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ORIGINAL RESEARCH

A prospective study of the role of platelet rich plasma in patients with plantar fasciitis

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Abstract

Background: This study is taken up to study the role of Platelet Rich Plasma in plantar fasciitis.

Material and methods: About 20ml of venous blood drawn under aseptic conditions and sodium citrate addedas anticoagulant. The sample will be collected in orthopaedics OPD at VIMS Ballari. And sent to biochemistry lab for PRP preparation,1st centrifugation done at 3500rpm for 7min.The upper layer above the buffy coat will be collected and transferred to emptytubes, these tubes will be centrifuged again at 3000 rpm for 5min. After this 2/3 rd of the upper portion of the volume will be discarded and lower 1/3 rd portion will be collected as platelet rich plasma. The final product of 3 ml of PRP will be obtained and it will be injected into medial calcaneal tubercle at the point of maximum tenderness onsame day. Platelet count assessment will be done initially in the whole blood as well asin PRP in all patients. Mean platelet in PRP should be 5-6 times of that in plasma.

Results: In the present study, majority of the study participants were in the age group of 51-60years. Followed by 34% in the age group of 40-50years. The mean age was 55.7 ±8.51 years. The most commonly affected side was right heel (64%), and 36% had their left heelinjured. The duration of the condition was 16-20 weeks among 16 participants, 21-25weeks in15 participants, 10-15weeks in 12 participants and 26-3-weeks in 7 participants. The mean duration was 19.72±4.92.

Conclusion: Plantar Fasciitis is a common cause of foot complaints that results from degeneration ofplanter fascia. PRP is an excellent autologous source of concentrated bioactive molecules with a potential to accelerate healing. It is a better alternative for conservative management, that enhances the tissue regeneration. PRP injection results in significant improvements specially in terms of pain and physical ability among patients with plantar fasciitis. The other beneficial part of PRP is its long-term effect. Hence, we conclude that, Autologous PRP injection is a safe and useful modality of treatment in the treatment of chronic plantar fasciitis.

Keywords: plantarfasciitis, VAS, Autologous PRP injection.

Introduction

Plantar fasciitis is one of the most common causes of heel pain and in its severe forms it can also lead to functional disability. Plantar fasciitis is an inflammatory condition that does not have a clear cause. Plantar Fasciitis that was considered to be an inflammatory condition that is caused mainly due to repetitive micro tearing of the plantar fascia is now being considered as a degenerative condition, especially with increasing age. Despite the diagnosis containing the segment "itis," this condition is notably characterized by an absence of inflammatory cells, there is evidence to suggest that it is probably initiated by repeated micro trauma leading to traction periostitis and results in inhibition of normal repair process that leads to chronic inflammation of the fascia. There have been various terms used to describe plantar

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fasciitis, such as jogger's heel, tennis heel, policeman's heel, painful heel syndrome, heel spur syndrome, sub calcaneal pain, calcaneodynia, calcaneal periostitis and even gonorrhoeal heel.[1,2]

Plantar fasciitis accounts for 15% of all foot disorder more than 10% of the population is affected by it over their lifetime. The peak incidence occurs between ages 40 to 60 years and is particularly common problem in older athletes, military recruits, and labourers. The risk factors for Plantar fasciitis are Pes Planus, Pes Cavus, Leg Length Discrepancies, Obesity, Prolonged Standing, excessive running and walking 2 occupations, extensive work-related weight bearing standing on hard surface for prolonged periods of time Sedentary lifestyle, tightness of intrinsic foot muscles etc.[3,4]

Plantar fasciitis causes pain on the bottom of the heel with maximum pain at the anteromedial border of calcaneum. This pain is usually worse first thing in the morning when getting out of bed. The pain also worsens with activity. Plantar fasciitis is not easy to treat and patient dis-satisfaction is common with most treatments, no evidence strongly supports the effectiveness of any treatment for plantar fasciitis. Most of the patients with this condition eventually have satisfactory outcomes with nonsurgical treatment. The majority of cases are managed non-surgically, but recurrence of pain is frustrating. Conservative management include relative rest from offending activity as guided by the level of pain should be prescribed. Ice after activity as well as oral or topical NSAIDs can be used to help alleviate pain. Shoe inserts or orthotics and night splints can be prescribed in conjunction with the previously mentioned therapies. Patient education about proper stretching and rehab of the plantar fascia, Achilles' tendon, gastrocnemius, and soleus. If the pain does not respond to conservative measures, then consider more advanced or invasive techniques such as extracorporeal shock-wave therapy, botulinum toxin A, or various injections that could include autologous platelet-rich plasma, dextrose prolotherapy, or steroids. For patients who do not improve after initial treatment, corticosteroid injection may provide short-term benefit. However, these therapies do not improve long-term outcomes and may cause plantar fascia rupture.[5,6]

