Traction

SOME IMPORTANT POINTS IN THIS UNIT

- Traction is the application of a mechanical force to the body in a way that separates or attempts to separate the joint surfaces, elongates soft tissues or aligns the bone fragments.
- Cyriax in 1950 popularized the use of traction for treatment of lumbar disk lesions causing sciatica.
- Traction can be manual, mechanical, motorized/hydraulic, positional, or inversion type, based on the method of application.
- Based on the nature of pull, traction can be sustained, continuous, and intermittent.

Traction is the application of a mechanical force to the body in a way that separates or attempts to separate the joint surfaces, elongates soft tissues or aligns the bone fragments. The history of traction can be traced to the ages of Hippocrates, where traction was primarily being used for reducing fracture and dislocations and later on, it was recommended for the treatment of spinal disorders such as scoliosis.

Cyriax in 1950 popularized the use of traction for treatment of lumbar disk lesions, causing sciatica. At present, traction is used in conjunction with other forms of conservative treatment for back and neck pain, as well as the peripheral arthritis/joint dysfunction to reduce pain and enhance mobility and to correct deformity, etc. In the past, some studies done reveal that traction is very helpful for the treatment of spinal dysfunctions and derangement as the result of treatment with this method when compared with other conservative procedures such as heat therapy, mobilization, corset application, etc., is superior whereas some other studies have failed to reveal any superiority of this modality over other conservative methods. A recent unpublished work done by Mrs Josni Khah, for her Master of Physiotherapy (MPT) thesis at Swami Vivekananda National Institute of Rehabilitation Training and Research (SVNIRTAR), Cuttack, Odisha, to find the long-term effect of this modality on increasing the intervertebral disk space of the lower lumbar segments, in normal young subjects revealed immediate separation of the disk space; however, there were no carry over effects. Though many controversies exist regarding the effectiveness of this modality, in my opinion, when it is applied in a proper way with required positioning of the segments to be effected, and proper selection of tractive force, it works as an useful adjunct to other therapeutic modalities for the treatment of the pain syndromes affecting the spine, as well as to mobilize stiff joints, correct deformities, etc.

TYPES OF TRACTION

Traction can be typed into two types:

1. Based on the methods of application
2. Based on the nature of pull.

Based on the Methods of Application

There are several different methods of delivering traction to patients, such as—manual, mechanical, motorized/hydraulic, positional, and inversion (placing the patient in a device that puts the patient in a head down position). It is not the scope of this book to

describe all these in detail; only the motorized traction which is powered by electricity and mostly used by the physiotherapists for the treatment of spinal disorders is discussed.

Based on the Nature of Pull

Based on the nature of pull, traction can be:

a. Continuous traction
b. Sustained traction
c. Intermittent traction

Continuous Traction

This method of traction is mostly used for temporary immobilization of a symptomatic spinal area, thereby relieving symptoms that get aggravated by spinal movements. A low force (10–20 lb, i.e. 4.5–9 kg) is applied for long periods, ranging from hours to days, and this method is commonly practiced for the indoor patients, having acute neck or back pain. But at present this method of traction application is rarely used as there is increased awareness that most patients with spinal pain do not benefit from prolonged bed rest and inactivity.

Sustained Traction

It uses force greater than that used in continuous traction and less than that in intermittent traction. The pull is maintained for 20–60 minutes. The frequency of treatment is variable; the common practice is to treat inpatients daily and outpatients three times weekly. This traction is very effective when applied on a split traction table meant for the purpose.

Intermittent Traction

This traction technique allows the application of greater forces for a short period of time. The force is gradually increased and decreased during each treatment cycle, and can be administered by pulleys or motorized system. In most of the equipments, the on (pull) and off (rest) function is controlled automatically once set. The time sequences can vary from as little as 7 to 10 seconds of tractive force with a 5 seconds rest up to 30–60 seconds of tractive force followed by 10–15 seconds of rest. The "on," "off" cycle is repeated for 15–25 minutes.

