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RESEARCH ARTICLE

"THERAPEUTIC EFFECT OF COCKTAIL VS PROLOTHERAPY INJECTION IN CHRONIC PLANTAR FASCIITIS, A PROSPECTIVE CONTROLLED RANDOMIZED CLINICAL STUDY"

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Abstract

Introduction:- Plantar fasciitis is the most common cause of heel pain. It is a self-limiting condition. If causative factors are not addressed properly, it becomes chronic plantar fasciitis.

Objectives:- The study aimed to evaluate the efficacy of 15 % hypertonic dextrose (treatment group) in the treatment of chronic plantar fasciitis through comparison with a cocktail group (control group).

Design:- In this prospective controlled, randomized clinical study at N.S.C.B. Medical College Jabalpur, from 1 January 2020 to 31 September 2021. The statistical test used in this study isthe chi-square test and independent student's t-test.A totalof 41 patients were taken intothe study. Patients were divided into two groups, In the Prolotherapy group (treating group) (n=18), a single shot of 15% Hypertonic dextrose injection was administered (1.2 ml of 50 % hypertonic dextrose, 1.8 ml distilled water and 1 ml of 2% lignocaine mixture)and the cocktail group (control group) (n=23) single shot of cocktail was given (1ml 40mg local methylprednisolone mixed with 1 ml distilled water and with 1 ml 2% lignocaine). During a 24-week follow-up period, pain intensity was measured using the visual analoguescale and American orthopaedics foot and ankle score, the measurements were undertaken before treatment and post-treatment weeks 4 and 12 and 24.

Result:- In this study, both treatments were significantly effective in plantar fasciitis treatment for up to the 12^{th} week. However the cocktail group (control group) was found to have a significantly better result at both the 4^{th} week (AOFAS 93.17±3.33, VAS 1.65±.49 vs AOFAS 71.94±5.46, VAS 4.54±.71) and 12^{th} week (AOFAS 90.43±2.86, VAS 1.91±.29 vs AOFAS 76.78±4.12, VAS 3.94±.64), but significantly better even up to 24^{th} weeks (AOFAS 86.39±4.20, VAS 2.35±.71vs AOFAS 67.22±4.19, VAS 5.00±.34), (p-value <.001) in term of pain intensity and disability as compared to prolotherapy group (treating group).

Conclusion:- This study showed a favourable outcome towards the cocktail injectionin terms of VAS and AOFAS score as compared to prolotherapy injection.

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Introduction:-

Wood was the first who described Plantar fasciitis in 1812. Since then, it is also known by many pseudonyms, including; jogger's heel, heel spur syndrome, sub-calcaneal bursitis, sub-calcaneal pain, calcaneal bursitis, and calcaneodynia [1].

Tendinopathy at the origin of the plantar fascia is called plantar fasciitis. The pain of plantar fasciitis is worst in nature when we start a walk after non-weight bearing and make it more severe by prolonged standing or walking. In plantar fasciitis, the foot remains in an equinus position during the night and the fascial fibres contract. In the morning, when we start weight-bearing, puts the plantar fascia under tension and aggravates the pain [2].

The most common explanation of heel pain is plantar fasciitis. Commonly affects women more than men. The 40-60 years is the most common age group[3].

There are several causes of plantar fasciitis. The most common causes are - [2][4]

1. The sudden gain in weight, or increased obesity.
2. Unaccustomed to walking or running.
3. Shoes with less cushioning.
4. Prolong running or increased intensity.
5. Changing walking or running surface.
6. Achilles tendon tightness.
7. Occupations that involve prolonged weight-bearing

This study aimed to evaluate the clinical efficacy of cocktail and 15% hypertonic dextrose solution injection for plantar fasciitis and to review the available works of literature.

Plantar fasciitis is a self-limiting disease, and most of the patients report spontaneous relief in heel pain within one year, even without treatment; however, 10% of patients seek treatment from the surgeon due to not being relieved in pain and disabled daily activity [5]. Countless non-operative and operative approaches have been used without uniform or reproducible success. Non-operative approaches include rest, immobilization, heel cups, stretching, orthotics, steroidal and non-steroidal anti-inflammatory drugs, and physiotherapy [6,7]. Steroid injection, prolotherapy, platelet-rich plasma, extracorporeal shock wave therapy, and Radiofrequency Thermal Lesioninghave also been utilized with variable success [8, 9, 10, and 11]. Surgical treatments include open, endoscopic, and percutaneous fascia release [12, 13].