The more advanced and invasive techniques should be combined with conservative therapies.[3] Surgery should be the last option if this process has become chronic and other less invasive therapies have failed and may include fasciotomy via an open or endoscopic approach. However, the surgical release does not guarantee a successful outcome. Complications of surgery include nerve injury, plantar fascia rupture and flattening of the longitudinal arch.[7] Platelet Rich Plasma which is a good source of many growth factors & cytokines like PDGF, TGF-beta, IGF-1, IGF-2, FGF, VEGF, EGF, has emerged as a new technology which is believed to stimulate revascularisation of soft tissue and increase the concentration of growth factors to improve and accelerate tendon healing. Keratinocyte growth factors & connective tissue growth factors is one of the new ways of treating this painful & disabling condition. It is defined as a sample of autologous blood with concentrations of platelets above baseline values.[8] Given this background of inconclusive evidence for treatment modalities and recent introduction of PRP as a biological agent promoting healing, there is need to examine the role of PRP in plantar fasciitis.[9]Hence this study is taken up to study the role of Platelet Rich Plasma in plantar fasciitis.

Material and methods

The proposed study is a hospital based prospective interventional study centered in patient presented with plantar fasciitis in MCH, VIMS Ballari. Inclusion criteria for the present study included patients with plantar heal pain worse with rising in the morning or afterperiods of sitting and lying presenting for 4 weeks or more and patients with maximal tenderness at the attachment of the plantar fascia onthe medial tubercle of the calcaneus.

Patients visiting VIMS MCH orthopaedic OPD fulfilling the inclusion criteria were enrolled

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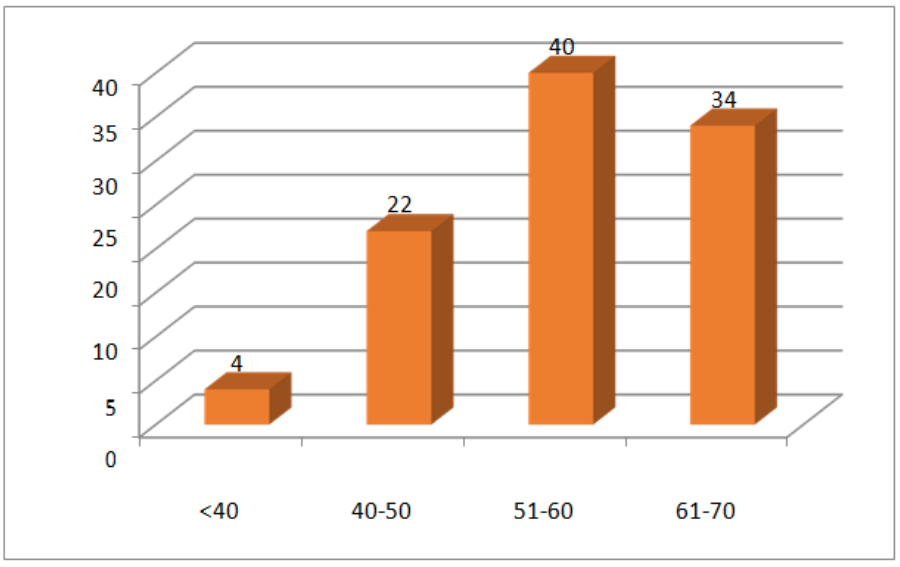
in the study. After explaining the patient about the purpose of the study, a written informed consentwas obtained from each patient in their own language. A pre-tested, semistructure questionnaire was used for data collection. Finally, after clinical diagnosis patients were selected for study and post procedure all the cases were be followed up and results were analysed based on VAS (Visual analogue score) and American orthopaedic foot and ankle society score (AOFAS). About 20ml of venous blood drawn under aseptic conditions and sodium citrate addedas anticoagulant. The sample will be collected in orthopaedics OPD at VIMS Ballari. And sent to biochemistry lab for PRP preparation,1st centrifugation done at 3500rpm for 7min.The upper layer above the buffy coat will be collected and transferred to emptytubes, these tubes will be centrifuged again at 3000 rpm for 5min.After this 2/3 rd of the upper portion of the volume will be discarded and lower 1/3 rd portion will be collected as platelet rich plasma. The final product of 3 ml of PRP will be obtained and it will be injected into medial calcaneal tubercle at the point of maximum tenderness onsame day. Platelet count assessment will be done initially in the whole blood as well asin PRP in all patients. Mean platelet in PRP should be 5-6 times of that in plasma. Post PRP injection patient will be regularly followed up after 15 days, 30 days, 2 months, and 3 months. At each visit assessment will be done using visual analogue scale (VAS) for pain and American orthopaedic ankle and foot society score (AOFAS) for function of foot. The adverse events are recorded throughout the entire 12 weeks.

