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Interventions of proprioceptive training in lateral ankle sprain- A case report

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ABSTRACT

Ankle sprain is the most common injury in which lateral ankle sprain is more common. A 27 year male working in fire service twisted his leg while jumping. Then after 21 days of immobilization in plaster cast he came to physiotherapy department with complaint of pain and impaired balance and difficulty in changing direction. On MRI investigations partial tear of anterior talofibular and tibiotalar ligament were seen. Initially to reduce pain ankle range of motion exercises were given with cryotherapy. Progressive Proprioceptive, Balance and strength training were given with intrinsic muscle strengthening. Balance and proprioceptive training is effective in lateral ankle sprain with 4 week training protocol.

Keywords: Ankle sprain, proprioceptive training, balance training

1. INTRODUCTION

Ankle is the most common site for sprains which accounts for 75 % of ankle injuries in which lateral ankle sprains most frequently occur involving injury to anterior tibiofibular and calcaneo-fibular ligament (Wolfe et al., 2001). Mechanism of injury of ankle sprain includes sudden inversion and supination. Ankle sprain limits daily activities such as running, jumping, kicking and changing direction which is commonly related to ligament injury, capsular, tendinous and muscular structures are subject to damage both due to acute trauma of mechanical origin and the disuse promoted by immobilization or pain (Morse et al., 2004). Repeated ankle sprains can lead to mechanical or functional deficits, resulting in chronic ankle instability, degenerative joint changes, chronic pain, and loss of proprioception (de Vasconcelos et al., 2018; Bolvardi et al., 2019).

Traditional modes of treatment used for the same are cryotherapy, ankle range of motion exercises, mobilization techniques and balance and coordination training. This could diminish the symptoms of the patient (Powden et al., 2019). But as there is also a need for the patient to return to his functional activities with improved weight bearing and balance, proprioceptive training can be incorporated as there is proprioceptive deficits associated with ligamentous injury to the ankle (McKeon and Hertel, 2008). In

this case we found impairment in balance and proprioception in a 27 year old male as his leg was twisted during jumping which leads to ligament injury so we targeted on proprioceptive training which can be effective in ankle sprain condition. We have given early running training in figure of eight to improve proprioception along with agility training as early proprioceptive training is found to be effective than prolonged immobilization (Darware and Naqvi, 2020).

2. CASE PRESENTATION

A 27 year old male working at the airport fire service has twisted his right leg while jumping. So he went to an orthopedician with the complain of pain and difficulty in walking where radiographic investigations were done, but there were no changes found. In MRI, mild thickening and partial tear of anterior talofibular and tibiotalar ligament were seen. Plaster casts were applied on the ankle which was covering only ankle and distal 1\3rd of tibia and fibula for 21 days. Then he visited for physiotherapy after the removal of the plaster cast. The patient had pain during daily activities such as stair climbing, prolonged walking, running and balance. The onset of pain was sudden and intermittent in nature. Initially he rated 4 on NPRS pain during activity and 2 on NPRS while resting. Patient complained of a dull aching type of pain, superficially. Mild severity is seen and 24 hour behavior was present during night. Balance was impaired.

3. CLINICAL EVALUATION

When the patient came to physiotherapy OPD following positive findings were seen. On postural evaluation in posterior view patient had an elevated left shoulder. Redness over the dorsal aspect of the ankle was seen. Patient uses elastic bandages. Grade 1 (patient complains of pain) tenderness over dorsal aspect of ankle was present. Patient had tightness in hamstring and tendo-achilles. During examination, initially his ranges were different between left and right ankle. Inversion, plantarflexion and dorsiflexion of right ankle was affected which was incomplete and painful (table 1 shows active and passive range of motion). End feel of ankle dorsiflexion and plantarflexion movement is empty due to pain. Manual muscle testing examination finding gave ranges between right and left ankle, as right ankle plantar flexors, dorsi flexors, invertors and evertors was grade 4 according to MRC grading and for left ankle it was grade 5 on MRC grading. Resisted isometric evaluation suggests that the right ankle is strong and painful. During gait analysis, the patient had reduced step length, stride length, angle of toe out and was increased of the affected leg. Balance of patient was affected.

