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Pneumatic Cervical Traction Machine with Monitor and Control

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Abstract: ***The practice of spinal traction goes back to the fourth century BC, where Hippocrates first described it as a treatment for kyphosis. It was subsequently implemented in other spinal pathologies including cervical pain and myelopathy. In the 1600s, the Germans employed cervical traction in their medical practice, as an adjunct to open reduction of cervical dislocations, and fractures. In 1929, the Halter device was introduced for the reduction of cervical injuries; then several other devices followed to ensure more efficient traction.***
To date, there is no accurate description of the mechanism of relief provided by cervical traction. The theory behind its efficiency emphasizes the widening of the intervertebral foramen upon traction, with separation of the facet joint. This will relieve the sustained pressure on the nerve roots, and hence alleviate symptoms of radiculopathy. Other theories suggest that relaxation, and is not involved in intervertebral separation.

I. INTRODUCTION

Computers and mobile phones have become an essential part of modern life. Improper ergonomic posture while looking at screens and reduced physical activities in regular life can lead to musculoskeletal disorders. Irrespective of age, many adults these days are being affected due to their working cultures and lifestyles. The therapies used for musculoskeletal disorders at the early stages of the disease yield good results. A cervical traction device is one such therapeutic device used for treating several such disorders like cervical spondylosis, cervical dis bulges, and cervical compression syndrome. Although several therapeutic machines exist, they are bulky, expensive, uncomfortable, and lack self-assistance. Moreover, the existing device can only provide uniaxial traction irrespective of the patient's problem. These devices create unnecessary traction on the other side of the cervical spine for patients with one sided dis bulge. Thus, there is a strong need for a new therapeutic device that can provide traction on a single desired side for these patients. A novel therapeutic machine is developed with the feasibility of traction coupled with single-sided twist in the neck. The new traction device uses a pneumatic piston-cylinder arrangement. The individual can have the pressure in the traction device set to his/her liking and can even lower or raise it as needed. For patients who suffer from single-sided cervical problems, and the new traction device has been proven to be more effective than previous devices.

II. WHAT IS CERVICAL TRACTION?

Traction of the spine, known as cervical traction, is a popular treatment for neck pain and related injuries. Essentially, cervical traction pulls your head away from your neck to create expansion and eliminate compression. It's considered to be an alternative treatment for neck pain, helping people avoid the need for medication or surgeries. It can be used as part of a physical therapy treatment or on your own at home.
Cervical traction devices lightly stretch the neck to reduce pressure on the spine by pulling or separate the vertebrae. It's said to be both highly effective and fast-acting.

A. Indications

Cervical traction has been used in a variety of cervical pathologies: -

1) Cervical disc disease
2) Cervical spine fracture
3) Facet joint dislocation
4) Atlantoaxial subluxation
5) Occipitocervical synopsis
6) Spondylosis

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7) Radiculopathy
8) Foraminal stenosis
9) Myofascial tightness

Overall, most published studies on cervical traction for spondylosis and myelopathy are of low quality and include a small number of participants. Among the few studies with adequate statistical power, there is no evidence on the long-term benefits of cervical traction, although many articles suggest a definitive temporary relief. Likewise, intermittent traction was not able to achieve a more favorable outcome than its sustained counterpart, despite its theory of increasing blood flow to the spine parenchyma and nerve roots. However, the practice cervical traction in fractures and facet joint dislocations is important when used along with closed reduction and fixation. In cases of facet joint dislocation, failure of traction suggests the need for surgical intervention.

B. Contraindications

There are no scientific reports that accurately describe the contraindications and relative contraindications for cervical traction. Probable contraindications to cervical or lumber traction include the following: -

1) Acute torticollis
2) Aortic Aneurysm
3) Active peptic ulcer disease
4) Diskitis
5) Old age
6) Osteomyelitis
7) Osteoporosis
8) Ligamentous instability
9) Primary or metastatic tumor
10) Spinal cord tumor
11) Myelopathy
12) Pregnancy
13) Severe anxiety
14) Untreated hypertension
15) Vertebral-basilar artery insufficiency
16) Midline herniated nucleus pulposus
17) Restrictive lung disease
18) Hernia

III. TECHNIQUES

A. Manual Cervical Traction

Manual traction is mainly for diagnostic purposes, with the ability to confirm a suspected diagnosis after successful relief of symptoms.

1) The head and neck are held in the hands of the practitioner, and then gentle traction of a pulling force is applied.
2) Intermittent periods of traction can be applied, holding each position for about 10 seconds.