MECHANISM OF ACTION OF TRACTION

The rationale for traction is based on the mechanical and reflex mechanism. Spinal elongation through an increase of the intervertebral joint space and the relaxation of the spinal muscles is assumed to be the most important of the proposed mechanisms by which traction could be effective.

Duration and Frequency of Traction

Although the duration of traction is subjective, some authorities suggest that initial duration of traction should be 5–10 minutes depending upon severity of symptoms. If symptoms are relieved significantly by brief low force traction, this short duration of application is to be maintained. However, if the symptoms remain unchanged after 10 minutes, the duration of traction may be increased by a further of 10 minutes. Further, it is suggested that, depending upon the response of the patient, the duration of traction in chronic conditions should be limited to 20–40 minutes. If the patient improves, the traction may be applied on a daily basis.

Application Techniques

Though various methods of application of traction exist, the ones most commonly used in therapy departments include—motorized and mechanical weighted devices. Before the traction is applied, it is essential to check the contraindications that include the following:

Contraindications for Traction

General

- Osteomyelitis or diskitis
- Bone/spinal cord tumor
- Unstable fracture
- Severe osteoporosis
- Hypertension
- Cardiovascular disease
- Inadequate expertise.

Lumbar traction

- Pregnancy
- Cauda equina compression
- Cord sign.

Cervical traction

- Central intervertebral disk herniation
- Carotid or vertebral artery disease
- Hypermobility
- Rheumatoid arthritis.

After the patient is found fit for the traction, the following procedures to be followed to apply traction for the cervical and lumbar regions.

Cervical Spine Traction

Evidence reveals on the efficacy of traction in decreasing the pressure within the intervertebral disk and unloading the structures of the spine by stretching the muscles and ligaments (Constantine Constantoyannis, MD et al. 2002). It is probable that traction has an important role in breaking the "circle pain" in cervical radiculopathy, caused by herniated disk, causing entrapment within the intervertebral foramina. Intermittent cervical traction helps to relieve the inflammatory reaction of nerve roots by improving circulation and reducing swelling in the tissues. Gentle alteration of stretching and relaxation of the neck soft tissues prevent the formation of adhesion of the dural sleeve. Based upon the finding, it is suggested that cervical spine traction could be considered as a therapy of choice for radiculopathy caused by herniated disk, even in cases of large volume herniated disks or recurrent episodes.

Traction is applied by the application of the halters which are of two types such as: Saunders occipital halter **(Fig. 19.1)** and mandibular halter **(Fig. 19.2)**. The patient can be placed in supine or can take the traction in sitting. The head should be positioned properly depending upon the segments to be separated as Colachis et al. have demonstrated that posterior vertebral separation is related to the angle of pull, with maximum separation occurring at 24° of flexion. The best clinical result occurs between 20° and 30° of cervical

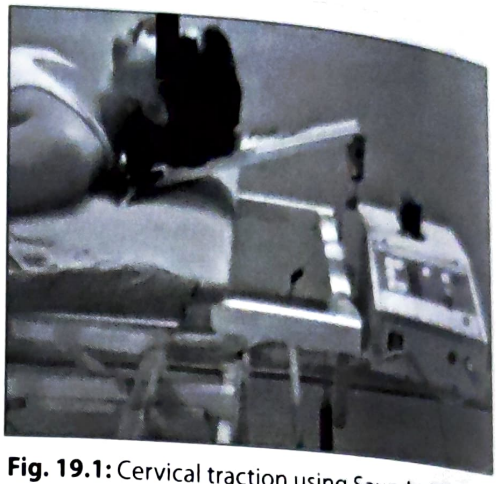

Fig. 19.1: Cervical traction using Saunder's halter.

flexion. However, it is found that placing the cervical spine in a neutral or slightly extended position focuses the traction force on the upper cervical spine, while placing the cervical spine in a flexed position focuses the traction force on the lower cervical spine.