Foot and ankle outcome score consist of 5 subscales like pain, other symptoms, function in daily living(ADL), function in sport and recreation and foot and ankle related quality of life. According to foot and ankle outcome score which used to evaluate functions of ankle in which patient gives 74% score which suggests the moderate involvement of function. Foot and ankle score is a valid and reliable measure for all ankle conditions. On MRI investigation, partial tears of anterior talofibular and tibiotalar ligament were seen.

Table 1 Pre-treatment evaluation of active and passive range of motion and MRC muscle power grading at base line (1st day of First week)

	Right	Left
Ankle Active ROM		
Dorsiflexion	15	20
Plantarflexion	25	40
Inversion	15	20
Eversion	15	30
Ankle Passive ROM		
Dorsiflexion	15	20
Plantarflexion	30	40
Inversion	20	20
Eversion	20	30
MRC Muscle power grading		
Dorsiflexors	Grade 4	Grade 5
Plantarflexors	Grade 4	Grade 5
Invertors	Grade 4	Grade 5
Evertors	Grade 4	Grade 5

Diagnosis

Diagnosis was done on the basis of subjective and objective evaluation and according to MRI findings partial tear in right anterior talofibular and tibiotalar ligament were seen which gives diagnosis of grade 2 right side lateral ankle sprains.

Intervention

This patient was treated 6 times per week over the course of 1 month (4 week). On first day cryotherapy for 10 min on dorsal aspect of ankle and active ROM exercises are given which are continued for 1week. 2nd day onward, ankle exercises with TA stretching were started with proprioceptive training and anteroposterior mulligan mobilization. Strengthening of Dorsiflexors, Plantarflexors, invertors and evertors (figure 1 & 2) started with progression according to Delorme principle. Intrinsic muscle strengthening (fig.6) was started initially with half kg weight then progresses accordingly. Training like wobble board (fig. 5), bosu ball (fig. 3) and star excursion (fig. 4) were given. Initially duration of proprioceptive training was 1 min on bosu ball than gradually duration was improved till 3 min. star excursion training will be given with full weight bearing on affected leg which was given 2 times per day then gradually increase to 5 times per day. On wobble board 3 min training in anterior, posterolateral, posteromedial and circular direction were given initially then gradually increase to 5 min per day. Balance training like single leg standing with eyes open was started and then progressively increased the duration.

