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Comparing Two Surgical Outcomes: Minithoracotomy or Full Sternotomy in Coronary Artery Bypass Grafting Surgery

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ABSTRACT

COMPARING TWO SURGICAL OUTCOMES: MINI- THORACOTOMY OR FULL STERNOTOMY IN CORONARY ARTERY BYPASS GRAFTING SURGERY

Cardiovascular diseases and heart-related conditions can be life-threatening; however, some cardiovascular conditions can be managed with open heart surgery. Coronary artery bypass grafting (CABG) is the most common type of heart surgery performed on adults. There are two different surgical procedures to correct cardiac defects: mini-thoracotomy and full sternotomy. Mini thoracotomy approach has been shown to reduce complications, such as pneumonia, excessive blood loss, and infection in mitral valve repair surgeries. However, little research has been done to compare these two surgical approaches performed for patients undergoing coronary artery bypass grafting (CABG).

Specifically, there is inadequate data to compare these two surgical approaches in relation to length of stay and duration of ventilator use. The purpose of this study was to compare the surgical outcomes of mini-thoracotomy and full sternotomy in patients undergoing CABG surgeries. A retrospective chart review was conducted from an archival data (2010 to 2016) in patients undergoing CABG surgeries with either a mini-thoracotomy or full sternotomy approach. Included were patients with coronary artery blockages who required CABG surgeries. A one-way ANOVA and independent sample t-test were used for statistical analysis.

Results showed that, there was no significant difference in days of hospitalization in those receiving mini-thoracotomy ($M= 10.75, SD=10.25$) as compared to those who receiving full- sternotomy ($M=11.91, SD= 10.03$), $F(1,537) = 1.17, p = .23$. There was no significant difference in number of hours of

ventilation time for mini thoracotomy (M= 13.62, SD= 17.58) and full sternotomy (M= 22.33, SD= 95.96), $F(1,537) = .90, p=.34$.

As the length of hospitalization and duration of ventilation did not differ in both surgical approaches, we can conclude that mini-thoracotomy was very comparable to full-sternotomy in these two areas for patients undergoing coronary artery bypass grafting.

Shirin Badrkhani
May 2019

COMPARING TWO SURGICAL OUTCOMES: MINI-
THORACOTOMY OR FULL STERNOTOMY IN
CORONARY ARTERY BYPASS
GRAFTING SURGERY

by

Shirin Badrkhani

A project
submitted in partial
fulfillment of the requirements for the degree of
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APPROVED

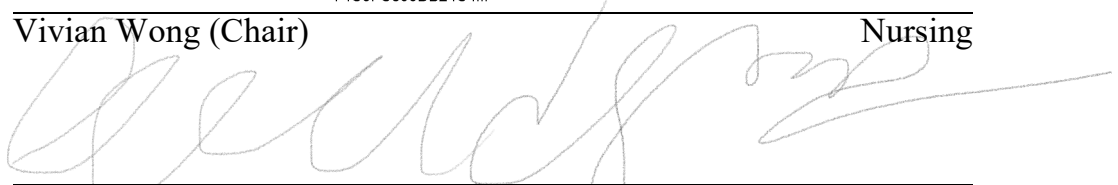
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Doctor of Nursing Practice:

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I am writing this letter today in order to express my deep appreciation and feeling towards all those amazing people who helped me, supported me, encouraged me and inspired me.

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CHAPTER 1: INTRODUCTION

Cardiovascular diseases and heart-related conditions in the United States are considered to be the most life-threatening events (Pilkerton, 2015).

Cardiovascular diseases and heart-related conditions in the United States are considered to be the most life-threatening events (World Health Organization, 2016). According to the World Health Organization, a total of 17.9 million deaths were registered which is consider 31% of all deaths. Some of the cardiovascular conditions can be managed with open heart surgery. Open heart surgery is an operation to repair a defect or damage in the heart. Heart valve repair or replacement, arrhythmia treatment, aneurysm repair, and coronary artery diseases are some of the reasons for open heart surgeries (Inderbitzi et al., 2012).

Currently, there are two surgical approaches utilized to correct cardiac defects: full sternotomy and mini-thoracotomy (Walker, 2012). A full sternotomy requires the surgeon to open the chest by making a midline incision down the chest and using a bone saw to open the sternum, which allows full access to the heart (Jenkinson, 2015). In contrast, a mini-thoracotomy approach is making only a small 3-5-inch incision under the breast, between the ribs (Jenkinson, 2015). The mini-thoracotomy approach can be done without stopping the heart and does not require the use of a heart-lung machine. According to the National Heart, Lung, and Blood Institute (NHLBI), coronary artery bypass grafting (CABG) is the most common type of heart surgery performed on adults. “In a CABG, a healthy artery or vein gets connected, or grafted, to the blocked coronary artery. This vein can be removed from the patient’s leg and then stitched to the aorta and coronary artery” (Jenkinson, 2015, p.1).

The full sternotomy approach has been utilized as the standard approach to cardiothoracic surgery for many years. However, pain and disabilities after sternotomy surgeries have led to multiple physical, social and psychological issues for the patients (Nourelden et al.,2016). Open-heart surgeries in general negatively affect the quality of life and an individual's well-being in their society (Nourelden et al., 2016).

Purpose

The purpose of this comparative study is to explore the surgical outcomes of two different types of surgical techniques in open-heart surgery: mini-thoracotomy and traditional full-sternotomy.

