Section: Surgical Gastroenterology

Original Research Article

ROLE OF PREHABILITATION ON POST OPERATIVE OUTCOMES AFTER MAJOR HEPATO-PANCREATICO-BILIARY SURGERIES

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ABSTRACT

Background: This study was initiated with the idea of improving postoperative outcomes of patients undergoing hepato pancreatico biliary (HPB) surgeries, with minimum extra resources, financial burden, manpower, and without delay in treatment. Prehabilitation, in the form of structured home-based exercise, nutritional support, respiratory exercise, psychological counseling, de-addiction, and optimizing co-morbidity, done during the waiting time for surgery, was thought to be feasible and improve outcomes.

Materials and Methods: Our prospective observational study included 80 consecutive patients, who required major HPB surgery. A minimum of 2 weeks of prehabilitation was recommended, starting from the first OPD visit, and was individualized according to patient disease, general condition, and waiting period for surgery. The primary outcome of the prehabilitation program was assessed based on the value of 6 MWT, which was measured just before surgery, and then after a minimum 2 weeks of prehabilitation. Secondary outcomes were hospital stay, complication rate, re-admission rate, and assessment by HADS scale.

Results: The mean 6MWT at baseline was 379.23 ± 67.2 meters, which increased post-prehabilitation to 390.29 meters (p value=0.15). There was an improvement in 6MWT by 11.06 meters, but it could not reach the level of clinical or statistical significance. Still, the benign subgroup had an improvement by 14.77 m, which was above the quoted clinical significance level of 14 meters. Secondary outcomes were similar to other previous prehabilitation study groups. The complication rate in our study was 55%. The average hospital stay in our study was 10.8 ± 4.8 days. The readmission rate was 11.25% and 2.5% of patients died post readmission. Assessment by HADS scale showed median anxiety and depression score at baseline to be 8 (9-7) and 6 (7-5) respectively which reduced to 4 and 6 after 4 weeks, which was found to be statistically significant.

Conclusion: Prehabilitation has the potential to affect a patient's general well-being pre-, peri- and post-treatment, as well as in the long term. It can impact a patient's life from the point of diagnosis onwards. It is simple, safe and applicable for patients of all age groups, without adding much additional cost.

Keywords: prehabilitation, frailty, hepatopancreatobiliary, surgery, preoperative optimization

INTRODUCTION

Prehabilitation is preoperative conditioning of patients, to improve postoperative outcomes. It is the process of enhancing the functional capacity of the individual to enable him/her to withstand the stressful event of surgery. It is person-centered, so tailored to the individual.

Many patients with hepato-pancreatico-biliary (HPB) diseases are poorly nourished due to anorexia,

malabsorption, cancer cachexia, and metabolic derangement. Additionally, data in the last decade have shown that surgical candidates are getting older in age. These weak patients are more susceptible and have less ability to withstand surgical stress. Previous measures with attempts to improve recovery after major surgery, largely focused on the peri and postoperative period.[1]

However, other modifiable risk factors have now been identified; like preoperative physical fitness, physical activity, and nutritional status. These act as predictors of surgical complications and recovery. The preoperative period is a golden time to invest in these modifiable risk factors, such as exercise, diet, and psychological support.[1,2]

Also, theoretically the postoperative period cannot be considered the best phase to adopt new changes in terms of optimizing nutrition and health because surgical injury is already inflicted on the patient.[2] In the latest trends, a paradigm shift has taken place in terms of optimizing patients, in which the focus is not only on post-surgery but also on the preoperative period, termed prehabilitation.

The collective measures taken in the preoperative period, in terms of physical, nutritional, addressing comorbidity, de addiction, and psychological support, can be integrated as a multimodal prehabilitation program, with physical exercise and nutritional support being the most common component.[3]

However, till now, there are only a few studies, low-quality evidence, and heterogeneity in prehabilitation programs and outcomes. There is a gradual trend towards expected faster recovery and lower complications with prehabilitation,[4] but its utility in HPB surgery is yet to be standardized.

Aims And Objectives: To observe the impact of prehabilitation in the form of structured home-based exercise, nutritional support, respiratory exercise, psychological counselling, de-addiction, and optimizing co-morbidity, on postoperative outcomes of patients undergoing hepato-pancreatico-biliary (HPB) surgeries for benign and malignant etiology.