AOFAS score ranges from 0 to 100, with healthy ankles receiving 100 points. Data was collected by using a structure proforma. Data entered in MS excel sheet and analysed by using SPSS 24.0 version IBM USA.

Results

TABLE1: DISTRIBUTION OF STUDY POPULATION ACCORDING TO AGE

Age group	Frequency	Percentage
<40	2	4
40-50	11	22
51-60	20	40
61-70	17	34
Total	50	100
Mean±SD	55.7 ±8.51	



Graph1: Distribution of study population according to age

In the present study, majority of the study participants were in the age group of 51-60years.

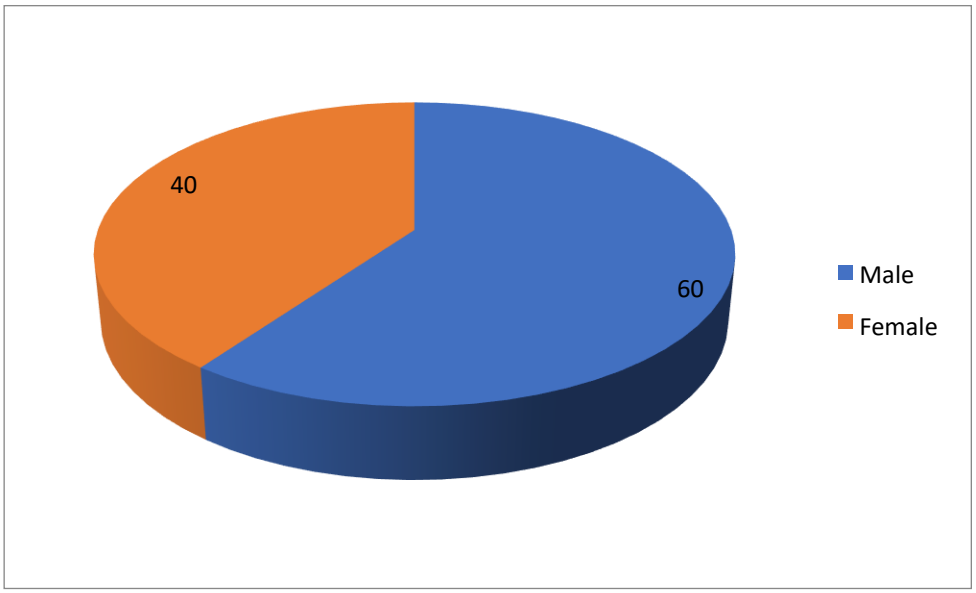
ISSN: 0975-3583,0976-2833 VOL14, ISSUE 12, 2023

Followed by 34% in the age group of 40-50years. The mean age was 55.7 ±8.51 years.

Gender distribution

TABLE2: DISTRIBUTION OF STUDY POPULATION ACCORDING TO GENDER

Gender	Frequency	Percentage
Male	30	60
Female	20	40
Total	50	100



Graph 2: Distribution of study population according to gender.