Problem Statement

There are two different types of surgical procedure to correct cardiac defects: mini-thoracotomy and full sternotomy. The mini-thoracotomy approach used in mitral valve repair surgeries has been shown to reduce complications, such as pneumonia, excessive blood loss, and infection. This surgical approach also has been reported to improve the quality of life for patients (Fareed et al., 2016). However, most of the studies comparing these two surgical approaches were performed in patients who needed mitral valve repair. No study has been done to compare these two surgical approaches performed for patients undergoing coronary artery bypass grafting (CABG). Specifically, there is inadequate data to compare these two surgical approaches in relation to length of stay and duration of ventilator use. Thus, this study is conducted to compare the surgical outcomes of mini-thoracotomy and full sternotomy in patients undergoing CABG surgeries.

Research Questions

1. Is there a difference in the length of stay between mini-thoracotomy and full sternotomy in patients undergoing CABG surgeries?
2. Is there a difference in the length of stay in mini-thoracotomy and full sternotomy surgical approaches based on demographic characteristics in patients undergoing CABG surgeries?
3. Is there a difference between the duration of ventilator use in mini-thoracotomy and in full sternotomy in patients undergoing CABG surgeries?

Conceptual Framework

For many decades, there has been debates in the United States in regard to the extent and consequences of surgical care (Jenkinson, 2015). Often the concept of appropriateness to do the surgery and the strategies to reduce inappropriate surgery are also brought up in this discussion. However, appropriateness is defined by perspective. Cooper et al. (2015) described an appropriate surgical approach was to do more good than harm for a patient given a certain set of clinical indications. Cooper and colleagues (2015) examined how high-quality decision is defined in health care. They developed a framework to determine if the right provider operates on the right patient in the right place, then a high-quality decision will be achieved (Cooper et al., 2015) (Appendix A, Figure 1).

According to the framework, the providers are the surgeons who must meet certain criteria, such as having board certifications and hospital privileging protocols. The right patient is defined as a patient presenting with a certain set of clinical indications, in which the outcome of an operation will result in more good than harm (Cooper et al., 2015). The right place means hospitals or surgical centers that can provide the best surgical treatment. Right operation is the

appropriateness of the operation performed for the particular condition. If all right elements are put in place, performing such surgery will become a high-quality decision. With a high-quality decision, it is hoped that a better surgical outcome will be achieved. In this study, this framework helps to evaluate if choosing a skilled cardiovascular surgeon with experience in mini-thoracotomies (right provider), selecting the hospital with the appropriate advanced technology (right place), and finding the patient in need of coronary artery bypass grafting due to coronary artery blockage (right patient), will result in a high quality decision towards a better surgical outcome.

CHAPTER 2: LITERATURE REVIEW

During a conventional sternotomy, the surgeon will make an incision in the sternum (a median sternotomy), with the rib cage spread to allow full access to the heart. Patients undergoing coronary artery bypass graft (CABG) surgery will require a vein or artery to be taken from one of four places in the body: the chest, leg, arm, or abdomen. The vein or artery is then grafted from the aorta onto the coronary artery, beyond the narrowed or blocked segment. These bypasses the section of the coronary artery that is restricted and restores regular blood flow to the area of the heart that would normally receive blood from the diseased artery.

While the heart is temporarily stopped during the procedure, blood circulation is maintained by what is commonly known as the heart-lung machine. This machine functions like the heart and lungs, allowing blood to continue to circulate providing oxygen to the body as well as fluids, nutrients, and medications if needed (Potger et al., 2007).

New surgical approaches have been developed that may reduce some risks associated with traditional bypass surgery. The new approach is known as "minimally invasive bypass surgery" and "off-pump surgery". This approach is performed through a small 3-5inch incision under the breast, between the ribs. This procedure can be performed on the heart while it is still beating. While this technique has become increasingly popular, it may not be appropriate for all bypass situations. Surgeons with extensive experience in this technique might have long-term outcomes that were comparable to the standard CABG operation and typically resulted in shorter hospital stays (Potger et al., 2007).

Complications of CABG include bleeding. Approximately 30%of patients require one blood transfusion after CABG and about 2% of people may require

reoperation due to excessive blood loss. These patients often need multiple blood transfusions and stay longer in the intensive care unit and hospital. Many medications can increase the risk of postoperative bleeding. Some medications, such as aspirin, clopidogrel, prasugrel, and ibuprofen may increase the risk of postoperative bleeding. These medications are generally discontinued for several days prior to coronary surgery. Patients taking other blood-thinning medications will be counseled by their surgeon on how and when to stop them before surgery (Potger et al., 2007).

CABG Surgeries

In a study done by Poston et al. (2008), the morbidity rate between patients who underwent mini-thoracotomy versus traditional full sternotomy was compared without specifying the underlying etiology or comorbidities of the patients. A total of 200 patients were equally divided into two groups with 100 patients in each group. The result of this study showed the cost intraoperatively was higher in mini-thoracotomy surgeries. However, post-operative cost significantly decreased due to shorter intubation time [4.80 ± 6.35 in mini-thoracotomy vs. 12.24 ± 6.24 hours in full sternotomy]. In addition, the length of disability after mini-thoracotomy in number of days was shorter compared to full sternotomy (Poston et al., 2008). The result of this study showed the overall shorter patients' recovery time in mini-thoracotomy versus full sternotomy (Poston et al., 2008). This study proved that even though the initial cost of mini-thoracotomy procedures is more for surgery, the cost of postoperative care is reduced due to shorter recoveries and intubation times.

These findings were similar in the study conducted by Srivastava and his colleagues (2006), who examined the length of hospitalization in 150 patients who

underwent CABG surgeries (75 in each group for mini-thoracotomy and full sternotomy). Srivastava and colleagues (2006) found that the post operatively patients who underwent mini-thoracotomies had shorter hospital stays (± 2.9 days) than those who had CABG surgeries (± 3.6 days).

