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Ramprasath Ramlal Dhurvas
Associate Professor, Institute of Orthopaedics and Traumatology, Coimbatore Medical College and Hospital, Coimbatore, Tamil Nadu, India

Vetrivel Chezian Sengodan
Professor and Head, Institute of Orthopaedics and Traumatology, Coimbatore Medical College and Hospital, Coimbatore, Tamil Nadu, India

Karthikeyan Kandasamy
Junior Resident, Institute Of Orthopaedics and Traumatology, Coimbatore Medical College and Hospital, Coimbatore, Tamil Nadu, India

Correspondence
Ramprasath Ramlal Dhurvas
Associate Professor, Institute of Orthopaedics and Traumatology, Coimbatore Medical College and Hospital, Coimbatore, Tamil Nadu, India

Skeletal traction for the management of lower limb fractures: Its relevance today

Ramprasath Ramlal Dhurvas, Vetrivel Chezian Sengodan and Karthikeyan Kandasamy

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Abstract
Purpose: Skeletal traction is one of the modalities of treatment for fractures involving appendicular skeleton. The purpose of our study is to evaluate the clinical and radiological outcomes of skeletal traction applied to injuries involving lower limb as a temporary / definitive procedure.
Methods: We have included 108 patients with various injuries involving bones of lower limb. Modalities of traction included upper/lower tibial pin traction/calcaneal pin traction. Steinmann pins (4.5mm to 5.5mm) Bohler stirrup and Bohler Braun splint were used for applying traction. X-rays were taken before and after skeletal traction and also every time when the weight of traction was either increased or decreased. The end point for removal of the traction apparatus was either surgery or POP application or fracture union. Until then quadriceps and ankle mobilisation exercises were performed.
Results: Results were analysed based on skin healing, bone healing, joint scores (Harris hip score, WOMAC score, Peterson score). Complications usually encountered were pin tract Infections. Most of the cases showed good results in either assisting the surgeon for closed manipulation and implantation during surgery, or for successful healing in good alignment in patients who were not fit for surgery or not willing for surgery.
Conclusion: Skeletal traction, even though rarely used nowadays, is still an important modality of treatment in selected situations where surgery may be delayed, denied or contraindicated for various reasons.

Keywords: skeletal traction, splints; fractures, open; conservative treatment, blister, skin care

Introduction
With increasing incidence of road traffic accidents, the number of patients with fractures of long bones (especially poly trauma) is on a steep rise. Even though immediate surgical intervention may decrease the incidence of fracture associated complications, not all patients can be operated immediately after the injury. Interventions to decrease the pain during the waiting period include treatment modalities like POP applications, splinting and skeletal traction. Nowadays the use of skeletal traction has drastically decreased because of shrinking indications for skeletal traction. The use of traction for treatment of dislocation and fracture has been recorded from the earliest days. The Italian surgeon Guglelmo de Saliceto (1210-1277) described the use of weights and pulleys for reduction of fractures and it is this description which is considered to be the earliest record of the use of sustained traction[1]. Huge Owen Thomas devised the Thomas splint in 1890 and used it for treating tuberculosis of knee joint [1]. In 1903 Balkan beam was developed by a Dutch ambulance unit. In 1911 Fritz Steinmann introduced Steinmann pin. In 1930s Bohler used a Steinmann pin through the tibial tuberosity with the lower leg supported on a Braun frame. The purpose of our study is to evaluate the clinical and radiological outcomes of skeletal traction applied to injuries involving lower limb as a temporary/definitive procedure.

Materials and Methods
This is a prospective observation study from July 2017 to October 2018. A total of 108 number of patients (84 males and 24 females) in the age group of 18 to 90 years.

The study was conducted with the full application of ethics regarding patient's care and management. Informed written consent was obtained for all the patients who were included in this study. Moreover informed consent for patient's information and images to be published was provided by the patient. In the emergency ward initial evaluation of the patient was done from head to foot including GCS scale and haemodynamic status. Once haemodynamic stabilisation was achieved, relevant X-rays were taken. Compound grade 3 fractures requiring debridement and external fixation were excluded from the study. Classification systems appropriate for the fracture was used. Of all the fractures the lower limb fractures were managed with skeletal traction using Steinmann pin, Bohler stirrup and Bohler Braun frame/Thomas splint. Traction weight corresponding to roughly 10% of body weight was suspended over the pulley attached to the stirrups with nylon cord (Figure 1).

