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Effect of bariatric surgery on physiological parameters in short span of 1-month post-surgery.

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ABSTRACT

Bariatric surgery is one of the most promising weight loss options for obese individuals with comorbidities. After bariatric surgery an individual loses significant amount of weight, ranging from 4-6kgs in first month itself depending on type and grade of obesity as well as type of surgery. This weight loss plays a major role in metabolic changes occurring in the body. These changes are directly correlated to physiological parameters like heart rate and blood pressure, the normalcy of which is not yet confirmed by numerous researches found in databases. Materials and methodology: Observational study conducted on cohort of 250 subjects undergoing bariatric surgery. The subjects heart rate and blood pressure were monitored at two instances pre-surgery and post-1month surgery. Results: Significant difference was found for resting heart rate ($p < 0.05$) and blood pressure ($p < 0.05$) post-surgery. It suggests decrease of at least 3bpm in RHR, 7mmHg in SBP and 2mmHg in DBP. Conclusion: Bariatric surgery is effective in reducing RHR and BP significantly in short span of 1-month. **Key words:** Bariatric surgery, metabolic surgery, post-surgery, resting heart rate, blood pressure, physiological parameters, obesity, BP after BS, HR after BS.

Introduction

Obesity is considered as one of the most morbid diseases. It is all related to mortality and many times directly linked to cause of death. Obesity doesn't exist in the body solely but it either accompanies other metabolic syndromes or invites them with it. (Ahirwar & Mondal, 2019)

Due to rapid increase in obesity, people tend to find a solution for weight loss in the form of exercise classes, diet, gym, fitness center and many other allied cares. But too many failures and inability to lose weight quickly or sustain the achieved weight loss, concept of metabolic surgery/bariatric surgery have come into light.(Kalra & Unnikrishnan, n.d.; Luhar et al., 2020)

Bariatric surgery (BS) is one of the most promising weight loss procedures, with high sustenance rate. It not only improves physiological levels of an individual but also gives cosmetic appearance.(5.06.01-Bariatric-Surgery-Review, n.d.; Keshavjee et al., 2021) It provides good long-term improvement over morbid diseases. Life-style, genetic and morbid diseases such as diabetes mellitus(Schauer et al., 2014, 2017), hypertension, hypothyroidism, pulmonary diseases tend to improve after BS. Not only morbid diseases are managed by BS but also orthopedic problems and respiratory disorders due to excess body weight contributed by obesity are relieved.(5.06.01-Bariatric-Surgery-Review, n.d.; Kalra & Unnikrishnan, n.d.)

It provides immense improvement in cosmetic appearance in long-term; overweight candidates unlike obese individuals can report it in short span of just 6-months post-bariatric surgery (PBS). It has also gained its popularity amongst post-delivery females as it is difficult for some women to go back to their normal weight post-partum.(5.06.01-Bariatric-Surgery-Review, n.d.) In initial month, weight loss post-surgery varies from minimum of 4kgs up to maximum of 8kgs. The higher the obesity grade, higher is the weight loss post-surgery. With the weight loss occurring at such rapid pace in just 1-month of surgery, suggests a rapid shift occurring in metabolism too.(Liao et al., 2022; Lopes et al., 2022; Silva et al., 2019; Sjöström et al., 2004) The effect of bariatric surgery on physical, physiological, psychological parameters is well researched and evidence suggests improvement in all of it. Although researches have shown effectiveness of BS, no evidences are found which suggests immediate effect of BS. Resting heart rate and blood pressure are the most basic and important vitals which briefs clinicians about physiological status of the patient and if further investigations are required or not. RHR(Brasel et al., 2007; Jiang et al., 2015a; Woodward et al., 2014) and BP(Joseph et al., 2017; Ljunggren et al., 2016) are basics clinical signs suggesting numerous illnesses with its variability for diseases like, hyper- or hypothyroid, heart diseases, metabolic disorders (diabetes mellitus, kidney diseases), respiratory illnesses, hyper-/hypotension, coronary artery disease, congestive heart failure, tachycardia, physiological rise or drop (fever, exercise, hormonal changes) and list continues.(Jiang et al., 2015b) In this scenario it is important to track and establish normalcy of RHR and BP post-bariatric surgery.(Lockwood et al., 2004; Sharashova et al., 2016)

This study aims to find out effect of BS in as short span as 1-month post bariatric surgery on physiological parameters and also to find normalcy of resting heart rate and blood pressure post bariatric surgery.

Materials and Methodology

Study design

It is a prospective observational study including cohort of 250 study participants undergoing bariatric surgery. The data was collected from bariatric surgery center Hope obesity hospital, Ahmedabad, Gujarat. The study duration was 3-months.