Fig. 19.2: Cervical traction using mandibular halter *(For color version. see Plate 8)*.

The optimal force for cervical traction varies depending upon the method of delivery. At least 4.5 kg of force is necessary to counter the effects of gravity on the head, while approximately 11.25 kg of force is necessary to provide straightening of the cervical lordotic curve and the earliest separation of posterior vertebral segments. The parameters recommended for cervical spine are given in **Table 19.1**.

Lumbar Spine Traction

Rationale for the application of lumbar traction to treat low back pain patients are numerous: to decrease muscle spasm, stretch muscles, rupture adhesions, stretch the facet capsule, achieve intervertebral joint distraction, reduce herniated disks, decrease pain, and cause spinal ligaments to become taut and

TABLE 19.1: Parameters for cervical traction.

Goal of treatment	Force	Hold/relax (seconds)	Total time (min)
Acute phase	3–4 kg	Static	5–10
Joint distraction	9–13 kg, 7% body weight	15/15	20–30
Decrease spasm	5–7 kg	5/5	20–30
Disk problem	7 kg	60/20	20–30

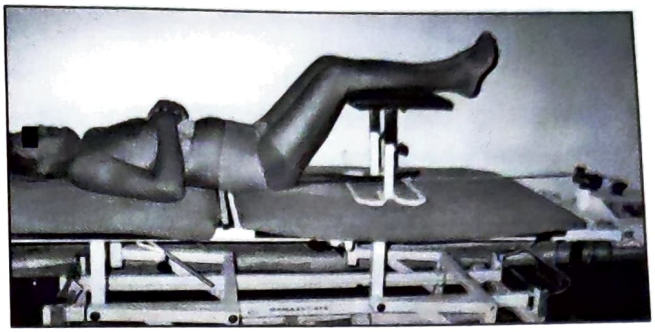

Fig. 19.3: Lumbar traction in supine with the hips flexed *(For color version, see Plate 8).*

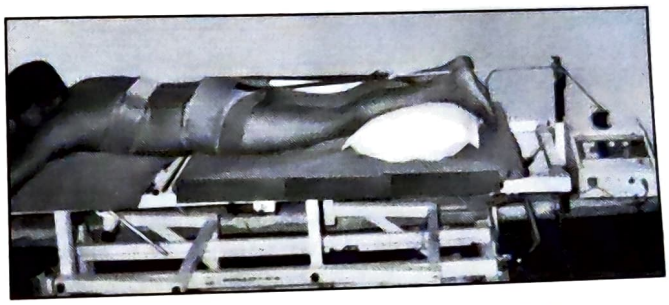

Fig. 19.4: Lumbar traction in prone *(For color version, see Plate 8).*

o mobilize pomobile joints. This traction equires q larger forces for vertebral eparation n the cervical traction. The raction is monly applied in the therapy epartmer sing motorized devices that tilize pelv nd thoracic belts. These belts re applied th the nonslip surface directly n contact v the patient's skin, and not over the clothin Both the belts must be securely ightened order to prevent slipping. The horacic b is used to stabilize the upper ody abov he level at which the traction orce is des d, thereby helping to isolate the raction for to appropriate spinal segments. The thoracic belt is placed so that its lower edge aligns with the upper limit at which the traction orce is desired, with its upper edge aligned pproximately with the xiphoid immediately elow the greatest diameter of the thorax. The osition of the pelvic belt should be such that s superior edge aligns with the inferior limit which traction force is desired, generally just perior to the iliac crests (in supine, **Fig. 19.3**), nd superior to the superior edge of the sacrum n prone, **Fig. 19.4**). Split traction tables that ave least surface resistance are of great benefit distracting the vertebrae, as it has got a fixed d mobile part and the lower body that rests the mobile unit get separated from the fixed it as the tractile force is applied.

