



A COMPARATIVE STUDY TO ANALYZE THE OUTCOMES OF BLOOD PRESSURE AND HEMOGLOBIN AFTER ON-PUMP & OFF-PUMP CORONARY ARTERY BYPASS GRAFTING:

Physiology

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ABSTRACT

AIM- To compare and analyze the variations in Blood Pressure and Hemoglobin during the pre and post-operative period in patients undergoing On-pump and Off-pump CABG.

SAMPLES- This observational comparative study was conducted among 242 patients (121 each group).

RESULTS- Post Systolic and Diastolic Blood Pressure are found to be increased on both the techniques. This post CABG hypertension usually comes to normal 4 to 6 weeks after the surgery. In majority of patients Hemoglobin (Hb) level is found to be reduced postoperatively on both the techniques of doing CABG.

CONCLUSIONS- Post CABG results of SBP, DBP and Hb levels showed almost similar outcomes among both the techniques of performing CABG. The main observation noticed in this study is the post CABG Hb level, which is found to be lower in females than from males.

KEYWORDS

Off-pump CABG, On-pump CABG, Coronary Artery Disease

INTRODUCTION

Coronary Artery Bypass Graft Surgery (CABG), is a surgical procedure to restore normal blood flow to an obstructed coronary artery. It reroutes blood flow around a blockage in the coronary artery so that the heart muscles can maintain a good blood supply. Yusuf et al. reported that patients who underwent CABG had significantly lower mortality than those who opted for medical treatment^[1]. Two alternative techniques are available to perform CABG. Either with the heart stopped, a procedure called "On-Pump beating" surgery or on a beating heart, a procedure called "Off-Pump beating" surgery. The only difference is that the heart is stopped using Cardioplegia for On-Pump Surgery, which is decided by the Surgeon at the time of surgery. There are a lot of physiological changes occurring throughout the body which can be different in these two techniques of doing CABG. On-pump CABG is the more traditional method of performing bypass surgery. However its resultant inflammatory effects cause renal dysfunction, gastrointestinal distress and cardiac abnormalities which have forced the surgeons to look for alternatives to the procedure^[2]. The parameters being used in this study are Systolic-Diastolic Blood Pressure and Hemoglobin.

The rationale of the study is to analyze and bring out different physiological variations, if any, between these two techniques of doing CABG and to find out if there is any benefit to On-pump in comparison to Off-pump CABG, in bringing out better physiological outcomes.

METHODOLOGY

STUDY DESIGN: Descriptive comparative design has been used for this study.

STUDY PERIOD: The study was conducted in between February 2019 to June 2019.

STUDY SETTING: The study was conducted at Department of Cardiovascular and Thoracic Surgery, Little Flower Hospital, Angamaly, Kerala.

POPULATION: A total of 242 samples with 121 in each group were analyzed in this study.

SAMPLING TECHNIQUE: Simple random sampling.

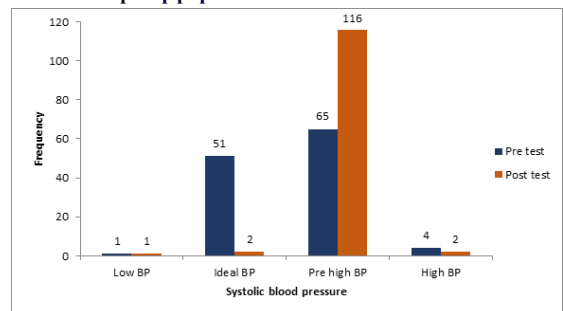
INCLUSION CRITERIA: Male and Female patients aged between 30-80 years of age, Willing participants, Patients not suffering with any other major complications.

EXCLUSION CRITERIA: Unwilling patients, Patients with any clinically significant valve diseases, Patients whose surgical technique could not be defined, Clinical reservations of the surgical team regarding patients with risk factor profiles that predisposed them to an extremely high risk of an adverse effect

STATISTICAL ANALYSIS: Kolmogorov smirnov test is used for normality tests. Variable with $p > 0.05$ is considered as normal. All variables in the group are equally distributed.