Figure 1 Strengthening of invertors

Figure 2 Strengthening of evertors

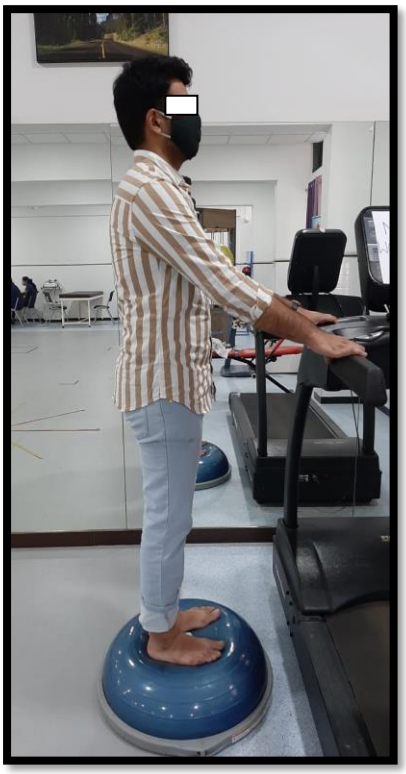


Figure 3 Bosu ball training

Figure 4 star excursion training

Figure 5 wobble board training

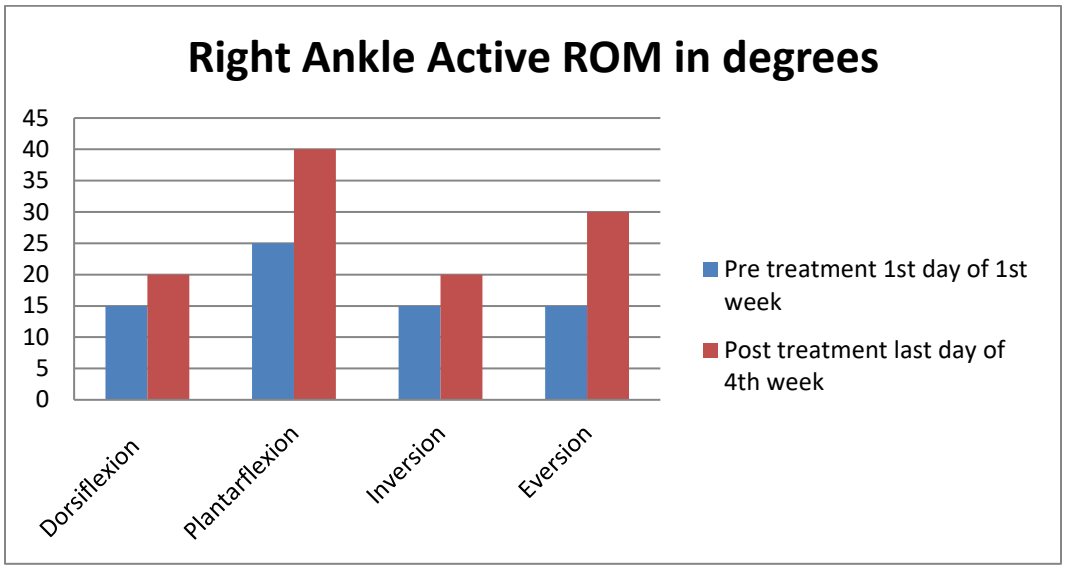
Figure 6 intrinsic muscle strengthening

Outcome measure

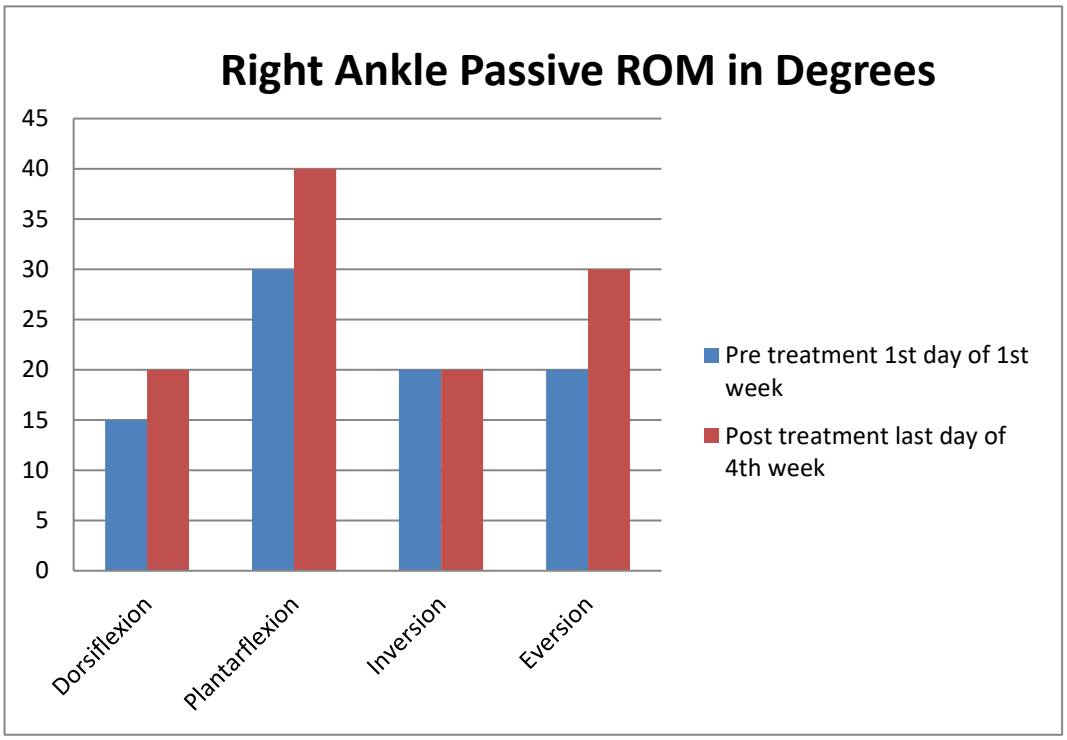
Redness over the dorsal aspect of the right ankle was reduced. Tenderness over the dorsal aspect of the ankle was reduced and it was only on the medial side of the ankle. Tightness was reduced due to stretching. Ankle ranges were improved (table 2 shows active and passive range of motion) and the patient started full weight bearing on the affected ankle. Balance and proprioception was improved as initially patient is not able to stand on affected leg after proprioceptive training patient is able to stand on affected leg for 1 min (graph 1 & 2). According to the feet and ankle outcome scale, the patient's score was 90% which was towards good. Patient is able to complete his airport fire service emergency work after proprioceptive and balance training.

