



General Surgery

SHOE LACE TECHNIQUE, A SIMPLE AND LESS EXPENSIVE METHOD FOR FASCIOTOMY WOUND CLOSURE OVER EXTREMITIES

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ABSTRACT

Introduction: Compartment syndrome is a common and severe medical condition that can lead to ischemia and ultimately tissue loss. The treatment of choice is emergent fasciotomy to lower the compartment pressure. However, closing fasciotomy wound often presents a problem because of edema and skin retraction. As a result, numerous techniques have been devised to optimize wound closure. **Aim:** To perform fasciotomy wound closure by shoe lace technique which is a type of dermal apposition technique for gradual primary closure of fasciotomy wound. **Materials and methods:** All patients admitted in surgery ward with fasciotomy and large size wound which needed other intervention like grafting during the period of September 2020 to March 2022. Decompression fasciotomy was performed in all the cases to relieve compartment pressure. Shoe lace technique was performed for closure of wound. Patients demographics, location of fasciotomy, time duration between injury and fasciotomy, number of tightening session, time to primary closure, length of hospital stay, need for skin grafts and any complication if occurred during procedure were recorded. **Results:** In this study most common cause for fasciotomy was Cellulitis which comprises 32 patients out of 40. All study subjects achieved wound approximation in an average of 4 suture tightening sessions. In this group, the average duration of hospital stay was 7.5 days (range 5- 10) and time taken for secondary closure was 6.3 days (range 5-8). In this study there was no complication and no need for skin grafting to any patient **Conclusion:** Shoe lace technique is a simple and economical method for fasciotomy wound closure. It takes less time to closure, does not need a second procedure for closure thus reduces need of nursing care, hospital stay resulting in lower morbidity, healthcare cost and better aesthetic result.

KEYWORDS : fasciotomy, compartment syndrome, shoe lace technique**INTRODUCTION**

Compartment syndrome, a situation where compartment pressure is higher than perfusion pressure occurs in both upper or lower extremities and can result from numerous injuries such as fracture, ischemia, reperfusion, crush injury, electrical injury, burns and over exertion, which if left untreated can cause vascular, neural and muscular compromise or even necrosis as a result of compression.

If ischemia remains for 2 hours nerve damage and tissue necrosis occur which can cause permanent functional deficit of involved limb. Therefore, early recognition and treatment via surgical decompression is of paramount importance. For limb preservation relieving pressure and enhancing tissue perfusion using fasciotomy is the most effective treatment for patients with compartment syndrome. Fasciotomy wound often presents a problem for surgeons performing primary closure due to persistent tissue edema and skin contracture.

Out of the numerous techniques, closure via skin grafting and primary delayed closure are the most commonly employed techniques. Skin grafting with partial thickness graft is the most classical method but came with complications such as donor site morbidity, sensory loss in grafted area, possibility of graft failure, prolonged hospital stay, additional wound and unappealing scar.

Hence newer techniques like vessel loop shoe lace technique, sub cuticular suture, Ty -Raps, sure closure, Dynamic wound closure, STAR and Silver Bullet Wound Closure Device eventually were introduced.

AIM

“Study of Shoe Lace Technique, A Simple, Less Expensive and effective Method for Fasciotomy Wound Closure over Extremities.”

OBJECTIVES

1. To prove that shoe lace technique is an effective and more economical alternative for fasciotomy wound closure.
2. To prove that shoe lace technique reduces the requirement of the split skin grafting.
3. To minimize the hospital stay.

MATERIALS AND METHODS**Source of Data**

Inpatients in all surgical units of Smt. Kashibai Navale Medical College and General Hospital, Narhe, Pune.

Method of collection of data

All patients admitted in surgery ward with fasciotomy and large size wound which needed other intervention like grafting during the period of September 2020 to March 2022.

Inclusion Criteria

1. Decompression fasciotomy
2. No skin loss
3. No muscle or soft tissue necrosis
4. Age 10-70 years
5. Elongated / Long wounds with Length to Breadth Ratio in the range of 3:1 to 4:1.
6. Shape Elliptical

Exclusion Criteria

1. Open fracture
2. Skin loss
3. Extensive soft tissue necrosis
4. Compartment syndrome due to burns, electrical injury
5. Age <10 and >70 years
6. Skin disorders, Steroid abuse and Collagen disorders
7. Chronic granulomatous infection like Tuberculosis, Actinomycosis
8. Wounds with Length to Breadth ratio > 3:1
9. Shape Circular

METHODOLOGY OF THE STUDY:**Procedure****Aim:**

In this procedure, the main aim is to put constant, optimum and firm traction on the wound edges so that they get approximated slowly over certain period of time.

Technique:

This approximation of wound edges can be achieved by various ways used in different materials. Initially we tried using ethilon 2-0 loops at the wound edges along with nelaton's catheter or feeding tubes.

In this procedure, after initial preparation of wound which includes undermining the edges for 1-2 cm and thorough wash of wound with betadine and normal saline. We created loops of 2-0 ethilon thread equidistantly placed along both the opposing edges of the wound at the distance of 2 cm apart. Approximately 12-14 loops were required for each wound. The nelaton catheter or feeding tubes then passed through these loops in shoelace fashion starting from one end and ending at

other. After this these tubes are tied at another end after tightening. Serial tightening is done on post op day 3, 6 & 8.