We prospectively conducted a study investigating the feasibility of prehabilitation, with exercise, nutrition, and psycho-social counselling, in adults undergoing major HPB surgery. We hypothesized that prehabilitation during waiting time for surgery (from initial visit to OPD till posted for surgery) would be feasible and may improve outcomes.

MATERIALS AND METHODS

Type of study: Single center, prospective observational study

Duration of study: From July 2023 to July 2024

Study Subjects: Consecutive patients undergoing major HPB surgeries in Surgical Gastroenterology department.

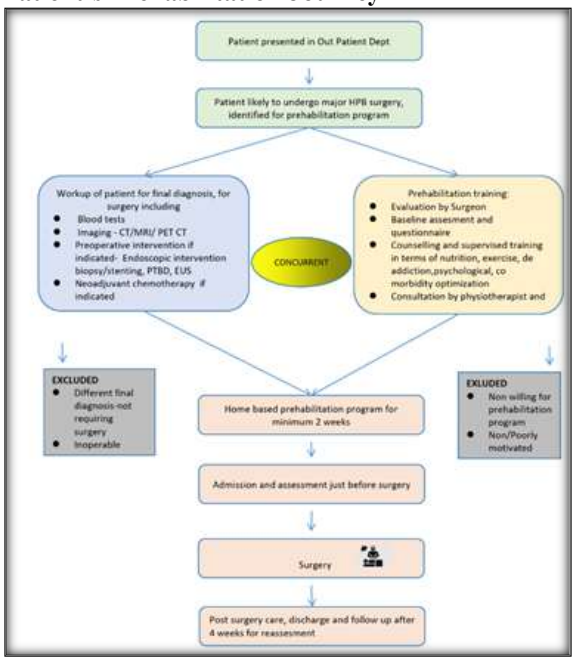
Place of study: Department of Surgical Gastroenterology, Nizams Institute of Medical Sciences, Hyderabad.

Sample size: 80

Materials:

1. Pedometer and Stopwatch
2. Respirometer (Romson's)
3. Hand grip dynamometer
4. Pulse oximeter

Patient's Prehabilitation Journey



Study subjects- Inclusion and Exclusion Criteria:

Our study included 80 consecutive patients, who were candidates for undergoing major HPB surgeries of benign or malignant etiology.The duration of prehabilitation was individualized according to the patient's disease, general condition, and waiting period for surgery. Patients were scheduled for a minimum of 2 weeks of prehabilitation, starting from the time of their initial OP visit to the time required for investigations, clearances, and final scheduling of surgery. Participants were excluded if their final diagnosis required nonsurgical management, the expected surgery date was <14 days from the day of enrolment, inoperable or metastatic disease.

Patients with old age and malignancy were given priority for early surgery. Patients planned for neo-adjuvant chemotherapy were advised prehabilitation program during the entire schedule of chemotherapy. In chronic and benign diseases, with longer wait lists for surgery, longer duration prehabilitation was offered.

Intervention: Eligible patients were identified in out patient department and were educated about the prehabilitation process by the treating surgeon. Intervention mainly focused on home-based exercises and nutrition.

A total body exercise training, which is suitable in terms of age and patient's physical capacity to tolerate, was suggested. A demonstration video was sent to the patient's attender mobile phone. Usually, 30-minute sessions, performed at least 5 times/week,

consisting of either of three types: 1) strength training (like push-ups, arm lifts, biceps curls, squats); 2) aerobic exercise (e.g. walking in a park for 30 min); and 3) flexibility (body stretching- targeting the chest, arms, legs, and trunk).

For the nutritional component, all patients were counseled on meal recommendations and supplements. Patients were asked to include a minimum of 3 eggs daily in their diet, with another high protein source, with balanced carbohydrate and fat intake. They were also prescribed Ensure protein powder (Abbott) at a quantity matching their estimated dietary deficit. The goal of the supplement was to help participants reach a daily protein intake of 1.5 g per kilogram of body weight.

The medical optimization component was addressed by counseling about smoking cessation, reducing/stopping alcohol intake, and weight reduction. Psychiatrist

consultation and counseling for de-addiction were taken wherever necessary. Management of anemia, control of blood glucose, hypertension, hypothyroidism, COPD, stroke, cardiac diseases, and optimization of pharmacological therapy of prior known illness were also addressed.

