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Physical Therapy Management of Atlas Fracture (Jefferson's Fracture): A Case Report

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The purpose of this report is to document a pain-reducing effect of physical therapy on a patient with fracture of the atlas (Jefferson's fracture). A 51-year-old man was caught in an automobile accident. He had been unconscious under respiratory management in an intensive care unit for two days following the accident. On the 48th day, the patient was referred to the physical therapy department. His neck was firmly fixed with a cervicothoracic-style orthosis. Physical therapy was performed five times a week for 6 months. The relief from the refractory neck pain and acquisition of activities of rolling-over and sitting-up resulted from intensive physical training accompanied with transcutaneous electrical nerve stimulation (TENS), cervical traction and other therapeutic modalities such as massage and heat therapy. This treatment demonstrates the significance and potential of rehabilitation management for relief of severe neck pain.

Key Words
Atlas fracture,
Physical therapy,
Neck pain,
Orthosis.

INTRODUCTION

Patients with the atlas fracture would pose significant physical problems associated with severe neck pain and limitation of range of motion of cervical spine. Moreover, it is uncommon to treat patients with the fracture in clinical settings. No reports have been found in this area of physical therapy for the last several decades. The primary aim of this report is to describe physical therapy management of atlas fracture, a typical Jefferson's fracture in an automobile accident[1-5].

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CASE REPORT

Assessment

A 51-years-old man was injured in accident in two years ago. Just after the accident, the man was transferred to the nearest hospital by an ambulance under the supervision of a medical doctor. For the subsequent two days, the patient was unconscious due to probable brain contusion. X-rays showed the fracture of the atlas (Jefferson's fracture) (Fig. 1). Even after regaining consciousness, the patient was lethargic for a while. Six weeks after onset, the patient was referred to physical therapy department with the primary objective of neck pain relief.

On initial evaluation, marked stiffness and spasms were palpated in the neck muscles. He complained of sev-

Fgiure 1. X-ray film of the fractured C1

ere neck pain around his nuchae and referred pain in the shoulder girdles. He sometimes suffered radiative neck pain spreading into the arms during the night, resulting in frequent sleeplessness.

Neither hypesthesia nor hypalgesia was noted. No deep sensory deficit of both fingers was accompanied.

The muscle tone of the biceps brachii, triceps brachii, quadriceps femoris, and triceps surae muscles were found to be distinctly hyperreflexive. Ankle clonus was also induced bilaterally. These findings were diagnosed as mild spastic quadriparesis.

Muscle strength of upper trapezius, deltoideus, gluteus maximus, and quadriceps was determined as Good grade (Grade 4) according to Daniel's & Worthingham's manual muscle testing[6]. The grip force of right hand showed 16.5 kgf and left 14.0 kgf with the Smedley adjustable grip dynamometer. The weakness of muscles was judged as a manifestation of mild quadriparesis and disuse muscle atrophy resulting from the six-week bed rest after onset.

Other joints than the cervical and the shoulder joints performed full range of motion.

In activities of daily living, the patient required some assistance only in rolling-over and sitting-up, because he had been attached the cervical orthosis.

Stabilization of Cervical Spine

For the first two weeks in the intensive care unit, the head was stabilized with sand bags for the purpose to maintain upper cervical spine in a stable position (Fig. 2).

Cervical Orthosis

During the sixth week after onset, a

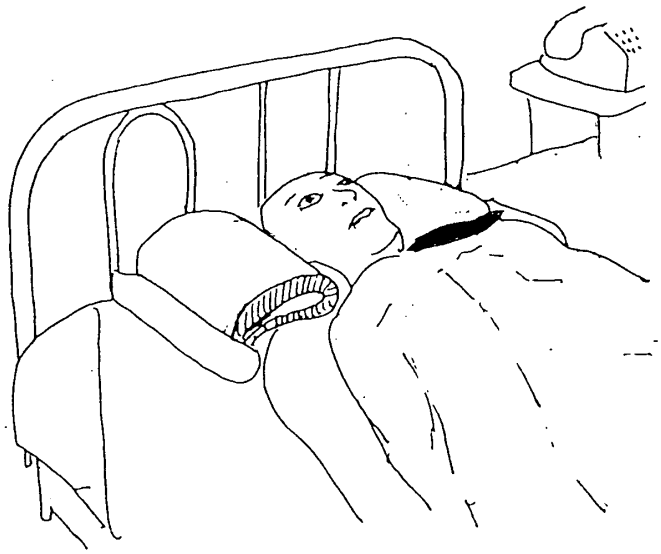
cervicothoracic-style orthosis was applied for reduction of head weight from the cervical joint and for support of the head (Fig. 3). At that time physical therapy began, focusing on relief of neck pain and increasing restricted neck range of motion. In 12 weeks the aforementioned orthosis was changed to a Philadelphia collar made of foam rubber because of its lightweight and mild restriction of motion in all directions (Fig. 4).