Valve Repairs

There is little data regarding the use of the mini-thoracotomy approach in CABG surgeries. However, there are many studies done on the efficacy of using the mini-thoracotomy approach in mitral valve replacement.

Lee et al. (2006) compared the differences between a mini-thoracotomy and a full sternotomy approach in valve replacement procedure. Their study consisted of 86 patients with mitral valve disease, who underwent minimally invasive surgery. The authors discovered that with mini-thoracotomy, patients had less pain, better cosmetic outcome, and shorter length of hospitalization (Lee et al., 2006).

The findings were similar in the study done by Fareed and colleagues who examined the quality of life of 30 patients after mitral valve surgery. There were many advantages for those patients who underwent the minimally invasive thoracotomy: fewer complications and reduced postoperative pain, less intensive care and hospital stay, and faster recovery to work with no movement restriction after surgery for the patients having minimally invasive thoracotomy (Fareed, 2016). This study showed that patients' overall satisfaction after receiving mini-thoracotomies was improved comparing to those who received full sternotomies.

Minimally invasive thoracotomies have also proved to be beneficial in aortic valve replacement. Kaczmarczyk et al. (2015) analyzed the benefits of mini-thoracotomies on 182 patients who required mitral valve surgery out of a group of

233 patients (the remaining 51 underwent full sternotomies). The authors suggested that mini-thoracotomy aortic valve replacement and repair has been proven to be as safe and as effective as the standard approach, with other advantages such as less surgical trauma, less postoperative bleeding and blood units transfused, faster recovery, shorter hospital and ICU stay, and less pain. The authors also recognized that if minimally invasive thoracotomies were performed by surgeons who did not have extensive experience, there were many risks involved. This study indicated that mini-thoracotomies for valve replacements resulted in less pain and trauma, as long as they were done in the hands of an experienced surgeon.

Other studies also examined benefits of minimally invasive thoracotomy such as blood transfusion, intubation duration, and cost of the procedure in mitral valve repair. Goldstone et al. (2012) studied post mitral valve replacement in 1011 participants. The sample consisted of 455 patients with sternotomies and 556 patients with right mini-thoracotomies. The authors found that duration of intubation and use of blood transfusion in the minimally invasive heart surgeries group were less than those in the full sternotomy group (Goldstone et al., 2012). No extra time was needed in performing the minimally invasive procedure and therefore more cost-effective. (Goldstone et al., 2012). Minimally invasive surgeries were a safer approach and much more affordable based on shorter length of hospitalization and lower number blood transfusions (Nourelden et al., 2016 & Down et al., 2016). The results of this study showed that mini-thoracotomy was a safe approach and it was more cost effective than a full sternotomy due to shorter length in hospital stays.

Chul and Kyung-Hwan (2016) compared mortality and chest-tube drainage amount in patients who underwent mini-thoracotomy versus conventional median

full sternotomy (CMS) for atrial septal defect closure. The sample included 60 patients (42 CMS and 18 MICS). There was a significant difference in chest-tube drainage in the first 24 hours between these two types of surgeries. Minimally invasive surgeries resulted in less chest tube drainage within the first 24 hours, better cosmetic outcomes, and a faster recovery (Joon & Kyung, 2016). In this aspect the study shows that the mini-thoracotomy was the superior approach.

Length of Stay

Nourelden et al. (2016) compared differences in mini-thoracotomy valve replacement surgeries in the amount of blood loss and length of hospitalization between a full sternotomy and a mini-sternotomy approach. The sample included 70 patients [45 male and 25 females], age between 35 and 12 years, who underwent mini-thoracotomy (MICS) or conventional median sternotomy (CMS) for mitral valve replacement (MVR). The results showed that minimally invasive surgeries were a safer approach and much more affordable based on shorter length of hospitalization and lower number blood transfusions. (Nourelden et al., 2016).

Long-Term Outcomes of Mini-Thoracotomies

Glauber et al. (2015) conducted a 10-year study that reported early and long-term outcomes of 1604 patients who underwent minimally invasive mitral valve surgery (MIMVS) through right mini-thoracotomy. It was found that minimally invasive mitral valve surgery had a low mortality and morbidity rate and a very high success rate with excellent long-term results.

Lange and colleagues (2017) also compared outcomes of mini thoracotomies and full sternotomies in mitral valve repair. The mini thoracotomy patients had comparable results in regard to mortality rates and durability of the

repair. These patients also reported higher satisfaction with the overall appearance of their scars.

Another similar study completed by Mikus and colleagues (2018) showed that mini thoracotomies can be safely utilized in patients up to 80 years old who needed aortic valve replacement. The rates of morbidity and mortality are similar to the full sternotomy patients in the comparative group. This study also showed that the rates of stroke incidence postoperatively may be reduced by performing mini thoracotomies. The researchers in this study suggested also that mini thoracotomies are faster to execute and resulted in earlier extubating and shorter recovery times.

Marcos et al. (2015) found a decrease in blood transfusion rates, ventilation times, ICU care, and overall length of hospital stay in mini thoracotomies in aortic valve replacement surgeries. This study also showed that there was no compromise to the short- or long-term mortality rates when compared to the full sternotomy group.

Seitz and associates (2019) investigated the results of mini-thoracotomies in patients undergoing isolated aortic valve procedures. Their study results showed that mini thoracotomies resulted in longer bypass times and ICU stays, however they also indicated that mini thoracotomies are safe and effective and overall resulted in similar outcomes for patients.

