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Effect of proprioceptive exercises on balance and kinesiophobia in a patient with bilateral total hip arthroplasty: A case report

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ABSTRACT

Total hip arthroplasty (THA), done as a result of idiopathic avascular necrosis damages the joint proprioceptors which leads to impairments in proprioception, balance and increase in the fear of movements that is kinesiophobia. A 42-year-old male, diagnosed with bilateral avascular necrosis was operated in the form of bilateral THA. The patient came to the physiotherapy outpatient department of Dhiraj General Hospital after one and half months with complaints of pain over the recently operated hip joint during sit-to-stand activities, fear of fall and difficulties in walking. A physiotherapy rehabilitation protocol was formed and personalized according to the needs of the patient. Berg Balance Scale, TAMPA scale for kinesiophobia and hip joint proprioception were taken as the primary outcome measures. This study concludes that proprioceptive exercises following THA help decrease kinesiophobia, improve balance and joint proprioception.

Keywords: Total hip arthroplasty, balance, hip joint proprioception, kinesiophobia, proprioceptive exercises, osteomyelitis, physiotherapy, rehabilitation, surgical treatment, inflammation.

1. INTRODUCTION

Total Hip Arthroplasty (THA) is a frequently performed surgical procedure in cases of Avascular Necrosis (AVN) of the hip as it commonly leads to the collapse of the femoral head (Väänänen et al., 2021; Ganesh et al., 2022). The joint mechanoceptors are present in the structures surrounding the joint which are compromised due to AVN and major surgeries like THA, as a result of which hip joint proprioception and balance get altered (Labanca et al., 2021). Kinesiophobia is an important psychological factor and an adaptation to an acute painful stimulus, which in the later phase leads to avoidance of movements resulting in chronic pain and decreased functional ability, which in turn affects the outcomes of THA (Alsaleem et al., 2021).

Many studies have proved that proprioceptive and balance training protocols are effective in improving balance and kinesiophobia in the geriatric population (Saluja and Sharma, 2022; Domínguez-Navarro et al., 2018). But to the best of our knowledge, no such evidence was found in THA cases. Hence, a stage-wise personalized physiotherapy protocol focusing on hip joint proprioception and balance was formed based on the precautions THA which was followed for eight weeks, after which the patient was reassessed and the results were noted.

2. CASE REPORT

Patient Description

A 42-year-old male telephone operator resident of Panchmahal district had a history of bilateral hip joint pain since one year. The pain was gradual in onset, intermittent and non-radiating in nature and aggravated during stair climbing, prolonged walking and sitting. There was no history of fall, trauma or any systemic illness. With all these complaints, he consulted a local hospital where just the symptomatic pain-relieving medications were given. But as there was no relief of symptoms, he visited again after two months; investigations were done in the form of X-Ray (Figure 1) which was suggestive of cortical collapse and posterosuperior subluxation of femoral head bilaterally and was diagnosed as Bilateral Grade IV AVN of the hip joint.

As a result of this, the patient underwent right uncemented THA on 12/07/2022 and left uncemented THA on 06/01/2023. The patient came to the physiotherapy outpatient department of Dhiraj General Hospital (DGH) on 20/02/23, with a postoperative X-ray (Figure 2) and complaints of pain over the recently operated hip joint during sit-to-stand activities, fear of fall and difficulties in walking. Before coming to DGH, the patient was following a basic home exercise program which was advised at the time of discharge. The timeline of events is given (Table 1).