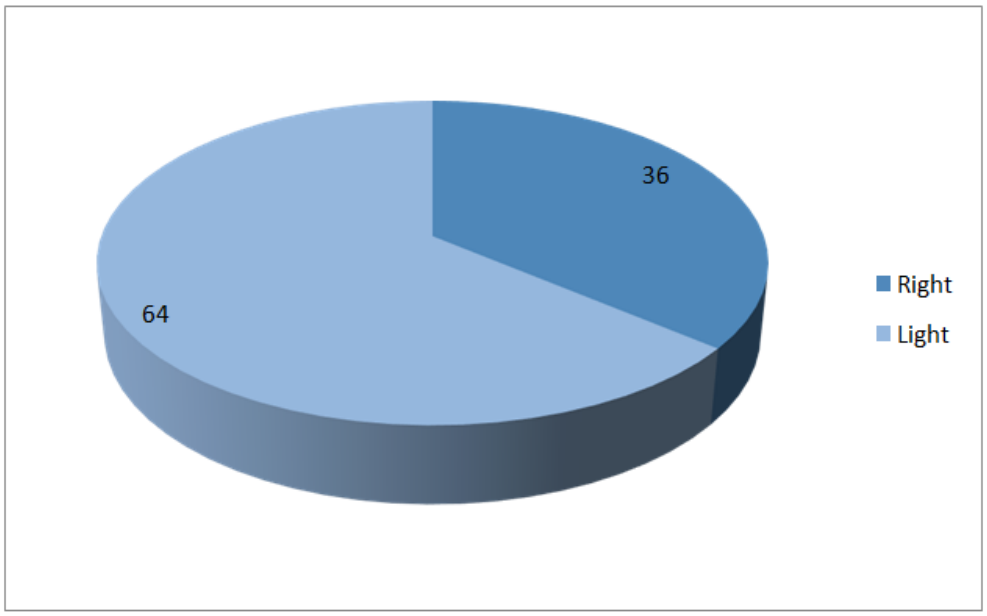
In present study out of 50 patients most of them were male (60%).

Side predilection

TABLE 3: DISTRIBUTION OF STUDY POPULATION ACCORDING TO SIDE OF INJURY

Side of injury	Frequency	Percentage
Left	18	36
Right	32	64
Total	50	100

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 12, 2023



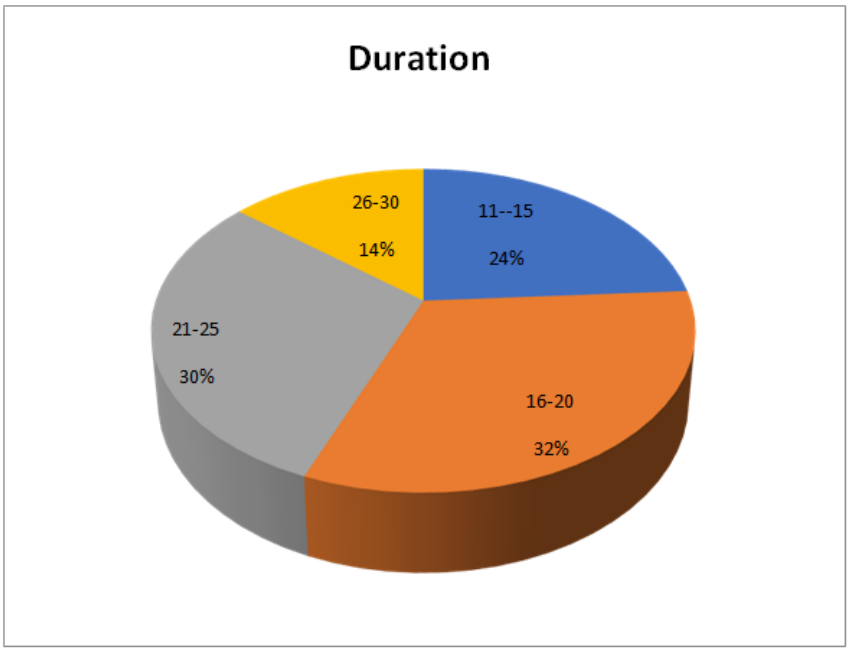
Graph 3: Distribution of study population according to side of injury