CHAPTER 3: METHODOLOGY

An archival cross-sectional study design was used to compare the data from 2010 to 2016 in a sample of 761 patients. In this group, 547 patients underwent full sternotomy and 214 underwent mini-thoracotomy. The sample consists of patients from Valley Cardiac Surgery (VCS) clinic. Included were patients with coronary artery blockages who required coronary artery bypass grafts. All patients were operated by the same surgeon. Patients were excluded if they underwent other cardiac surgeries such as valve replacement, valve repair, mechanical hearts, or aneurysm repairs and patients who died before time for discharge.

Procedure

Data were previously collected by using the STS version 2.9 data collecting tool. This instrument has been used and evaluated, thus providing a valid and reliable result for this research (The Society of Thoracic Surgeon, 2017). The clinic data collector provided the researcher with a secure code for data access and retrieval.

Data Collecting Tool

The data specialist at the hospital collected all data used in this research using the hospital's electronic medical record system called Epic. The data specialist used specific search criteria to gather all medical record info on each patient who received a full sternotomy CABGs and mini- thoracotomy CABGs. The data was then exported all patient data to an excel spreadsheet. The spreadsheet is broken into columns that include patients identification number (this ID number will be assigned to each patient by the researcher), gender, date of admission, date of discharge, type of procedure (full sternotomy CABG vs mini-

thoracotomy CABG), length of stay from admission to discharge in number of days, and total intubation time in hours.

Method of Analysis

A one-way ANOVA and independent sample t-test were used for statistical analysis. The researcher compared the differences in average hospital stay and intubation time by analyzing three independent variables.

Variables

The first independent variable was the type of open-heart surgeries and this has two levels. The first level is mini-thoracotomy which includes any procedures performed by opening a space between the ribs to execute CABGs, valve replacements and aneurism. The second level was full sternotomy which includes any procedures performed by opening the sternum to execute surgeries including CABGs, valve replacements and aneurism.

The second independent variable was extended ventilator use, which has two levels, extended and none extended. This was used to perform chi square analysis. This data were directly taken from the archival documents and were assumed reliable and valid.

CHAPTER 4: RESULTS

From 2010 to 2016, a total of 761 patients underwent mini thoracotomy and full sternotomy at Fresno Community Hospital, Fresno Heart Hospital and Saint Agnes medical Center. There were 214 patients (29%) who underwent mini-thoracotomy CABG. There were 547 CABGs performed via the traditional median sternotomy approach (71%).

1. Is there a difference in the length of stay between mini-thoracotomy and full sternotomy in patients undergoing CABG surgeries?

An independent samples T-test was conducted to test for differences in mean number of days in hospitalization days for mini thoracotomy and full sternotomy surgeries as well as mini thoracotomy CABG and full sternotomy CABG. Results showed there is no statistically significant difference between those receiving mini thoracotomy ($M= 13.35$, $SD=12.61$) as compared to those who receiving full sternotomy ($M=16.65$, $SD= 11.23$), $t(758) = .74$, $p = .46$.

A one-way ANOVA was conducted to test for differences in mean number of days in hospitalization days for mini thoracotomy and full sternotomy. Results showed there is no statistically significant difference between those receiving mini ($M= 10.75$, $SD=10.25$) as compared to those who receiving full ($M=11.91$, $SD= 10.03$), $F(1,537) = 1.17$, $p = .23$.

2. Is there a difference in the length of stay in mini-thoracotomy and full sternotomy surgical approaches based on demographic characteristics in patients undergoing CABG surgeries?

Due to the lack of demographic information given with this dataset, the relationship between the length of hospitalization and the demographic of the patients could not be computed.

3. Is there a difference between the duration of ventilator use in mini-thoracotomy and in full sternotomy in patients undergoing CABG surgeries?

A second independent samples T-test was conducted to test for differences in the mean number of hours of ventilation time for mini thoracotomy and full sternotomy. The results showed there is no statistically significant difference between those receiving mini –thoracotomy ($M= 20.33$, $SD= 37.23$) as compared to those receiving full sternotomy ($M= 24.09$, $SD= 96.61$), $t(758) = -.55$, $p=.58$).

A one-way ANOVA was conducted to test for differences in the mean number of hours of ventilation time for mini thoracotomy and full sternotomy. The results showed there is no statistically significant difference between those receiving mini ($M= 13.62$, $SD= 17.58$) as compared to those receiving full ($M= 22.33$, $SD= 95.96$), $F(1,537) = .90$, $p=.34$.

A one way between subjects ANOVA was conducted to test for differences between total ventilation time for mini-thoracotomy and full sternotomy. The results showed that average time on ventilator does not vary by these two different types of surgery, $F(1,539) = .69$, $p =.41$. Those receiving mini ($M= 11.27$, $SD= 12.51$), spend fewer hours on the ventilator as compared to those receiving full ($M= 11.91$, $SD= 10.03$). These differences are not significant.

Another similar study conducted by Poston et al. (2008), The result of this study showed the length of disability after mini-thoracotomy in number of days was shorter compared to full sternotomy [3.77 ± 1.51 vs. 6.38 ± 2.23 days] [$t = -2.15$; $P = 0.04$] (Poston et al., 2008). However, Figure 1 shows the results of this study had an overall shorter patient recovery time in mini-thoracotomy versus full sternotomy.

These findings were similar to the study done by Goldstone et al. (2012) which studied post mitral valve replacement in 1011 participants [455 patients had sternotomies while 556 patients had right mini-thoracotomies]. The authors found that duration of intubation was about the same and use of blood transfusion in the minimally invasive heart surgeries group were less than those in the full sternotomy group (Goldstone et al., 2012). However, our study showed no significant difference between the two groups.