It also allows the performer to apply controlled pressure on pressure points, which helps alleviate the patient's pain. Ideally, it is done at a 20-degree angle of flexion, but the examiner must explore all angles, including the extension of the neck and chin rotation, with a thorough assessment of each position.

B. Mechanical Cervical Traction

Mechanical traction includes pinning, wit the placement of a halo device around the head; where anterior pins are placed 1 cm above each of the eyebrows, and two posterior pins are placed on the opposite end of the skull. The addition of pins can be essential if further stabilization is required.

1) A harness attaches to the head and neck of the patient while he is laying down on his/her back.
2) The harness is itself attached to a machine that applies a traction force, which can be regulated through a control panel.

Other shorter-term traction devices comprise the Gardner-Wells tongs, which constitute two pins, pointing upward (towards the vertex of the head), to be placed below the temporal ridge, bilaterally. In both cases, careful pinning is to be applied with a torque pressure of 2 lb (0.9 kg) to 4 lb (1.8 kg) in the pediatric population, and up to 8 lb (3.6 kg) in adults.

Mechanical traction requires a 0-degree angle pull for C1 and C2 pathologies, and a 20-degree angle flexion for below C2 cases. Moreover, the force applied during pull tension must not exceed 10 lb (4.5 kg) in cases of C1-C2 subluxation, but can otherwise increase up to 45 lb (20.4 kg). Some practices require a gradual increase of the pull tension, while others prefer choosing the lowest weight inciting an effective response.

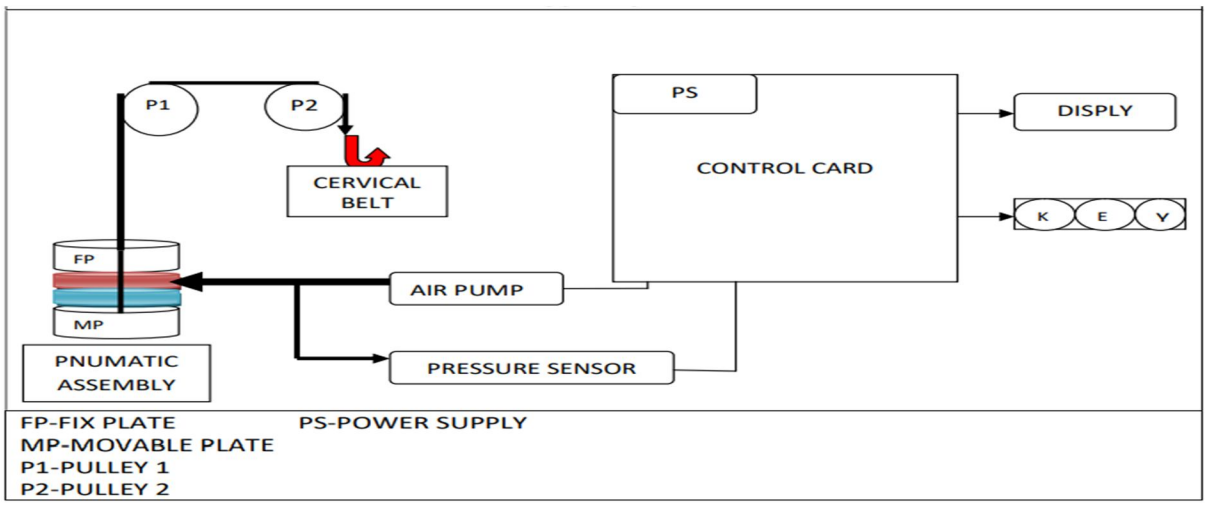
C. Over the Door Traction

This is a more practical way of applying cervical traction, that is more accessible to outpatient practices.

1) Over the door traction entails strapping a harness to the head and neck of the patient that is in a seated position.
2) The harness is connected to a rope in a pulley system over a door. The force is applied using weights (a sandbar or a waterbag) attached to the other end of the rope.

Furthermore, intermittent traction is another modality where a repeated sequence of rest and traction is applied. It is believed to increase blood flow to the nerve roots and spine parenchyma. One must understand that during the rest phase, tension is not entirely released. As a general rule, intermittent traction is the method of choice for degenerative disc disease and/or joint hypomobility. On the other hand, sustained traction is most often used for neck pain of muscle or soft tissue etiology, and/or disc herniations. Cervical traction can be applied while the patient is supine or seated. The supine position is preferred, allowing for more posterior pressure on the temporomandibular joint (TMJ). The sitting position is favored only for patients who cannot lay supine for a prolonged period of time, as in cases of patients suffering from reflux esophagitis.