Psychological support aimed to reduce psychological distress and anxiety associated with diagnosis and surgery. The nature of the disease and surgery options were explained using simple diagrams on paper, and questions/doubts were cleared. Attempts were made to maximize patients' motivation to comply with the exercise and nutritional aspects of the program.

Surgery included: Only patients undergoing major surgery of the liver, pancreas or biliary tract (benign or malignant indication), with minimum operative time of 4 hours were included. This included

- **LIVER:** major hepatectomy with at least 2 Couinaud segments, complex hydatid surgery requiring at least 1 bilio-enteric anastomosis
- **GALL BLADDER & BILIARY SYSTEM:** Major biliary resection, requiring at least 1 anastomosis, Radical/ extended cholecystectomy with/without reconstruction
- **PANCREAS:** tumors of head, body or tail, requiring resection with/without reconstruction or bypass. Surgery for chronic calcific pancreatitis requiring anastomosis.

Adherence to protocol: The initial schedule was supervised, and patient was motivated to continue the same, in home basis. Attendants were counselled, and asked to maintain daily record of events in a notebook. Adherence was checked by telephonic contact weekly, and notebooks were assessed on revisit. More than 75% participation in the adviced module, was considered acceptable.

Outcomes and measures: The primary outcome of the prehabilitation programme was assessed based on the value of 6 MWT, which was measured just before surgery, and then after minimum 2 weeks of prehabilitation. It was compared to the baseline 6MWT value at presentation.

This would translate to the effect of prehabilitation program on patients undergoing surgery.

The secondary outcomes were analyzed based on-

1. Post operative hospital stay
2. Complications and their categorization as per Claiven Dindo scale
3. Rate of readmission rate/ emergency department visit
4. Assessment of psychological state with HADS scale.

Table 1: Prehabilitation- initial assessment summary

Assessment	Scoring system	Score implication
Functional Status ECOG	0-5	0: fully active, able to carry on all pre-disease performance without restriction 1: restricted in physically strenuous activity but ambulatory and able to carry out work of a light or sedentary nature, e.g. light housework, office work 2: ambulatory and capable of all self-care but unable to carry out any work activities, up and about more than 50% of waking hours 3: capable of only limited self-care, confined to bed or chair more than 50% of waking hours 4: completely disabled, cannot carry on any self-care, totally confined to bed or chair 5: dead
BMI	Kg/m2	<18.5 Underweight ;18.5 - 24.9 Normal; 25 -29.9 Overweight ;>30 Obese
Physical performance -6MWT	meters	Distance covered while walking to and fro of two points of measured distance. Used to assess aerobic capacity and endurance
-TUG -Handgrip strength	Seconds Kilograms	>12 seconds = high fall risk Men: <29 kg for BMI <24; <30 kg for BMI 24-28; <32 kg for BMI >28 Women: <17 kg for BMI <23; <17.3 kg for BMI 23.1-26; <18 kg for BMI 26.1-29; <21 kg for BMI>29
Charlson comorbidity index	1- 37	Predicts 10-year survival 10-year survival = .983^(eCCI × .9)
Haemoglobin Serum albumin	12- 16g/dl 3-5-5.5g/dl	Important serum biochemical indices of the nutritional status of patients
Modified Fried's frailty Phenotype(FP)	0-5	Not frail: 0; intermediate frailty: 1-2; frail >3
Incentive spirometry (Romson's)	Balls- Red Yellow Blue	Romson's respirometer and chest physiotherapy , reduces chest symptoms and improves the lung capacity - FEV1 and VC
Questionnaire's BORG scale Hospital anxiety and depression scale (HADS)	Rating of percieved exertion Self report Rating scale of 14 items on scale 0-3	0-2: nothing to slight 3-4: moderate >5: severe 7 items assigned each for Anxiety and Depression. Total score range -(0-21) 0-7: normal; 8-10 :borderline; >11- abnormal

Intra and post-operative analysis:

Following data were observed and recorded:

- Diagnosis and surgery done
- Intra operative events, complications, operative time, blood loss
- Post operative complications
- Clavein dindo classification of complications
- Length of hospital stay

Sample size calculation and statistical Analysis: The primary endpoint was the change in 6MWT from baseline to assessment in pre-operative time, after prehabilitation.