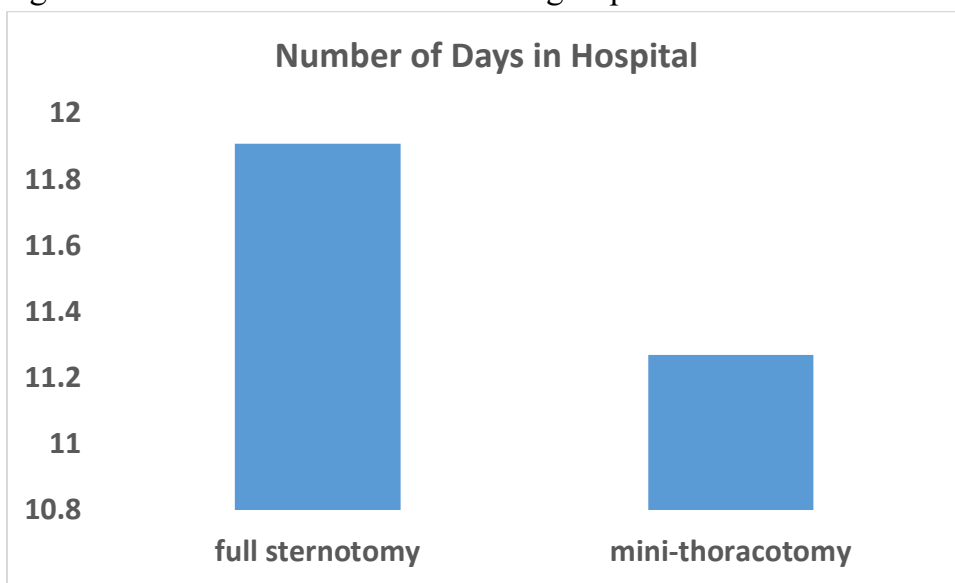


Figure 1. The average number of days spent in the hospital for full CABG and mini CABG.

There was not a significant difference between patients receiving mini ($M= 13.62$, $SD= 17.58$) as compared to those receiving full ($M= 22.33$, $SD= 95.96$), $t(537) = -.95$, $p = .34$.

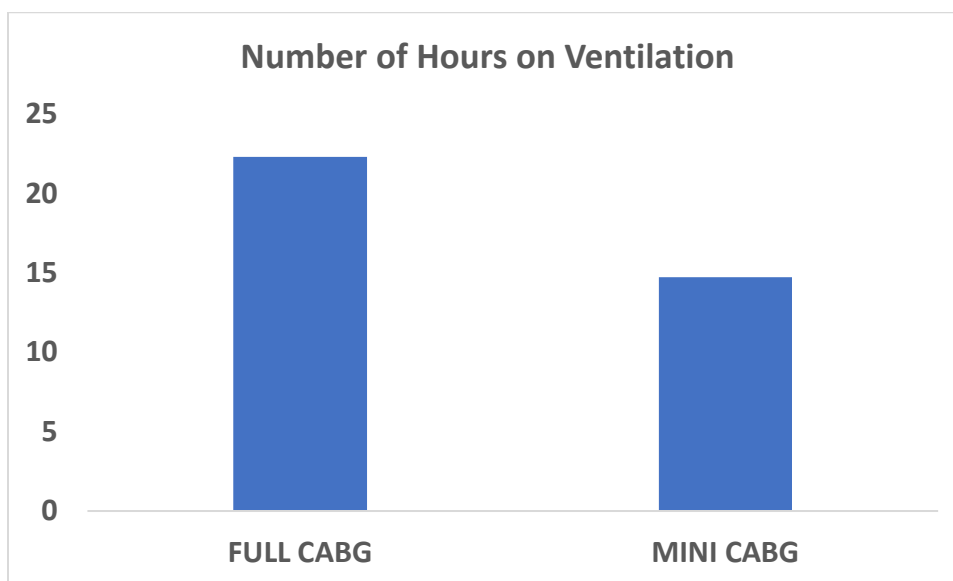


Figure 2 shows the average number of hours on ventilation for full CABG and MINI CABG.

There was no significant difference in duration of ventilator use in between the two groups.

Discussion

A total of 761 patients underwent mini-thoracotomy surgery vs full sternotomy between January 1, 2010 and December 2016. There were no statistically significant differences between the mini-thoracotomy group and the full sternotomy group in length of hospitalization or intubation time. The results were not as expected, patients receiving full CABG spend an average of 11.91 days (SD=10.03) in hospital while patients receiving mini CABG spend an average of 10.75 days (SD=10.25) in the hospital. The result was different from Srivastava and colleagues (2006) who found a longer length of stay in patients undergoing full sternotomy in CABG surgeries.

Our findings were in line with Lange and colleagues (2017) who compared outcomes of mini thoracotomies and full sternotomies in mitral valve repairs. In their study, the mini thoracotomy patients had comparable results in hospital length of stay.

Our data suggests that mini-thoracotomies are equally as safe as total thoracotomy for CABG procedures when length of stay is concerned, Since there was a lack of demographic information in this dataset, we were unable to explore the relationship between the length of hospitalization and the demographics of the patients.

The results for average ventilation time were similar, patients receiving full sternotomy spent 22.33 hours (SD =95.96) on ventilator while patients receiving mini- thoracotomy CABG spent 13.62 hours (SD= 17.58) on ventilator. The results of this study did not show that mini-thoracotomies result in faster recovery times had shorter intubation times. While our data showed no significant difference in ventilation time for patient receiving both surgeries for CABG, literature suggests that there is an improvement in length of ventilation times for patients receiving mini thoracotomies for treatment of other heart conditions. Goldstone et al. (2012) studied post mitral valve replacement and found that duration of intubation in the minimally invasive heart surgery group was less than those in the full sternotomy group.