Figure 1 Pre-operative X-ray of hip joint indicating Grade IV Avascular necrosis

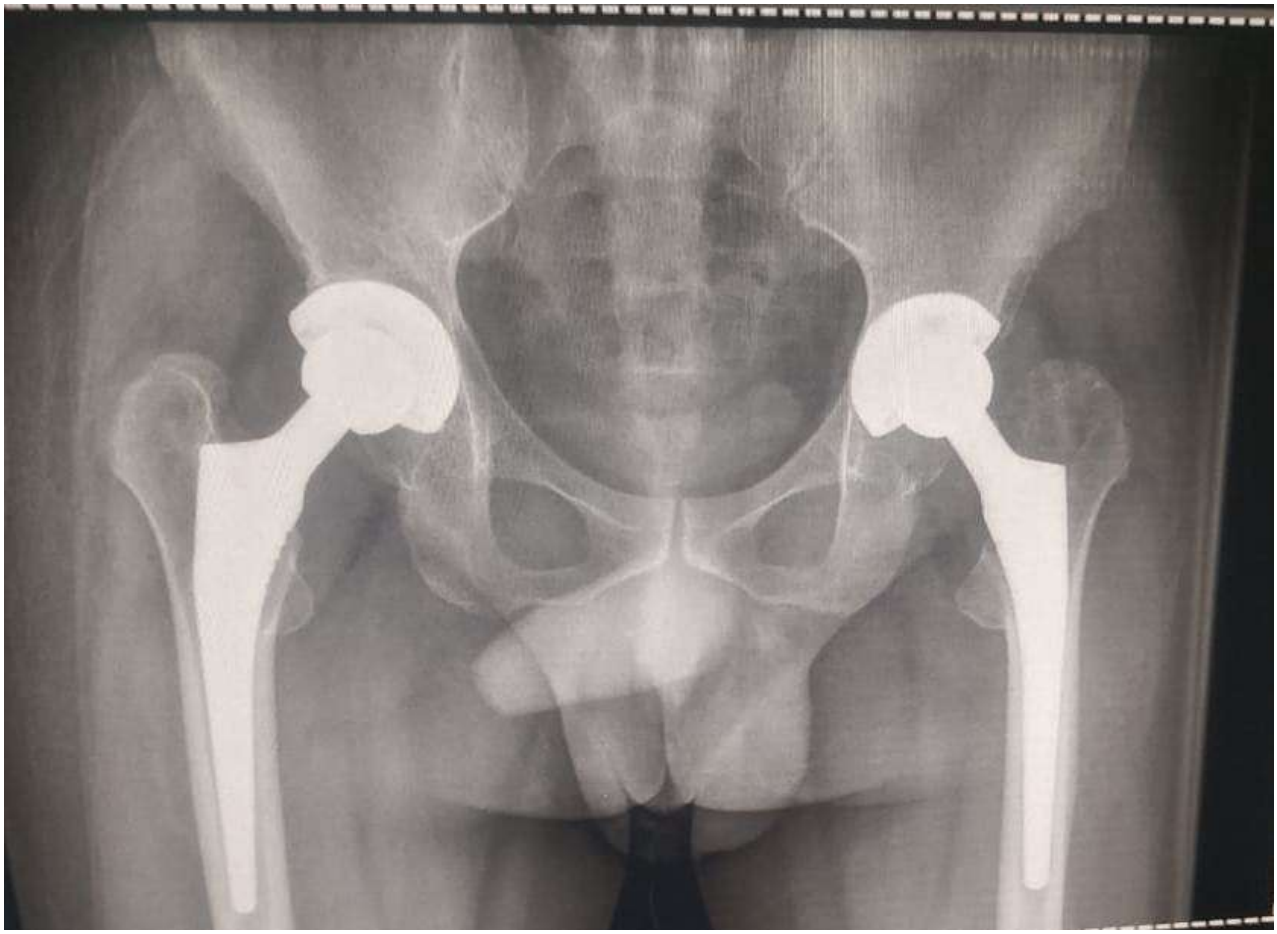

Figure 2 Post-operative X-ray of hip joint showing bilateral THA

Table 1 Timeline of events

Events	Date of events
Onset of pain	Since one year
Date of right THA	12/07/2022
Date of left THA	06/01/2023
Date of admission to physiotherapy OPD of DGH	20/02/2023
Date of discharge	08/04/2023

3. CLINICAL FINDINGS

Informed consent was taken from the patient and a comprehensive physiotherapy assessment was done. On observation, the patient was taking less weight on the left side during sitting and standing positions and had bilateral flat feet deformity. Waddling gait was observed with more truncal sway towards the left side. Pain was present over the lateral aspect of the hip joint during prolonged walking and sit-to-stand activities. The Numerical Pain Rating Scale (NPRS) was zero on rest and six during walking and sit-to-stand activity. The patient also had left knee pain during prolonged walking and the NPRS was zero on rest and four on walking. Grade 2 tenderness was present over the medial joint line of the knee. Trendelenburg sign was positive on both sides more marked on the left side (Figure 3).