IV. BLOCK DIAGRAM



V. RESULT

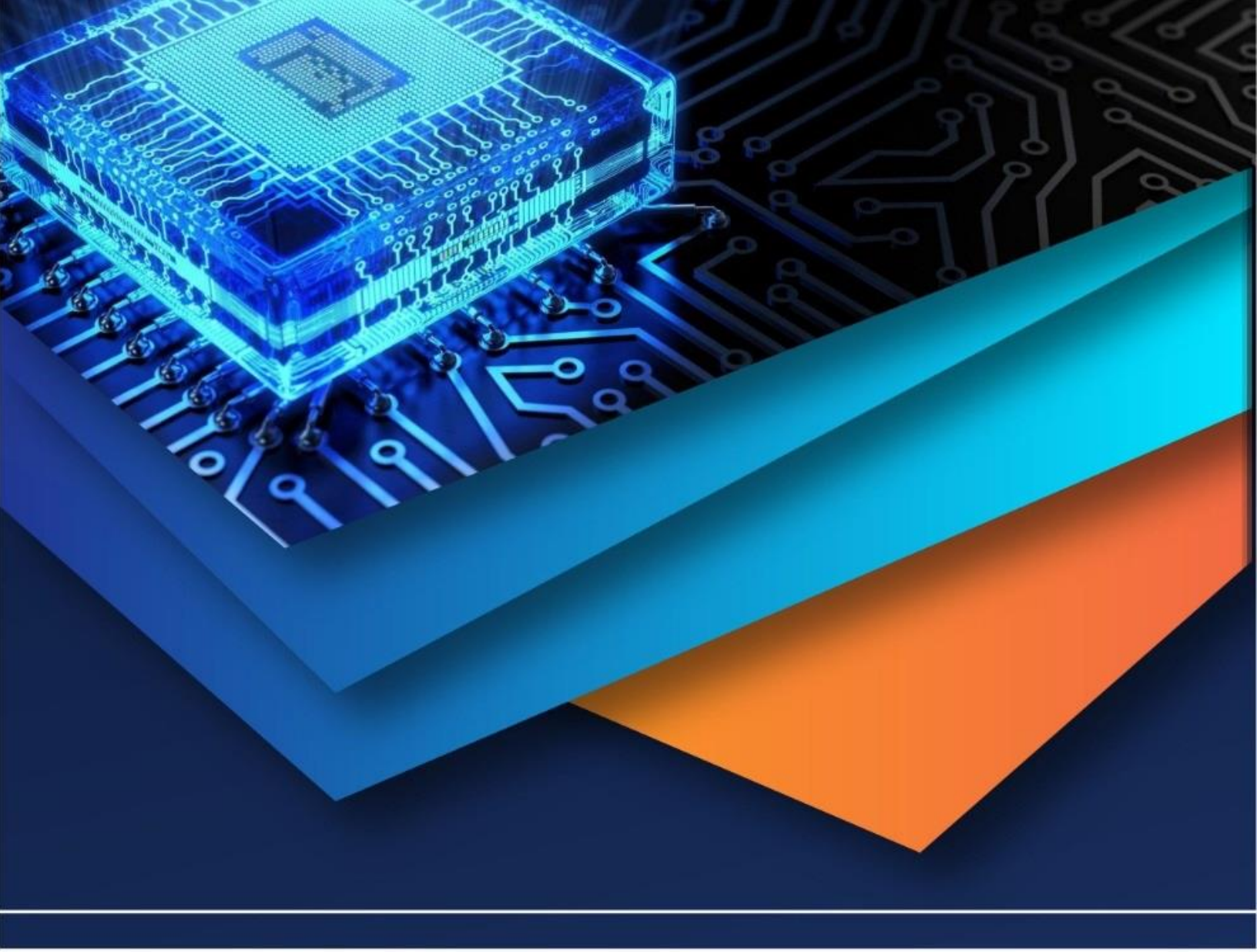
People who benefit from cervical traction often have an instant improvement in their neck pain after a few treatments. Some of the common benefits include :

1) Reduced pain
2) Reduced stiffness and tension in your neck muscles.
3) More flexibility in the muscles along your cervical spine.

Some studies have found that in addition to stretches and other physical therapy exercises, cervical traction can improve your range of motion.

VI. CONCLUSION

Home traction exercises for the neck provided pain relief for this patient with cervical traction. This traction exercise seems simple, easy to learn, and reproducible. It can be done at home without involving any extra cost.



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