In our study steroid and prolotherapy injection was given under the guidance of ultrasound.

Ultrasound-guidedinjection for plantar fasciitis is more accurate and give good result as compared to the palpatory method [14].

In my study single shot of steroidinjection showsthe best result as compared to a single shot of prolotherapy for up to 6 months. The same finding was shown by Raissi et al. [15] but in his study effect of both injections was the same after 12 weeks.

Material And Method:-

This prospectivecontrolled, randomizedclinical study was approved by the committee for ethics in research at our institute, N.S.C.B. medical college Jabalpur approved this study and conductedaccording to the world medical association's declaration of Helsinki [16]. All Patients were informed about the study and written informed consent was taken.

Duration of study from 1 January 2020 to 31 September 2021

Inclusion Criteria

1. All patients aged 20-70 years of either sex.
2. Heel pain for > 4 months and has been diagnosed as chronic plantar fasciitis.
3. Ability to walk.

4. Subject understands the risk and benefit of the protocol and can give informed consent.

Exclusion Criteria
1. Previously operated case for plantar fasciitis.
2. Deformation of the foot (congenital and acquired).
3. Allergy to local anaesthesia.
4. Pregnancy
5. Fracture
6. Tumour foot
7. Osteomyelitis involvingcalcaneum
8. Lumber, knee, hip pain
9. H/O systemic disease capable of including pain or sensitivity to foot (diabetes mellitus, seronegativearthritis, fibromyalgia).
10. Abnormal coagulation

We have screened 92 patients with complaints of foot pain out of 92 patients, 48 patients were not included due to exclusion criteria and, 7 were lost of follow up. Rest 41 patients with plantar fasciitis have investigated with Random blood sugar, radiograph (anterior-posterior and lateral view), and USG, and then the cohort was randomized into treating and control groups. Patients with an odd number were allocated randomly to the dextrose prolotherapy group (Treating group), and even numbers were allocated randomly to the cocktail group (Control group).

Pre-Injection Assessment:-
Pre-injection Assessment of pain severity was done by using a visual analogue scale. Pain severity and impact on functional status were assessed using AOFAS (American orthopaedics foot and ankle society).

VAS score Activity [17]
The visual analog scale is a linear line, the left end of the line indicating no pain and the end of the right, the line indicating worst pain. There are 4 categories. A. None (0) - no pain B. Mild (1-3) - occasional pain at work. C. Moderate (4-6) – continue pain during work. D. Severe (7-10) – severe pain causes discontinuation of the work but resumed after rest.

The patient is advised to put the finger on the line where the pain is in relation to the two extremities of the scale. For those who can't understand the pain scale, pain assessment was done by asking the part of one rupee.

AOFAS clinical rating scale [18]
AOFAS is a clinical rating scale, that contains both subjective and objective clinical variables in the numerical rating system. The score on the AOFAS scoring scale ranges from 0 to 100, with a higher score indicating lesser impairment. No radiological factors are included in this score and the items being assessed are classified into 3 major categories: pain, function, and alignment. the AOFAS clinical rating scale has the high advantage of applying to a wide variety of feet and ankle disorders.

In both groups, a single shot of injection was given under ultrasound-controlled guidance.

Material:-

Cocktail injection: -
3 ml cocktail injection, comprised of 1ml (40mg) of methylprednisolone suspension with 1 ml distilled water and 1 ml 2% lignocaine (plain), was injected under USG guidance.

Dextrose injection:-
4ml 15% hypertonic dextrose injection, comprised of 1.2ml 50% hypertonicdextrose mixed with 1.8 ml distilled water with 1ml 2% lignocaine (plain), was injected under USG guidance

Technique:
USG guided injection was done in the prone position with the affected foot lying outside the table, keeping the foot in a relaxed manner.The injection site was prepared in a sterile manner using 72% V/v alcohol + 1% isopropyl

alcohol solution and covered in a sterile manner. A 6-15 MHz high-frequency linear array US probe was used and scanned in the longitudinal axis of the heel [19]. During scanning, we can see the calcaneum, plantar fascia, its thickness, and the change inechogenicity of the plantar fascia and perifascial oedema.After initial scanning of the fascia, the injection was given from the medial side of the heel in an out-of-plane approach.Mark the point of the maximal tenderness of the fascia on the sole and the needle entry point was marked on the line extending from the posterior border of malleolus and just 1 finger width proximal to the sole [19].

