# Extracorporeal Shock Wave Therapy to Treat Refractory Neurogenic Heterotopic Ossification in Patient with Spinal Cord Injury

Hyun Min Jeon,MD[1], Chi Hwan An, MD[1], Won Jae Lee, MD, PhD[1], Kyung Hee Do,MD,PhD[1] [1] Department of Physical Medicine and Rehabilitation, Veterans Health Service Medical Center, Seoul, Korea

## Introduction

- Neurogenic Heterotopic Ossification (NHO) is a pathologic ectopic bone formation that was gradually generated in major synovial joint, related to central nervous system (CNS) injury or disease.
  - It is a frequent complication in major CNS injuries, including spinal cord injury (SCI), and the incidence of NHO in patients with SCI is as high as 11 to 53%.
- Treatment of NHO is crucial because NHO can cause disability such as pain and ROM limitation, and these can be a factor of lower quality of lives.
  - Several treatments have been used to treat NHO.
    - Medications such as non-steroidal anti-inflammatory drugs
    - Bisphosphonates
    - Physical modalities
    - Radiation
    - Surgical excision

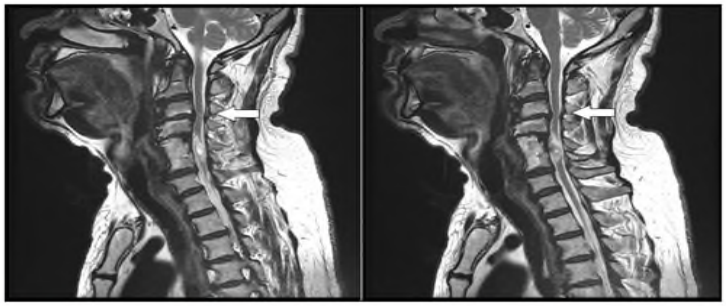

**Fig 1. Sagittal T2 magnetic resonance image demonstrating spinal cord injury with focal high signal intensity spinal cord lesion**

- Extracorporeal shockwave therapy (ESWT) recently has been used to treat some NHOs. However, no study has reported the use of ESWT for treating NHO in patient with SCI.
- We presented a case of a 55-year-old male with C4 [S(C7/C7), M(C4/C4)] ASIA Impairment Scale A SCI due to cervical myelopathy, who experienced painful NHO which was treated well with ESWT.

## Case report

- An 55-year-old male patient with SCI with C5 [S(C5/C5] ASIA Impairment Scale A visited to the department of physical medicine and rehabilitation due to his severe right hip pain.
- He had suffered from tetraplegia due to fall in the military on July, 1983, and he was conducted C5/6 vertebral body fusion at that time. As time passed, he also developed multiple cervical spinal stenosis with cervical myelopathy on C3/4.
- Magnetic resonance imaging (MRI)
  - Severe central canal stenosis compressive myelopathy at C3/4 with vertebral body fusion at C5/6 with cystic lesion at spinal cord at this level (Fig. 1).
- Physical exam
  - Manual muscle test
    - Elbow flexors, wrist extensors, elbow extensors, finger flexors, finger abductors, hip flexors, knee extensors, ankle dorsiflexors, long toe extensors, ankle plantar flexors
      : all trace
  - Sensory physical examination
    : hypoesthesia over the entire whole 4 extremities
  - Spinal Cord Independence Measure score: 35
  - Modified Barthel index: 24
- Patient's evaluation
  - Hip x-ray of the patient revealed heterotopic ossification on the right hip joint (Fig.2).
  - Serum alkaline phosphatase (sALP) levels were 192 IU/L.


**Fig 2. Radiograph of the hip showed neurogenic heterotopic ossification before extracorporeal shock wave therapy treatment**

- His pain had been treated with medications (aceclofenac 100mg twice a day and disodium etidronate 600mg once a day) and physical modalities during a minimum of 3 weeks, however, he still exhibited severe pain with a Numeric Pain Rating Scale score of 7 to 8.
- In addition, because of his severe pain, he could not sit on the wheelchair at all.
- ESWT treatment
  - Ultrasound (Accuvix XQ; Medison, Seoul, Korea) guided ESWT treatment
  - Each application of ESWT
    - 4,000 shocks
    - a rate of 3 Hz
    - an energy flux density (EFD) from 0.056-0.068mJ/mm$^2$ (intensity 6~7)
  - A total of 7 times of ESWT was administered weekly.
- After ESWT treatment, his pain reduced to VAS 3, and he also could sit on wheelchair more than 10 hours, although the size of NHO remained unchanged. These therapeutic effects of ESWT lasted for 10 weeks.

## Conclusion

- To the best of our knowledge, this is the first case report for treatment of NHO using ESWT in patients with SCI.
- The application of ESWT would constitute a possible alternative to other treatment techniques for treatment of NHO in patients with SCI.