

Medical Science

To Cite:

Pathan PA, Wadibhasme BH, Shukla KG, Nimkar TH, Sasun AR. Scapular Proprioceptive Neuromuscular Facilitation and Plyometrics Integration for Overhead Functional Restoration in a Kabaddi Player Post Bankart Lesion Repair: A Case Report. *Medical Science* 2025; 29: e209ms3709
doi: <https://doi.org/10.54905/disssi.v29i164.e209ms3709>

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Peer-Review History

Received: 18 June 2025
Reviewed & Revised: 29/June/2025 to 01/October/2025
Accepted: 09 October 2025
Published: 16 October 2025

Peer-review Method

External peer-review was done through double-blind method.

Medical Science

pISSN 2321-7359; eISSN 2321-7367



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Scapular Proprioceptive Neuromuscular Facilitation and Plyometrics Integration for Overhead Functional Restoration in a Kabaddi Player Post Bankart Lesion Repair: A Case Report

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ABSTRACT

Anterior shoulder dislocations, Bankart lesions, and Hill-Sachs lesions are common traumatic injuries caused by high-intensity contact sports like Kabaddi. Because playing entails quick and strong body motions, injuries are unavoidable. Playing Kabaddi requires both offensive and defensive abilities, and players are more likely to sustain a variety of sports-related ailments. Overuse injuries, knee injuries, muscular strains, and ligament sprains can result from improper technique or overload. To restore the patient to their pre-injury state and enhance their quality of life, physiotherapy is essential. The patient presented to us complaining of reduced strength of the left shoulder, along with the inability to perform overhead activities. He underwent surgical repair of the left Bankart lesion. A physiotherapy protocol was designed for six weeks, which included the early integration of scapular PNF, plyometric training, and conventional physiotherapy in a structured rehabilitation plan. The Visual Analogue Scale, the Oxford Shoulder Instability Score, the Shoulder Pain and Disability Index, and the Constant Murley Scale were among the outcome measures used to evaluate the patient's progress. The patient showed notable improvement after completing the rehabilitation protocol. This case study concludes that a Kabaddi athlete's dynamic shoulder stability and functional capacity were successfully restored after Bankart repair through the early integration of plyometric training and scapular proprioceptive neuromuscular facilitation within a structured rehabilitation program. This strategy could be used as a template to treat shoulder injuries in comparable contact sports.

Keywords: Bankart lesion, Kabaddi, Plyometric training, Scapular PNF, Rehabilitation, Return to play

1. INTRODUCTION

Kabaddi is a widely popular combat sport that began in South Asia and nowadays has gradually gained popularity in other countries. Kabaddi, a dynamic contact sport and proudly known as India's national game, is played enthusiastically in every corner of the country. Over the last decade, it has garnered significant attention and popularity, not only within India but also on the international stage. It's a game that's all about strategy, speed, and strength — players make quick, powerful moves that demand a lot from their bodies. Due to the sport's intense physical nature, injuries are relatively common. Soft tissues and ligaments are the most commonly injured structures in Kabaddi players. Among all injury locations, the shoulder is the most affected (50.00%), followed by the hand (26.00%) and fingers (3.50%) (Pal et al., 2020). Around 90-95% of all shoulder instabilities occur anteriorly (Widjaja et al., 2006).

Bankart’s lesion’s anterior labrum tear causes shoulder instability (Nimse et al., 2023). Players involved in sports activities like volleyball, Kabaddi, and basketball are more susceptible to shoulder dislocations more frequently (Sonone et al., 2022). Shoulder external rotation with abduction causes anterior shoulder dislocation, which leads to a Bankart lesion (Tupe and Tiwari, 2023).

A Hill-Sachs lesion is a humeral head bony defect that is commonly associated with anterior shoulder instability. The injury mechanism is the blow against the glenoid rim, as the dislocating motion will produce a compression fracture (Provencher et al., 2012). Male sex and contact sports increase recurrent instability risk (Zhang et al., 2022).

