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Research Article

Preoperative Risk-Stratification In Patients Undergoing Radical Nephrectomy Using Five Factor Frailty Index-An Observational Study

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ABSTRACT

Background: Radical nephrectomy is the gold standard treatment for large renal cell carcinoma. Given the rising incidence of renal cell carcinoma and higher prevalence of geriatric patients in the population, readily identifying patients preoperatively that are at risk for a more complicated postoperative course is critical. Frailty is a complex multifactorial syndrome, characterised by a clinically significant increase in vulnerability of the patient and worsened health outcomes. **Objective:** To Evaluate the Post-Operative Complication in a Patient Who Undergone Radical Nephrectomy on the basis of five frailty index. To compare the data between the groups of class 0, 1 and \geq 2. The procedures followed in accordance with the ethical standards of the responsible committee of the institution with addition of approved study design in the title.

Methods: The present study was a prospective observational study. This Study was conducted from From August 2023 to February 2025. (18 months) at Department of urology, R. G. Kar Medical College and Hospital, Kolkata.. Total 50 patients were included in this study.

Result: In this study, increasing age, higher TOL scores, greater intraoperative bleeding (p = 0.0091), and longer hospital stays (p < 0.0001) were significantly associated with higher-risk frailty groups. Paralytic ileus (p < 0.0001) and wound infection (p = 0.0012) were also significantly more common in higher frailty categories. CDC 1 (p < 0.0001) and CDC 3A (p = 0.0166) complications showed significant associations, with severe complications more frequent in frailer patients. Overall, the Five Factor Frailty Index effectively stratified surgical risk in radical nephrectomy patients.

Conclusion: We concluded that the study's findings, individuals having radical nephrectomy can benefit from preoperative risk stratification using the Five Factor Frailty Index (FFFI). Individuals who were classified as fragile by the FFFI had far greater 30-day morbidity and death rates, longer hospital stays, and surgical complications. Improved identification of high-risk patients with the use of FFFI in preoperative evaluation protocols facilitates customized perioperative care and more informed surgical decision-making.

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Keywords: Radical nephrectomy, ASA, NSQIP, CT, CKD.

BACKGROUND

Radical nephrectomy is the gold standard treatment for large renal cell carcinoma. Given the rising incidence of renal cell carcinoma and higher prevalence of geriatric patients in the population, readily identifying patients preoperatively that are at risk for a more complicated postoperative course is critical. Frailty is a complex multi factorial syndrome, characterised by a clinically significant increase in vulnerability of the patient and worsened health outcomes. Frailty is considered to represent the systemic burden of human aging and erosion of a patient's homeostatic reserve . Frailty has been described as a state of decreased physiological reserve, a reduced resilience to stress, or an accumulation of deficits[3]

After 2012, the variables required to calculate 11-modified frailty index were removed from the American College of Surgeons(ACS)-National Surgical quality improvement Program(NSQIP) version, 11-mfi is further revised to 5-modified frailty index, including a history of diabetes, a history of chronic obstructive pulmonary disease (COPD), a history of congestive heart failure within 30 days before surgery, a complete or partial dependence on functional health during surgery, and the presence of hypertension requiring drug treatment. Later, studies in multi-subfamilies also showed that 5-modified frailty indexis an effective predictor of mortality and postoperative complications in the elderly.[4]

METHODS

This is a prospective observational study. The study was conducted in tertiary care hospital with a time frame of about one and half years from August 2023 to February 2025. (18 months) .The study was conducted in the department of urology, R. G. Kar Medical College and Hospital, Kolkata India

All the patients with renal space occupied lesion on imaging who are planned for radical nephrectomy at Urology OT of R. G. Kar Medical College and Hospital, Kolkata during the period of study. With inclusion criteria adult patients (>40 years) presenting to the urology OPD/IPD with/without haematuria ,with renal space occupied lesion in imaging with fall under criteria of radical nephrectomy also with exclusion criteria patient unwilling or unable to undergo surgery, Patient didn't give consent ,Patient less than 40 years of age.

Total 50 patients with renal space occupied lesion on the radiological investigation evidence was evaluated on OPD/IPD basis. After detailed history and clinical examinations these patients was divided on 3 groups .On the basis Of five Frailty Index Into class 0, 1, and ≥ 2 then evaluate post operative complication in each group.

The outcome indicator included Operation time/Length of hospital stay ,Poor wound healing ,Paralytic ileus ,Modified Clavien-Dindo Classification complications,,Mortality.

