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Research Article

**STERNAL PLATING IN OBESE PATIENTS UNDERWENT
CARDIAC SURGERY IN MAYO HOSPITAL LAHORE**Dr Abdul Basit Maqbool¹, Dr Nafisa Shahid², Dr Abdul Samad³¹Basic Health Unit Zamin Shah Liaquatpur, Rahim Yar Khan, ²District Headquarter Teaching Hospital, Gujranwala, ³Tehsil Headquarter Hospital Daska, Sialkot.**Article Received:** February 2019**Accepted:** March 2019**Published:** April 2019**Abstract:**

Overview: Patients who undergo cardiac surgery and are "morbidly obese", surgery which specifically involves sternotomy, they have a risk of sternal dehiscence that is higher than normal. We have tried to examine the use of transverse sternal plating to find a potential solution which involves primary sternal closing in morbidly obese patients.

Methods: The data is reviewed retrospectively in the patients who were undergoing cardiac surgery involving primary reinforcement of sternal closure through xiphoid transverse titanium plate. This study was prepared from December 2017 to December 2018. We studied the outcomes of obese patients who underwent cardiac surgery with and without the use of sternal plate reinforcement. The patients who were included in the study had a BMI of 35kg/m² or more.

Results: All patients included in the two groups had about the same demographics and morbid rates ($P > 0.05$). The follow up of sternal plate reinforcement had been reported 27 months post operation. Range of such patients was between months 8.4 to 49.3. One of the patients ($P = 0.4$, 7.1%) who had standard closure came to develop sterile sternal dehiscence. The postoperative use of morphine was found to be higher in patients without sternal plate reinforcement ($P = 0.008$, 1.3mg/h vs 3.6mg/h for patients without sternal plate reinforcement). Wound seroma was not evident in sternal plate reinforcement also the perioperative complications were to be attributed to this technique.

Conclusion: Post-operation narcotics usage can be lowered using the technique of sternal plate reinforcement and it can also decrease the risk of developing sternal dehiscence found to be true in this study.

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INTRODUCTION:

In recent years Obesity and diabetes have come up as a rapidly growing and alarming problem among populations of developed countries. It is considered to be a problem that is associated with increased mortality from conditions such as coronary artery disease [1,2]. Increased risk of cardio vascular factors for example hypertension, dyslipidemia and diabetes leading to cardiac problems [3]. Myocardial infarctions is developed in 2/3 of patients who have a BMI > 25kg/m² or more than that [4]. CAD has a strong connotation with obesity and that increases the number of patients who will require surgical intervention.

Some studies reported that deep sternal wound infections are closely related to high mortality rates which could be between fourteen and 47% in patients who go through coronary artery bypass grafting [5]. Body habitus, non-union and sternal instability are considered to be the reasons that increase the risk of disruption in median sternotomy and sternal dehiscence in CABG and postoperative DSWI [6].

There are about 40 different closure techniques to optimize sternal stability and traditionally the method that is considered to be preferred is primary wire closure [7,8]. Some studies have reported the efficiency and value of different methods as a comparison, they have also reported their significance in biochemical properties [9,10,11,12]. Several studies show that dehiscence and DSWI, wiring of sternotomy incisions are the reasons for perioperative mortality increase [13,14]. Sternal closure in patients with complications sternal plating has been used recently and studies suggest that it is a reliable technique to stabilize the sternum [15,16,17]. Fawzy et al. concludes that addition of a sternal plate in closure procedure improves the sternal closure and adds to its strength [15]. After the operation the patient's time of stay in hospitals was shorter who had sternal closure with sternal plating [17].

However the data regarding sternal plating and on its use in morbidly obese patients is limited but the process is considered to be useful in secondary sternal reconstruction [13]. This study considers the use of sternal closure and its effect of the patients and the short term outcomes in patients who are morbidly obese.

