

## The therapeutic effect of hydraulic distension with pumping technique in frozen shoulder

Sanghoon Shin<sup>1\*</sup>, Ho Sang Yoo<sup>1</sup>, Young Seok Kim<sup>2</sup>, Hyeon Su Kim<sup>1</sup>, Sang Chul Lee<sup>1†</sup>, Sang Chul Lee<sup>1†</sup>

Department of Rehabilitation Medicine and Research Institute, Yonsei University College of Medicine, Seoul, Korea<sup>1</sup>, Department of Rehabilitation Medicine, Gangnam Severance Hospital, Yonsei University College of Medicine, Seoul, Korea<sup>2</sup>

### Introduction

Frozen shoulder, one of the most common shoulder pain diseases, is characterized by shoulder pain and limited range of motion. Conservative treatment is preceded by surgical treatment to reduce pain and recover range of motion. Hydraulic distention was one of the conservative procedures in which a sufficient amount of solution is injected into the shoulder joint to rupture the rigid joint capsule. The optimal Method of hydraulic distension is still a matter of controversy. Recently, it has been proposed that continuously maintaining the expanded capsular state after injection, without the process of rupturing the rigid joint, reduces the side effects. However, to obtain maximal stretching effect, we proposed a new hydraulic distension Method called 'pumping technique' in which we inflate and shrink the rigid joint capsule by repeating the process of infusion and regurgitation of the injection fluid into the capsule. Case A 74-year-old female patient had been suffering from shoulder pain for 3 months. Ultrasonography revealed degenerative rotator cuff disease, but there were no other abnormal pathologic findings. Physical examination of the shoulder revealed limited range of motion and patient complained of severe shoulder pain during examination. Ultrasonographically guided hydrodynamic inflation was performed by injection under aseptic Method (Accuvix V10; Samsung Medison, Seoul, Korea) in a lateral lying posture and 0.5% lidocaine at a minimum of 20 mL to 29 mL with tamcetone 40 mg (Total injection volume: 21 mL to 30 mL) was injected into the shoulder. Each procedure was separated by 2 weeks, and follow-up evaluation was performed 4 weeks after the third procedure. In case of left shoulder, conservative hydraulic distension was performed and the right shoulder was subjected to a 'pumping technique'. The injection fluid was infused to the glenohumeral joint and was maintained for 15 seconds followed by regurgitation. The same procedure was repeated 10 times to stretch the rigid capsule. After 4 weeks, during which total of 3 procedures were performed, the increase in the range of motion of the right shoulder was 27% more than that of the left shoulder using conservative hydraulic distention. Pain improved in both shoulders according to Visual Analog Scale (VAS) score. Right shoulder using pumping technique showed interval change from 8 to 2 points, and left shoulder using conventional hydraulic distension showed interval change from 7 to 2 points.

## Conclusion

In frozen shoulder, our proposed 'pumping technique' reduced pain and was shown to be more effective in increasing range of motion than the conventional hydraulic distension. This 'pumping technique' can be suggested as an effective therapeutic option for frozen shoulder.

Table 1. Comparison between Pumping Technique and Conventional Hydraulic Distension Technique

Right shoulder		After		Deg of		After		Deg of		After		Deg of	
:Pumping		1st Inj		Imp(%)		2nd Inj		Imp(%)		3rd Inj		Imp(%)	
technique		(2 wks)				(4 wks)				(8 wks)			
Forward flexion, <sup>o</sup>		100	130	30		135	35		170	70			
Abduction, <sup>o</sup>		70	90	29		90	29		110	57			
Internal rotation, <sup>o</sup>		45	60	33		60	33		70	56			
VAS		8	4	50		2	75		2	75			
Left shoulder		After		Deg of		After		Deg of		After		Deg of	
:Conventional		1st Inj		Imp(%)		2nd Inj		Imp(%)		3rd Inj		Imp(%)	
Technique		(2 wks)				(4 wks)				(8 wks)			
Forward flexion, <sup>o</sup>		110	120	9		125	14		140	27			
Abduction, <sup>o</sup>		70	70	0		80	14		90	29			
Internal rotation, <sup>o</sup>		30	40	33		45	50		55	83			
VAS		7	5	29		2	71		2	71			

Inj: injection, Deg: Degree, Imp: Improvement, wks: weeks, VAS: Visual Analogue Scale

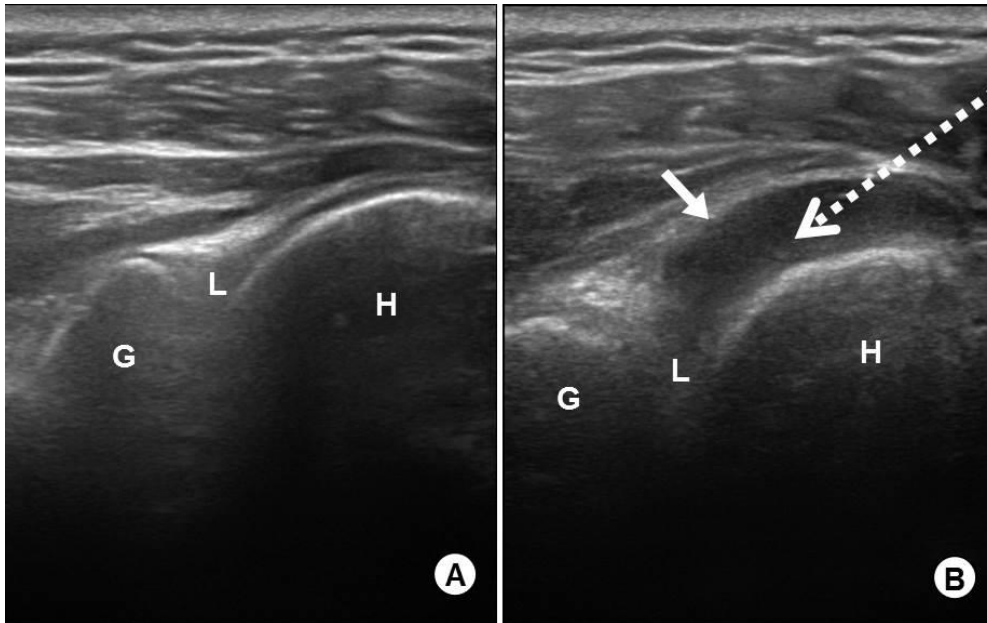


Fig. 1. 'Pumping technique' in a patient with frozen shoulder. While the patient was lying down comfortably, the needle was inserted to the glenohumeral joint (dotted arrow) 1 cm lateral to the ultrasound transducer and was advanced into joint capsule under ultrasound guidance. The injection fluid was infused to the glenohumeral joint and was maintained for 15 seconds followed by regurgitation. The same procedure was repeated 10 times to stretch the rigid capsule. (A) Before sono-guided intraarticular injection at glenohumeral joint. (B) After sono-guided injection with capsular distension (arrow). G (Glenoid), H (Humeral head), L (Labrum).