The sample size was calculated based on a previous study. Assuming that the average 6MWT in the non prehabilitation group would be 25 ± 66 m lower than baseline, compared with 35±68 m above baseline in prehabilitation group.[5] A sample size of 80 was required to detect these differences with a power of 80% and an alpha of 0.05. Statistical analysis was performed using Microsoft Excel and SPSS Statistical Software version 22.0. Clinical Parameters are presented in terms of Mean and SD for quantitative variables and frequency (%) for qualitative variables. The data for continuous variables were expressed as Median (Inter-quartile range). Two sample Z tests and Paired T-Tests were used to compare continuous clinical variables between pre and post-operation. Level of statistical significance (p) was taken as $p < 0.05$.

RESULTS

Table 2: The baseline demographic characteristics of patients were recorded

Sl no	Characteristics	Value(n=80)
1	Age(Mean ± SD)	47 ± 17
2	gender	
	Male	43(53.7%)
	Female	37(46.3%)
3	BMI [kg/m2] (Mean ± SD)	24.6 ± 4.36
4	Performance status(ECOG)	
5	0	42(52.5%)
	1	21(26.2%)
	2	13(16.2%)
	3	4(5%)
6	Co Morbidity	
	Coronary artery disease(CAD)	13(16.2%)
	Dyslipidemia	10(12.5%)
	Diabetes mellitus(DM)	14(17.5%)
	Hypertension	17(21.2%)
	Hypothyroidism	7(8.7%)
	Seizure disorder	2(2.5%)
7	CCI	
	0	14(17.5%)
	1	26(32.5%)
	2	22(27.5%)
	3	7(8.7%)
	4	5(6.2%)
	≥ 5	6(7.5%)
8	Addiction	
	Alcohol	42(52.5%)
	Tobacco/smoking	31(38.7%)
	Both alcohol+tobacco	26(32.5%)
9	Fried's frailty Phenotype(FP)	
	Not frail: 0	29(36.2%)
	Intermediate frailty: 1-2	31(38.7%)
	Frail >3	20(25%)
10	Sr. Haemoglobin(Mean ± SD)	11.8 ± 1.67
	Sr Albumin(Mean ± SD)	3.85 ± 0.61
11	Diagnosis- etiology	
	Benign	47(58.7%)
	Malignant	33(41.3%)

Table 3: Benign conditions

Sl No	Diagnosis	n (%)
1	Choledochal cyst	14 (17.5%)
2	Benign biliary stricture	4 (5%)
3	Distal CBD stricture	5 (6.25%)
4	Chronic calcific pancreatitis	11 (13.75%)
5	Biliary cystadenoma	2 (2.5%)
6	Cystic neoplasm of pancreas	3(3.75%)
7	Xanthogranulomatous cholecystitis	2 (2.5%)
8	Complex hydatid cyst of liver	3 (3.75%)
9	Insulinoma (neck of pancreas)	1 (1.25%)

10	Hepatolithiasis	1 (1.25%)
11	Periampullary adenoma	1 (1.25%)
Total		47

Table 4: Malignant conditions

Sl No	Diagnosis	n (%)
1	Periampullary carcinoma	7 (8.75%)
2	Carcinoma gall bladder	8 (10%)
3	Carcinoma pancreas	5 (6.25%)
4	Neuroendocrine tumour head of pancreas	3 (3.75%)
5	Cholangiocarcinoma	3 (3.75%)
6	Hepatic neoplasms	
	- Hepatocellular carcinoma	4 (5%)
	-Hepatic sarcoma	1 (1.25%)
	-Hepatoblastoma	1 (1.25%)
	-MCN of liver	1 (1.25%)
Total		33

Table 5: Surgery done: Following surgeries were performed, which were majorly open surgeries (Table 6)