Inclusion criteria

Age criteria – 18 years to 70 years

Gender – both male and female

All the candidates undergoing bariatric surgery and willing to participate.

Exclusion criteria

Any subject not willing to participate

Outcome measures

Resting Heart Rate (RHR)

Systolic Blood pressure (SBP)

Diastolic Blood pressure (DBP)

Procedure

The subjects were informed about the study and consent was taken. All the parameters were recorded pre-surgically and post-1month of surgery during the follow-up period. There was no drop-out recorded from the study. Resting heart rate was assessed using finger probe device (*Dr trust USA fingertip pulse oximeter*), blood pressure was measured using electronic sphygmomanometer (*Omron HEM 7124*). Electronic devices were given preference over manual recording for physiological measurements to avoid human error and subjective bias.(Buchanan, n.d.; Hermand Clemence; Richalet Jean-Paul; Lhuissier Francois J., 2021; Iyriboz et al., 1991; Losa-Iglesias et al., 2016) All the parameters were recorded only after giving 10 minutes of rest to the subjects to avoid any over or under estimation of

recordings. (American Thoracic Society ATS Statement: Guidelines for the Six-Minute Walk Test THIS OFFICIAL STATEMENT OF THE AMERICAN THORACIC SOCIETY WAS APPROVED BY THE ATS BOARD OF DIRECTORS MARCH 2002, n.d.; Pescatello et al., n.d.)

Results And Discussion

The statistical package SPSS 22.0 was used to analyze the data. The Kolmogorov-Smirnov (KS) test was used to test normality of the data. Wilcoxon signed rank test was used to conduct within group analysis amongst cohort participants and compare them at two different instances which prior to surgery and post-surgically. Significant difference was considered when $p < 0.05$. The data are presented as mean (SD). Baseline characteristics of participants shown in table 1.

The present study was conducted to assess change of vitals in short span of post-1 month of bariatric surgery. This study also suggests about how much drop can be expected in physiological parameters post bariatric surgery. The results suggest significant difference between comparisons of vitals of the same subjects at two instances, that is drop-in resting heart rate and blood pressure post-surgically as shown in table 2. The decrease in heart rate and blood pressure is contributed to increased vagal stimulation as brought by weight loss PBS. Since there is scarcity of evidence on direct relation of effect of BS on RHR and BP, the result in present study can be compared to similar studies conducted in bariatric surgery patients in whom aerobic exercise protocol was administered. The hypotensive effective of exercise which is beneficial for hypertensive patients can be compared to bariatric surgery providing similar effect to reduce resting heart rate and blood pressure PBS. (Cornelissen et al., 2010) Cardiac autonomic dysregulation is considered prime cause for disrupted heart rate and blood pressure in obese individuals, the weight loss brought about after surgery may correct this dysregulation by improving resting energy expenditure and provide beneficial effect for BS patients. (Benjamim et al., 2021; Gil et al., 2021; Koschker et al., 2023; Rebello et al., 2022)

This study is unique and no studies are found in our knowledge that provides information about RHR and BP immediately post-surgically in first month. Although two studies were found but it included lesser sample size ($n=20$), no information on blood pressure and heart variability was noted as a part of baseline measurement for exercise protocol. (Ibache et al., 2020; Ricci et al., 2020) This study provides important information for not only clinicians and patients but also to everyone who are involved in care of BS patients. In current study all

vitals were not included, further study can include respiratory rate, oxygen saturation and temperature. Also, this study could be conducted in diverse way considering ethnicity, extending it to different states/cities of the country to make it much more generalized.

Conclusion

Resting Heart rate and Blood pressure are important vital parameters as it directly correlates with health of an individual. Bariatric surgery yields positive effect on physiological parameters of obese individuals and post surgically one can expect decrease of 3bpm, 7mmhg, and 2mmhg in RHR, SBP and DBP respectively in just 1-month.

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TABLES

Table:1 Baseline characteristics of participants

Gender	Male (n=100)	Female (n=150)
Mean age (years)	52.56 (10.8)	48.95 (13.6)
Metabolic disorders	95	132
Cosmetic appearance (n=23)	5	18
Smoking	26	2
Drugs Antihypertensive medication	43	94

Table:2 showing comparison of pre- and post-surgery and level of significance.

	Pre-surgery	Post- 1m surgery	P value	Rank sum difference
	Mean (SD)	Mean (SD)		
Resting heart rate(bpm)	93 (3.39)	90.05 (3.33)	<0.01	42
Systolic blood pressure (mmHg)	139.45 (8.29)	132.82 (7.72)	<0.01	51
Diastolic blood pressure (mmHg)	89.36 (4.18)	87.45 (5.51)	<0.01	40.5