For statistical analysis all raw data of study parameters was entered in the Microsoft Excel spread sheet and analyzed by standard statistical software. Comparison of patient characteristics between groups was made using the 2-sample student's t-test for parametric continuous variables. These data was presented as means and 95% confidence interval. Statistics derived from non- parametric data was calculated using Mann-Whitney U test and was presented as medians and interquartile ranges. A multivariate linear regression model was used to compare the differences in the length of ICU and hospital stay. A p value < 0.5 was defined as statistically significant. All measurements was performed using SPSS software (version 14; SPSS, Chicago, IL, USA).

RESULT

This prospective observational study included 50 patients who underwent radical nephrectomy. Patients were stratified into three frailty groups: Group 0 (non-frail), Group 1 (pre-frail), and Group 2 (frail), based on the modified frailty index (mFI).

Age Distribution: A statistically significant association was observed between age and frailty group (p = 0.0001), with older patients predominantly in Group 2 (mean age 62.47 ± 8.41 years).

Gender: Although the study included more males (64%), sex was not significantly associated with frailty group (p = 0.2918).

Surgical Procedure: Open radical nephrectomy was more common among frail patients (Group 2: 81%), but the association with frailty was not statistically significant (p = 0.2265).

Postoperative Complications:

Paralytic Ileus: Significantly more common in frail patients (Group 2: 90.5%; p < 0.0001). Wound Infection: Significantly higher in Group 2 (61.9%; p = 0.0012).

Clavien-Dindo Classification:

Grade 1: Significantly higher in non-frail groups (p \leq 0.0001).

Grade 3A: Significantly more common in Group 2 (p = 0.0166).

Grades 2, 3B, 4A, and 5: Observed more in frail patients, but not statistically significant. Mortality: One death occurred, exclusively in Group 2.

Frailty and Clinical Outcomes:

Total Score: Significantly higher in Group 2 (2.57 \pm 0.75; p < 0.0001).

Intra operative Bleeding: Significantly higher in Group 2 (354.76 \pm 149.92 ml; p = 0.0091).

Hospital Stay: Significantly longer in Group 2 (9.05 \pm 2.50 days; p < 0.0001).

Operative Time: Shortest in Group 2, though not statistically significant (p = 0.2462).

Table 01 Summary of Key Variables

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Variable	Group 0 (n=8)	Group 1 (n=21)	Group 2 (n=21)	P-value	Significance
Age (years)	49.13 ± 6.71	53.10 ± 7.25	62.48 ± 8.41	< 0.0001	✓ Significant
	(Median 48.5)	(Median 52)	(Median 63)		_
TOTAL Score	0.00 ± 0.00	1.00 ± 0.00	2.57 ± 0.75	< 0.0001	✓ Significant
	(Median 0)	(Median 1)	(Median 2)		_
	237.5 ± 83.45	244.29 ± 99.18	354.76 ± 149.92	0.0091	✓ Significant
Bleeding (ml)	(Median 250)	(Median 250)	(Median 350)		
Hospital Stay	5.25 ± 0.71	5.86 ± 1.15	9.05 ± 2.50	< 0.0001	✓ Significant
(days)	(Median 5)	(Median 5)	(Median 10)		
Operative Time	157.25 ± 49.26	155.24 ± 47.05	134.24 ± 39.50	0.2462	× Not
(min)	(Median 145)	(Median 140)	(Median 125)		Significant
Paralytic Ileus	0 (0%)	9 (42.9%)	15 (71.4%)	< 0.0001	✓ Significant
Wound Infection	0 (0%)	4 (19.0%)	13 (61.9%)	< 0.0001	✓ Significant
CDC Grade 1	Most frequent	Moderate	Least frequent	< 0.05	✓ Significant
CDC Grade 2	25%	57.1%	57.1%	>0.05	× Not
					Significant
CDC Grade 3A	0%	4.8%	33.3%	0.0166	✓ Significant
CDC Grades 3B-	0%	Rare	Rare	>0.05	X Not
5					Significant
Mortality	0 (0%)	0 (0%)	1 (4.8%)	>0.05	× Not
					Significant

DISCUSSION

The present study was a prospective observational study conducted from August 2023 to February 2025 (18 months) at the Department of Urology, R. G. Kar Medical College and Hospital, Kolkata. A total of 50 patients were included.