The most commonly affected side was right heel (64%), and 36% had their left heel injured 36 64 Right Light

Duration of symptom

TABLE 4: DISTRIBUTION OF STUDY POPULATION ACCORDING TO SYMPTOMS DURATION

Duration(week)	Frequency	Percentage
10-15	12	24
16-20	16	32
21-25	15	30
26-30	7	14
Total	50	100



Graph 4: Distribution of study population according to duration of symptoms

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 12, 2023

	Mean	±SD
DURATION(WEEEK)	19.72	4.92

The duration of the condition was 16-20 weeks among 16 participants, 21-25weeks in15 participants, 10-15weeks in 12 participants and 26-3- weeks in 7 participants. The mean duration was 19.72±4.92.

Vas score

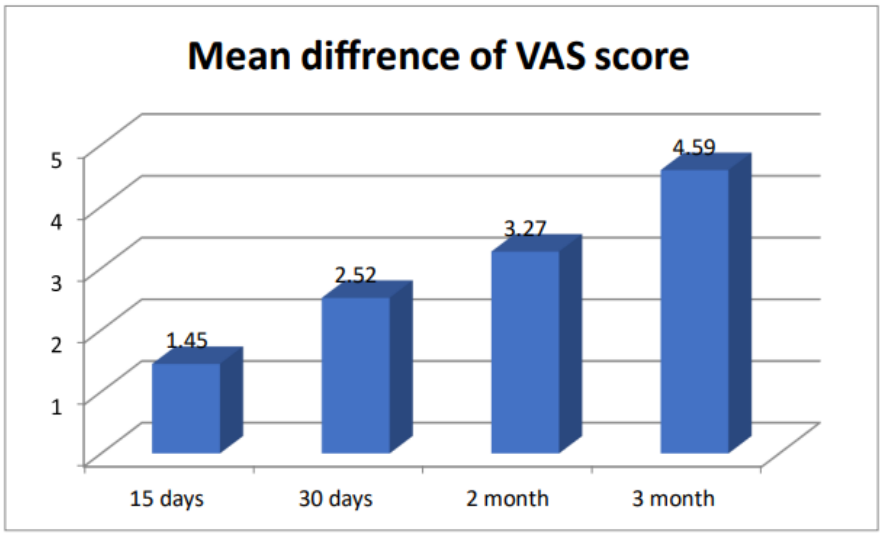
TABLE 5: DISTRIBUTION OF STUDY POPULATION ACCORDING TO VAS SCORE

VAS score	Mean	±SD
Preprocedure	7.85	1.52
15days	6.39	1.83
30days	5.32	1.86
2 month	4.57	1.86
3 month	3.25	1.45

Graph 5: comparison of VAS score according to pre procedure, 15 days, 30 days, 2month & 3 month

TABLE 6: COMPARISION OF VAS SCORE ACCORDING TO PRE PROCEDURE, 15DAYS, 30 DAYS, 2 MONTH AND 3 MONTH

VAS score	Mean
Diffrence from preprocedure	
15days	1.45
30days	2.52
2 month	3.27
3 month	4.59
Pvaluefrom preprocedure	
15days	<0.0001
30days	<0.0001
2 month	<0.0001
3 month	<0.0001



Graph 6: Comparision of VAS score with preprocedure/baseline

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 12, 2023

AOFAS

TABLE 7: DISTRIBUTION OF STUDY POPULATION ACCORDING TO AOFAS

AOFAS score	Mean	±SD
Preprocedure	62.35	9.66
15days	68.53	9.57
30days	71.32	10.39
2 month	84.30	7.62
3 month	95.43	6.66

Graph 7: Comparison of AOFAS score according to pre procedure, 15 days, 30 days,2 month, 3 month