Figure 3 Trendelenburg sign

Tightness of hamstrings was present, measured by active knee extension angle as 40 degrees. Muscle length of gastrosoleus group of muscle was 10 degrees which indicates tightness. The range of motion (ROM), manual muscle strength (MMT), NPRS, hip joint proprioception, Berg Balance Scale (BBS) and TAMPA scale for kinesiophobia were taken at baseline, after four weeks and after eight weeks (Labanca et al., 2021; Alsaleem et al., 2021; Reddy et al., 2022). The hip joint position sense (JPS) was measured using a bubble inclinometer in supine and side-lying positions (Figure 4). There was a positive improvement in all the outcome measures (Table 2, 3, 4) as well as the gait pattern of the patient was also normalized.

Figure 4 Hip joint position sense assessment

Table 2 Range of motion measurements at baseline, four weeks and discharge

Movements		Baseline				Discharge			
		Left		Right		Left		Right	
		Active	Passive	Active	Passive	Active	Passive	Active	Passive
Hip	Flexion	0-90˚	N/A	0-90˚	N/A	0-90˚	N/A	0-90˚	N/A
	Extension	0-15˚	0-20˚	0-20˚	0-25˚	0-25˚	0-30˚	0-30˚	0-33˚
	Abduction	0-30˚	0-33˚	0-35˚	0-37˚	0-40˚	0-45˚	0-40˚	0-45˚
	Adduction	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Internal rotation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	External rotation	0-27˚	0-30˚	0-30˚	0-35˚	0-37˚	0-40˚	0-40˚	0-42˚
Knee	Flexion	0-120˚	0-125˚	0-125˚	0-130˚	0-125˚	0-130˚	0-125˚	0-130˚
	Extension	120-0˚	125-0˚	125-0˚	130-0˚	125-0˚	130-0˚	125-0˚	130-0˚
Ankle	Dorsi-flexion	0-15˚	0-20˚	0-15˚	0-20˚	0-15˚	0-20˚	0-15˚	0-20˚
	Plantar-flexion	0-30˚	0-35˚	0-30˚	0-35˚	0-30˚	0-35˚	0-30˚	0-35˚
	Inversion	0-30˚	0-35˚	0-30˚	0-35˚	0-30˚	0-35˚	0-30˚	0-35˚
	Eversion	0-15˚	0-20˚	0-15˚	0-20˚	0-15˚	0-20˚	0-15˚	0-20˚

Table 3 Manual muscle strength assessment at baseline and discharge

Movements		Baseline		Discharge	
		Left	Right	Left	Right
Hip	Flexors	Functionally good	Functionally good	Functionally good	Functionally good
	Extensors	3/5	4/5	4/5	5/5
	Abductors	3/5	4/5	4/5	5/5
	Adductors	Functionally fair	Functionally fair	Functionally good	Functionally good
	Internal rotators	Functionally fair	Functionally fair	Functionally good	Functionally good
	External rotators	3/5	4/5	4/5	5/5
Knee	Flexors	4/5	5/5	5/5	5/5
	Extensors	4/5	5/5	5/5	5/5
Ankle	Dorsi-flexors	5/5	5/5	5/5	5/5
	Plantar-flexors				
	Invertors				
	Evertors				