In comparison to an open procedure, arthroscopic surgery offers the advantages of preserving the subscapularis muscle, improving range of motion, reducing postoperative pain, allowing for selective soft tissue tensioning, and anatomically restoring the glenoid labrum. With arthroscopically treated Bankart lesions, shoulder function and return to the same level of sport are improved. When the loss of glenoid bone is 13.5% to 17.3%, non-engaging, and has a low risk of recurrence. Patients suffering from Hill-Sachs lesions are treated with Open Bankart repairs or isolated arthroscopic procedures (Tupe and Tiwari, 2023). Promoting tissue healing, protecting the surgical site, regaining mobility and strength are rehabilitation goals for arthroscopic repair. It involves principles such as immobilization, early closed kinetic chain exercises, resistance training, and functional exercises (McDonough and Funk, 2013).

Regarding the available literature in physiotherapy. Very few studies are available that have utilised plyometric training for return to play post-Arthroscopic Bankart lesion in kabaddi players. Hence, we are utilising plyometric training in the post-Arthroscopic Bankart lesion.

2. CASE PRESENTATION

A 17-year-old left-hand dominant male Kabaddi player from Nagpur reported a left shoulder dislocation. On November 1, 2024, while playing Kabaddi, the patient suffered an anterior dislocation. He did not sustain any contact injuries; instead, the dislocation occurred due to a fall on an outstretched hand while playing, which eventually led to sudden pain and swelling, which gradually increased in intensity over time. Following this, the patient underwent several investigations where he was diagnosed with anterior shoulder dislocation.

The same incident reoccurred when, suddenly, while performing an overhead activity, he felt his left shoulder loosening and hanging, followed by a popping sound. Further, he relocated the shoulder himself. After this, he visited an orthopaedic surgeon who advised him to undergo magnetic resonance imaging, where he was diagnosed with a Bankart lesion. Following this, he was advised to undergo surgical repair. The surgery was performed to repair the Bankart and Hill-Sach's lesion. Postoperatively, the operated limb was immobilised, and the patient was advised to begin a planned physiotherapy rehabilitation programme. The entire Timeline of events is described in Table 1.

Table 1: Timeline of events.

Date of events	Timeline of Events
1 /11/ 2024	Fell on an outstretched hand while playing Kabaddi, an anterior dislocation occurred, and a closed reduction was done
13 /02/ 2025	Repeated history of falls and relocated his Left shoulder by himself
14 /02/ 2025	A magnetic Resonance Imaging was done
16 /02/ 2025	Arthroscopic Bankart repair with Hill-Sachs repair was done
25 /03/ 2025	Initiated physiotherapy rehabilitation

3. CLINICAL ASSESSMENT

The patient visited the outpatient department with the left shoulder elevated, adducted, and internally rotated; the elbow was flexed and supported with an arm pouch sling. visual analogue scale was used to measure the severity of pain, which was 7/10 on movement and 3/10 at rest. On inspection, the scar was noted on the anterior aspect of the shoulder, and no signs of inflammation were noticed. On posture examination, the inferior borders of the scapula were not symmetrical, and the left shoulder was elevated than right. Tenderness (Grade 1) was reported over the incision site. The range of motion was measured by using a goniometer, where the ranges for Flexion, Abduction, and Lateral rotation of the left shoulder were restricted due to Empty end-feel (Tables 2 and 3). The muscle strength is mentioned in Tables 4 and 5.

Table 2: Pre-Rehabilitation Shoulder Range of Motion Assessment

Joint	Right limb			Left limb		
Joint movements	active	passive	end-feel	active	passive	end-feel
Flexion	0-175	0-180	Firm	0-85	0-90	Empty
Extension	0-40	0-40	Firm	35-0	35-0	Firm
Abduction	0-175	0-178	Firm	0-40	0-42	Empty
Adduction	175-0	178-0	Firm	40-0	42-0	Firm
Internal rotation	0-90	0-95	Firm	0-70	0-74	Firm
External rotation	0-80	0-85	Firm	0-10	0-15	Empty

