

Therapeutic Effect of Low-energy Extracorporeal Shock Wave Therapy on Painful Plantar Fibromatosis

Jin Tae Hwang^{1*}, Kyung Jae Yoon¹, Jong Geol Do¹, Jung Sang Lee¹, Kun Woo Kim¹, Jae Hyeoung Choi¹, Yong Taek Lee^{1†}

Kangbuk Samsung Medical Center, Department of Rehabilitation Medicine¹

Introduction

Plantar fibromatosis is an uncommon benign, hyperproliferative disease of the superficial plantar fascia, leading to the formation of nodules. Therapeutically, conservative therapy is applied in early stage. In intractable cases, radiotherapy or surgery have been applied with substantial recurrence rates and impaired functional status. Extracorporeal shock wave therapy (ESWT) has been applied as a safe alternative treatment for intractable plantar fasciitis. Some previous studies showed ESWT could be therapeutically applied in plantar fibromatosis. The purpose of this study is to evaluate and compare the therapeutic effect of ESWT between plantar fibromatosis and plantar fasciitis confirmed by US.

Methods and Materials

Flow chart for inclusion of eligible subjects is shown in Figure 1. Medical records of 88 consecutive feet were retrospectively reviewed, who underwent ESWT for plantar fibromatosis (N= 15) and plantar fasciitis (N =73) confirmed by US. Plantar fibromatosis was confirmed when hypoechogenic echogenic nodule with elongated shape involving the superficial plantar fascia was shown on US. Plantar fasciitis was confirmed by Korean US diagnostic criteria as follows: 1. plantar fascia thickness > 3.8 mm; 2. difference of plantar fascia thickness between the symptomatic and asymptomatic foot >1.0 mm; or 3. hypoechogenicity in plantar fascia. ESWT was conducted weekly (0.06-0.12 mJ/mm²; 600-1000 shocks per session) when the Roles-Maudsley score (RMS) still showed "Poor" or "Fair" grade after conservative treatment. Subjective pain intensity was measured by Numerical Rating Scale (NRS) at immediate follow-up (one week after the last ESWT). A more than 50% reduction in the NRS score was regarded as treatment success. Statistical analysis. Repeated measured ANOVA was used to analyze the time effect on the NRS score for each group and their interaction effects. Comparisons of treatment success and failure between the two groups were achieved by chi-square test and Fisher's exact test, respectively.

Results

The basic characteristics of them were shown in Table 2. There were no significant differences between groups in baseline data. In the plantar fibromatosis group, the mean NRS score decreased from 5.4 up to 2.0 and in the plantar fasciitis, it did from 5.8 up to 3.0. Repeated measure ANOVA demonstrated that NRS significantly decreased after ESWT (time effect, $p < 0.001$) without time x group interaction effect ($p = 0.414$), indicating that ESWT equally decreased pain in both groups. Eleven feet (73.3%) in plantar

fibromatosis group and 44 feet (60.3%) in plantar fasciitis group were found to be treatment success, respectively.

Conclusion

Low-energy extracorporeal shockwave therapy reduced the subjective pain in plantar fibromatosis and its efficacy was not inferior to that of plantar fasciitis. Therefore, low-energy ESWT can be considered an alternative therapeutic Method for pain relief in plantar fibromatosis.

Table 1. Characteristics of subjects (n=88)

Characteristics	Plantar fibromatosis (n=15)	Plantar fasciitis (n=73)	p-value
Age (years)	49.4±10.4	52.9±10.9	0.252 ^{a)}
Sex			0.130 ^{c)}
Male	10	33	
Female	5	40	
Location			0.785 ^{c)}
Right foot	6	32	
Left foot	9	41	
Baseline NRS (score)	5.4±1.5	5.8±1.8	0.371 ^{a)}
Baseline RMS			0.386 ^{c)}
Poor	4	31	
Fair	11	42	
Total number of ESWT sessions	6.2±2.8	5.4±3.0	0.355 ^{a)}
Total duration of ESWT sessions (day)	68.1±35.3	55.5±36.7	0.225 ^{a)}
Duration of post-treatment soreness after first ESWT (day)	1.0 (0.0-1.0)	1.0 (0.0-3.0)	0.237 ^{b)}
Mean duration of post-treatment soreness (day)	1.4 (0.8-2.1)	1.2 (0.2-1.2)	0.889 ^{b)}
Diameter of plantar fibromatosis (mm)	7.1±3.5		
Thickness of plantar fascia (mm)		4.9±0.9	

Values are presented as mean±standard deviation or median (interquartile range).

NRS, Numeric Rating Scale; RMS, Roles-Maudsley Score; ESWT, extracorporeal shockwave therapy.