After injection, all patients were advised to apply an ice pack, and not to bear heavy weight for up to 5 days. And simple non-steroidal anti-inflammatory drugs (paracetamol 500 mg bd) were prescribed SOS.

Post injection follow-up was done on the 1st month, 3rd month and 6th months. Assessment of pain severity was done by using a visual analogue scale. Pain severity and impact on functional status were assessed using AOFAS (American orthopaedics foot and ankle society).

Statistical Analysis:-
After the collection of data, SSPS version 23.0 was used for statistics. The following tests were used for comparison:-

1. Means and standard deviation
2. Chi-square test was done for the demographic variable and the results between the two comparison groups.
3. Independent student t-test was done between the two comparison groups.
4. P-value was calculated for all variables and showed as <.001 forsignificant, and >.05 for insignificant.

Result:-

The baseline demographic data such as age, gender, body mass index, foot involved, and plantar fascia thickness of both groups were similar to each other (table-1).All laboratory investigations of all the patients were within normal range.

The mean VAS score and mean AOFAS score of both groups were shown no significant difference before treatment (p>.05) (Table-2). After treatment both the groups were shown improvement in mean VAS score and mean AOFAS score up to 3 months of follow-up but the control group showed higher significant improvement (p<.001). At the end of 6 months, the follow-up means VAS score and mean AOFAS score of the treating group were the same as the mean VAS score and mean AOFAS score before treatment. In the control group, the mean VAS score was increased and the mean AOFAS score was decreased at the end of the 6-month follow-up but it was significantly higher as compared to the treating group (p<0.001) and before treatment (p<0.001).

The incidence of the calcaneal spur in our study was 32 out of 41 patients with 78% of the patient's heel radiographs demonstrating the presence of a calcaneal spur.

Discussion:-

Diagnosis of plantar fasciitis can be made clinically.Plain radiograph usually shows calcaneum spur from the calcaneum tuberosity. The incidence of the calcaneal spur in our study was 32 out of 41 patients with 78% of the patient's heel radiographs demonstrating the presence of a calcaneal spur. Similar results were seen in Raad Jaradat, et al. [20], K. S. Johal, et al. [21] and Mohammad Ali Taheririan, et al. [22].

Most surgeons used Corticosteroid injection as the first line of treatment for plantar fasciitis.Raissi et al. [15]reported that a single injection of corticosteroid showed higher significant improvement in daytime and morning Numeric Rating Scale, increased Foot and Ankle Ability,and plantar fascia thickness as compared to a single dose of dextrosein the first 12 weeks of same as my study showed.After 12 weeks,in contrast to our study, all the measurements were statistically insignificant between corticosteroid and dextrose prolotherapygroups. Meriç Uğurlar, MD et al. [23] reported that atotal of 3 injections of local corticosteroid showed that the mean VAS scores at the first step in the morningwereat pre-injection 7.4 ± 5.5, 1st month 3.2 ± 2.4, 3rd month 4.4 ± 3.5, 6th month 5.2 ± 3.6, 12th month 6.8 ± 4.4, 24th month 7.4 ± 5.4, 36th month 7.5 ± 6.4 ascompared our study effect of a single dose of corticosteroid decreased after 6 monthsto pre-injection level.Histologically, plantar fasciitis is a degenerative disease. This raised the question of the efficacy of corticosteroid injection [20]. Corticosteroid injection worked by inhibiting the synthesis of arachidonic acid from membrane phospholipids so that it inhibits prostaglandin-mediated

inflammation and pain. The mechanism of action of corticosteroids on plantar fasciitis treatment is currently unclear. Corticosteroids inhibit fibroblast proliferation and expression of ground substance proteins because, in plantar fasciitis, the most commonly reported features are increased fibroblast proliferation and excessive secretion of proteoglycans [24]. Corticosteroid injections are associated with numerous complications, such as plantar fascia rupture, fat pad atrophy, lateral plantar nerve injury, and calcaneum osteomyelitis.

Hakan Genc et al. [3],showed,that the mean VAS values and the thickness and hypo-echogenic fascia of the plantar fascia in the cases decreased significantly 1st month after steroid injection as compared with pre-injectionand a furtherdecrease was noted 6th months post-injection same as our study.Sunil h. Shetty et al. [11], and Tunay Erden, MD et al. [12],concluded the same duration of efficacy of corticosteroid injection as inthe present study. F. Crawford et al. [26], in their study oncorticosteroid injection, showed a statistical difference in1st month as compared to pre-injection, but at 3 and 6 monthsstatistically, no significant difference was detected.