Sl No	Surgery/ Procedure	n (%)
1	Choledochal cyst excision+Roux en Y HJ	14 (17.5%)
2	Roux en Y Hepatico jejunostomy (HJ)	12 (15%)
3	Whipples surgery	9 (11.25%)
4	Lateral Pancreatico jejunostomy (LPJ)/Frey's	6 (7.5%)
5	LPJ +HJ	3 (3.75%)
6	Central pancreatectomy	3 (3.75%)
7	Distal pancreatectomy ± Splenectomy	4 (5%)
8	Radical cholecystectomy	9 (11.25%)
9	Hepatectomy	10 (12.5%)
10	Right portal vein ligation	2 (2.5%)
11	Palliative bypass	5 (6.25%)
12	Hydatid deroofing + cysto jejunostomy	2 (2.5%)
13	Deodenotomy + wide local excision+ frozen	1 (1.25%)
Total		80

Table 6: Intra op details

Variables	Benign/ malignant	Mean ± SD
Operative time	 Benign Malignant	 238.5 ± 117.23 min 175.75 ± 85.1 min 327.87 ± 97.4 min
Blood loss	 Benign Malignant	261.8 ± 135.1 ml 184.2 ± 76.5 ml 372.4 ± 123.3 ml
Blood transfusion	 Benign Malignant	n=33 8 (10%) 25 (31.25%)

Table 7: Post operative events

Sl No.	Complications	n (%)
1	Pulmonary(pneumonia, effusion, atelectasis)	33 (41.25%)
2	Sepsis	13 (16.25%)
3	UTI	12 (15%)
4	Post operative pancreatic fistula(POPF)	9 (11.25%)
5	Delayed gastric emptying (DGE)	4 (5%)
6	Hemorrhage	2 (2.5%)
7	Bile leak	3 (3.75%)

Complication was seen in 48 out of 80 patients, complication rate in our study being 60%. Complications were graded by Clavien dindo score (CDS) classification. (Table 9). CDS I-II and III-IV was seen in 32(40%) and 16(20%) respectively. 32 patients had no complications.

Table 8

Grade	n (%)
I	6 (7.5%)
II	26 (32.5%)
III	12 (15%)
IV	4 (5%)

Average hospital stay in our study was (Mean ± SD) = 10.8 ± 4.8 days.

9 cases(11.25%) had 30-day emergency visits, and all required readmission. All were managed non-surgically; 3 required percutaneous drainage of collection, 1 required vascular embolization, and rest 3 were managed with ICU care, iv fluids, antibiotics and nutritional support. 2 patients died after re-admission.

Impact of prehabilitation(6MWT): A minimum of 2 weeks prehabilitation program was suggested. The duration of prehabilitation varied in our study, from 2 to 8 weeks, depending on patient profile, adherence to program and diagnosis. Patients with malignancy, who were suitable for upfront surgery, were subjected to shorter periods.

The mean duration of prehabilitation was (4 ± 1) weeks. It was higher in benign subgroup (5.1 ± 1.3) weeks, compared to malignant (3.3 ± 0.93 weeks).

Baseline 6MWT was compared to post-prehabilitation 6MWT values (Fig 1). According to a previous study,(6) a minimum change of 14 meters after intervention was considered clinically significant..

The mean 6MWT at baseline was 379.23 meters, which increased post prehabilitation to 390.29 meters. There was an improvement by 11.06 meters, but it was less than the earlier quoted minimum clinically significant level. The calculated p value was 0.1515, which was not statistically significant.

Subgroup analysis was done - benign vs malignant conditions. [Figure 1]

- Benign: Mean baseline and post-prehabilitation 6MWT was 386.7 and 401.47 meters respectively. There was a mean increase of 14.77 meters, which was more than minimum clinically significant value of 14 meters.(6) The calculated p value was 0.1401, which was not statistically significant.
- Malignant: Baseline and Post prehabilitation 6MWT were 368.6 and 374.36 meters respectively. There was a mean difference of 5.76 meters, which was not clinically significant. The calculated p value was 0.3669, which was not statistically significant.