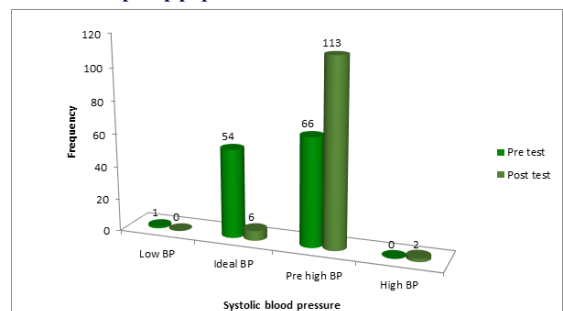
RESULTS:

Graph 1: SBP distribution among pretest- posttest assessment periods in On-pump population



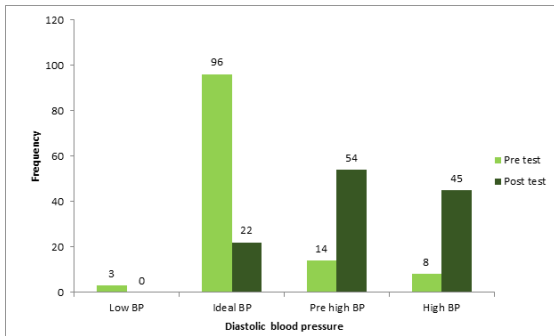
Graph 1 shows the distribution of systolic blood pressure among the on-pump patients. The mean SBP in the pre-test period was 128.7 ± 17.58 and it turns to 144.00 ± 13.23 in the post op period. We can see an increase in SBP in the post-operative period and the observed difference was highly statistically significant ($p = .000$). Thus we conclude that SBP will increase in on pump patient population after the surgery.

Graph 2: SBP distribution among pretest- posttest assessment periods in Off-pump population



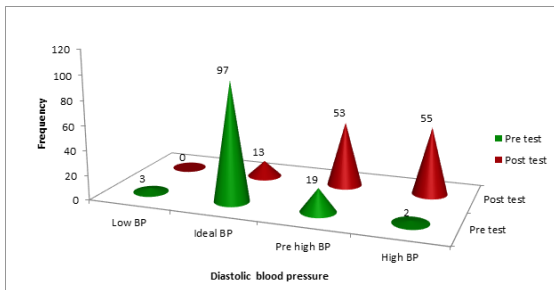
Graph 2 shows the comparison of SBP among off pump patients. The mean SBP in the pre-test period and the post-op period were 125.75 ± 13 . The observed difference was highly statistically significant ($p = .000$). Thus we conclude that SBP will increase in off pump patient population after the surgery.

Graph 3: DBP distribution among pretest- posttest assessment periods in On-pump population



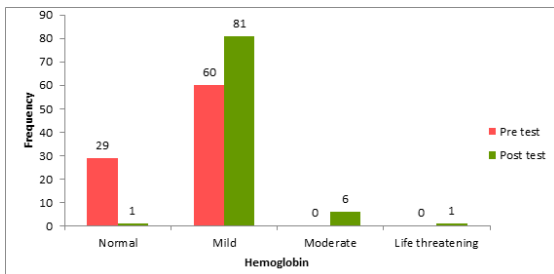
Graph 3 shows the distribution of Diastolic blood pressure among the On-pump patients. The mean DBP in the pre-test period was 79.22 ± 9.05 and it turns to 88.14 ± 7.79 in the post op period. We can see an increase in DBP in during post-operative period and the observed difference was highly statistically significant ($p=0.000$). Thus we conclude that DBP will increase in on pump patient population after the surgery.

Graph 4: DBP distribution among pretest- posttest assessment periods in Off-pump population

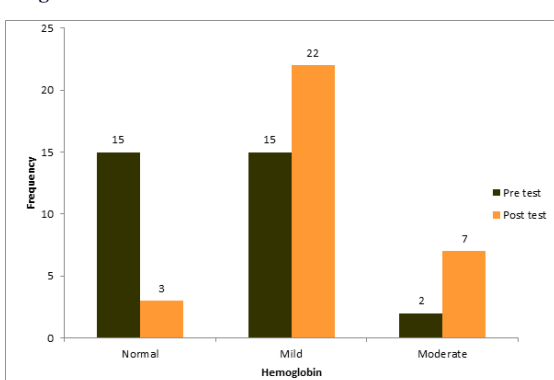


The mean DBP in the pre-test period was 78.5 ± 7.96 and it turns to 89.77 ± 7.49 in the post op period. We can see an increase in DBP in the post-operative period and the observed difference was highly statistically significant ($p=0.000$). Thus we conclude that DBP will increase in off pump patient population after the surgery.