Fgiure 3. Patient with a cervicothoracic-style orthosis

Therapeutic Modalities

Therapeutic modalities of heat, transcutaneous electrical stimulator (TENS), massage and cervical traction were selected. Moist packs were placed on the back of the neck and shoulders for 15 minutes, twice a day.

The electrodes were placed on the site of the painful shoulders. The pulse rate was administered 80 to 120 pulses per second. Treatment time was 15 minutes for one session, five times a week. Very light massage (effleurage) was applied for



Fgiure 2. Head stabilized with sand bags in the acute phase

Fgiure 4. Patient with a Philadelphia collar

relief of the pain. At the beginning of massage, the stroke was performed with a little pressure over the nuchal region and shoulders for 15 minutes.

The cervical traction was performed at an angle of 20 degrees of flexion. The continuous cervical traction was applied for 15 minutes in the sitting position five times a week (Fig. 5). Initially five-kg weight was used in sitting position and then the traction was increased to 12kg for 10 minutes in one session.

On discharge the patient acquired functions enough to manage some activities of daily living including rolling-over on bed and sitting-up from lying position.

DISCUSSION

This case report provided physical therapists with some significant problems. The fracture might produce soft tissue injuries in the region of cervical spine such as the muscles, ligaments, disks, blood vessels, and nerves, which are frequently associated with radiating pain caused by automobile accidents[1,7].

Severe pain around the neck restricted basic functions such as rolling-over and sitting-up activities. It was hypothesized, therefore, that decrease in neck pain would get the patient more independent functional daily activities. The purpose of the treatment was to relieve neck pain, to improve range of motion of shoulders and neck, and to restore the functional activities of gait[7,11]. Attachment of the cervical orthosis relieved the patient from muscle spasms and neck pain[4,5], and eased him in self-care activities.

Fgiure 5. Cervical traction in a sitting position

Heat therapy and massage enabled the patient to rest and protect the injured region which allowed relaxation of muscle spasms, an increase in neck range of motion, and the recovery of fuctional activities[8-10]. Especially the effectiveness of manual massage could be best understood as having physiological and psychological components[10]. Increase in superficial blood flow was easily observable, as evidence by hyperemia of the skin following massage. This response could be induced due to stimulated must cells, which produced a histamine-like substance and caused vasodilation of the superficial arterioles[11].

The advantages of cervical traction are increased relaxation, decreased muscle guarding, increased stability, and less force required to overcome head weight[9], therefore, a motorized cervical traction was chosen. Decreased neck pain by motorized cervical traction[12] Suggested that cervical muscle relxation was best accompanied with 9 to 13.5kg traction, sufficient to support the weight of the head[8]. Moreover, the neck was placed in as much as 20 to 30 degrees of flexion for the best result[10]. It was considered that cervical traction was an effective treatment modality in relieving cervical muscle spasm and stretching cervical muscles. Electrical stimulation with a low frequency might achieve pain relief by stimulating large sensory afferent fibers and inhibiting pain perception[10].

These treatments demonstrated improvement of neck motion as well as relief of neck pain, indicating that muscle relaxation and stretching of the contracted muscle influenced the gain of cervical joint range of motion. Furthermore, these results allowed the patient to increase his activities of daily living. The physical therapy management had been successful in terms of relief of neck pain, improvement of neck range motion and that of rolling-over and sitting-up.

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