: The authors and planners have disclosed no potential conflicts of interest, financial or otherwise.

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