Fig 1: Skeletal traction apparatus.

Once this was done, the distal neuro vascular status in the fractured limb was re-evaluated. X-rays were repeated after 24 hours. Depending on the alignment of the fracture either the traction weight was increased (with insertion of blocks under the foot end of the cot) or the limb was re positioned (abduction of hip or flexion of knee) (Figure 2).

Fig 2: Re positioning, in this case hip abduction

X-ray was repeated after 24 hours to find if satisfactory reduction was achieved (Figure 3).

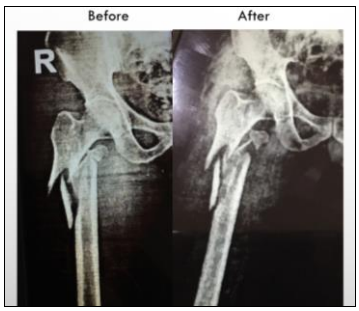

Fig 3: Alignment after repositioning.

Necessary entries were made in the traction chart. Meanwhile the patients were evaluated for co morbid conditions like CAD, diabetes, hypertension, COPD, bleeding diathesis. Patients who were fit for surgery (category A) were operated as early as possible (within one week of injury) (Figure 4).

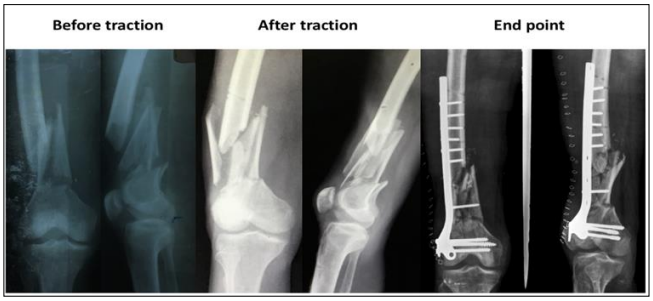

Fig 4: Post-operative X-ray after successful traction.

In those patients who were unfit for surgery (category B), skeletal traction was prolonged for another three weeks. Patients were encouraged to perform static quadriceps exercises, and quadriceps muscle wasting was measured and recorded simultaneously. Bowel, bladder and back care was given by nursing personnel. X-ray was repeated after three weeks, and if the reduction was found good, POP was applied and the patient was discharged (Figure 5).

Fig 5: Fracture union with POP after successful traction.

Skin care in the form of blister management (Figure 6) and wound management was

Fig 6: Patient was on skeletal traction until blisters healed.

Skin care in the form of blister management (Figure 6) and wound management was done adjacent to the fracture site. Skeletal traction was also used in old neglected fractures of neck of femur with proximally migrated trochanter who were planned for hip arthroplasty procedures (Figure 7).

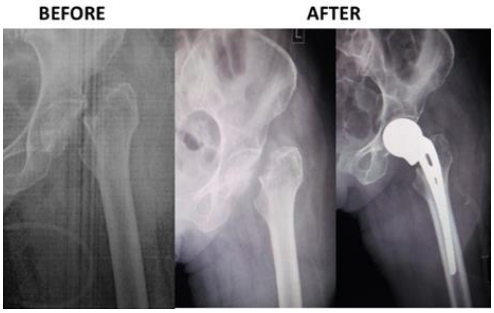

Fig 7: Over riding trochanter pulled down effectively with traction, for hip replacement surgery.

Follow up X-rays were taken at monthly intervals. Minor surgical intervention (eg: Screw fixation) were documented. The improvement of pain and function were evaluated using VAS score, Harris hip score, WOMAC score for knee and Karlsson and Peterson score for ankle.

Results

The number of cases according to the region of injury and the end point (conservative/surgery) of treatment with skeletal traction is shown in the Table 1.

