

*Aspetar Orthopaedic and Sports Medicine Hospital, Doha, Qatar.*

## **Introduction**

Footballer's ankle or ankle impingement is defined as a chronic ankle pain with painful restriction of dorsiflexion (anterior), or plantarflexion (posterior) caused by compression of bony or soft tissue, often due to recurrent ankle sprain, chronic ankle instability or repetitive microtrauma during sports or after ankle surgery (Dhooghe et al, 2022; Lavery et al, 2016; Ross et al, 2016; Tol et al, 2006). This condition is diagnosed clinically with confirmation by imaging (X-ray and MRI of the ankle), with painful ankle dorsiflexion or plantarflexion, tender areas of impingement, osseous lesions, hypertrophied synovium, bone oedema, and cartilage lesions (Russo et al, 2013; Berman et al, 2017). This condition affects the competitive participation of the athlete during the season if not treated appropriately (Dhooghe et al, 2022). Conservative treatment (e.g., rest, bracing, orthoses, physiotherapy, and injection therapy) is usually attempted prior to attempting surgical intervention (Lavery et al, 2016; Ross et al, 2016). Unfortunately, one-third of footballers with posterior impingement fail to respond to conservative treatment (Kudas et al, 2016). Recently, arthroscopic surgery has been suggested to be more effective than open surgery in treating this condition (Ribbans et al, 2015; Ross et al, 2016).

High energy ESWT has been shown to be useful to remove calcifications in rotator cuff tendons and improving pain relief and function in osteoarthritic knee joints has not been demonstrated previously (Verstraelen et al 2014; Wang et al, 2017; Hsieh et al, 2020). It has also been previously used to reduce pain and improve function in subacromial impingement (Testa et al 2020). In Aspetar, athletes with ankle impingement have been treated with focal ESWT for both bony and soft tissue impingement. We hypothesize that focal ESWT would have a beneficial effect in reducing pain and expediting return to play in ankle impingement.

## **Methods**

A retrospective analysis patients diagnosed with anterior or posterior ankle impingement treated with focal ESWT was done from 2015 to 2022. Inclusion criteria were patients who did not respond to physiotherapy or injection therapy (Corticosteroid or hyaluronic acid or platelet rich plasma injection) or have residual pain and restricted ankle movement after ankle arthroscopic or open surgery. Meanwhile, patients with recent treatment with PRP injection or corticosteroid injection or double anti-coagulation were excluded. Each athlete was treated with up to four treatments (once fortnightly) of focal ESWT (Orthogold 100). Energy flux density (EFD) used was 0.10 -0.27mJ/mm<sup>2</sup>, 1000-1400 pulses (depending on the size of lesion (s)). Once the patients were able to return to play (RTP) (or physical activities for non-athletes), and was satisfied with treatment, no further treatment was provided. Patients were allowed to continue with physiotherapy during treatment. No NSAIDS was recommended. For each patient, number of treatments, minimum EFD (Elow), maximum EFD (Ehigh), total energy (TotalE), number of pulses, frequency (Hz) was reported. Pre and post VAS score, patient perceived outcome (5-point likert scale), adverse effects and RTP were routinely collected. Patients who had to resort to PRP injection or Corticosteroid injection or surgical treatment were considered as failure to RTP. Ethics review for the chart review is pending with Aspetar IRB.

## **Results**

In this study, 56 patients (54 male and 2 female, 46 athletes and 10 non-athletes, 38 conservative and 18 postsurgical) required 94 treatments for ankle impingement. The age and BMI were 30 ± 11 years and 25.6 ± 4.0 kg/m<sup>2</sup> respectively. Most of the athletes belonged to the sport football (32.1%), followed by volleyball (16.1%), basketball (14.3%) handball (8.9%), and others. The duration of symptoms before treatment were 13.1 ± 15.0 months. Average number of treatments given was 1.7 ± 0.89 (ranging from 1 to 4), and it did not differ significantly irrespective of the type of sports, location (anterior or

posterior) or previous treatment (conservative or post-surgical). Most of the patients (n=47, 85.5%) only required up to 2 treatments. The treatment parameters are given in Figure 1. Pre and post VAS score was  $4.1 \pm 2.4$  and  $1.8 \pm 1.7$  respectively. From the 44 patients who could be followed-up, only 35 patients RTP (79.5%) with  $1.5 \pm 1.1$  months. A greater proportion of patients from the post-surgical group (n=14; 87.5%) RTP compared to the conservative group (n=21; 75%). From those who failed to RTP in both groups (n=9; 20.5%), three were treated with corticosteroids, one with PRP injection, two with ankle surgery whereas three did not continue treatment. Patients from the post-surgical group also had a quicker RTP compared to the conservative group ( $1.1 \pm 0.9$  months vs  $1.76 \pm 1.1$  months,  $p=0.008$ ). There were no adverse events reported.

Figure 1

		Indication											
		Ankle Impingement - anterior						Ankle Impingement - posterior					
		Treatment						Treatment					
		Conservatively N=50			Post-surgical N=20			Conservatively N=18			Post-surgical N=6		
		N	M	SD	N	M	SD	N	M	SD	N	M	SD
ApType	SoftFocused	11			2			0			0		
	NonFocused	6			2			1			0		
	Focused	33			16			17			6		
E low			.15	.04		.17	.04		.15	.03		.19*	.02
E high			.22	.06		.25*	.04		.26	.02		.27	.00
Total E			5483	1621		6510*	1246		5354	727		6380*	982
Hz			4.2	.8		4.3	.7		3.9	.6		4.8*	.4
Pulses			1188	127		1245	185		1140	164		1133	163

\* P<0.05.

Treatment parameters according to location and previous treatment given

### Conclusion

Focal ESWT is an effective and safe non-invasive treatment option for ankle impingement in athletes with a mean of RTP of 1.5 months. However, a prospective study including longer-term observation is needed to determine the durability of treatment.

**Technology:** Focused Shockwave

**Device and Manufacturer:** MTS

**COI:** 'No conflict of interest'.

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Study Performance: **OW100**