



ORIGINAL ARTICLE

The efficacy of ultrasound-guided extracorporeal shockwave therapy in patients with cervical spondylosis and nuchal ligament calcification



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Abstract We investigated the effects of extracorporeal shockwave therapy (ESWT) on the rehabilitation of cervical spondylosis with nuchal ligament (NL) calcification under X-ray and ultrasound guidance. Sixty patients with cervical spondylosis and calcification of NL were selected and randomly assigned to three groups: A, B, and C. Patients in Group A received rehabilitation with 20 minutes of hot packs and underwent 15 minutes of intermittent cervical traction three times/week for 6 weeks. Patients in Group B received the same rehabilitation as those in Group A and ESWT (2000 impulses, 0.27 mJ/mm²) over the calcified NL guided by X-ray image. Patients in Group C received the same treatment as those in Group B, but the ESWT was guided by musculoskeletal sonography. The therapeutic effects were evaluated by: changes in range of motion (ROM) of the cervical spine including flexion, extension, lateral bending, and rotation; visual analog pain scale; and Neck Disability Index before and after treatment and at follow up 3 months later. We found a significant reduction in pain in each treated group after treatment and at follow up. However, patients in Groups B and C showed more improvements in ROM and neck pain relief after treatment and a decrease in Neck Disability Index. Furthermore, patients in Group C showed better cervical ROM at follow up than Group B. ESWT is an

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adjuvant treatment in the management of cervical spondylosis with calcification of NL and ultrasound-guided ESWT results in more functional improvements.

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Introduction

The nuchal ligament (NL) is an intervertebral syndesmosis which spans the median nuchal line to the cervical spinous process; it is firmly attached to the external occipital protuberance and extends to the spinous process of C7. It is typically described as a bilaminar fibroelastic intermuscular septum interposed between the paired groups of four muscles (rhomboides minor, serratus posterior superior, splenius capitis, and trapezius) of the cerviconuchal region [1–3]. The NL is a reliable landmark and widely used as a means to assure a midline orientation. Some reports have demonstrated that NL is important for maintaining the lordotic alignment of the cervical spine and stabilizing the head during movement of the cervical spine [4–6]. Furthermore, dysfunction of the NL may be one of the factors that predisposes a patient to progressive kyphosis or localized junctional deformity [7,8] and may worsen cervical spine stability and alignment [9].

Ossification of the NL (ONL) is a radio-opaque formation in the soft tissue behind the spinous processes of the cervical spine. It is usually clinically asymptomatic, but is often observed in patients, especially of Asian descent, who are older than 40 years. ONL is usually discovered by radiography taken for other clinical reasons, such as pain or stiffness in the neck, head, upper arms, or upper back [10,11].

Not all reported cases of cyamella are associated with knee arthritis. Scapinelli [12] reported that ONL is a true sesamoid bone resulting from a slow, gradual substitution of normal ligamentous tissues by calcified fibrocartilage, and is similar to those commonly found in the tendons of limb muscles, such as cyamella of the popliteus. Others reported that the formation of ONL may be a result of NL trauma or, more often it may be related to chronic overload in the NL [13–15]. Some authors articulated that ONL may be one of the spinal ligament ossification syndromes such as ossification of the ligamentum flavum, ossification of the anterior longitudinal ligament, and ossification of the posterior longitudinal ligament [11,16,17]. Therefore, similar to the ossification of other spinal ligaments, ONL may be a coexisting disorder or may be a risk factor of other cervical degenerated diseases.

In a prior report, we demonstrated a relationship between the size of ONL and the severity of cervical disorder including decreased range of motion (ROM), radiculopathy, spinal degeneration, and malalignment [18]. Our results showed that more than half of all patients with chronic neck pain and stiffness were positive in cervical root signs and prone to having larger ONL, and that the neck ROM of all participants was significantly below the normal average in all directions. Most patients had moderate loss of

cervical lordotic curve, which made them prone to changes in cervical spondylosis.

After introduction of extracorporeal shockwave therapy (ESWT) for the treatment of nephrolithiasis, the indication of ESWT has been extended. In orthopedics, ESWT is indicated in pseudarthrosis and enthesopathies, such as epicondylitis, calcifying tendonitis, and plantar fasciitis [19]. Clinical reports revealed that good to very good clinical success was established for tennis elbow as well as for plantar fasciitis [20]. However, there are still few reports focusing on the effects of ESWT on the calcification of NL. Therefore, in the present study, we investigated the effects of ESWT on the rehabilitation of patients with cervical spondylosis with NL calcification. While performing ESWT, the patient was kept in a sitting position with neck flexion to fix the ONL, which may affect the distance between the probe and ONL. Therefore, our hypothesis is that ESWT is an effective adjuvant management for ONL and ultrasound-guided ESWT may be more practical for ONL treatment than X-ray guided.

Materials and methods

Patients

Sixty patients with cervical spondylosis and NL calcification (Figure 1) were selected and randomly assigned to three groups: A, B, and C (20 patients in each group, as shown in Figure 2). Patients in Group A received 20 minutes of hot packs and underwent 15 minutes of intermittent cervical traction three times/week for 6 weeks, with a traction force of 15–25% of their body weight. Patients in Group B received the same rehabilitation as those in Group A and ESWT (2000 impulses, 0.27 mJ/mm²) over the calcified NL guided by X-ray image. Patients in Group C received the same treatment as Group B but the ESWT was guided by musculoskeletal sonography. The therapeutic effects were evaluated by: changes in ROM of cervical spine including flexion, extension, lateral bending, and rotation; visual analog pain scale (VAS); and Neck Disability Index (NDI) [21] before and after treatment and at follow up 3 months later.

All participants gave informed consent for the study, and the study protocol was approved by the Ethical Review Committee of Kaohsiung Medical University.

Radiographic assessments of the cervical spine

All patients underwent serial cervical radiographic images at anterior-posterior view, lateral view, and bilaterally oblique view. These images were optimized for evaluation of cervical bony structures and were digitally acquired through a

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