Table 1: Distribution of cases and the end point.

S. No	Region of injury	N (%)	End point	
			Surgery (Category A) n (%)	Conservative (CategoryB) n (%)
1	Sacro iliac joint	3(2.7%)	2(1.8%)	1(0.9%)
2	Acetabulum	6(5.5%)	4(3.7%)	2(1.8%)
3	Neck of femur	4(3.7%)	4(3.7%)	0%
4	Intertrochanter	25(23%)	17(15.7%)	4(3.7%)
5	Subtrochanter	14(12.9%)	14(12.9%)	0%
6	Shaft of femur	16(17.2%)	16(17.2%)	0%
7	Supra condylar femur	16(17.2%)	6(5.5%)	10(9.2%)
8	Tibial plateau	8(7.4%)	6(5.5%)	2(1.8%)
9	Proximal tibia	6(5.5%)	4(3.7%)	2(1.8%)
10	Distal tibia	10(9.2%)	4(3.7%)	6(5.5%)

There were complications in the form of pin loosening (10 cases), pin tract infection (12 cases), ring sequestrum (2 cases) (Figure 8).

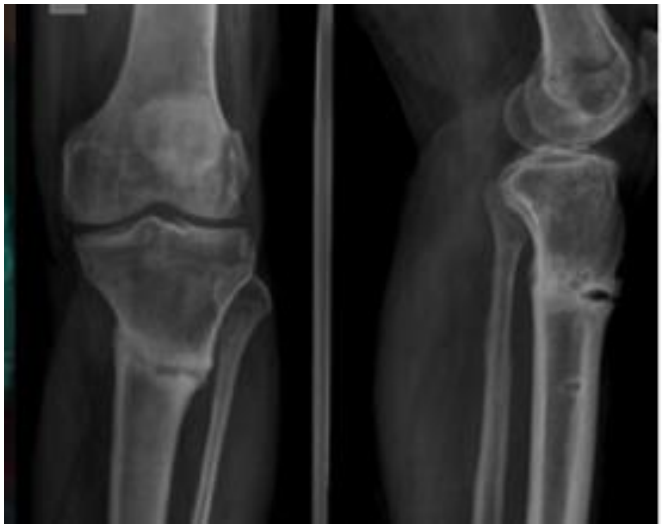

Fig 8: Ring sequestrum.

The improvement of pain and function were evaluated using VAS score (mean 8), Harris hip score (mean 82), WOMAC score (mean 27) for knee and Karlsson and Peterson score (mean 85) for ankle. We noticed quadriceps atrophy in those patients whose duration of traction exceeded one week.

Discussion

The application of a steady pull on an injured limb by weights and pulleys is defined as traction- by Collins 1992[1]. The traction can be applied either through the skin or through the skeleton. The skin traction cannot be used where wounds, sores, abrasions or rashes will come into contact with the apparatus (Taylor 1987) [2]. Moreover it can take a maximum weight of 6-7 kg only (Stewart 1983) [3]. On the other hand the above patients where skin traction is contraindicated can undergo skeletal traction. The skeletal traction relieves pain due to muscle spasms, restores and maintains the alignment of bone, allows treatment and dressing of soft tissues, allows movements of joints, prevents contracture of the soft tissues, etc.

The following are the essential principles to be followed.

1. Provisions for counter traction must be made.
2. Non slip knots must be used to secure the cords to pulley.
3. The line of pull should be able to counter the deforming forces (eg: abductors in the sub trochanteric fracture and flexors in supra condylar fracture femur).
4. Frequent check of the patients and of the apparatus.

Nursing care is of paramount importance which should envisage general aspects like lung sounds, bowel movements, back care and frequent patient education. The role of physiotherapist for exercising the muscles and mobilising the joints is also equally important.

The size of the drill bit should be about 0.3 mm less than the size of Steinmann pin. A drill bit which is equal to the size of Steinmann pin will not create a preload effect; similarly a drill bit which is more than 0.3 mm thinner than the Steinmann pin will create micro fracture and splinters in the bone (Rockwood).