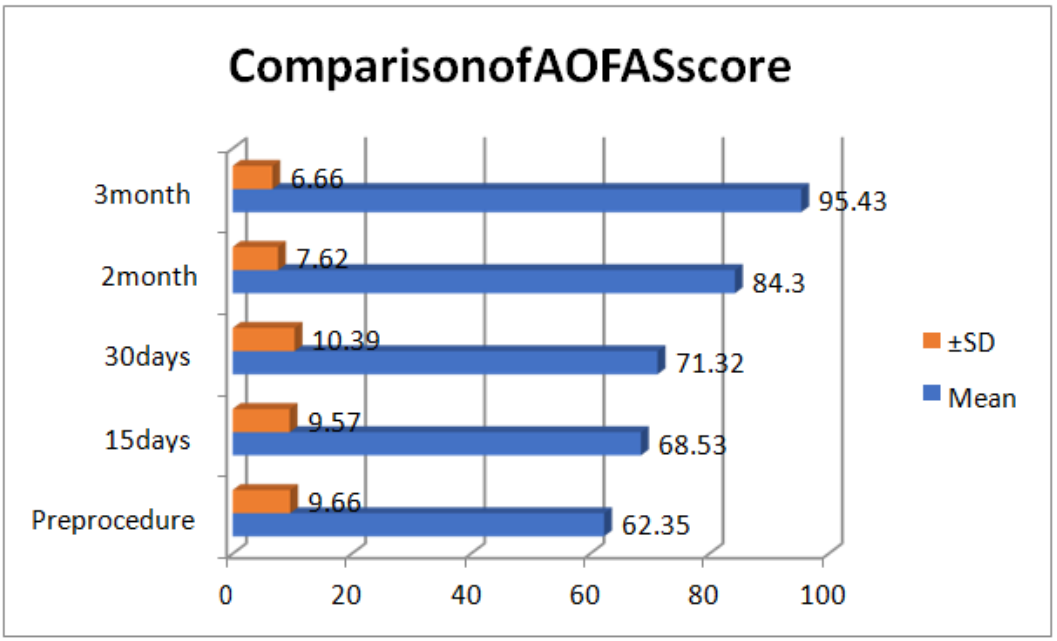
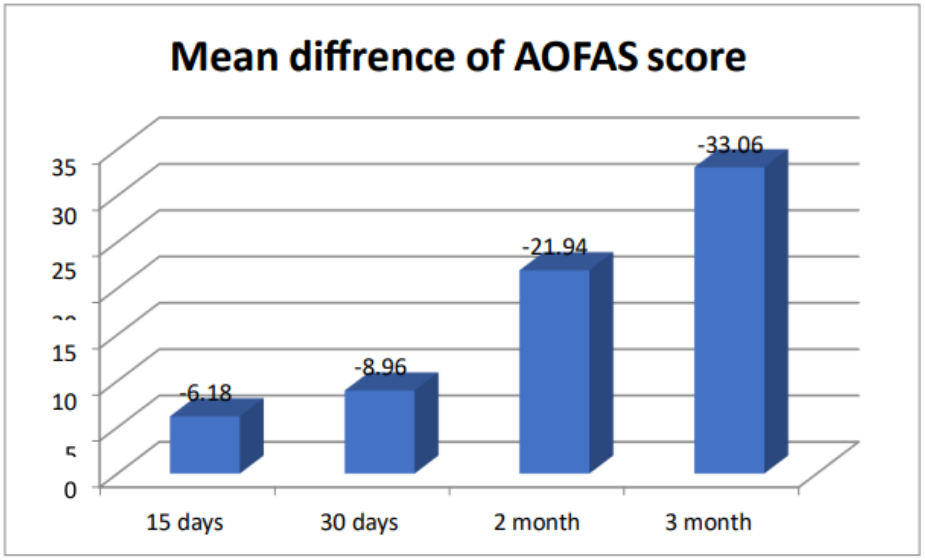


TABLE8: COMPARISON OF AOFAS SCORE ACCORDING TO PREPROCEDURE, 15 DAYS, 30 DAYS, 2 MONTH&3 MONTH

AOFAS score	Mean diffrence
Diffrence from preprocedure	
15days	-6.18
30days	-8.96
2 month	-21.94
3 month	-33.06
Pvalue from preprocedure	
15days	0.001
30days	<0.0001
2 month	<0.0001
3 month	<0.0001