On the other hand, prolotherapy injections are made up of hypertonic dextrose in different concentrations, which causes the osmotic rupture of the local cells. This increases the level of glucose in the extracellular matrix, so increasing the growth factors such as platelet-derived growth factor, epithelial growth factor, connective tissue growth factor, transforming growth factor-beta, and complex proteins followed by healing. Deoxyribonucleic acid (DNA) comes into the extracellular matrix after the rupture of cells-encoding growth factors also increases the hypertonic environment in the extracellular matrix [26] [27]. So prolotherapy requirestwo or more than two injections for its effects.Ersen Ö et al. [28]. in their studyusing 3 injections of prolotherapy showed significant improvement of VAS, AOFAS and FFI for up to 360 days, as compared to the current study single dose of prolotherapy showed significantimprovement in VAS and AOFAS in 1st and 3rdmonths and at 6th month no significant difference as compared to pre-injection.

No severe side effects were reported on prolotherapy treatment. Dextrose is usually known as a safe proliferating agent for injection as it is naturally present in the blood. The only most common side effect is increased pain starting after the injection because dextrose initiates inflammation around the local cell/tissue and is not an anti-inflammatory agent [29], so paracetamol is prescribed to reduce pain, so for the same reason, only paracetamol was given in this study.

No adverse effects were seen in both the prolotherapy group (treating group) and cocktail group (control group) in our study.

Conclusion:-

A Single-injection of prolotherapy is not sufficient, it requires two or three injections for its growth-promoting effect.

Patients requiring injection for chronic pain due to plantar fasciitis, benefit from a US-guided injection. The injection is site-specific, image-guided, and done in real-time.

Limitation

Due to the presence of pandemics, A short sample size was a limiting factor in our study.

Demographic

Table: - 1

Variable		Treating group (prolotherapy)	Control group (cocktail)	p-value
Gender	Male Female	8 10	7 16	0.854
Affected foot	Right Left Bilateral	6 4 8	5 5 13	0.794

Table:- 2

Variable		Treating group	Control group	p-value

		(prolotherapy)	(cocktail)	
Age	Mean Range	43.72±9.65 28 to 62	39.3±8.64 26 to 52	0.480
Plantar fascia thickness	Mean Range	4.5mm±1.09 2.6 to 6.9 mm	4.85mm±1.50 23 to 8 mm	0.370
Body mass Index	Mean Range	26.55±2.56 22.8 to 29.7	26.69±2.71 23 to 29	0.886

Comparison Between Treating And Control Group
Table:- 3

	Treating group (prolotherapy) Mean±SD	Control group (Cocktail) Mean±SD	p-value	t-value
VAS –pretreatment	5.06±0.24	5.13±0.34	0.435	-0.788
1st month	4.54±0.71	1.65±0.49	<0.001	15.588
3rd month	3.94±0.64	1.91±0.29	<0.001	13.612
6th month	5.00±0.34	2.35±0.71	<0.001	14.477
AOFAS – pretreatment	66.94±4.02	67.26±5.11	.826	-0.215
1stMonth	71.94±5.46	93.17±3.33	<0.001	-15.381
3rd month	76.78±4.12	90.43±2.86	<0.001	-12.518
6th month	67.22±4.19	86.39±4.20	<.001	-14.518

