

DETERMINANTS OF THE RISK FACTOR FOR THE POST CABG MEDIAN STERNOTOMY WOUND KELOID. A RANDOMIZED CONTROL TRIAL

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Date of Submission : 14-08-2020; Date of Acceptance: 23-09-2020; Date of Publication: 15-02-2021

ABSTRACT:

BACKGROUND:

Scar formation is a normal process of wound healing. A keloid is an abnormal scar which happens because of excessive fibrotic tissue accumulation in the scar. Sternal wounds closed with absorbable sutures and prone to infection are at higher risk of developing keloids posing an increased mortality and morbidity.

AIMS & OBJECTIVE:

To find and minimise the Risk of Keloid formation in Sternal scar, by using a simple technique with different sutures Material in our study population under going open Heart surgeries.

MATERIAL & METHODS:

This was an observational randomized study where 50 patients undergoing cardiac surgery were randomized into two groups, 25 patients in each, Group-A was closed with extensive use of diathermy and absorbable suture (vicryl) and group-B had minimal use of diathermy and non-absorbable suture were used for skin closure. Infection rate and formation of keloid or abnormal scarring were noted up-till 30 days after operation.

RESULTS:

The patients in group B had less frequency of infection and formation of keloid as compared to group A patients.

CONCLUSION:

We conclude that the use of non-absorbable sutures like prolene, for closing the sternal skin tissue can provide better protection against the risk of superficial infection and thus prevent post-operative hypertrophic scarring and keloid formation.

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Author's Contribution: IP: Formulated the study, methodology and conducted the study. MM: Helped in article review and proof read. JI: Tables and Figures. YK: Data analysis and reviewed discussion. MHC: Data entry and article writing

INTRODUCTION:

Scar formation is a normal process of wound healing. A keloid is an abnormal scar which happens because of excessive fibrotic tissue accumulation in the scar.¹ However, it is very important to differentiate a keloid from hypertrophic scar. Hypertrophic scars are raised scars limited to the initial boundary of wound. Hypertrophic scars are related to factors such as tension in the wound and delayed healing. Hypertrophic scars occur soon after injury and show spontaneous regression over the period of years.² On the other hand, keloid extend beyond the boundaries of regional injury. Keloids tends to appear after longer time interval following injury. The risk factors for keloids are wound edges tension, infection, dark skin and genetic predilections. Keloids are common and can occur in any wound but most favorite sites are anterior chest, shoulders and deltoids. Median sternotomy is done during majority of cardiac surgery procedures. In our population, sternal keloids are common after median sternotomy.³ These keloids behave in different ways as compared to keloids on other areas. Sternal keloids are more itchy, resistant to surgery and radiation. These are becoming major issue after median sternotomy. There are several theories about formation of keloid but little is known about the pathophysiology of keloid.

Incidence of abnormal scarring after median sternotomy wound in our population is not yet reported however in the literature the figures are between 5 to 15%.^{4,5} We believe that incidence of abnormal scarring after median sternotomy is much higher than it is reported in the literature. One of the major symptoms of abnormal scarring is the itching mostly this is controlled by massage, steroid injections and antihistamine drugs. However, in few cases the symptom become debilitating. Another major issue of abnormal scarring after median sternotomy wound is cosmetics specially in younger population where the situation worsens. So, the reason to conduct this study was to know some factual figures in our populations.

In this study we conducted a randomized control trial for the etiological risk factors for the formation of keloids after median sternotomy in our population.

This study was based on the hypothesis that abnormal scarring after median sternotomy is because of subclinical infection due to excessive use of diathermy and sub cuticle use of polyglactin suture. During cardiac surgery use of anticoagulant is vital and there is a fear of post-surgery hematoma

formation so cardiac surgeons use extensive diathermy after opening of median sternotomy wound to get meticulous hemostasis. After doing the procedure the wounds are closed by using wires to approximate sternal halves. Subcutaneous tissue is approximated by using absorbable braided suture (polyglactin suture). This hypothesis was based on the theory that use of diathermy lead to formation of necrotic tissue on the bed of wound and braided suture add up subclinical infection. Based on this hypothesis we randomized our patients in two groups.

MATERIAL AND METHODS:

After taking the approval from ethical committee of Chaudhary Parvez Elahi Institute of Cardiology we conducted this controlled randomized trial. This study was performed during the period of January 2019 To December 2019. We included all those patients with age 30-50 years who underwent some sort of cardiac surgery by using median sternotomy approach. We excluded those patients who were at increased risk of infections like patients with diabetes, patients using steroids, patients who were malnourished, old population and history of abnormal wound healing. We included 50 patients, fulfilling inclusion criteria and randomized them by lottery method into two groups of 25 patients each.

