The Ankle Stirrup Splint for Post-Operative Immobilization

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Abstract

There are a wide variety of splints for fracture immobilization and the post-operative setting. Nothing is more frustrating than to finish a surgical procedure only to have it ruined by a secondary complication from the splint applied post-operatively. The ankle stirrup splint was used with 327 patients post-operatively from 2002 to 2008 following an ankle scope and dorsiflexion procedure. They were left in the splint for two to four days and the ankle was checked twice daily. None of the patients had a complaint about the splint during this time period. The splints were titled for time and price were a fiberglass posterior splint, ankle stirrup splint, sugar tong, ankle stirrup splint with a posterior splint, and finally a fiberglass cast. The ankle stirrup splint provides the best results of all for post-operative setting in terms of ease of application for the attending, the patient, and a waiting room. The ankle was immobilized when compared to other splints.

Introduction

Splinting the lower extremity has become very common in the emergency department for stabilizing fractures, also to establish fixation or to protect delicate soft tissue following surgery. Splinting is a more effective way to deal with trauma or to immobilize post-operative procedure than a cast. There have been examples of post-operative immobilization. For example, some older patients may have severe soft tissue necrosis as a result of compartment syndrome in a 5-year-old child who was placed in a cast following a lower extremity fracture (1). There are a wide variety of splints for fracture immobilization and in the post-operative setting. Many times placing a cast or splint is effective at keeping the ankle in a neutral position without breaking down the splint in the process (2). Studies have also indicated that a sugar tong or ankle stirrup splint is more effective at keeping the ankle in a neutral position without breaking down the split in the process (2).

There are many benefits to the ankle stirrup splint. TheAnkle Stirrup Splint is preferred for a couple of reasons which include: cost, time and ease of application, decreased chance of pressure sores, and decreased immobilization for a cast. Studies have also indicated that a sugar tong and ankle stirrup splint is more effective at keeping the ankle in a neutral position without breaking down the split in the process (2).

Complications from splints and casts, which would include pressure ulcers, can increase medical cost from $11,500 and even up to $77,000. Medicare and Medicaid reimbursement will, possibly, no longer be provided when a patient is under anesthesia or is not documented upon admission. The formation of pressure sores is either a cost or splints following an elective surgery can have catastrophic consequences. Many times placing a cast or splint can cause severe harm to the patient post-operatively because it causes the patient to be on the operating table longer while receiving anesthesia. Usually, it takes multiple people to apply a splint or cast in the operating room, which can be cumbersome.

In this manuscript the authors will discuss the application of the ankle stirrup splint and show its advantages over a posterior splint, the combination posterior splint with an ankle stirrup ankle splint (sugar tong, fiberglass cast).

Patients and Method

The 327 patients that were included in the study were seen and treated between 2002 and 2008 for lateral ankle instability in an ankle scope and dorsiflexion. They underwent a modified Bunnell procedure with an ankle arthroscopy. Immediately following the procedure, while the patients were still under anesthesia, an ankle stirrup splint was applied to the lower extremity that was operated. The patients were left in the stirrup for approximately two weeks. Patients who had a wound other than the incision from surgery were excluded from the study.

When the splint initially came out, the patient’s lower extremities were examined for areas of skin breakdown, areas of friction or any areas of nerve irritation that would be a direct cause from the splint placement.

The different types or types of splints and costs were applied to lower extremities and the application process was timed from start to finish. The results were compared with each type of splinting and to evaluate application times of a split, the surgeon/author was timed when the splint was applied according to its application. The splitting techniques that were timed were the ankle stirrup splint, posterior splint with the fiberglass, posterior splint using plaster, sugar tong/ankle stirrup splint, and posterior splint with plaster. The ankle stirrup splint was the one that was compared for the ankle stirrup ankle splint was split plaster extra fast, 30 x 10 inches. The posterior splint used was a fiberglass cast 4 x 36. To evaluate differences secondary to ankle stirrup splint that are commonly applied at the post-operative department was asked to report what the hospital purchase price of the materials used for splitting and the cost was recorded and compared.