It might be possible that the length of intubation time and length of hospital stay were similar in patients receiving full sternotomy and mini -thoracotomy due to similar preexisting comorbidities requiring CABG surgery. Common underlying etiologies that lead to coronary artery disease are hypertension, diabetes mellitus and history of myocardial infarction. As a result, these patients had similar length of stay in the hospital and intubation time, regardless of the surgical approach. Patients who participated in other cardiac surgeries, such as valve repairs and replacements might have a different underlying etiology. Valve repair and replacement patients may not have as many comorbidities, which might require less length of stay and less intubation time. The intubation time in our study

was similar in both surgical approaches, indicating that mini-thoracotomy was very comparable to full sternotomy for respiratory status.

CHAPTER 5: CONCLUSION

The full sternotomy approach has been utilized as the standard approach to cardiothoracic surgery for many years. Patients suffering from pain and disabilities after sternotomy surgeries have led to multiple physical, social and psychological issues. Open-heart surgeries negatively affect the quality of life and an individual's well-being in the society (Nourelden et al. ,2016). Minimally invasive thoracotomy has been reported in literature to decrease complications and improve the quality of life for patients (Fareed, et al., 2016). The results of this study were somewhat surprising, there was no statistically significant differences in length of hospital stay or intubation times.

In recent years there has been an influx in the number of mini thoracotomies being performed worldwide. Many investigators have reported positive results and outcomes when treating a variety of heart conditions. Benefits of the mini thoracotomy surgeries included improved cosmetic outcomes, higher patient satisfaction, improvement on hospitalization and intubation time. However, those surgeries were mostly done in patients requiring valve repairs. Few studies were done for patients needing CABG surgeries.

Some studies have no reference group for comparison, and the reference groups may have significant differences in risk factors. Even though the result of this study cannot identify which approach is superior, we can suggest that mini-thoracotomies, at the very least, are equally as safe and have similar outcomes in length of stay and intubation duration as the full sternotomy approach.

Limitations

This study was limited due to the missing demographic data. Postoperative care took place at three different locations, which might have affected the length of stay.

Future Direction

Minimally invasive surgical approaches have been utilized in other specialties for many years and have been proven safer with better outcomes for patients. With increasing patient interest and education on minimally invasive procedures, studies like this are becoming more important than ever. Future studies should include multiple outcome variables. Questions for future studies may include: what are the cost differences in these procedures are there any financial benefits for hospitals, are there any differences when patient demographics are included, are mini thoracotomies as reproducible as full sternotomies? Other studies should focus on comparing patient satisfaction, pain levels, and length of time before they were able to engage in normal activities. Larger surgical centers that are performing mini thoracotomies should be involved so that a bigger sample size can be obtained.

REFERENCES

- BioMed Central Ltd. \$\$Q BioMed Central Ltd. (2006). *Journal of Cardiothoracic Surgery*. Montrief, Koyfman, & Long. (2018). Coronary artery bypass graft surgery complications: A review for emergency clinicians. *American Journal of Emergency Medicine*, 36(12), 2289-2297.
- Cooper, Z., Sayal, P., Abbett, S., Neuman, M., Rickerson, E., & Bader, A. (2015). A Conceptual Framework for Appropriateness in Surgical Care: Reviewing Past Approaches and Looking Ahead to Patient-centered Shared Decision Making. *Anesthesiology*, 123(6),1450-1454.
- Glauber, Miceli, Canarutto, Lio, Murzi, Gilmanov, . . . Solinas. (2015). Early and long-term outcomes of minimally invasive mitral valve surgery through right minithoracotomy: A 10-year experience in 1604 patients. *Journal of Cardiothoracic Surgery*, 10(1), 181.
- Goldstone, Andrew B., Atluri, Pavan, Szeto, Wilson Y., Trubelja, Alen, Howard, Jessica L., Macarthur, John W., Newcomb, Craig, Donnelly, Joseph P., Kobrin, Dale M., Sheridan, Mary A., Powers, Christiana, Gorman, Robert C., Gorman, Joseph H., Pochettino, Alberto, Bavaria, Joseph E., Acker, Michael A., Hargrove, W. Clark, and Woo, Y. Joseph. "Minimally Invasive Approach Provides at Least Equivalent Results for Surgical Correction of Mitral Regurgitation: A Propensity Matched Comparison." *The Journal of Thoracic and Cardiovascular Surgery* (2012): *The Journal of Thoracic and Cardiovascular Surgery*. Web.

- Fareed, Abou Senna, Sewielam, Fouad, Sabry, & Bassiony. (2016). Early outcome of minimally invasive mitral valve surgery. *Journal of the Egyptian Society of Cardio-Thoracic Surgery*, 24(2), 173-180.
- Ira Tabas. (2016). Heart disease: Death-defying plaque cells. *Nature*, 536(7614), 32-33.
- Inderbitzi, R., Schmid, R., Melfi, F., & Casula, R. (2012). *Minimally Invasive Thoracic and Cardiac Surgery: Textbook and Atlas*.
- Jenkinson, Joshi, Sanders, Okiwelu, Shetty, & Passage. (2016). Minimally Invasive Aortic Valve Surgery - Our Early Experience. *Heart, Lung and Circulation*, 25(8), E96.
- Joon Chul, J., & Kyung-Hwan, K. (2016). Minimally Invasive Cardiac Surgery versus Conventional Median Sternotomy for Atrial Septal Defect Closure. *Korean Journal Of Thoracic & Cardiovascular Surgery*, 49(6), 421-426. doi:10.5090/kjts.2016.49.6.421.
- Kaczmarczyk, Marcin, Szalanski, Przemyslaw, Zembala, Michal, Filipiak, Krzysztof, Karolak, Wojciech, Wojarski, Jacek, . . . Zembala, Marian. (2015). Minimally invasive aortic valve replacement - pros and cons of keyhole aortic surgery. *Kardiochirurgia I Torakochirurgia Polska*, 12(2), 103-110.
- Kelly, M. (2010). Regulating the Reproduction and Mothering of Poor Women The Controlling Image of the Welfare Mother in Television News Coverage of Welfare Reform. *Journal of Poverty*, 14(1), 76-96.

