

Current Place of Traction in Orthopaedic and Trauma Practice: A Review



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Abstract

Summary: Traction in Orthopaedic and trauma has been an age-long practice designed to provide a pulling force to achieve the desired purpose. Traction has traditionally been used to treat fractures in all age groups, dislocations, splint injured part and enforced bed rest. Presently, with advancement in better treatment options, traction has been replaced by other methods of treatment. The role of traction in modern practice remains mainly in the treatment of fractures in children, as a temporizing method of splinting, manipulation of fractures or deformities during surgery. In areas with limited resources for advanced treatment options, traction is still used to fill its traditional roles some roles in orthopaedic and trauma care.

Aim: This review aims to evaluate the place of traction in contemporary orthopaedic and trauma care.

Method: Literature search was conducted on traction using keywords: Traction, Orthopaedic, Trauma. Identified literature was reviewed to establish the use of traction, benefits, and consequences in orthopaedic and trauma care.

Conclusion: Traction has been an age-long practice in orthopaedic and trauma care. Traction still has some role in current practice particularly in resource-challenged regions as well as in the developed world especially as temporary treatment, pre, intra, and postoperative periods in orthopaedics and trauma. However, traction should not be adopted as the standard of care where better options of care are available.

Introduction

Traction in orthopedics can be defined as the application of a pulling force to achieve the desired purpose. For medical purposes, traction is used to treat muscle or skeletal disorders [1]. It is usually applied to the arms, legs, spine, skull, or the pelvis, to treat fractures, dislocations, and long-duration muscle spasms, and to prevent or correct deformities [1]. While Traction has been used for years, the underlying central principle remains the same: alignment of a long bone fracture can be achieved and maintained by continuous isotonic traction at a point distal to the fracture on the extremity in line with its longitudinal axis [2]. Historically traction has been a mainstay of fracture treatment around the world. It is a technique used less often now with the increasing use of internal fixation and other operative methods and high costs due to prolonged hospital stay [3].

Traction is based on simple mechanical principles and is a well-established treatment Option in orthopaedic settings [1]. For effective application of traction, there must be something to pull against, which is in the opposite direction, referred to as counter traction [1]. There are several advantages of traction, which include cost-effectiveness, minimal interference with

fracture site and its adjustability [4]. There are three methods of applying traction. The Skin traction: the pulling force is exerted tangentially along the skin by using adhesive strapping attached to the cord and weight [3]. Skin traction may be adhesive or non-adhesive however, the adhesive type is very frequently used [1]. If much more than 8 lbs is applied for some length of time, it may result in pressure necroses, skin blistering, and superficial layers of skin being pulled off [5]. Other difficulties such as migration of the bandage may occur with lower weights [5].

Another method of applying traction is the Skeletal traction, in which a pin or similar device is applied directly through the bone, it enables a greater force to be used, but may result in infection into the bone through the pin/screw insertion site [3]. The application of traction by a transfixing pin bone was introduced by Fritz Steinmann [5]. Now a threaded Denham pin is preferred to prevent early loosening of the device [5]. The other method of applying traction is physical pulling methods either manually or with some mechanical devices [6]. In manual traction, the hands are used to exert a pulling force on the bone, which is to be realigned. It is primarily used for very stable

fractures or dislocations before splinting or immobilization in a cast. Manual traction can also be applied to maintain reduction before application of a skeletal or skin traction [6].

Traction may be described as Fixed traction in which the traction is applied against a counter force applied to the patient's body [3]. The Pull is exerted against a fixed point, e.g., tapes are tied to the cross piece of a Thomas splint, and the leg pulled down until the root of the limb abuts against the ring of the splint [5]. Traction may also be Sliding traction in which the patient's weight is balanced against an applied load, utilizing frictional and gravitational forces to counter balance the applied traction [3]. Pugh first introduced sliding traction by applying traction tapes to the limb and fastening them to the raised foot of the bed which was then inclined head down [5]. The traction was subsequently modified by Hendry using a mattress on a sliding frame, which resulted in the same amount of traction with an inclination of 10°, as on a standard mattress at 30 – 40° inclination [5]. In sliding traction, the amount of weight is determined by the inclination of the bed [5].

The uses of Traction in Orthopaedics Include:

- i. To relieve pain due to muscle spasm, maintaining the limb in a position of comfort and rest [1]. When an injury such as a fracture occurs, the muscles around that region go into spasm, and this may lead to deformity. The use of traction helps in prevention of this by relaxing the muscles in anatomical position.
- ii. To restore and maintain the alignment of bone following fracture and dislocation [1].
- iii. To help restore blood flow and nerve function [1].
- iv. To rest injured or inflamed joints and maintain them in a functional position [1].
- v. To gradually correct deformities due to contraction of soft tissues, caused by disease or injury [1].
- vi. Traction is also used for enforcing rest [7]. This role of traction is a relevant and useful way of managing low backache.

Traction has been used therapeutically, pre-operatively, intra-operatively or post-operatively. Pre-operatively, it may be used as a temporary mode of reducing fractures or pain. Intra-operatively, it is used mainly in spine surgeries to obtain better results while post-operatively, it can be used to maintain reduction and ensure immobilization [8,9]. A study revealed that the application of skin traction assists in decreasing the pain severity (before the surgery in patients with intertrochanteric fracture) [10]. Traction contributes to the patient's comfort and relaxation before surgery and is therefore highly recommended [10]. This role is an example of the use of traction before surgery. Although its use here is not in definitive treatment, it helps in

general patient care which is especially important in developing countries such as Nigeria where the interval between patients' presentation and surgery may be prolonged for several reasons including logistics. Application of skin traction, in this case, serves to splint the fractures, reduces pain and improve the patient's comfort while the necessary arrangements for surgery are undertaken.