Various studies mention the rates of diffuse muscle atrophy ranging from 0.5-0.6 per day [4], to 8.5% in 14 days [5], but these muscle atrophy developed after cast immobilisation. According to one study [6], skeletal traction doesn't result in detectable knee dysfunction at 6 month post insertion.

Watson- Jones felt that the use of calcaneal pin traction led directly to local complications from the calcaneal pin and discouraged its use. But there were no infections in a series of 25 patients in the study by Pearce [7].

In one study pin tract infection rate was 20% and the rate of pin loosening was 15% [8]. Rates for pin tract infection were reported to be 11.2% - 63%, by other studies [9-12]. In our study rate of pin tract infection 11.11%, out of which, 2 patients developed ring sequestrum and one patient developed

fracture at the pin site.

Even though surgical management as early as possible is the rule of treatment in displaced fractures, there are some cases in which surgery is delayed to optimise the conditions of patients through pre-operative medical management, availability of infrastructure in the hospital and schedule of the surgeons. In such patients, skeletal traction is helpful to decrease the pain and maintain the fracture alignment, until the surgery is performed. We have also effectively eliminated the chances of infection in the fractured bone (as may occur in a bone with external fixator), by inserting the Steinmann pin at a place far away from the fracture site. Moreover skeletal traction may be of benefit until a soft callus is formed, after. which a POP application may facilitate the immobilisation and fracture union.

Conclusion

Early surgical intervention is the gold standard for treating displaced fractures. For various reasons, if the surgery is delayed, skeletal traction provides an interim management plan to decrease pain and align the fracture, at the same time optimise the patients of their medical conditions and then perform surgery. Proper nursing care and patient education should include evidence based protocol for the care of this patients. Skeletal traction, even though rarely used nowadays, is still an important modality of treatment in selected situations where surgery may be delayed, denied or contraindicated for various reasons.

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References

1. Journal of Orthopaedic Nursing a Royal College of Nursing. Published by Elsevier Science Ltd. 2002; 6:230-235. Doi: 10.1016/S1361-3111(02)00099-7.
2. Taylor I. Ward Manual of Orthopaedic Traction. Churchill Livingstone, Edinburgh, 1987.
3. Stewart J, Hallett J. Traction and Orthopaedic Appliances. Churchill Livingstone, Edinburgh, 1983.
4. Wall BT, Van Loon LJ. Nutritional strategies to attenuate muscle disuse atrophy. Nutr Rev. 2012; 7:195-208.
5. Wall BT, Dirks ML, Snijders T, Senden JM, Dolmans J, van Loon LJ. Substantial skeletal muscle loss occurs during only 5 days of disuse. Acta Physiol. 2014; 210:600-611.
6. Bumpass DB, Ricci WM, McAndrew CM. A prospective study of pain reduction and knee dysfunction comparing femoral skeletal traction and splinting in adult trauma patients. J Orthop Trauma. 2015; 29(2):112-8.
7. Pearce MS. Calcaneal Pin Traction in the Management of Unstable Tlblal Fractures. Aust. N.Z.J. Sur R. 1993; 63:279-283.
8. Althausen PL, Hak DJ. Lower extremity traction pins: indications, technique, and complications. Am J Orthop (Belle Mead NJ). 2002; 31(1):43-7.
9. Alonge TO, Ogunlade SO, Salawu SA, Adebisi AT. Management of open tibia fracture-Anderson and Hutchins technique re-visited. Afr J Med Med Sci. 2003; 32(2):131-4.
10. Coester LM, Nepola JV, Allen J, Marsh JL. The effects of silver coated external fixation pins. Iowa Orthop J. 2006; 26:48-53.
11. Hargreaves DG, Drew SJ, Eckersley R. Kirschner wire pin tract infection rates: a randomized controlled trial between percutaneous and buried wires. J Hand Surg Br. 2004; 29(4):374-6.
12. Parameswaran AD, Roberts CS, Seligson D, Voor M. Pin tract infection with contemporary external fixation: how much of a problem? J Orthop Trauma. 2003; 17(7):503-7.