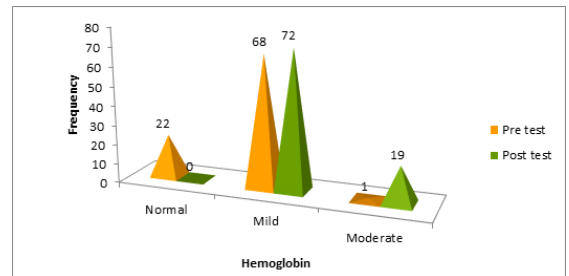
Graph 5: Hemoglobin distribution of On-pump population among males



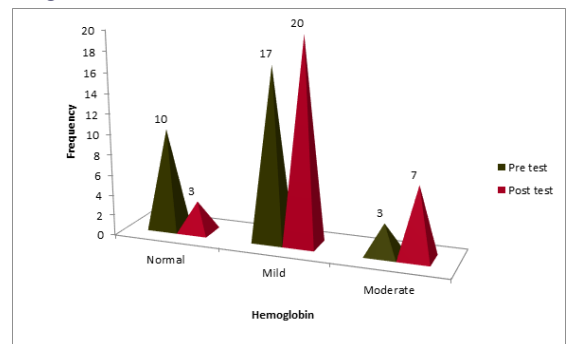
Graph 6: Hemoglobin distribution of On-pump distribution among females



Graph 7: Hemoglobin distribution of Off-pump distribution among males



Graph 8: Hemoglobin distribution of Off-pump distribution among females



Graph 7, 8 shows the gender distribution of hemoglobin among Off-pump patient population. The mean pre-test score of hemoglobin among males was 12.69 ± 1.55 mg/dL and post test score was 10.97 ± 1.15 mg/dL. There is a reduction in Hb among males in post op periods and it was highly statistically significant ($p=0.000$). The mean pre-test score of hemoglobin among males was 12.68 ± 1.52 mg/dL and post test score was 10.48 ± 1.13 mg/dL. There is a reduction in Hb among females in post op periods and it was highly statistically significant ($p=0.000$).

DISCUSSION

This study was undertaken to analyze and compare the outcomes of physiological parameters among On-pump and Off-pump techniques of doing CABG.

In this study, both On-pump as well as Off-Pump CABG's were performed more among the patients within the age group of 51 to 70 years. And this is in accordance with a study conducted by Arun Natarajan that states that an increasing number of elderly individuals are now undergoing CABG, when maximal pharmacological treatment fails to limit the symptoms of dyspnea and angina [3].

In 2016, Krishnan et al. have conducted a community based cross sectional study to know the Prevalence of CAD and its risk factors in Kerala. The results showed that overall age adjusted prevalence of any CAD was 12.5 %: men 9.8 %, women 14.3 % CAD ($p<0.001$) [4]. This is in accordance with our present study that shows CAD is more in females.

In both the groups, majority of the patients had hypertension during the pre-operative period. And hence, most of the patients were taking preoperative antihypertensive drugs. But it is noticed in the present study that Hypertension was still present even after CABG surgery among both the groups, which was highly statistically significant. That is, there was elevation in both Systolic as well as Diastolic BP. This elevation in BP can be due to multiple reasons among which are: the pain of the cut, stress and tense of the patient and because of some medications, which the patient was receiving preoperatively may get withdrawn postoperatively, thereby leading to shooting up of Blood Pressure [5]. This post CABG hypertension usually comes to normal range 4 to 6 weeks after the surgery.

Hence, as far as the parameters SBP and DBP are concerned, both On-pump as well as Off-pump techniques of doing bypass surgery proved to give uniform results post operatively and there was no significance noticed on one over other method.

In majority of patients Hemoglobin level is found to be reduced on

both On-pump as well as Off-pump techniques of doing CABG. And it is noticed that Hb level of females were much reduced when compared to men. And the reason behind this can be well explained on the basis of certain studies conducted by several researchers like Koch CG et al^[6], Rogers MA et al^[7], Ried M et al^[8] suggesting, it is a matter of fact that women have a higher bleeding tendency and are more likely to be transfused than men^[6-8].

Thus this study figure out and validate the fact that even though Off pump techniques has got several advantages over On-pump technique like reduced myocardial injury, inflammatory response, postoperative morbidity etc. there was no significant difference noted when the parameters SBP, DBP and Hb were considered.

CONCLUSION

CABG being one of the most common types of cardiac surgery, lowers the risk of Myocardial Infarctions and patients can remain symptom free for as long as 10-15 years. Though this surgery became more common, there are 2 methods of performing CABG, and they are On-pump and Off-pump techniques. Recent studies reveals several advantages for Off-pump technique than performing On-pump technique. So the intention of this study was to analyze if there is any physiological significance of doing On-pump over Off-pump technique. The physiological parameters being considered in this study includes SBP, DBP and Hb. Results of present study reveals CAD is found to be more common among the age group 50-70 years and also it is noticed that females are more affected than males. Post CABG results of SBP, DBP and Hb levels showed almost similar outcomes among both the techniques of performing CABG surgery. But the main observation noticed in this study is the post CABG level of Hb, which is found to be lower in females than from the males.

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