

# Extracorporeal Shock Wave Therapy for the Treatment of Anterior Knee Pain after ACLR with BTB autograft



Funabashi Orthopedic Hospital  
Sports medicine ▪ joint center



**Hideaki Fukuda**

Disclosure  
ISAKOS 2023 @ Boston

Conflict of Interest : Hideaki Fukuda  
The authors declare that I have no conflict of interest.

# Anterior Knee Pain (AKP) following BTB graft harvest

- Etiology**
- Bone harvesting site pain
  - neuroma due to infrapatellar branch of medial saphenous nerve lesion
  - patellar tendinopathy

## Incidence

- 25.5 % - 62.9%

(Shelbourne KD, AJSM. 1997)

(Kartus J, KSSTA. 1999)

(Pinczewski LA, AJSM. 2007)

(Ahn JH, Arthrosc Relat Surg. 2012)

(Shaieb MD, AJSM. 2022)

(Shaieb MD, AJSM. 2022)

(Janani G, Journal of Orthopaedics 2020)

# Anterior Knee Pain (AKP) following BTB graft harvest

## Treatment

- Rehabilitation focused on obtaining optimum strength and full knee extension
- PRP

(Seijas R, KSSTA 2015)

(Cervellin M, KSSTA 2012)

(Walters BL AJSM 2018)

## Our Institution

Extracorporeal Shock Wave Therapy ( ESWT ) for AKP treatment

No report to assess the clinical outcomes of

ESWT for the Treatment of AKP after ACLR with BTB



Storz(Ger)  
Duolith SD1

2015.4.~

## Purpose

To evaluate the clinical outcomes of  
Extracorporeal Shock Wave Therapy  
for the Treatment of Anterior Knee Pain  
after ACLR with BTB autograft

## Material

Sep 2015 – Oct 2022

**121** cases < Primary ACLR with BTB autograft by Single Surgeon (H.F)>



**42** patients (34%) with **AKP** after ACLR ( at least post-op 6 months )



**ESWT Treatment**

**20 Patients** (male 11 / female 9)

Mean Age : 32.4 (18-39)

Follow up : 17.7 months (7-36)

Exclusion criteria : Other treatment cases (injection / nerve block ) / PF arthritis / Revision  
Multiple ligament injury

## Material

### Application of ESWT

- Energy : Non-Anesthesia / Pain-tolerable energy
- Total Number of shocks : 3000 / time
- Treatment Interval : every 2-3 weeks

ESWT was applied until patient's pain was sufficiently relieved

## Evaluation items

- \* **Pain Assessment**      NRS (numerical rating scale)
- \* **Total ESWT times**
- \* **Complication**

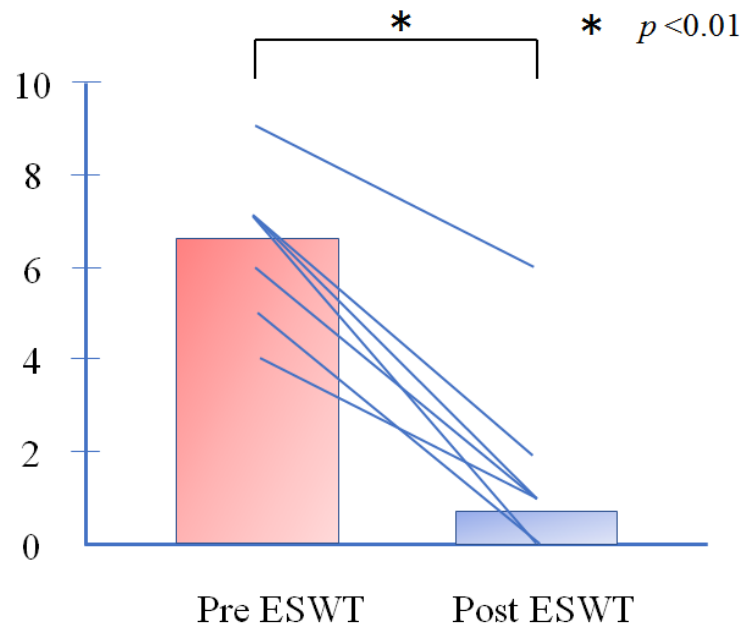
**ESWT group** vs **Non-ESWT group** @ post-op 12 month

- \* **Pain Assessment**      NRS
- \* **Lysholm Score**
- \* **Isokinetic muscle strength measurement**

Peak Torque / Body weight (60deg/sec : Biodex System 3)

(@ 4,6,8 months post-op)

## Results



NRS : pre ESWT mean 6.3 (5-9)

post ESWT mean 0.9 (0-6)

Total ESWT times mean 3.4 (2-8)