a)Student t-test, b)Mann-Whitney U-test, c)chi-sqaure test

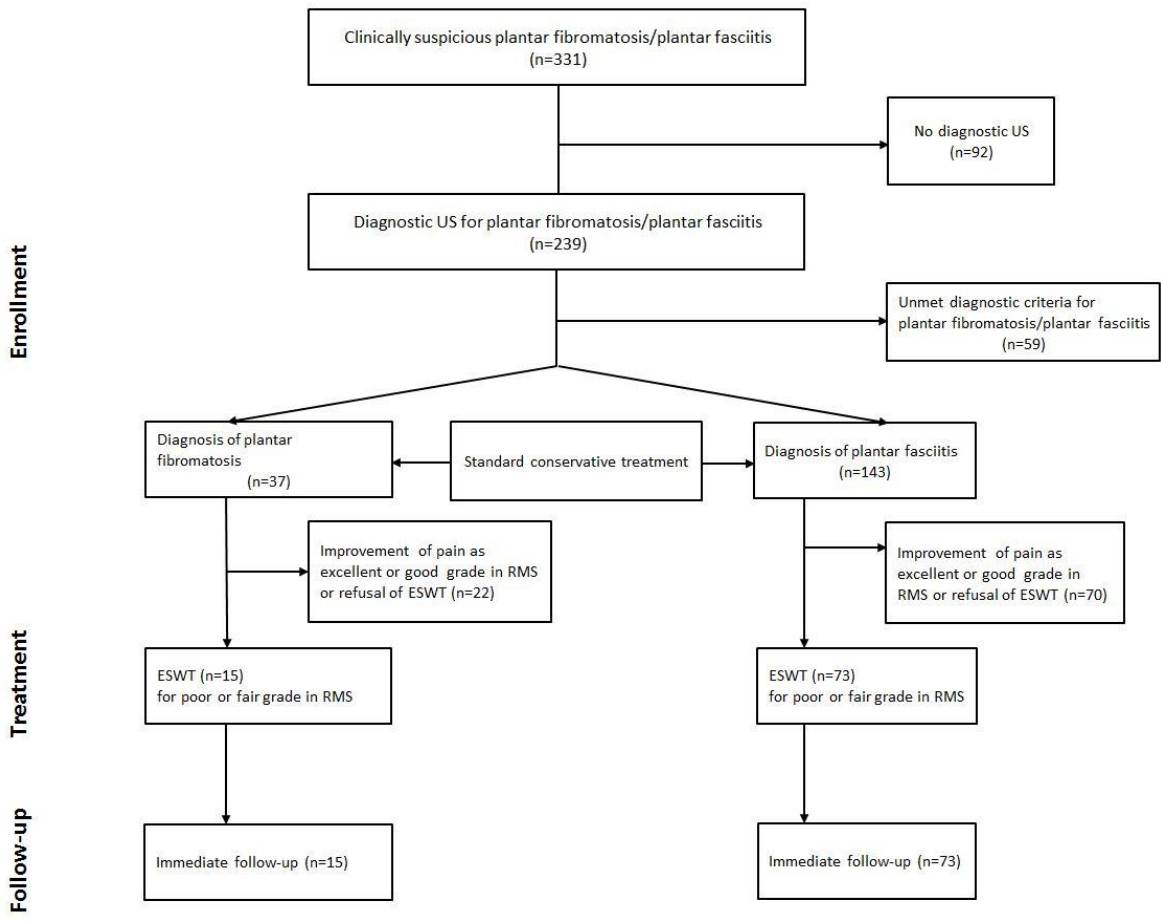


Figure1. Flow Chart for this study

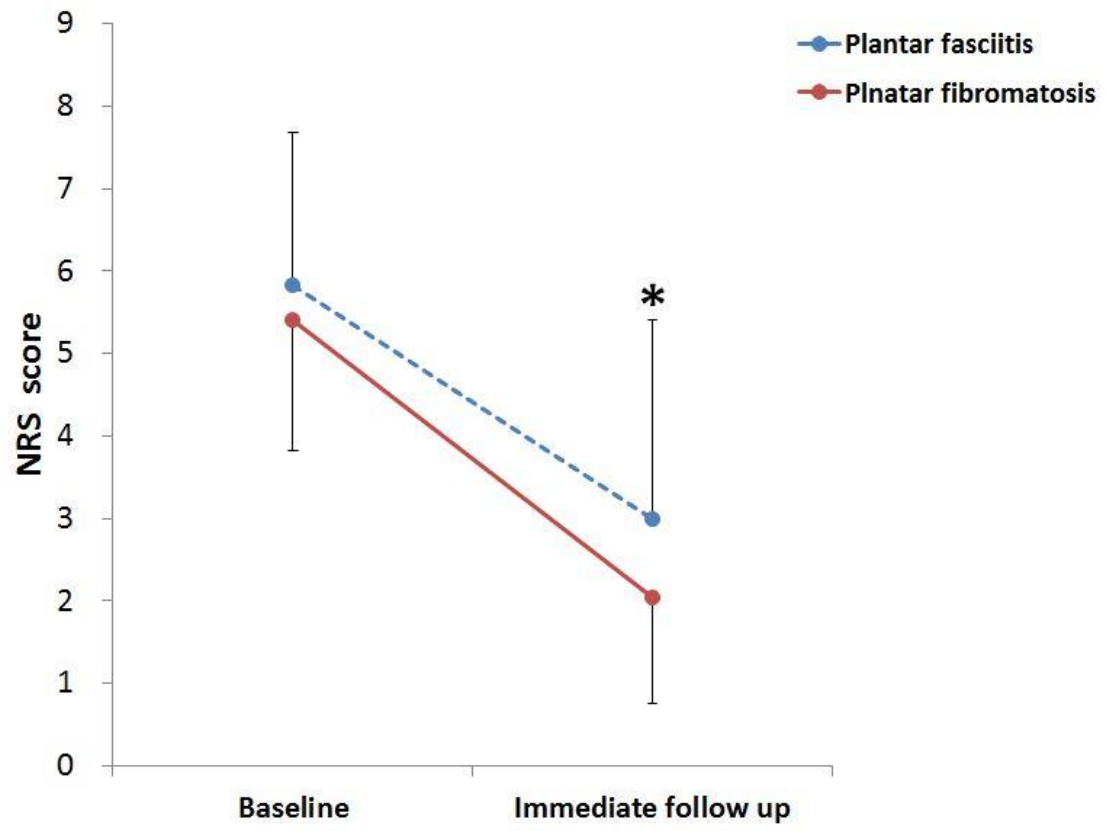


Figure2. The NRS improvement at immediate follow up as a primary outcome measure