통증 및 근골격재활
발표일시 및 장소 : **10 월 27 일(토) 14:40-14:50 Room B(5F)**

OP1-3-5

The effectiveness of intraarticular pulsed radiofrequency in a rabbit model of rheumatoid arthritis

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Purpose
Rheumatoid arthritis (RA) is a chronic autoimmune pathology characterized by the proliferation and inflammation of the synovium and this process leads to the joint erosion. When arthritis worsen in one or two joints, the most often therapy is known as intraarticular corticosteroid injection. Although fast in reducing arthrogenic pain, corticosteroid injection may lead severe adverse events such as septic arthritis with repeated usage. Pulsed radiofrequency (PRF) was initially introduced for the relief of chronic neurogenic pain. Recently, some clinical studies have shown that intraarticular PRF administration reduced chronic peripheral joint pain. However, to our knowledge, there is no research that has investigated about the effectiveness of PRF in an animal model of RA. We aimed to compare the effectiveness of intraarticular PRF administration and corticosteroid injection using histopathologic and motion analysis Methods in ovalbumin (OVA)-induced arthritis rabbit model.

Methods
Eighteen rabbits were included in this study. RA was induced in right knee joint by intraarticular OVA injection. Rabbits were randomly allocated into three groups to receive either ultrasound guided intraarticular PRF administration with a 45 V, 5 Hz, and 4 minute or intraarticular corticosteroid injection with 0.1 ml of triamcinolone acetonide (10 mg/ml). For rabbits in the sham stimulation group, electrode placement was conducted in precisely the same manner, but the machine was turned off and radiofrequency stimulation was not applied in the joint. Rabbits were tested motion analysis at 2 weeks, 4 weeks, and 8 weeks after PRF administration. Histopathologic evaluation of distal femur and synovium was performed at 2 weeks, 4 weeks, and 8 weeks after PRF administration.

Results
After intraarticular PRF administration and intraarticular corticosteroid injection, walking distance, fast walking time, and mean walking speed was statistically increased as time goes by ($p < 0.05$) (Figure 1). Histopathologic image analysis showed significantly decreased damage of medial and lateral femoral condyle at 2 weeks and 4 weeks after both intraarticular PRF administration and corticosteroid injection groups than sham

stimulation group ($p < 0.05$). However, at 8 weeks, histopathologic score of femoral condyle in intraarticular PRF administration group did not showed significant difference from sham stimulation group (Table 1). The mean grade of synovitis score of intraarticular PRF administration and corticosteroid injection groups had a tendency to be lower than that of sham stimulation group, but statistically no significant (Table 2).

Conclusion

The study demonstrated that intraarticular PRF administration in rheumatoid arthritis could improve cartilage protection capability as well as the functional motion of the rabbits. This study could provide a new therapeutic strategy for RA-induced arthrogenic pain through the local administration of PRF current.

Table1. Semiquantitative score of histopathological findings of distal femurs at 2, 4, 8 weeks after intraarticular pulsed radiofrequency administration, corticosteroid injection, and sham stimulation

Group	Time, mean(SE)			p-value†		
	2 weeks	4 weeks	8 weeks	G	T	G x T
Control[1)]	4.000(0.623)	4.625(0.623)	4.458(0.623)			
Sham PRF[2)]	15.875(1.079)	16.250(1.079)	16.750(1.079)			
PRF[3)]	12.000(1.079)	13.250(1.079)	14.250(1.079)	<0.001*	0.320	0.218
Steroid[4)]	10.375(1.079)	12.250(1.079)	8.125(1.079)			
p-value‡	< 0.001* (1<3,4<2§)	< 0.001* (1<3,4<2§)	< 0.001* (1<4<2,3§)			

(Abbreviation) SE: Standard Error, G: Group, T: Time effect, GxT; Group x Time Interaction

* : Statistically significant with $p < 0.05$

† : Result by Generalized Linear Model

‡ : Result by Kruskal-Wallis Test

§ : Multiple comparison(post-hoc) result by Dunn's procedure method

Table2. Semiquantitative score of histopathological findings of synovium at 2, 4, 8 weeks after intraarticular pulsed radiofrequency administration, corticosteroid injection, and sham stimulation

Group	Time, mean(SE)			p-value†		
	2weeks	4weeks	8weeks	G	T	G x T
Control[1)]	1.917(0.419)	1.333(0.419)	1.917(0.419)			
Sham PRF[2)]	5.750(0.725)	6.500(0.725)	6.250(0.725)			
PRF[3)]	4.500(0.725)	5.250(0.725)	5.250(0.725)	<0.001*	0.722	0.428
Steroid[4)]	4.500(0.725)	4.750(0.725)	3.000(0.725)			
p-value‡	0.040* (1<2,3,4§)	0.025* (1<2,3,4§)	0.070			

(Abbreviation) SE: Standard Error, G: Group, T: Time effect, GxT; Group x Time Interaction

* : Statistically significant with $p < 0.05$

† : Result by Generalized Linear Model

‡ : Result by Kruskal-Wallis Test

§ : Multiple comparison(post-hoc) result by Dunn's procedure method

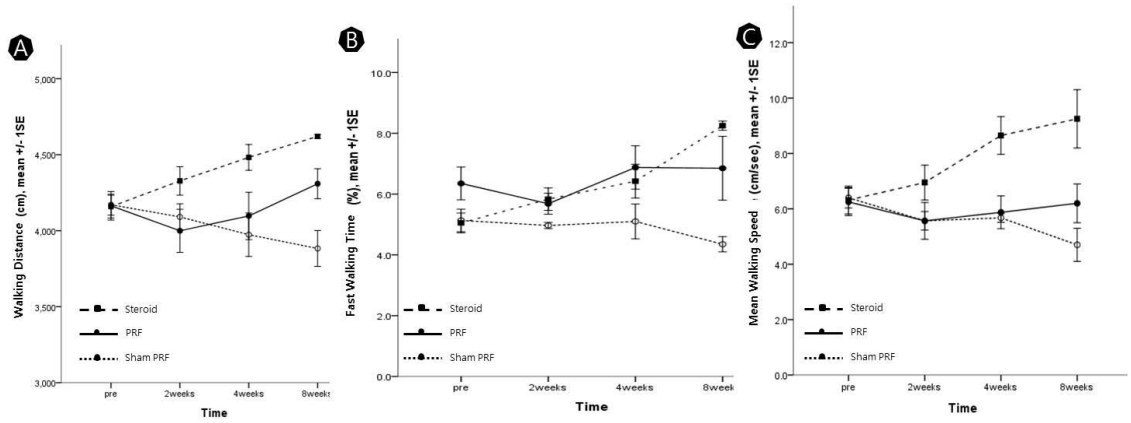

Figure 1. Semiquantitative score of motion analysis of ovalbumin-induced arthritis rabbits at 2, 4, 8 weeks after intraarticular pulsed radiofrequency administration (PRF), corticosteroid injection (Steroid), and sham stimulation (Sham PRF). (A): walking distance (cm), (B): fast walking time (%), and (C): mean walking speed (cm/sec)