Figure 1:- Marking of injection site

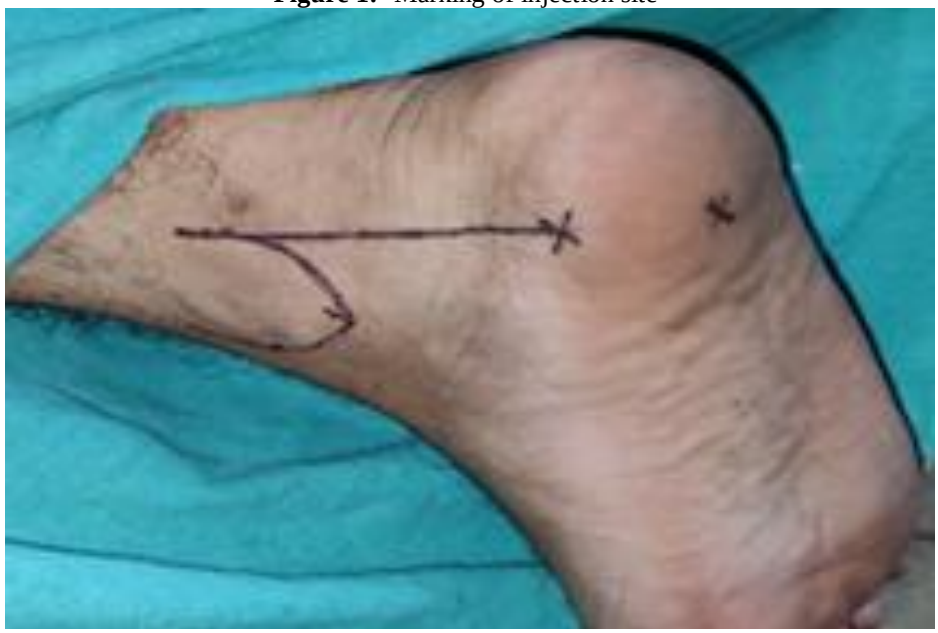

Figure 2:- Ultrasound-guided injection.

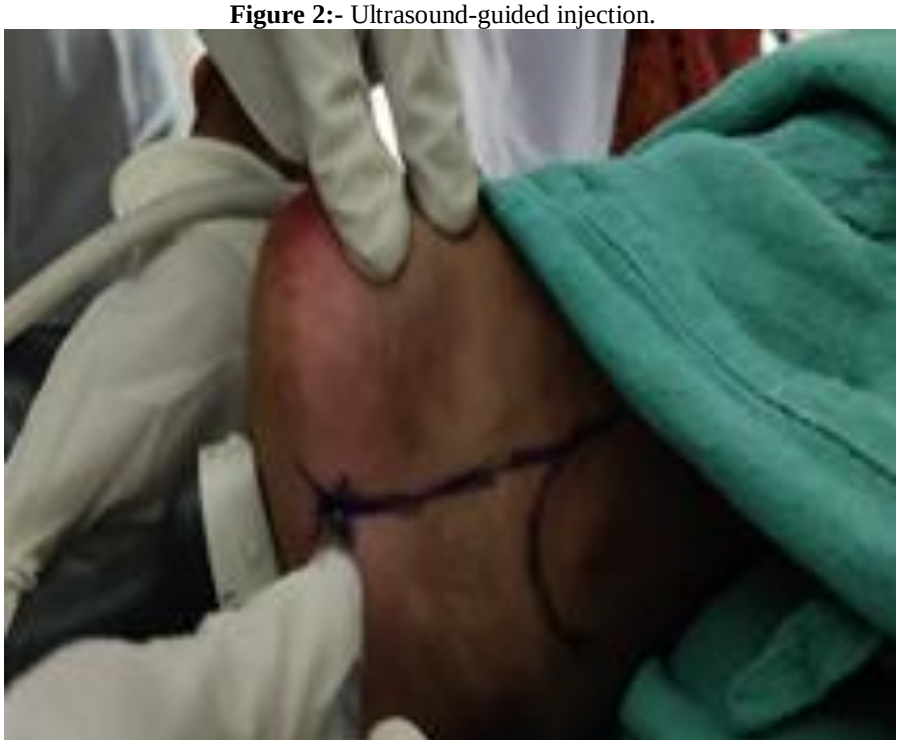

Figure 3:- Plantar fascia thickness.