The selection of the body position is very portant for the application of the traction. hen traction is applied in the flexed position, eparates the posterior structures including facet joints and the intervertebral foramina. amount of hip flexion affects the segment distraction, as the more the hips flexed more is the effect on the upper lumbar segments. Colachis and Strohm found that with the hips flexed to 70°, an angle of pull of 18° is created which provides the greatest vertebral separation. The traction applied in neutral or extended position results in greater separation of the anterior structures including the disk spaces. Generally a supine position, where the spine is flexed is selected for separating the posterior elements and to localize the traction force to the upper lumbar and thoracic segments. But when the patient is prone, the lumbar spine is slightly extended or in neutral position and the traction force is localized to the lower lumbar segments. Traction can be applied both as static and intermittent manners. Cyriax advocates that static lumbar traction is beneficial in reducing spasm of the paravertebral muscles, which may help in distracting the vertebrae, as electrical silence was noted in the muscles of paravertebral region, 3 minutes after start of static traction. The findings of Mathew and Onel et al. support the view of cyriax that vertebral distraction occurs with static lumbar traction applied in supine. The parameters of lumbar traction are as in **Table 19.2**.

TABLE 19.2: Parameters for lumbar traction.

Goal of treatment	Force	Hold/relax (seconds)	Total time (min)
Acute phase	13–20 kg	Static	5–10
Joint distraction	22.5 kg, 50% body weight	15/15	20–30
Decrease spasm	25% of body weight	5/5	20–30
Disk problem (stretch soft tissue)	25% of body weight	60/20	20–30

Some Salient Points to be Realized

- Apply static traction when the tissues are inflamed, motion of the segments aggravates the pain, as well as in acute disk protrusion.
- Static traction does not evoke stretch reflex of the muscles and thereby does not increase muscle spasm.
- Apply intermittent traction when the objective is to treat joint dysfunction, where a short hold and rest time is recommended. If intermittent traction is used for disk protrusion, a long hold time (say 60 seconds), and short rest time (say 20 seconds) are used.
- With intermittent traction, a greater tractive force can be applied compared to the static traction.
- If intermittent traction is selected, maximum traction force should be applied during the hold time and minimum force should be applied during the rest time.
- When the patient's symptoms are severe both long hold and rest times are recommended, whereas when the symptoms become less severe, the rest time is gradually decreased. When the discomfort has reduced to a local ache, reduce the hold time. In case of very mild local symptoms, hold and rest times of 3–5 seconds should be applied to produce oscillatory movements.
- The force of traction should be kept low initially, to prevent aggravation of muscle spasm and symptoms and to determine the patient's response to this treatment.
- It is recommended that for all applications, the traction force for the lumbar spine should start at between 13 kg and 20 kg, whereas for the cervical spine, it should start at between 3 kg and 4 kg.
- For the lumbar spine to cause separation at the facet joints, thereby freeing the nerve roots off pressure, a tractive force of approximately, 22.5 kg, and approximately 50% of the patient's body weight is recommended, whereas if the objective is to decrease spasm, stretch soft tissues, and to apply a centripetal force to the disk, by spinal elongation, without joint surface separation, lower force of 25% of body weight is used.
- For the cervical spine to cause facet joint separation, thereby freeing the nerve roots off pressure, a tractive force of 9–13 kg, or approximately 7% of the patient's body weight is recommended, whereas if the goal is to decrease muscle spasm, stretch soft tissues, and to exert a centripetal force on the disks by spinal elongation without joint separation, a force of 5–7 kg is recommended.
- The duration of traction should be very low initially which may be 5–10 minutes depending upon the severity of symptoms. If severe symptoms are relieved significantly by brief low force traction, this short duration of application should be maintained. But if the patient's symptoms are partially relieved, after 10 minutes of traction, do not exceed this duration. In cases where there is no change in the symptoms after 10 minutes, increase the traction duration gradually, up to 20–40 minutes.
- The frequency of treatment should be on a daily basis.