Results

There were 357 patients within the research group that followed through with the study from start to finish. Of the 357 patients, 186 were male and 96 were female. The average age of the patient cohort was 39.71 years.

Of the 357 patients that were splinted using the ankle stirrup technique when questioned about the splint reported the splint being comfortable and secure. There were no few complications noted with a sugar tong. All of the complications were not attributed to the application technique and were from the procedure that was performed. This is a significant improvement of complication secondary to the splinting. The average times were then calculated and recorded for each splitting technique. The ankle stirrup splint had an average time of 5 minutes, 51 seconds. The average times were then calculated and recorded for each splitting technique. The ankle stirrup splint had an average time of 5 minutes, 15.44 seconds, and plaster ankle stirrup splint with a posterior splint was 6 minutes, 56.0 seconds. The ankle stirrup splint was 5 minutes, 44.52 seconds, and plaster ankle stirrup splint with a posterior splint was 6 minutes, 00.00 seconds.

At the local hospital, the price for one fiberglass splint ($5 One Step fiberglass, 4 x 30 inches) would be $11.10. The cost for 30 sheets of plaster (splitter plaster extra fast, 490 mil = $1.40 a pack or 4.05 dollars per sheet. The plaster is used requires one sheet per split which would cost about $4.10 per sheet to be about $12.30. The posterior splint with plaster will have the same cost as the ankle stirrup splint $12.30. The ankle splint with a posterior splint cost $20.50. The cost of a fiberglass cast for the local hospital would cost $161.00 in total costs were not included in the total cost.

The ankle stirrup splint is then applied followed by four or six inch ace wraps. The leg can then be held without assistance in the desired position until the plaster sets in three to four minutes. The other splints and casts were applied in standard fashion.

Analysis/ Discussion

The main finding in this study that the ankle stirrup splint is successful, cost effective, time saving, efficient technique of splinting with minimal complications, especially when compared to other techniques.

Pressure sores are caused by prolonged pressure over a bony prominence. The foot is susceptible to pressure ulcers due to the relative width of the surface area and little amount of subcutaneous fat. Pressure ulcers can be divided into two types, pressure sores and moisture remaining on the foot (6). A cohort study performed in Italy in 2009 showed that patients staying on the floor for a certain amount of time had a posterior splint with plaster had an increase incidence of 12.9% (6/2916) (5). heel sore pressures account for 30% of all pressure sores, and lower extremity surgeons need to be aware of this with cast and splint applications, and limited mobility of post-operative patients. The incidence of pressure sores in elderly post-operative patients is 3.6% in seven days (8). The cost of treatment for full thickness pressure ulceration can be as high as $705,000 (6) by avoiding direct pressure over the calcaneus, like a sugar tong splint, will decrease the risk of pressure ulcers.

Hofverson et al did a comparison study of 4 different plaster splints to determine which type of splint, the posterior, ridge, posterior, modified figure-of-eight, or the sugar tong (ankle stirrup splint) was the plaster splint with the most incidence of poster heel 30 minutes after application (2). Pressure was measured under the metatarsal heads or the amount of force compared to the degree of active plaster friction. Strain gauge sensors were placed under the plaster to determine the degree of plaster friction was recorded. The sugar tong splint required the maximum pressure, 25 degrees, with the least degree of plaster friction. Hofverson et al determined that the sugar tong splint provided the least amount of friction. A wide range of splinting techniques is a key factor for healing, especially around the ankle where the incisions are subject to increased movement, and the sugar tong splint provides this added immobilization (7).

In conclusion, the conclusion of applicability of the ankle stirrup splint, such less trauma to revascularization, decreased time, reduced cost, strength and low complication rate, make it a more advantageous splinting over other described techniques as well as cost. The authors note no surgical correction due to this type of splinting method.

The authors understand that there are limitations to this study that include no control group to compare the splinting techniques to the ankle stirrup as well as having no trauma patients in the study group. In the future other comparative studies would need to be performed with control groups that compare the other splinting techniques to the ankle stirrup and post-operative patients. Understanding the limitations, the ankle stirrup splint is still a successful technique for lower extremity splinting.

References