Newer traction techniques have also been tried successfully and are now more commonly used in orthopaedic practice. Such include placing 2 Denham pins in the proximal tibia 2.5 cm posterior to and 2.5 cm distal to the tibial tubercle, the pins are then connected with a Hoffmann external fixator connector producing a stable construct and traction is applied to both pins through free weights attached to a pulley at the end of the bed [11]. This method is used for long bone fractures, particularly in osteoporotic patients where pin loosening and poor pin fixation are more likely to occur [11]. In elderly osteoporotic patients who have sustained femoral supracondylar fragility fractures and are not fit for operative fixation of the fractures due to the osteoporotic changes or due to their general health fragility, this technique represents a means for effective reduction of the fracture. Traction also becomes the definitive treatment when local soft-tissue and systemic conditions become unsuitable for surgery.

According to a study, traction has been safely used in arthroscopic procedures, traction of up to 64 kg on the lower limb failed to produce evidence of labral or capsular injury [12]. Furthermore, traction of 23 kg resulted in little change in the position of adjacent neurovascular structures relative to the standard arthroscopic portals [12]. The use of traction in arthroscopic procedures with proven safety shows the irreplaceable position traction occupies in modern orthopaedic practice.

Traction remains a practical option in the initial temporization of patients with femoral shaft fracture with severe injury [13]. According to a study, which compared skeletal traction and damage control external fixation, there is no significant advantage in clinical outcomes when using damage control external fixation rather than skeletal traction [13]. The use of skeletal traction for initial temporization is minimally invasive as compared to external fixation hence is therefore preferred. More so, damage control external fixation requires insertion of multiple pins into the intact bone as such requires some analgesia/anesthesia, operating room space and surgeon with the experience needed on the technique. In developing countries, these may not be readily feasible.

Perioperative Halo-Gravity traction has been used in the treatment of severe Scoliosis in children with encouraging results [14]. In patients who were placed on traction before spinal fusion surgery, it was discovered that the Cobb angle improved 35% from an average 84° before traction (range 63°–

100°) to 55° preceding fusion, trunk decompensation improved in all patients and trunk height increased 5.3 cm in traction [14]. Even in cases where traction is not the definitive means of treatment such as seen above, it improves the prognosis of patients and promotes the general outcome of surgery. The role of traction with traction devices such as traction tables, femoral distractors, and other similar traction systems in the reduction of complex and displaced limb fractures during surgery is well appreciated [15].

Because of the sophistication of modern methods of internal and external fixation, it is uncommon to treat fractures or dislocations definitively in traction [16] except in children. Traction is a useful backup method for situations where internal and external fixation is impossible. Temporary traction is routinely employed in the transportation of patients with fracture such as that of the femur and tibia [16]. Traction may also be necessary to treat unstable dislocations, particularly of the hip, where static methods are inadequate or impractical. Traction is rarely used for upper extremity problems, as current methods of internal and external fixation are usually superior. However, treatment of the humeral fracture by the hanging cast is in principle traction by gravity. Traction may also be readily applied in dislocation of the hip for some time following closed or open reduction to provide for soft tissue healing. In painful conditions of the hip such as septic arthritis as a supportive measure, traction can be applied to rest the limb and as an aid to relieve pain [16].

One of the significant drawbacks to the use of traction currently is the prolonged hospital stay. This drawback is a particularly important point in countries with efficient healthcare systems such as efficient health insurance because the costs incurred by the patient are catered for by the insurance system which would naturally want to reduce healthcare spending. However, in developing countries where skilled human resources are scarce, and the working environment is unfavorable, the use of traction is very readily employed.

Continuous traction is indicated in the treatment of fractures when reduction of the fracture or the proper length of the limb cannot be maintained by the static immobilization provided by casts and splints [16]. In a Cochrane review on the pre-operative traction for hip fracture, the authors found that the routine use of traction (either skin or skeletal) before surgery for a hip fracture does not appear to have any benefit. However, the evidence is also insufficient to rule out the potential advantages for traction. The decision was therefore within the purview of the managing surgeon on the need to use pre-operative traction or not for hip fractures [17]

Complications of Traction include:

a. Hazards of prolonged bed stay such as Thromboembolism, Decubiti ulcers, Pneumonia and Atelectasis [5]. Due to the long periods of immobilization

during traction use, patients are at increased risk for clot formation. These clots may travel in the circulation and cause pulmonary embolism. Other complications of immobilization include muscle wasting, disuse osteoporosis and an increased tendency to stones formation from demineralization of bones.

b. The distraction of the fracture, if excessive force is applied [5]. When the weights applied via traction is too extreme, it may become counter-productive and impede healing of the fracture due to the distraction of the fracture.

c. In the use of Skull calipers, Cerebral, Subdural and extradural abscesses, as well as osteomyelitis, have been recorded [8]. These infections are some of the major complications seen in skeletal traction. If proper aseptic principles are not keenly followed, patients may come down with infective complications.

d. Excessive traction in the treatment of fractures may well initiate diffuse arterial spasm and neuropraxia from stretching of neurovascular tissues [9].

e. Pin-track infections in cases of skeletal traction. Such infections can also lead to overt pin-track osteomyelitis.

Conclusion

In conclusion, the use of traction in current orthopaedic practice cannot be overemphasized. Traction remains a cheap way of reducing fractures in children as well as maintaining fracture reduction in adults. Traction is still used effectively even in diagnostic procedures such as arthroscopy and remains one of the most effective and efficient methods of enforced bed rest in orthopaedic and trauma patients. Newer means for the application of traction are being reported; hence it is safe to say that the use of traction in orthopedics will remain important. Its use peri-operatively, intra-operatively, and post-operatively can be hardly substituted; therefore, though it is one of the oldest methods in orthopedics, its relevance has not diminished.

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