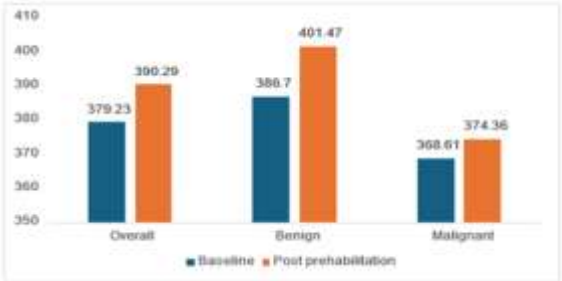


Figure 1: 6MWT at baseline & post prehabilitation- overall, benign & malignant subgroups

BORG scale of RPE(rating of perceived exertion): All 80 patients were asked to rate their exertion level after 6MWT, at baseline and after prehabilitation (Fig 2). At baseline, the median was 4, with IQR (Q3-Q1)= 5-2. After prehabilitation, the median value was 3, with IQR 4-2.

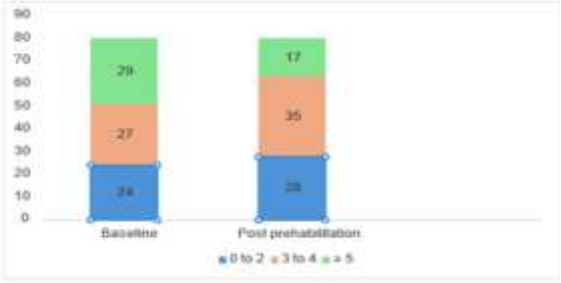


Figure 2: BORG scale at baseline & post-prehabilitation

HADS scale: Median HADS score, pre and post prehabilitation among the study subjects were observed. Median anxiety and depression score at baseline was 8 (9-7) and 6 (7-5) respectively which reduced to 4 and 6 after 4 weeks (Figure 3). When depression and anxiety score was compared between baseline and after 4 weeks, in elderly subgroup, it was found to be statistically significant as p<0.000462 and p<0.00035.

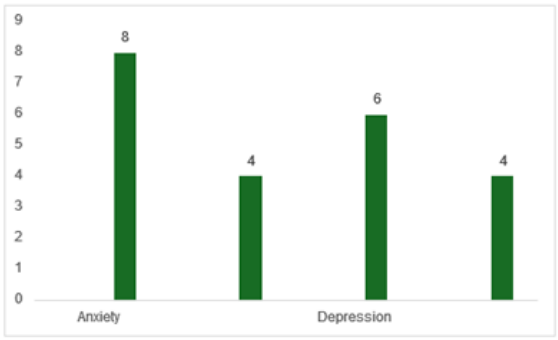


Figure 3: Median HADS score at baseline and after 4 weeks.

DISCUSSION

Prehabilitation has the potential to affect a patient's general well-being pre, peri, and post-treatment, as well as in the long term. It can impact a patient's life from the point of diagnosis onwards. There is an established evidence base for outcomes of prehabilitation for non-cancer morbidities, as well as an emerging evidence base around prehabilitation for cancer. Identification of high-risk populations susceptible to adverse outcomes is difficult, particularly with pancreatic and biliary malignancies that frequently present with cachexia, frailty, and functional decline, regardless of age.[7]

Our study tried to address the functional status, nutrition, exercise, and psycho-social health of our patients. The schedule was individualized as per patient profile with-performance status, compliance, adherence, and diagnosis, taken into consideration. In this prospective, observational study, there was an improvement in the primary endpoint- the 6-minute

walk test (6MWT), but it could not reach the level of statistical significance. But, in the benign subgroup, improvement of 6MWT was found to be clinically significant.

Secondary outcomes in terms of hospital stay, complication rate, and readmission rate did not vary significantly from previous study groups. Assessment of psychological state by the HADS scale showed a significant reduction in anxiety and depression rates among study subjects, with a statistically significant p value.

The mean age in our study was (47± 17) years. 43 (53.7%) of patients were male and 37(46.3%) were females. The mean BMI(kg/m2) of our patients was (24.6 ± 4.36). Performance status (ECOG) of 0,1 and ≥2 was in (52.5%), (26.2%) and (21.2%) of patients in our study.

Charlson comorbidity index (CCI) score grading in our study was- mild (77.5%), moderate (15%), severe (7.5%). The most common addiction in our study was alcohol (52.5%), followed by tobacco (38.7%). 25% of patients in our study group were frail (score >3). Intermediate frailty (score 1-2) was seen in 38.7% of patients. 36.2% were not frail.