Table 3: Post-Rehabilitation Shoulder Range of Motion Assessment

Joint	Right Limb			Left limb		
Joint movements	active	passive	end-feel	active	passive	end-feel
Flexion	0-175	0-180	Firm	0-165	0-170	Firm
Extension	0-40	0-40	Firm	40-0	40-0	Firm
Abduction	0-175	0-178	Firm	0-160	0-165	Firm
Adduction	175-0	178-0	Firm	160-0	165-0	Firm
Internal rotation	0-90	0-95	Firm	0-80	0-85	Firm
External rotation	0-80	0-85	Firm	0-55	0-60	Firm

Table 4: Pre-Rehabilitation Shoulder Manual Muscle Testing Assessment

Muscles	Right limb	Left limb
Flexors	4+/5	3/5
Extensors	4+/5	4/5
Abductors	4+/5	3/5
Adductors	4+/5	3/5
Internal rotator	4+/5	3+/5
External rotator	4+/5	3-/5

Table 5: Post-Rehabilitation Shoulder Manual Muscle Testing Assessment

Muscles	Right limb	Left limb
Flexors	4+/5	4/5
Extensors	4+/5	4+/5
Abductors	4+/5	4/5
Adductors	4+/5	4/5
Internal rotators	4+/5	4+/5
External rotators	4+/5	4/5

4. DIAGNOSTIC ASSESSMENT

The X-ray finding revealed dislocation of the left anterior shoulder. Further, Magnetic Resonance Imaging showed a complete avulsion tear of the anteroinferior lateral ligamentous, suggestive of a Bankart lesion. Also, a small wedge-shaped compression fracture involving the posterolateral humeral head, showing a Hill-Sachs lesion (Figures 1 and 2).



Figure 1: X-Ray left shoulder joint



Figure 2: MRI of left shoulder joint

5. INTERVENTION

Physiotherapy sessions were conducted five days a week, with careful consideration of the patient's fatigue levels. The rehabilitation program was precisely tailored to the patient's specific problem list. No adverse events were reported. The rehabilitation protocol is mentioned in Table 6.

Table 6: The rehabilitation protocol from 1st to 8th week.

Week	Goals	Intervention	Regimen
0-2	Reduce Pain	▪ Cryotherapy	15 minutes
	Improve joint mobility	▪ Active-assisted shoulder exercises (Finger ladder, wand exercises) (Figure 3)	10 repetitions, 2 sets, with 10 sec hold and rest 15 seconds between each set.
	Improve muscle strength	▪ Isometric contraction of the muscles of the shoulder compartment	10 repetitions, 2 sets, with 10 sec hold and rest 15 seconds between each set.
2-4	Increase joint mobility	▪ Shoulder active range of motion exercise ▪ Arm elevation with the wand. ▪ Codman's exercise	15 repetitions × 3 sets, with a 10-second hold and a 15-second rest between each set.
	Increase the strength of the shoulder muscles	▪ Shoulder abduction in side lying in the pain-free range ▪ Shoulder flexion in standing in the pain-free range ▪ Isometric exercises for the rotator group	15 repetitions and 2 sets, with a half-kg weight cuff and hold for 10 seconds. and 15 seconds rest between each set.
	Improve the strength of the scapular muscles	▪ Prone lying shoulder abduction and lateral rotation by the I, Y, and T raises ▪ Scapular orientation exercise on a wall (figure of 8, circles, and alphabet) (Figure 4) ▪ Scapular PNF exercises (Figure 5)	15 repetitions and 2 sets, with a hold for 10 seconds and 15 seconds rest between each set Shoulder range: 90°.
4-6	Shoulder muscles strengthening	▪ Shoulder flexion and abduction exercises in standing ▪ Shoulder press exercises with a dumbbell ▪ Side lateral raises ▪ shoulder front raises ▪ Shoulder Internal and External Rotation	15 repetitions and 2 sets, with a 1 kg weight cuff and hold for 10 seconds and 15 seconds rest between each set. 10 repetitions and 3 sets, with a Theraband, and hold for 10 seconds and 15 seconds rest between each set.
	Scapular muscle strengthening	▪ Prone lying shoulder abduction with lateral rotation in the I, Y, and T raises ▪ Scapular push plus exercise on a Swiss ball (Figures 6 and 7)	15 repetitions and 2 sets, with a half kg weight cuff and hold for 10 seconds and 15 seconds rest between each set.
	Improve motor control	• PNF – D1 diagonal lifts, PNF – D2 diagonal lifts with a TheraBand (Figures 8 and 9)	10 repetitions of 2 sets with a 5-second hold and 15 seconds rest between each set
6-8	Return to play	▪ Plyometrics training ▪ Doorway fall Push-up ▪ Up and down ball rolls on the wall	10 repetitions of 2 sets with 5 seconds hold and 15 seconds rest between each set