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 12, 2023



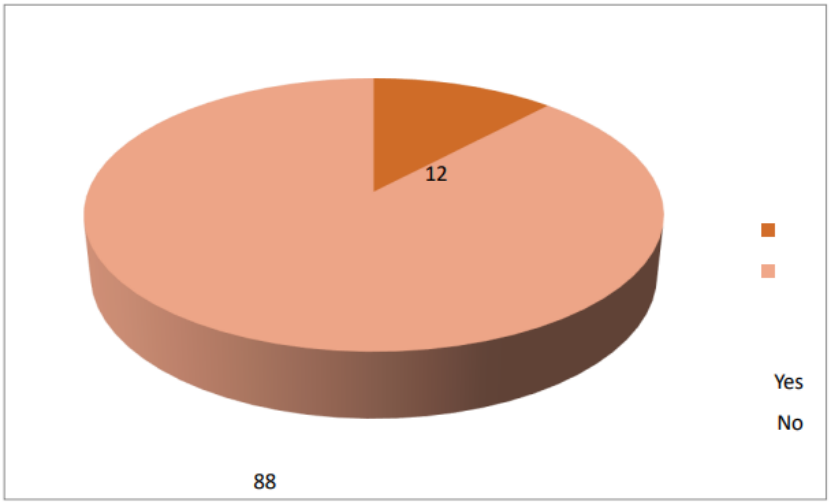
Graph 8: Mean difference of AOFAS score with preprocedure

Complications

TABLE 9: DISTRIBUTION OF STUDY POPULATION ACCORDING TO COMPLICATION

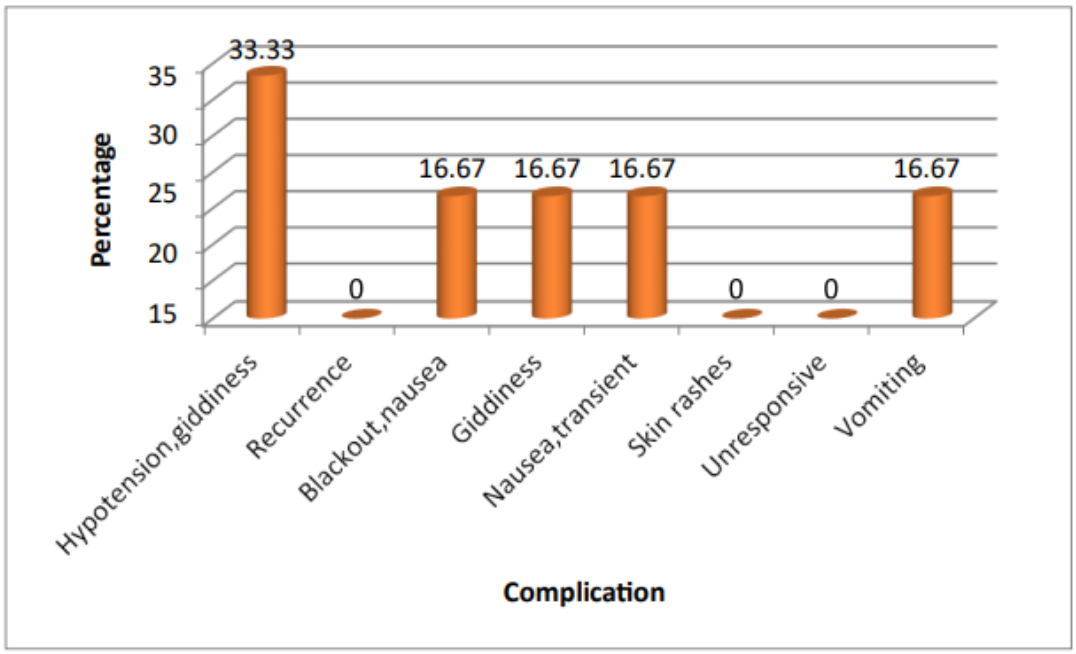
Complications	Frequency	Percentage
Nil	44	88
Yes	6	12
Hypotension, giddiness	2	33.33
Recurrence	0	0.00
Blackout, nausea	1	16.67
Giddiness	1	16.67
Nausea, transient Hypotension	1	16.67
Skinrashes	0	0.00
Unresponsive	0	0.00
Vomiting	1	16.67
Total	6	100

Out of 50 patients, only 6 patients had complications (Hypotension, giddiness,blackout, vomiting)



Graph 9: Distribution of study population according to complication.