- Lee, S., Chang, B., Lim, S., Hong, Y., Yoo, K., & Kang, M. (2006). Clinical Results of Minimally Invasive Open-Heart Surgery in Patients with Mitral Valve Disease: Comparison of Parasternal and Low-Sternal Approach. *Yonsei Medical Journal*, 47(2), 230-236.
- Li, S., Chou, Shin-Yi, Deardan, James, Deily, Mary, & Wang, Yang. (2012). Three Essays on Entry, Volume and Outcomes in Hospital Markets, ProQuest Dissertations and Theses.
- Mikkola, T., Gissler, M., Merikukka, M., Tuomikoski, P., & Ylikorkala, O. (2013). Sex Differences in Age-Related Cardiovascular Mortality. *PLoS One*, 8(5), PLoS One, May 2013, Vol.8 (5).
- Mikus, Calvi, Campo, Pavasini, Paris, Raviola, Panzavolta, Tripodi, Ferrari, and Del Giglio. "Full Sternotomy, Hemisternotomy, and Minithoracotomy for Aortic Valve Surgery: Is There a Difference?" *The Annals of Thoracic Surgery* 106.6 (2018): 1782-788. Doi: 10.1016/j.athoracsur.2018.07.019
- Montrief, Koyfman, & Long. (2018). Coronary artery bypass graft surgery complications: A review for emergency clinicians. *American Journal of Emergency Medicine*, 36(12), 2289-2297.
- Negargar Sohrab, Anvari Shahriar, Abbasi Kyomars, & Enamzadeh Elgar. (2014). Immediate Postoperative Complications in Patients Undergoing CABG; Investigating the Role of Prior Coronary Stenting. *Journal of Cardiovascular and Thoracic Research*, 6(4), 229-234.

- Nourelden, Khudair, Alnajjar, & Arnous. (2016). 3. Early outcomes of minimally invasive versus conventional mitral valve surgery in mitral valve diseases. A single institutional experience. *Journal of the Saudi Heart Association*, 28(3), 186-187.
- Pilkerton, C., Singh, S., Bias, T., & Frisbee, S. (2015). Changes in Cardiovascular Health in the United States, 2003-2011. *Journal Of The American Heart Association*, 4(9), E001650.
- Poston, R. S., Tran, R., Collins, M., Reynolds, M., Connerney, I., Reicher, B., ... Bartlett, S. T. (2008). Comparison of economic and patient outcomes with minimally invasive versus traditional off-pump coronary artery bypass grafting techniques. *Transactions of the Meeting of the American Surgical Association*, 126, 281-289. doi:10.1097/sla.0b013e31818a15b5.
- Potger, K.C., McMilian, D., Southwell, J., Connolly, T., Smith, K.K., & Ambrose, M. (2007). Transfusion and bleeding in coronary artery bypass grafting: An on-pump versus off-pump comparison. *J. Extra Corpor Technol.*, 39 (1), 24-30.
- Sakaguchi, T. (2016). Minimally invasive mitral valve surgery through a right mini-thoracotomy. *General Thoracic and Cardiovascular Surgery*, 64(12), 699-706.
- Saleh, M., & Ambrose, J. (2018). Understanding myocardial infarction. *F1000Research*, 7, 1378.
- Schoen, F. (2010). Introduction to congenital heart disease articles in Cardiovascular Pathology. *Cardiovascular Pathology*, 19(5), 257-258.

Seitz, Goldblatt, Paul, Marcus, Larobina, & Yap. (2019). Minimally invasive aortic valve replacement via right anterior mini-thoracotomy: Propensity matched initial experience. *Heart, Lung and Circulation*, 28(2), 320-326.

Walker, I., Reshamwalla, S., & Wilson, I. (2012). Surgical safety checklists: Do they improve outcomes? *British Journal of Anaesthesia*, 109(1), 47-54.

Yi, Youn, Hong, Song, & Yoo. (2012). Comparison of Long-Term Outcome of Off-Pump Coronary Artery Bypass Grafting Versus Drug-Eluting Stents in Triple-Vessel Coronary Artery Disease. *The American Journal of Cardiology*, 109(6), 819-823.