		with both hands ▪ Push-up with a therapy ball ▪ Theratube exercise for rotator cuff (Figures 10 and 11) ▪ Cuban press ▪ Dumbbell snatch ▪ Open chain exercises: - Chest fly, ▪ Closed chain exercises: - Push-up	
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Figure 3: Patient performing Finger ladder exercises for increasing shoulder flexion.



Figure 4: Patient performing Scapular orientation exercise on a wall to improve glenohumeral stability



Figure 5: Therapist performing Scapular PNF to improve motor control



Figure 6: Patient performing Scapular I,Y,T Exercise on Swiss ball to strengthen scapular muscles



Figure 7: Patient performing Scapular I,Y,T Exercise on swiss ball with a dumbbell



Figure 8: Patient performing PNF D1 Flexion



Figure 9: Patient performing PNF D2 Flexion



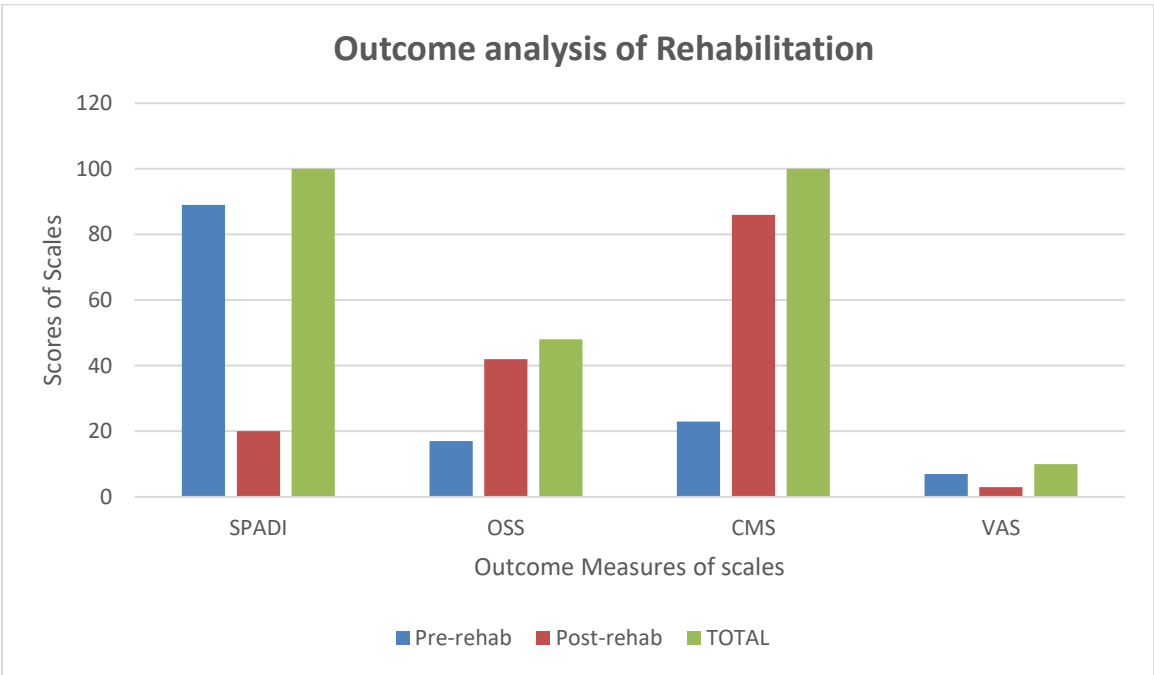
Figure 10: Patient performing Theratube exercise to strengthen rotator cuff muscles



Figure 11: Theratube exercises in throwing specific position, integrated with throwing specific movements.