Same procedure can be done using staples instead of ethilon 2-0. After few cases, we found it difficult to tighten the tubes as those were getting impacted and cut through the ethilon sutures or either staples used to get open up. So later on we started using these plastic tubes passed directly through wound edges. This is very well and conveniently done by using No. 8 or No. 10 size Romovac suction tubes with their sharp piercer attached at one end. With this piercer it was very easy to pass these tubes through wound edges. Also the tubes used were from the remnant of the romovac set used for other procedures.

Remaining all the cases were done using the same method. Between 5 to 10 days later, Approximation of skin edges were done and drain tubes were removed. The wounds were cleaned daily with saline solution, and a dressing with betadine solution done daily.



RESULTS

This is a HOSPITAL BASED OBSERVATIONAL STUDY involving 40 cases of fasciotomy was done in the Department of General Surgery, between the duration of September 2020 to March 2022

Table no. 1) Age Distribution

AGE GROUP	NO OF CASES
<40	03
41-50	17
51-60	13
>60	07

Table no. 2: Causes for Fasciotomy

CAUSE OF FASCIOTOMY	NO OF PATIENTS
CELLULITIS	32
NECROTIZING FASCITIS	08

Table no. 3: Total no. of Tightening sessions

TOTAL NO OF TIGHTENING SESSIONS	NO OF PATIENTS
03	13
04	16
05	11

In this study, average no. of 4 sessions are required for closure of wounds.

Table no. 4: Duration of Hospital Stay

DURATION OF HOSPITAL STAY	NO OF PATIENTS
05	02
06	06
07	12
08	11
09	08
10	01

In this study average duration for hospital stay is 7.5 days.

Table no. 6: Material Costing

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MATERIAL COSTING	NO OF PATIENTS
250	14
300	16
350	10

In this study, average cost of materials that is romovac suction drain tube and prolene sutures are used for Shoelace Technique is around 295.

DISCUSSION

Fasciotomy wound often presents a problem for surgeons performing primary closure due to persistent tissue edema and skin contracture. Out of the numerous techniques, closure via skin grafting and primary delayed closure are the most commonly employed techniques. Skin grafting with partial thickness graft is the most classical method but came with complications such as donor site morbidity, sensory loss in grafted area, possibility of graft failure, prolonged hospital stay, additional wound and unappealing scar. Hence newer techniques like vessel loop shoe lace technique, sub cuticular suture,

Ty -Raps, sure closure, Dynamic wound closure, STAR and Silver Bullet Wound Closure Device eventually were introduced.

This study includes 40 cases admitted in surgery ward with fasciotomy and large size wound which needed other intervention like grafting during the period of September 2020 to March 2022.

Age incidence

In our study, Fasciotomy was common in age group 41-60 years. The youngest was of 38 years and oldest was of 69 years. The average age of patients at the time of presentation was 52.22 years.

Cause for Fasciotomy

In this study most common cause for fasciotomy was Cellulitis which comprises 32 patients out of 40. Only 8 patients presented with Necrotizing Fascitis as in necrotizing fasciitis there are more chances of skin loss due to necrosis.

Total No. Tightening Sessions

All study subjects achieved wound approximation in an average of 4 suture tightening sessions. In a similar study by Eid et al, closure was obtained at an overall average of 4.2 tightening sessions (range 3-7) whereas, Park et al and Cheng et al reported 2-6 sessions for wound approximation.21-23 Marek et al and Chiverton et al suggested obtaining closure in single sitting.20,24 We achieved wound approximation in 4 tightening sessions which was on par with other studies in literature.

Time Taken For Secondary Closure and Hospital Stay

In this group, the average duration of hospital stay was 7.5 days (range 5-10) and time taken for secondary closure was 6.3 days (range 5-8). Hospital stay and secondary closure time was affected by the presence of comorbidities. In literature, wound approximation was achieved in 8.3 days by Saini et al. Zorilla et al reported approximation time of 8.8 days (range 6-19) days using shoelace technique.15,19 As time to closure varies according to the technique used, surgeon plays a key role in decision making regarding the best method to be used for closure considering the financial status and medical condition of the patient. With regards to duration of hospital stay, on an average it was 7.5 days which is on par with studies till date. In Saini et al study it was 12.3 days, whereas in Zorilla et al, study it was 10 days.

Material Costing

Disease related financial burden was one of the main factors in a developing country like ours. One of the important objectives of this study was the hospital related expenses. In this hospital setting, average expenditure of patients was ~Rs. 295 which is below par than other conventional method. Hence, this study found that The Shoelace technique is more economical than conventional methods.

Complications and Need for skin Grafting =In this study there was no complication and no need for skin grafting to any patient which make The Shoelace technique more effective and safe method for fasciotomy wound closure.

CONCLUSION

Shoelace technique is a recent modality of treatment of fasciotomy wound over extremities. Its introduction has changed the course of management of wounds.

Based on the data from the present study, Shoelace technique does appear to result in better healing, with no complications and not required skin grafting and thus looks to be a promising technique for the management of fasciotomy wounds.

The Shoelace technique is simple, but requires training to ensure appropriate and competent use. The Shoelace technique is a cost effective and will vary which is depend on the cost of supplies and hospital stay. More rigorous studies with larger sample size assessing the use and cost- effectiveness of Shoelace technique therapy on different wound types are required.

Hence The Shoelace technique is the most effective to treat fasciotomy wounds.

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