APPENDIX A: CONCEPTUAL FRAMEWORK

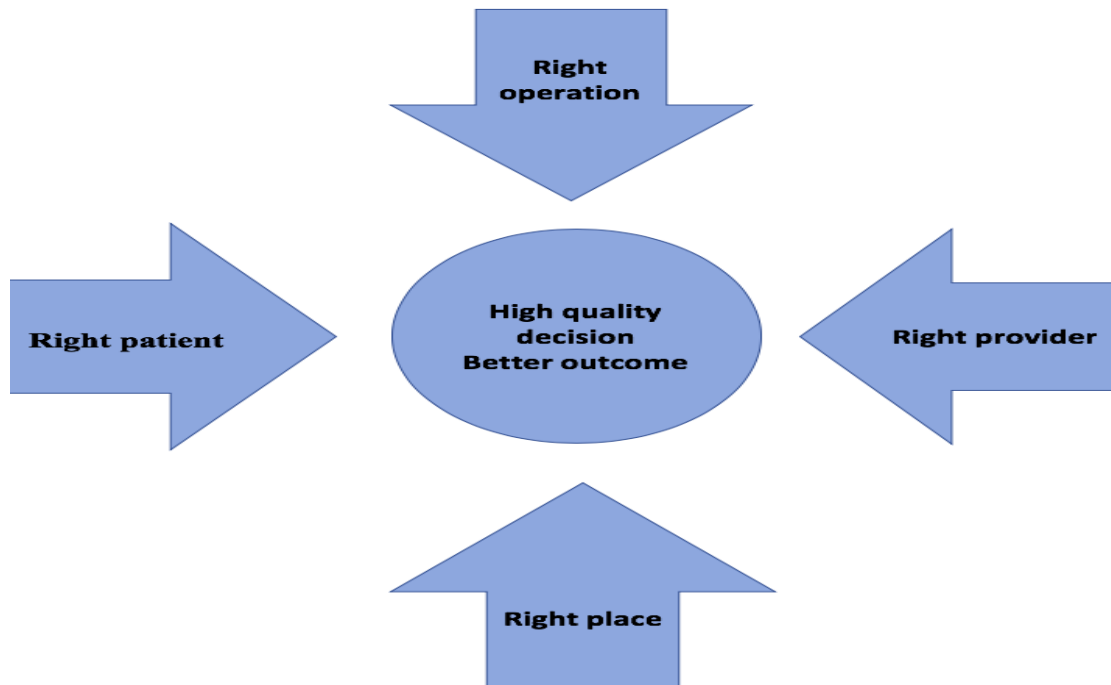


Figure 1. The conceptual framework demonstrating the right provider, right patient, right operation, and right place leads to a high quality decision (Cooper et al., 2015).

APPENDIX B: INSTITUTIONAL REVIEW BOARD

Institutional Review Board

Date / /2018
Valley cardiac surgery

Address: 1903 E Fir Ave #101

RE: Permission to Conduct Research Study

Dear Dr. Pervaiz Chaudhry

I am writing to request permission to conduct a research study at your clinic. I am currently enrolled in the Doctorate of Nursing Practice (DNP)a at California State University in Fresno, CA, and am in the process of writing my doctorate project. The study is entitled “improving the quality of life by undergoing mini thoracotomy coronary artery bypass grafting by decreasing length of hospitalization and post operation complications”

I hope that the school administration will allow me to recruit 1049 patients from the patient list to anonymously complete the research. Due to the nature of the study, I will not have any direct contact with the patient population of this study.

If approval is granted, the survey results will be pooled for this doctorate project and individual results of this study will remain absolutely confidential and anonymous. Should this study be published, only pooled results will be documented. No costs will be incurred by either your clinic or the patients.

Your approval to conduct this study will be greatly appreciated. I would be happy to answer any questions or concerns that you may have at that time. You may contact me at my email address: __badrkhani20@mail.fresnostate.edu__.

If you agree, kindly sign below and return the signed form in the enclosed self-addressed envelope. Alternatively, kindly submit a signed letter of permission on your institution’s letterhead acknowledging your consent and permission for me to conduct this survey/study at your institution.

Sincerely,

Shirin Badrkhani FNP, BSN, PHN

Enclosures

cc: Dr. Vivian Wong research chair , and Dr Sylvia Miller Research Advisor,



Valley cardiac surgery gives Shirin Badrkhani permission to use data that we have collected in regards to all aspects of minimally invasive thoracotomy and full sternotomy procedures. Shirin Badrkhani will be using our data in her doctorate of nursing practice project titled, “ improving the quality of life by undergoing mini thoracotomy coronary artery bypass grafting by decreasing length of hospitalization and post operation complications.”

Approved by:

Dr. Pervaiz Chaudhry MD

Print your name and title here

Signature

Date

A handwritten signature in black ink, appearing to read "Pervaiz Chaudhry", is written over a horizontal line.

07/25/2018

APPENDIX C: DATA COLLECTING TOOL

APPENDIX D: IRB APPROVAL LETTER



California State University, Fresno
School of Nursing
IRB Approval

Date: October 16, 2018

RE: DNP 1827 Comparing Two Surgical Outcomes: Mini-Thoracotomy or Full Sternotomy in Coronary Artery Bypass Grafting Surgery

Dear Shirin Badrkhani,

As the Chair of the School of Nursing Research Committee, serving as the Institutional Review Board for the School of Nursing, I have reviewed and approved your review request for the above-referenced project for a period of 12 months. I have determined your study to meet the criteria for Minimal Risk IRB review.

Under the Policy and Procedures for Research with Human Subjects at California State University, Fresno, your proposal meets minimal risk criteria according to section 3.3.7: Research in which the risks of harm anticipated are not greater, probability and magnitude, than those ordinarily encountered in daily life or during the performance of routine physical or psychological examinations or tests.

The Research Committee may periodically wish to assess the adequacy of research process. If, in the course of the study, you consider making any changes in the protocol or consent form, you must forward this information to the Research Committee prior to implementation unless the change is necessary to eliminate an apparent immediate hazard to the research participant(s).

This study expires: October 16, 2019

The Research Committee is authorized to periodically assess the adequacy of the consent and research process. All problems having to do with subject safety must be reported to the Research Committee. Please maintain proper data control and confidentiality.

If you have any questions, please contact me through the CSU, Fresno School of Nursing Research Committee at nishanair@csufresno.edu.

Sincerely,

Nisha Nair, DNP, RNC, CNS, CNE, IBCLC
School of Nursing, Research Committee, Chair

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