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 12, 2023



Graph 10: Distribution of study population according to types of complications

Discussion

Platelet rich plasma is also known as platelet rich concentrate, autologous platelet gel or platelet releasate.10 Platelet rich plasma is defined as autologous blood with a concentration of platelets above the base line values. Platelet contains biologically active substance for blood clotting, such as coagulation factors, adhesive proteins, and protease inhibitors. Platelets are also known to release growth factors like TGF –beta 1, CGF, VEGF, and PDGF. These growth factors are released once the platelets were activated. by the process of cellular proliferation and differentiation, chemotaxis, tissue debris removal,angiogenesis, and extra cellular matrix formation these growth factors in turn initiates the process of tissue healing 11. These properties of tissue healing by platelets are usedin treating degenerative enthesopathies like plantar fasciitis In the present study, majority of the study participants were in the age group of 51- 60years. Followed by 34% in the age group of 40-50years. The mean age was 55.7 ±8.51 years. Most of them were male (60%). The most commonly affected side was right heel (64%), and 36% had their left heel injured. The duration of the condition was16-20 weeks among 16 participants, 21-25weeks in 15 participants, 10-15weeks in 12 participants and 26-3- weeks in 7 participants. The mean duration was 19.72±4.92. In a study conducted by Martin J. O'Malley et al.,12 the study subjects were composedof 5 males and 19 females, with an average age of 47 (range, 25–63 years), The averageduration of symptoms before injection was 9 months (range, 6 to 12 months). Mukesh Tiwari et al13 in their study mentioned that the age range varies between 30 yrs. and 85 yrs. of age. The range of heel pain duration varies from 1 to 120 months, the median duration was 6 months (20.6). Raymond Rocco Monto14 in his study included 23 females and 17 males. Almost similar mean age group was observed by Babak Vahdatpour et al15 (45.44±7.74). Disease duration was (month) ± SD 27.56±30.92 The VAS score pre-procedure was 7.85±1.52. Follow-up: 15 days after the proceduremean VAS: 6.39±1.83, 30 days - 5.32±1.86, 2 month - 4.57±1.86 and at 3 month - 3.25±1.45. Similar observations were made by Kumar V et al16 , he mentioned that VAS improvedfrom 7.7 to 4.2 ($p < 0.001$) and AOFAS improved from 60.6 to 81.9 ($p < 0.001$). And concluded that, 28 patients (64%) were very satisfied and would have the injection again. O' Malley MJ also observed similar findings in his study (The mean VAS score improved from 7 to 4). 12 Similar observations

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 12, 2023

were made by Vahdatpour B et al., PRP group started with an average pre-treatment AOFAS score of 37, which increased to 95 at 3 months, remained elevated at 94 at 6 and 12 months, and had a final score of 92 at 24 months.15 In the current study, the mean AOFAS score observed was as follows: The AOFAS score pre-procedure was 62.35 ± 9.66. At 15 days: 68.53±9.57,30 days: 71.32±10.39, 2 month: 84.30 ±7.62, 3 month :95.43±6.66. Raymond Rocco Monto6 also made similar observations in his study, he mentioned thatthe PRP group started with an average pre-treatment AOFAS score of 37, which increased to 95 at 3 months, remained elevated at 94 at 6 and 12 months, and had a finalscore of 92 at 24 months. Babak Vahdatpour et al 15 , the PRP group started with an average pre-treatment AOFASscore of 37, which increased to 95 at 3 months, remained elevated at 94 at 6 and 12 months, and had a final score of 92 at 24 months. Out of 50 patients, only 6 patients had complications (Hypotension, giddiness,blackout, vomiting).

Conclusion

Plantar Fasciitis is a common cause of foot complaints that results from degeneration of planter fascia. PRP is an excellent autologous source of concentrated bioactive molecules with a potential to accelerate healing. It is a better alternative for conservative management, that enhances the tissue regeneration. PRP injection resultsin significant improvements specially in terms of pain and physical ability among patients with plantar fasciitis. The other beneficial part of PRP is its long-term effect. Hence, we conclude that, Autologous PRP injection is a safe and useful modality of treatment in the treatment of chronic plantar fasciitis.

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