Initially the patients who fulfilled our inclusion criteria were given the detailed information about the study protocol and after getting their approval and randomized our study populations into two groups using Consecutive sampling method. We also excluded those patients who were included in our study but had some complicated outcome of the surgery so only those patients were included who had an uneventful Outcome of surgery.

In conventional group (group A) we used conventional method i.e: using extensive diathermy to open the wound and using braided absorbable polyglactin suture subcutically for the closure of wound. In second group (prolene group-B) we opened the skin with knife and used diathermy only for bleeding points. The skin was closed by using continuous monofilament suture.

Relevant data of patients regarding their registration, history, primary pathology, medical report, operative notes, pre- and postoperative photographs, duration of hospital stay and outcome were filed individually. During their stay in the ward, strict monitoring was done.

After discharge of the patients from the hospital, follow up plan was given to the patients which was a monthly follow up for 6 months by the same team

of surgeons who operated them. During the follow-up behavior of the scar was observed. Factors that were observed during the follow-up of the scar were the color of scar and its confinements and any symptoms like itching. All the wounds were photographed periodically and the records were made. Each time when the patient came for follow up performa was filled and filed.

During follow-up, those patients were excluded who had superficial or deep wound infections. Keeping this thing in view that all the confounding variables should be controlled. Whenever the patient developed abnormal scar, he was referred to plastic surgeon in Burn Center Multan for further treatment.

All the data was analyzed by using SPSS version 21. Tailed Unpaired Student t-test was used to analyze predictors between two groups. P value of less than 0.05 was considered to indicate statistical significance.

RESULTS

We included 25 patients in each group. The demographics of patients are summarized in table-1.

In both the groups, no deaths were observed. Post-operatively, patients were observed in the ICU until they were stable and off ventilator support. The drains were kept until drainage was less than 100 cc in 12hours. Daily wound inspection was done and were assessed for infection on 5th post op day. The frequency of wound infection at 30 days

follow up was 4% for the prolene group and 18% for the vicryl group (P=0.019)

In this study the authors found that there was no significant difference between the age range of the two groups. After controlling the confounding variable in our study 50 patients were included of both genders with age range between 35 to 55 years. Among them 36 had coronary artery bypass grafting remaining 14 patients had valvular surgery. All the patients had favorable surgical outcome. It was emphasized that same type of surgeons should follow up the scar according to the performa given.

After 6 months of follow up in which we find that there was 10 patients out of 25 had abnormal scarring. Out of 10 patients, 7 had developed keloids which came into the definition of abnormal proliferation of scar beyond the boundaries of the wound edges. All patients who had abnormal group scarring had itching was of different grades and none had severe problem. Which was managed only massage and topical steroid creams. When keloid developed patients were referred to plastic surgeon in burn center Multan. Group B where is used less extensive diathermy and element non-absorbable prolene suture subcutically. It's not found in this group that 9 out of 25 patients had abnormal scarring. Out of 9 patients 3 had developed keloids. In these patients teaching was the symptom but it was not severe and easily managed by massage and topical steroids. Four

Figure 1: Shows abnormal scar vs keloid.