MATERIALS AND METHODS:

The study was undertaken in Mayo hospital Lahore and the data was obtained before and after the cardiac

surgery of patients included in the study. Details of the data consists the demographics of the patients, clinical data, outcomes and other variables, the data was compared to the VA Health care system [18]. The patients who were included in the study underwent sternal plate xiphoid for sternum closure and the data was collected between December 2017 to December 2018. Patients included in the study had BMI of 35 kg/m² or more and their outcomes were compared to patients whose sternum closure technique was different than sternal plate reinforcement. Figure 1 shows that the titanium sternal plate is secure with screws and the comparison is done with standard closure technique through stainless steel wires. Body habitus of the patients was the reason to undertake sternum closure through sternal plate reinforcement.

Fig. 1

The patients who were ventilator dependent for more than two days were not included in the study, because of increased pain their medication varied. The patients who had a stroke after the operation were also excluded from the study also the patients whose morphine usage record was insufficient or incomplete. Finally, only eight patients were included in the study out of the 14 patients considered initially.

The definition considered as the primary end point was defined by CICSP [18]. The secondary end point of the study was a recording of mortality, patient's time of stay and morphine usage in a 30 day period. After extubation and until the transfer of patients out of the ICU they received PCA immediately.

χ^2 test and the Fisher exact test was used to compare data between groups and categorical variables were used as percentages (frequencies). The data was compared by using the t test and variables were considered as \pm standard deviations as the statistical analysis of variables. All the statistical analysis were done through using SPSS v17.0.

RESULTS:

The differences between both the groups were not significant in terms of demography and comorbidity as shown in Table 1. Standard wire closure patients did not undergo with more complex procedures and did not incur long myocardial ischemic times as compared to the patients who received xiphoid sternal plating. The sternal plate recipients used less PCA morphine after the operation. Table 2 shows that there were no other significant differences found in the end points.

Table 1

Pre operation appearances

Sternal plate**(n = 8)****No sternal plate****(n = 14)****P value**

Age (y)

64 ± 5

61 ± 6

0.23

Gender (male)

8 (100.0)

14 (100.0)

1.00

Body mass index (kg/m²)

40.6 ± 4.2

38.6 ± 2.8

0.25

Diabetes mellitus

6 (75.0)

8 (57.1)

0.40

Peripheral vascular disease

0 (0)

1 (7.1)

0.44

Hypertension

8 (100.0)

14 (100.0)

1.00

Cerebral vascular disease

1 (12.5)

3 (21.4)

0.60

COPD

4 (50.0)

2 (14.3)

0.88

Current smoker

2 (25.0)

2 (14.3)

0.07

Creatinine level (mg/dL)

1.2 ± 0.2

1.1 ± 0.2

0.45

Albumin level (g/dL)

3.8 ± 0.4

3.6 ± 0.2

0.32

Ejection fraction (%)

50 ± 10

51 ± 8

0.79

Data presented as mean ± standard deviation or absolute number (percentage). COPD chronic obstructive pulmonary disease

Table 2

Intraoperative and outcome measures

Sternal plate (n = 8)

No sternal plate (n = 14)

P value

Isolated CABG

3 (37.5)

13 (92.9)

0.005

Isolated AVR

1 (12.5)

1 (7.1)

0.67

Cardiopulmonary bypass time (min)

145 ± 57

98 ± 41

0.06

Myocardial ischemic time (min)

100 ± 46

58 ± 31

0.04

Time in OR (min)

362 ± 82

413 ± 60

0.15

Length of stay (d)

17 ± 5

11 ± 3

0.07

Morphine usage (mg/h)

1.3 ± 1.2

3.6 ± 2.3

0.008

Wound drainage

0 (0)

0 (0)

1.00

Sternal dehiscence

0 (0)

1 (7.1)

0.44

Mediastinitis

0 (0)

0 (0)

1.00

30-day mortality

0 (0)

0 (0)

1.00

Data presented as mean \pm standard deviation or absolute number (percentage). CABG coronary artery bypass grafting, AVR aortic valve replacement, OR operating room

Expect one patient all patients in the standard closure group showed a stable sternum in their follow up visit. (A median of 27 months postoperatively; range, 8.4–

DISCUSSION:

Cardiac problems and the surgery is in incline as the prevalence of obesity increases in the developed countries [1,2]. Morbid obesity is a factor of risk for sternal dehiscence in patients also mediastinitis after sternotomy [6]. Sternal plating in closure after sternotomy has limited previous data and research.