Mean operative time was (314.5 ± 64.3 minutes) and blood loss (261.8 ± 135.1 ml). It was higher in malignant group- mean operative time of (371.5 ± 53.6 minutes) and mean blood loss of (372.4 ± 123.3 ml).Operative time and blood loss depends on the procedure and radicality of surgery. Only patients undergoing major surgery of the liver, pancreas or biliary tract (benign or malignant indication), were included in our study, with 37% of malignant cases. So, operative time and blood loss in our study were higher than study group by Garcia et al,[8] and Baimas-George et al,[9] and lower than H. Nakajima et al.[10]

Complication rate in our study was 60% (48/80), pulmonary complications being most common (41.25%). Clavien-Dindo grade I-II and III-IV were reported in 40% (32/80) and 16% (16/80) respectively. Average hospital stay in our study was (Mean± SD) = 10.8 ± 4.8 days. Readmission rate was 11.25% and 2(2.5%) patients died post readmission.

6 minute walk test

The duration of prehabilitation varied in our study, from 2 to 8 weeks. The mean duration of prehabilitation was (4 ± 1) weeks. It was higher in benign subgroup (5.1 ± 1.3) weeks, compared to malignant (3.3 ± 0.93 weeks).

The mean 6MWT at baseline was 379.23 ± 67.2 meters, which increased post-prehabilitation to 390.29 meters (p value=0.15). In the benign subgroup mean baseline and post-prehabilitation 6MWT was 386.7 and 401.47 m. In the malignant subgroup, baseline and post-prehabilitation 6MWT were 368.6 and 374.36 meters respectively.

Our study group had improvement of 6-MWT by 11.06 meters, but it was less than earlier quoted minimum clinically significant level of 14 meters, but not statically significant. Similar to our study, Carli et al,[11] also did not see any clinical meaningful improvement in 6MWT in their study group. Garcia et al,[8] and Soares et al,[12] also found no statistical overall difference in 6MWT in their study.

Still, in our study, the benign subgroup had improvement by 14.77 m, which was above the clinical significance level of 14 meters, while in the malignant group, the increase was by 5.76 meters. This could be explained by the benign subgroup being less frail, having better performance status, longer prehabilitation duration (5.1 ± 1.3 vs 3.3 ± 0.93 weeks), and better adherence to the program.

Scales and questionnaires: As perceived by the BORG scale- slight, moderate and severe were in 30, 33.7 and 36.2 %, which was improved post-prehabilitation to 35. 43.7 and 21.2% respectively. Although it did not reach a statistically significant level, the median improvement was from 4 to 3 on BORG scale.

Median HADS score, pre and post prehabilitation among the study subjects were observed. Median anxiety and depression score at baseline was 8 (9-7) and 6 (7-5) respectively which reduced to 4 and 6 after 4 weeks. When depression and anxiety score was compared between baseline and after 4 weeks, in the elderly subgroup >65 years, it was found to be statistically significant as $p<0.000462$ and $p<0.00035$.

Limitations:

1. Observational study, with no control arm in our study to compare the differences.
2. Prehabilitation duration was not uniform, ranging from 2 to 8 weeks. A shorter duration, particularly in malignant cases would have translated to less impact on outcomes.
3. Home based program, and lack of multi-disciplinary support for each patient. Directly supervised and dedicated support from a nutritionist, physiotherapist and psychological counselor would have better results
4. Adherence to the program, as patient and attenders, are less motivated and usually find this program unattractive, because of the mindset of immediate surgery.
5. here is no standardization and described protocol of the prehabilitation program till present.

CONCLUSION

Prehabilitation has the potential to affect a patient's general well-being pre-, peri- and post-treatment, as well as in the long term. It can impact a patient's life from the point of diagnosis onwards. After implementation of a minimum 2 weeks of prehabilitation, we conclude that:

1. It is simple, safe and applicable for patients of all age groups, without adding much additional cost.
2. Improvement in physical and functional capacity is seen, as indicated by increased 6-minute walk test values, particularly when a longer duration prehabilitation program is offered.

3. Reduced Depression and anxiety score after 4 weeks of surgery is seen on HADS scale with statistically significant p value.
4. Prehabilitation, in general, improves personalized patient care, so this optimization program may be effective in preparing the patient to endure the stress of major surgery, resulting in improved postoperative outcomes and survival. However, to prove this we need to have further multi-institutional studies, with larger sample size.

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