Complication (—)



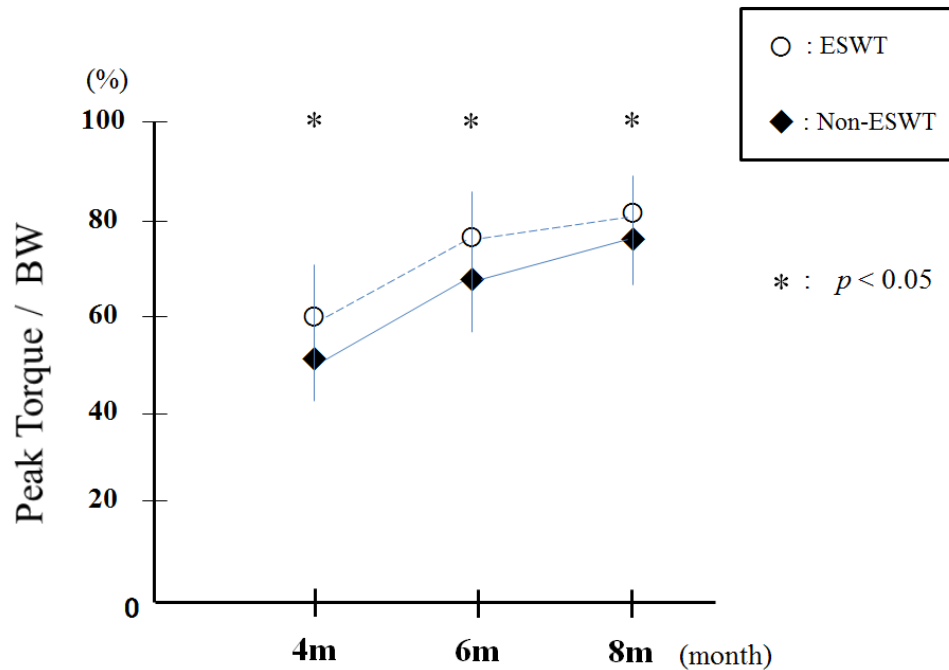
## Results

	ESWT	Non-ESWT	<i>p</i>
Number (knees / cases)	2	2	
Mean Age	32.4±6.9	29.7±7.8	.62
Sex, male / female	12 / 8	12 / 10	.14
BMI (kg/m <sup>2</sup> )	24.7±2.7	23.1±2.6	.61
Affected side (right/left)	99 / 511	127 / 510	.71
Time from injury to surgery, months	2.2±1.9	2.5±1.8	.78
Follow-up period, months	26.2±5.9	27.9±5.1	.74
Preoperative Tegner scale	8.0±1.3	7.1±1.2	.04
NRS	0.9±1.2	2.0±1.0	.01
Lysholm Score	93.8±4.3	95.1±4.9	.61

## Results

### Isokinetic extension muscle strength measurement

(60 deg/ sec)  
Biodex system 3



ESWT Group > Non-ESWT Group

## Discussion

### ESWT : Pain Relief & Anti-Inflammation

- ✓ Destruction of subcutaneous free nerve endings  
(Ohtori et al, Neurosci lett.2001)
- ✓ Suppression of neuropeptide conduction  
(Takahashi N; Auton. Neurosci. 2003)
- ✓ Selective destruction of unmyelinated nerve fiber in postganglionic sympathetic fiber  
(Hausdorf J, Neuroscience 2012)
- ✓ MMP-1, MMP-13 , IL-6 → Significantly reduced  
(Han SH, Foot and Ankle Int. 2009)



*Pain Relief by decreasing pain transmitters in lesion*

## Discussion

### **ESWT for Patellar Tendinopathy**

Improvement function :73.5%-83.5%:

(Wang CJ, Am J Sports Med, 35, 972-978.2007)

(M.T.van Leeuwen, Br J Sports Med, 43,163-168.2009)

### **ESWT for Patellar Tendinopathy after BTB ACLR**

Improved tendon vascularization

(Peers KH ,Clin J Sports Med, 13, 79-83.2003)

Reduced tendon thickness

(Wang CJ, Am J Sports Med, 35, 972-978.2007)

## Discussion

- No paper to assess the clinical outcomes of ESWT for the Treatment of AKP after ACLR with BTB

### Present Study

AKP after surgery  
42 cases (34%)

ESWT (+)  
20 cases

NRS 6.3 → 0.9

Biodex Peak Torque / BW : 83%

ESWT (-)  
22 cases

NRS 5.9 → 2.0

Biodex Peak Torque / BW : 71%



## Conclusion

ESWT was effective in improving post-operative Anterior Knee Pain after ACLR with BTB autograft.