Previously published research that has contributed to this study in transverse sternal plating is where the secondary data is collected [13], the primary data however is not as well documented and as compared to secondary reconstruction, primary is used less frequently by surgeons because of infection risk and increased length of operation apprehensions.

The rigid sternal plating in primary closure is high risk for sternal dehiscence reported by some studies which included patients having sternal dehiscence from 3% to 9% of sternal plate placement without wire circle technique [16,17]. This study is based on the hypothesis that the use of one sternal plate without wire cerclage has the same strength as sternal plating with wire cerclage, that being said it can be used in sternal closure as primary technique for patients who are morbidly obese [15].

49.3 months). No wound seromas were found or any other complication in patients with sternal plate.

Figure 2 is the Chest CT scan after one week for detection of early mediastinitis and figure 3a and 3b are taken after a month of operation for detection of pulmonary embolism showing evident and almost complete sternal union.

The study based on the technique of single plate placement in xiphoid region is significant in achieving the primary sternal union without more infection rate as compared to previous techniques and the time taken in the implantation being fifteen minutes only demonstrates the feasibility of performing sternal plate placement without increasing risk of infection and extended operation time.

The limitation of the study is its small size of subjects and there is no significant difference found in the outcomes between both the groups included in the study. The study cannot be considered as a powerful one to detect differences such as sternal dehiscence occurrences in outcomes of factors whose frequency is lower.

However, the study shows a significant reduction in use of morphine post operation. This study should be considered as the pilot study in understanding of the differences of both groups through the use of morphine in pain control post operation due to the small size of cases included in the study, the difference recorded was $P=0.008$, making it low possibility of difference of narcotic drug usage by chance. The findings of the study can impact the costs associated with healthcare of such patients and also improvement in pain. The possibility of potential complications

associated with surgery and drug usage and their side effects can also be said to reduce if the findings of the study are to be implicated.

Keeping that in consideration, the results can be regarded as striking in improvement of sternal stability after the operation through xiphoid sternal plate as an add on to standard practice of wire cerclage as found in the studies that xiphoid area comes in as primary area of stress after sternal surgeries and deep sternum surgical infections^{19, 20, 21}. Specially when it comes to obese morbid patients they have more soft tissue and the later stress increase is even more than standard patients due to habitus.

Due to bone fracture, the pain fibres present in the periosteum cause pain [22,23]. For most bone fractures this type of pain as a rationale should be addressed to control pain by cast placement and open fixation. The possibility in this study is that the patients included in the plate reinforcement group had increased early stability and reduced pain through stressed sternotomy closure.

The association of sternal dehiscence is considered to be post sternotomy mediastinitis specifically in obese subjects²⁴. The patients included in our study showed stability at their last followup, excluding one of the patients in the group. This is due to the enhancement of sternal union through the plate at the lower sternotomy closure. The stability can be seen in Figure. 3 in the first week and 1 month after the operation. This eliminates the doubt of sternal plate being stronger in its tensile strength than steel wires [9,25]. It can be considered to perform best in morbidly obese patients and can decrease the risk of post sternotomy mediastinitis [24].

The study has its limitations and biases, due to the fact that all the patients included in the study were male and the results of this study cannot be generalized. The number of cases included in the study is also limited therefore, more studies are needed to establish and reinforce the results of this study.

CONCLUSION:

The study reports that single sternal plate can be considered to be a better option for sternal union and stability. The drug use post operation for pain is also reduced therefore reducing the costs associated with healthcare of such patients. Further studies should be considered to determine and reinforce the findings of sternal plate xiphoid reinforcement in patients who are morbidly obese.

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