Table 2 Post-treatment at the end of the course evaluation of active and passive range of motion and MRC muscle power grading (Measurement at last day of 4th week)

	Right	Left
Ankle Active ROM		
Dorsiflexion	20	20
Plantarflexion	40	40
Inversion	20	20
Eversion	30	30
Ankle Passive ROM		
Dorsiflexion	20	20
Plantarflexion	40	40
Inversion	20	20
Eversion	30	30
MRC Muscle power grading		
Dorsiflexors	Grade 5	Grade 5
Plantarflexors	Grade 5	Grade 5
Invertors	Grade 5	Grade 5
Evertors	Grade 5	Grade 5



Graph 1 Pre treatment 1st day of 1st week & Post treatment last day of 4th week right Ankle Active ROM



Graph 2 Pre treatment 1st day of 1st week & Post treatment last day of 4th week right Ankle Passive ROM

4. DISCUSSION

According to calibhe Doherty 2017 (Risaldar et al., 2020), in this systematic review effect of early mobilization, exercise and manual therapy techniques have strong evidence for pain, swelling and function in acute ankle sprain, in our case mulligan mobilization, ankle range of motion exercises were effective in reducing pain and improving range of motion. In our case study we have given strengthening, cryotherapy and balance training which was effective. According to Ryan p mcgovern (2016) (Darware and Naqvi, 2020), intermittent immersion cryotherapy application over 1 week period was found to be more effective in short term reduction of pain with activity. Therapeutic exercise for acute ankle sprain includes strength and balance training it suggest that training with wobble board improve functional performance, improve postural control and decrease risk of recurrence in those with CAI. This study concluded that interventions for lateral ankle sprain should include weight bearing with bracing, manual therapy, progressive therapeutic exercises and cryotherapy (McGovern and Martin, 2016).

In this case proprioceptive training improved his daily function. Patrick o McKeon 2008, done research on postural control and lateral ankle instability where they found effectiveness of prophylactic balance and coordination training over reducing risk of

ankle sprain. Balance training was found to be effective in our case (Doherty et al., 2017). Gabriela souza de vasconcelos (2018) gives a systematic review on ankle sprain concluded that balance training reduces the incidence of ankle sprain and increases dynamic neuromuscular control in anterior, posteromedial and posterolateral directions and also improve joint position sense and postural sway too (Chaiwanichsiri et al., 2005). Dootchai chaiwanichsiri 2005, did research on star excursion balance training in 15 - 22 year age group concluded that star excursion balance training is more effective than the conventional therapy programmme in improving functional stability of the sprained ankle. In this case star excursion training improved balance (Ling et al., 2018).

5. CONCLUSION

Ankle sprain physiotherapeutic management show effective results after proprioceptive and balance training. It also improves functional activities of daily living. Balance and proprioceptive training reduced the risk of repeated sprains. 4 weeks of proprioceptive training protocol is effective in reducing chances of chronic ankle instability. Hence in future it needs to be done on larger scale with more functional and objective outcomes to see effectiveness in ankle sprain patients.

Informed consent

Informed consent of patient is taken.

Acknowledgement

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Author Contributions

VK, TC, BD conceptualized the case TC, RM assisted in the designing and implication of the treatment, VK, BD assisted in documenting the case TC, RM wrote the case report.

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Conflict of Interest

The authors declare that there are no conflicts of interests.

Data and materials availability

All data associated with this study are present in the paper.

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