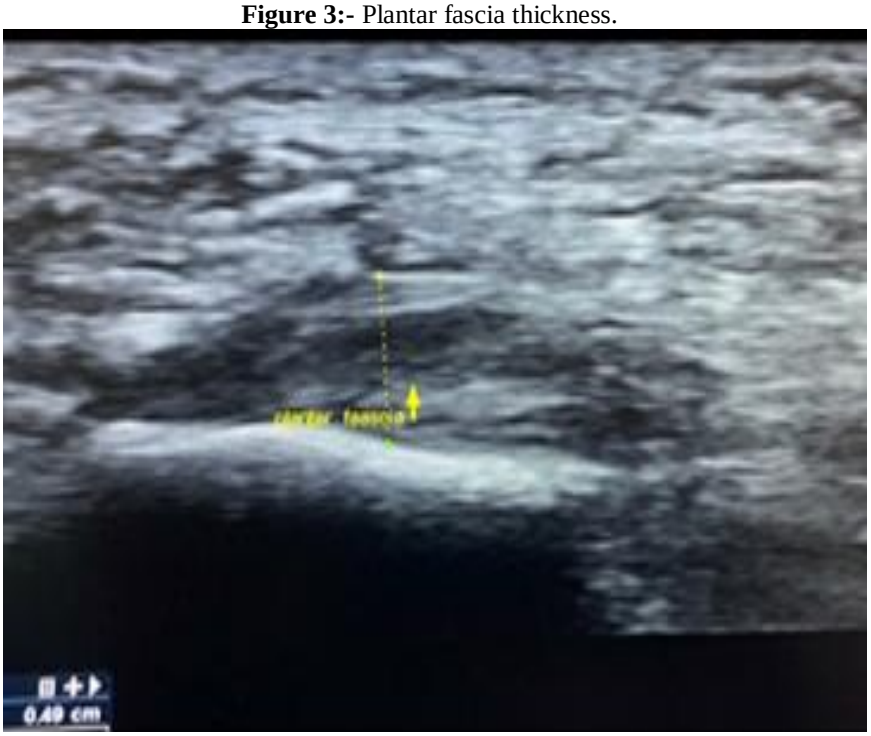

Table And Figure Legends:-

Table: - 1and 2Demographic data

Table: - 3Comparison between treating and control group

Figure: - 1 Marking of injection site

Figure: - 2 Ultrasound-guided injection

Figure: - 3 Plantar fascia thickness

Bibliography:-

1. DeMaio M, Paine R, Mangine RE, Drez D. Plantar fasciitis. Orthopaedics. 1993 Oct 1;16(10):1153-63.
2. Singh D, Angel J, Bentley G, Trevino SG. Fortnightly review: plantar fasciitis. Bmj. 1997 Jul 19;315(7101):172-5.
3. Genc H, Saracoglu M, Nacır B, Erdem HR, Kacar M. Long-term ultrasonographic follow-up of plantar fasciitis patients treated with steroid injection. Joint Bone Spine. 2005 Jan 1;72(1):61-5.
4. Riddle DL, Pulisic M, Pidcoe P, Johnson RE. Risk factors for plantar fasciitis: a matched case-control study. JBJS. 2003 May 1;85(5):872-7.
5. Lemont H, Ammirati KM, Usen N. Plantar fasciitis: a degenerative process (fasciosis) without inflammation. Journal of the American Podiatric Medical Association. 2003 May;93(3):234-7.
6. Monto RR. Platelet-rich plasma efficacy versus corticosteroid injection treatment for chronic severe plantar fasciitis. Foot & ankle international. 2014 Apr;35(4):313-8.
7. Toomey EP. Plantar heel pain. Foot Ankle Clin. 2009;14: 229-245.
8. Akşahin E, Doğruyol D, Yüksel HY, Hapa O, Doğan Ö, Çelebi L, Biçimoğlu A. The comparison of the effect of corticosteroids and platelet-rich plasma (PRP) for the treatment of plantar fasciitis. Archives of orthopaedic and trauma surgery. 2012 Jun;132(6):781-5.
9. Malay DS, Pressman MM, Assili A, Kline JT, York S, Buren B, Heyman ER, Borowsky P, LeMay C. Extracorporeal shockwave therapy versus placebo for the treatment of chronic proximal plantar fasciitis: results of a randomized, placebo-controlled, double-blinded, multicenter intervention trial. The journal of foot and ankle surgery. 2006 Jul 1;45(4):196-210.
10. Shetty SH, Dhond A, Arora M, Deore S. Platelet-rich plasma has better long-term results than corticosteroids or placebo for chronic plantar fasciitis: randomized control trial. The Journal of Foot and Ankle Surgery. 2019 Jan 1;58(1):42-6.
11. Erden T, Toker B, Cengiz O, Ince B, Asci S, Toprak A. Outcome of Corticosteroid Injections, Extracorporeal Shock Wave Therapy, and Radiofrequency Thermal Lesioning for Chronic Plantar Fasciitis. Foot & Ankle International. 2021 Jan;42(1):69-75.
12. Cheung JT, et al. Consequences of partial and total plantar fascial release: a finite element study. Foot Ankle Int. 2006;27:125-132.
13. Hogan KA, Webb D, Shereff M. Endoscopic plantar fascia release. Foot Ankle Int. 2004;25:875-881.
14. Li Z, Xia C, Yu A, Qi B. Ultrasound-versus palpation-guided injection of corticosteroid for plantar fasciitis: a meta-analysis. PLoS One. 2014 Mar 21;9(3):e92671.
15. Raissi G, Arbabi A, Rafiei M, Forogh B, Babaei-Ghazani A, Khalifeh Soltani S, Ahadi T. Ultrasound-guided injection of dextrose versus corticosteroid in chronic plantar fasciitis management: a randomized, double-blind clinical trial. Foot & Ankle Specialist. 2021 Jan 19:1938640020980924.