Outcome Measures:

Outcome measures were evaluated at the beginning and at the end of the 8 weeks (Graph 1).



Graph 1: Describing outcome measures of rehabilitation

6. DISCUSSION

This case report aimed to demonstrate the effectiveness of integrating Scapular Proprioceptive Neuromuscular Facilitation (PNF) and plyometric training into the rehabilitation protocol of a Kabaddi player following arthroscopic Bankart lesion repair to restore overhead functional activities and enable a return to play. Insufficient evidence was found, specifically linking Bankart lesions to Kabaddi players. According to the results of our rehabilitation, which included scapular PNF, plyometric training, and conventional physiotherapy, our patient achieved positive outcomes. The Exercise regimen was planned for improving motor control and strength of the shoulder musculature. More sport-specific research is required to establish a clear association and rehabilitation outcomes.

According to Sonone et al., (2022) physiotherapy has been demonstrated to enhance postoperative results in arthroscopic Bankart repair. A well-designed and structured protocol led to continuous improvements in functional goals. The patient's condition improved as a result of pain relief, increased range of motion, forearm, arm, and shoulder strength, and postural corrective exercise. Swanik et al., (2022) demonstrated the crucial importance of Plyometric training in improving proprioception and kinaesthesia. Upper extremity rehabilitation programs are beginning to utilise plyometric activities as a means of increasing neuromuscular control and dynamic stability of the joint. The exercise therapy protocol includes active-assisted range of motion exercises, active-assisted exercises against gravity, strengthening exercises, wall climbing, and open cage exercises (Vittala et al., 2023).

Phansopkar et al., (2020) in their study showed that after four weeks of treatment, the patient's post-rehabilitation functional independence and muscle strength significantly boosted due to the effects of neuromuscular re-education, electrotherapy, strengthening exercises, and other physical therapy techniques. Sasun et al., (2022) in her study, concluded that the intensity of pain gets reduced due to effect of muscular re-education techniques and manual therapy on the spine.

According to Saito et al., (2022), stretching activities help to lengthen specific muscles, tendons, and muscle groups while improving flexibility. Scapular strengthening exercises target the surrounding muscles to enhance strength and provide crucial postural support during both static and functional activities. This case study highlights the importance of structured physiotherapy protocol and the implications of Scapular PNF and plyometric techniques for functional recovery of the patient.

7. CONCLUSION

This case report emphasises the value of a structured and progressive rehabilitation program involving Scapular PNF and plyometric training to restore functional overhead activities in a Kabaddi player after arthroscopic Bankart lesion repair. The rehabilitation protocol effectively addressed specific goals, including reducing pain, improving range of motion, strengthening muscles, achieving neuromuscular control, and safely returning to play. During the six weeks of physical therapy rehabilitation, no dislocation episodes occurred.

Abbreviation:

SPADI: Shoulder Pain and Disability Index

OSIS: Oxford Shoulder Instability Score

CMS: Constant Murley score

VAS: Visual Analogue Scale

PNF: Proprioceptive Neuromuscular Facilitation

ROM: Range of Motion

MRI: Magnetic Resonance Imaging

Acknowledgments

We would like to thank our patient, who consented to be part of our case report. We would like to thank the team of Bhausaheb Mulak Physiotherapy College for their contribution to diagnosis, management and rehabilitation.

Author contributions

ARS led the assessment and various interventions for the patient, ARS and PP suggested changes for manuscript processing, and BW, KS and TN made the necessary corrections for the publication. Overall, every author contributed equally.

Patient's Perspective

I would like to thank Parveen and Anam for all the facilities provided throughout my rehabilitation. I am thankful to them so that I can resume my duties.

Informed consent

The patient consented to the publication of photographs. Written & Oral informed consent was obtained from individual participants included in the study.

Ethical approval

Not applicable.

Funding

This research did not receive any external funding like specific grant from funding agencies in the public, commercial, or nonprofit sectors.

Conflict of interest

The authors declare that they have no conflicts of interests, competing financial interests or personal relationships that could have influenced the work reported in this paper.

Data and materials availability

All data associated with this study will be available based on the reasonable request to corresponding author.

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