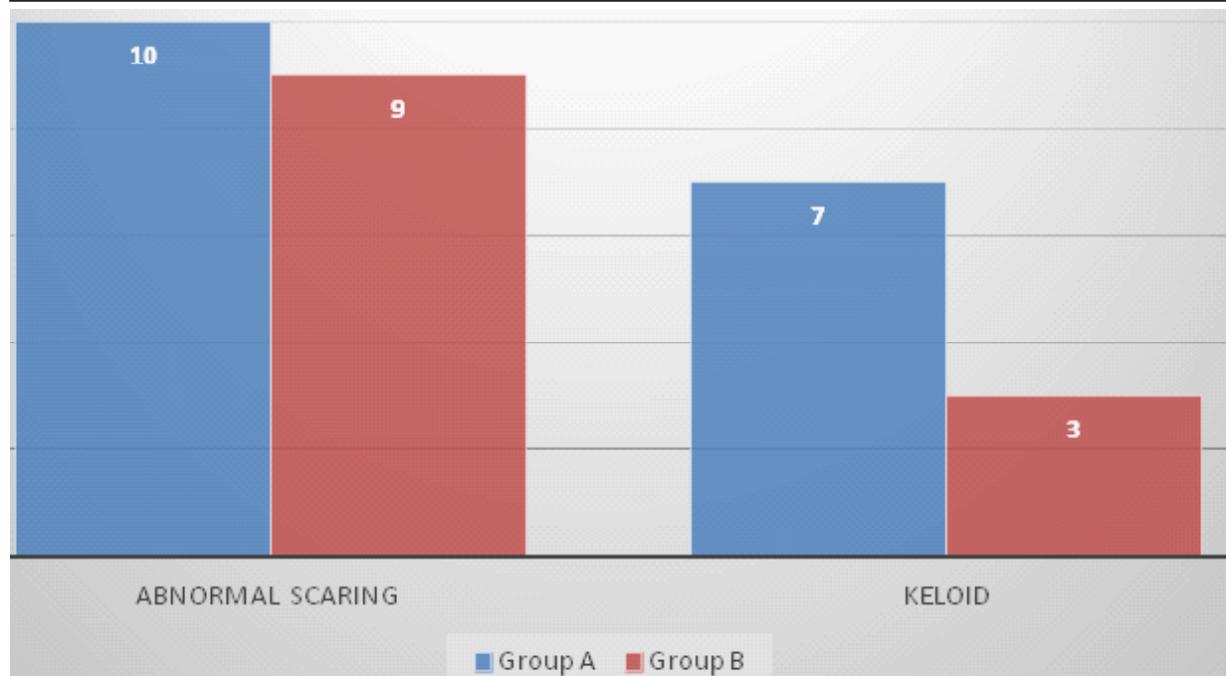


Table -1: Frequency of Keloid formation in both groups:

Patients Characteristics (Gender)		Group A (n=25)	Group (n=25)
	Male	17 (68%)	09 (36%)
	Female	8 (32%)	16 (64%)
Primary Disease			
CABG	36	18	9
Valvular	14	7	16
BMI (mean)		35±3	33±2
Age (mean)		45±2.5	50±3.5
COPD		20%	15

patients who had the keloids referred plastic surgeon in Burn center Multan. Two-Tailed Unpaired Student T-Test was used to analyze predictors between two groups. P value of less than 0.05 was considered to indicate statistical significance. P value of two groups profound significant so it was concluded that group B had less chance of developing abnormal curing as compared to group-A which means that our hypothesis regarding the abnormal scarring is correct.

DISCUSSION:

There are several theories on the formation of hypertrophied or keloid scarring. Some risk factors include age, gender, race, black color of skin, incidence of post-operative infection.

In a study conducted by Aytieh and colleagues, they found that keloid and hypertrophic scars are of two different origins and their pathophysiology and therapeutic options are different.²

In this study there was no apparent pre disposition to risk factors for the formation of either hypertrophic scar or keloid. Majority of the patients had fair skin and there was no sternotomy wound infection in any of our patient in both the groups.

Study conducted by Elliot et al showed that fair skin people showed a predisposition to hypertrophic scarring and it was unrelated to suture material used.⁷ They observed scars and hypertrophy to arise mainly over the scar overlying the sternal body and that too particularly in female patients. There was also occurrence of wound stretching over xiphisternal joint and epigastric region.

There are many methods that are described for the

treatment of hypertrophic scars and keloids. Some treatment modalities include local corticosteroid injection and the use of gels with excision of scars. At the moment there is no consensus on a single effective treatment modality. The formation of keloid and hypertrophic scars cause significant morbidity.⁸⁻¹⁰

In this randomized control trial, we compared suture technique in a hope to establish best method for skin closure so that keloid and hypertrophic scars can be avoided

Mofikyo et al. were not able to ascertain single, trustworthy and efficient practice regarding management. They showed that surgical treatment with post-operative steroid injection had low rates of recurrence.¹¹ The surgical sternotomy incision is immobile and skin closure done is usually tension free.

Durkaya et al. established that the lower half of the wound was more susceptible to scarring irrespective of the suture used, but the upper portion was more prone to hypertrophy with the usage of vicryl.¹²

Overall the risk of scar hypertrophy is less with the use of monofilament sutures when compared with absorbable sutures. The relative mobility and increased tension over the xiphoid process was felt to yield a less satisfactory result.¹³

CONCLUSION:

We conclude that the use of non-absorbable suture like prolene, for closing the sternal skin tissue can provide better protection against the risk of superficial infection and thus prevent post-operative hypertrophic scarring and keloid formation.

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