There was a statistically significant association between age and frailty groups (p = 0.0247). Younger patients (41–50 years) were primarily in Groups 0 and 1, while older patients, especially those above 60, were predominantly in Group 2. The mean age was highest in Group 2 (62.5 \pm 8.4 years) compared to Group 1 (53.1 \pm 7.2) and Group 0 (49.1 \pm 6.7), with the difference being statistically significant (p < 0.0001). This trend is supported by Lin et al. (2016), who observed mean ages ranging from 75 to 87 years in various surgical populations. Gender distribution showed more males (64%) than females (36%), with a male-to-female ratio of 1.7:1[5]. However, this difference was not statistically significant (p = 0.2918). Similar findings were reported by Arabsalmani et al. (2016), where 66.1% of renal cancer cases were male[6].

Regarding surgical procedures, most Group 2 patients underwent Open Radical Nephrectomy (81%), followed by Group 1 (52.4%) and Group 0 (50.0%), although this was not statistically significant (p = 0.2265). Goldwag et al. (2021) noted that 27.5% of patients undergoing Open RN were frail by FFFI criteria [7]. Paralytic ileus occurred most frequently in Group 2 (90.5%), compared to Group 1 (23.8%) and none in Group 0. This was statistically significant (p < 0.0001), consistent with Cheadle et al. (2019), who reported higher ileus incidence in frail patients[8]. Wound infection was also more common in Group 2 (61.9%) compared to Group 1 (19%) and none in Group 0 (p = 0.0012). This aligns with Ayoub et al. (2023), who found a higher infection rate in frail patients (18% vs. 7.2%; p < 0.01)[9]. Clavien-Dindo Grade I complications were less common in Group 1 (52.4%) than Group 0 (75%), with statistical significance (p < 0.0001). Other CDC grades, such as 3A, were more frequent in Group 2 (33.3%) compared to Group 1 (4.8%) (p = 0.0166). Higher CDC grades were also seen more in Group 2 but without statistical significance. wound infection seen in group 2(61.9%), group 1(19.0%, group 0(0%) and Wong et al. (2017) similarly reported increased wound complications in frail patients (18.3% vs. 5.5%; p < 0.01)[10]. Only one mortality occurred, and this was in Group 2. This suggests that mortality was confined to the highest-risk group. Total Score was highest in Group 2 (2.57 ± 0.75), followed by Group 1 (1.00 ± 0.00) and Group 0 (0.00 ± 0.00) , with a significant difference (p < 0.0001), echoing findings by Alameddine et al. (2020). Mean blood loss was significantly higher in Group 2 (354.8 \pm 149.9 ml) compared to Group 1 (244.3 \pm 99.2 ml) and Group 0 (237.5 \pm 83.5 ml) (p = 0.0091)[11]. The mean length of hospital stay was significantly longer in Group $2 (9.05 \pm 2.5 \text{ days})$ than in Group 1 (5.86 ± 1.2) and Group 0 (5.25 ± 0.7) (p < 0.0001). Operative time was shortest in Group 2, but the difference was not statistically significant (p = 0.2462).

CONCLUSION

This prospective observational study highlights the clinical relevance of preoperative frailty assessment using the Five Factor Frailty Index (FFFI) in patients undergoing radical nephrectomy. Our findings demonstrate that increased frailty, as indicated by higher FFFI scores, is significantly associated with older age, greater intraoperative blood loss, longer hospital stay, and higher incidence of postoperative complications such as paralytic ileus and wound infections. Additionally, Clavien-Dindo Grade 1 and 3A complications were significantly more common in higher frailty groups.

Although overall mortality was low, it was confined exclusively to the most frail group, underscoring the importance of frailty as a predictor of poor postoperative outcomes.

Frailty assessment should thus be integrated into preoperative evaluation to improve surgical planning, patient counseling, and perioperative care strategies. Larger, multicenter studies are warranted to further validate the role of FFFI in optimizing outcomes in urologic oncology surgery.

LIMITATIONS OF THE STUDY

In spite of every sincere effort my study has lacunae.

The notable short comings of this study are:

The sample size was small. Only 50 cases are not sufficient for this kind of study.

The study has been done in a single center. The study was carried out in a tertiary care hospital, so hospital bias cannot be ruled out.

DECLARATIONS:

ETHICS APPROVAL AND CONSENT: All procedures followed in accordance with the ethical standards of the responsible committee of the institution with addition of approved study design in the title (IEC/RKC/990).

CONSENT FOR PUBLICATION: Proper consent was taken from all patients included in the study. **FUNDING:** No funding taken for the study.

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