Table 4 Outcome measures at baseline and discharge

Outcome Measure		Baseline	At four weeks	At eight weeks
NPRS- Rest (Left hip joint)		0/10	0/10	0/10
NPRS- Activity (Left hip joint)		6/10	2/10	0/10
NPRS- Rest (Left knee joint)		0/10	0/10	0/10
NPRS- Activity (Left knee joint)		4/10	0/10	0/10
Hip joint proprioception	Left	15˚	12˚	10˚
	Right	13˚	11˚	8˚
TAMPA scale of Kinesiophobia		57	44	34
Berg Balance Scale		30	42	51

Therapeutic intervention

The patient continued physiotherapy for eight weeks at the physiotherapy OPD of DGH. The physiotherapy treatment protocol is given (Table 5).

Table 5 Therapeutic intervention

Rationale	Week-wise progression			
	1-2 weeks	3-4 weeks	5-6 weeks	7-8 weeks
Patient education	Patient and his family member were educated about the importance of following a regular exercise program		-	-
Relief of pain and muscular spasm	Cryotherapy at left hip joint TENS at left knee joint	Cryotherapy continued	-	-
Warm-up	Active movements of lower limb, muscle setting exercises of glutei, abductors, adductors, hamstrings and quadriceps; and stretching of major muscles- hamstrings, quadriceps and gastrosoleus			
Strengthening	Straight leg raises (SLR) in supine, side lying positions, Bridging, High sitting-knee extension	Repetitions and sets of SLR was increased, SLR in prone position, one leg bridging, wall squat	500 gm weight was added on in SLR in supine and side lying positions, bridging and wall squat with theraband	1 kg weight was added in SLR, wall squats with physioball in between, sumo quats
Balance and proprioceptive exercises	One leg standing with support on firm base, heel raise and toe raise on firm base with maximum support, Star excursion balance exercise on firm base, standing with eyes open on sand filled tray, Side-ward walking, obstacle walking	One leg standing without support on firm base, heel raise and toe raise on firm base with minimum support, Star excursion balance exercise on firm base, Anteroposterior and lateral balance on tilt board with maximal support, side-ward walking with obstacles, slope walking standing with eyes closed on sand filled tray	One leg standing with support on foam base, heel raise and toe raise on foam base with maximum support, Star excursion balance exercise on foam base, Anteroposterior and lateral balance on tilt board with minimal support, one legged standing on sand filled tray with support, slope walking, stair climbing	One leg standing with minimal support on foam base, heel raise and toe raise on foam base with minimum support, Star excursion balance exercise on foam base, Anteroposterior and lateral balance on tilt board with minimal support, one legged standing on sand filled tray without support, slope walking, stair climbing
Cool down exercises	Active movements of lower limb and stretching of major muscles- hamstrings, quadriceps and gastrosoleus			

4. DISCUSSION

Studies have proved that major surgeries like THA lead to damage of the joint mechanoceptors which leads to balance and proprioceptive deficits (Labanca et al., 2021). Kinesiophobia is one of the important psychological factors, as the fear of movement due to physical activity which has led to injury in the past persists (Alsaleem et al., 2021). Both the above impairments were evident in our patient. Saluja and Sharma, (2022) studied the effects of proprioceptive training protocol on balance and kinesiophobia in the elderly population and a positive outcome was noted. Hence, a personalized physiotherapy protocol was formed focusing on the hip joint proprioception. This study concluded that the above-mentioned protocol improved the patient's hip joint proprioception, balance and kinesiophobia.

5. CONCLUSION

This study concludes that patients with THA benefitted from proprioceptive and balance exercises and showed improvements in hip joint proprioception, balance and kinesiophobia.

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Author contributions

Tushara Nair: Planning the treatment protocol, treatment of patient and article writing.
GP Kumar: Language editing and reviewing the article.

Informed consent

Written and Oral informed consent was obtained from the patient included in the study. Additional informed consent was obtained the identifying information is included in this manuscript.

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Conflict of interest

The authors declare that there is no conflict of interests.

Data and materials availability

All data sets collected during this study are available upon reasonable request from the corresponding author.

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