16. World Medical Association: Ethical principles for medical research involving humansubjects[http://www.wma.net/en/30publications/10policies/b3/index.html].
17. Hawker GA, Mian S, Kendzerska T, French M. Measures of adult pain: Visual analog scale for pain (vas pain), numeric rating scale for pain (nrs pain), mcgill pain questionnaire (mpq), short-form mcgill pain questionnaire (sf-mpq), chronic pain grade scale (cpgs), short form-36 bodily pain scale (sf-36 bps), and measure of intermittent and constant osteoarthritis pain (icoap). Arthritis care & research. 2011 Nov;63(S11):S240-52.
18. Kitaoka, H. B., Alexander, I. J., Adelaar, R. S., Nunley, J. A., Myerson, M. S., & Sanders, M. (1994). Clinical Rating Systems for the AnkleHindfoot, Midfoot, Hallux, and Lesser Toes. Foot & Ankle International, 15(7), 349–353.
19. Nair AS, Sahoo RK. Ultrasound-guided injection for plantar fasciitis: A brief review. Saudi Journal of Anaesthesia. 2016 Oct;10(4):440.
20. Jaradat R, Al-bakheet M, Khresat R. The Occurrence of Calcaneal Spurs In Plantar Fasciitis Patients. International Journal of Medical Investigation. 2017 Mar 10;6(1):1-3.
21. Johal KS, Milner SA. Plantar fasciitis and the calcaneal spur: fact or fiction?. Foot and Ankle Surgery. 2012 Mar 1;18(1):39-41.
22. Tahririan MA, Motififard M, Tahmasebi MN, Siavashi B. Plantar fasciitis. J Res Med Sci. 2012 Aug;17(8):799-804. PMID: 23798950; PMCID: PMC3687890.
23. Uğurlar M, Sönmez MM, Uğurlar ÖY, Adıyeke L, Yıldırım H, Eren OT. Effectiveness of four different treatment modalities in the treatment of chronic plantar fasciitis during a 36-month follow-up period: a randomized controlled trial. The Journal of Foot and Ankle Surgery. 2018 Sep 1;57(5):913-8.
24. McMillan AM, Landorf KB, Gilheany MF, Bird AR, Morrow AD, Menz HB. Ultrasound-guided corticosteroid injection for plantar fasciitis: randomize controlled trial. BMj. 2012 May 22;344.

25. Crawford F, Atkins D, Young P, Edwards J. Steroid injection for heel pain: evidence of short-term effectiveness. A randomized controlled trial. Rheumatology (Oxford). 1999 Oct;38(10):974-7.
26. Okuda Y, Adrogué HJ, Nakajima T, Mizutani M, Asano M, Tachi Y, Suzuki S, Yamashita K. Increased production of PDGF by angiotensin and high glucose in human vascular endothelium. Life sciences. 1996 Sep 20;59(17):1455-61.
27. Di Paolo S, Gesualdo L, Ranieri E, Grandaliano G, Schena FP. High glucose concentration induces the overexpression of transforming growth factor-beta through the activation of a platelet-derived growth factor loop in human mesangial cells. The American journal of pathology. 1996 Dec;149(6):2095.
28. Ersen Ö, Koca K, Akpancar S, Seven MM, Akyıldız F, Yıldız Y, Özkan H. A randomized controlled trial of prolotherapy injections in the treatment of plantar fasciitis. Turk J Phys Med Rehabil. 2017 Aug 12;64(1):59-65.
29. Rabago D, Patterson JJ, Mundt M, Kijowski R, Grettie J, Segal NA, Zgierska A. Dextrose prolotherapy for knee osteoarthritis: a randomized controlled trial. The Annals of Family Medicine. 2013 May 1;11(3):229- 37.