SHORT REPORT

Significance of Charlson co-morbidity index as predictive factor for post-op complications after radical nephrectomy

Nazish Mughal, Naveed Ahmed Mahar, Usama Bin Shaheen, Harris Hassan Qureshi, Naseem Akhtar, Sara Rasheed Kalwar, Altaf Hashmi

Abstract

The current study planned to explore the correlation between an elevated Charlson Comorbidity Index score and post-operative complications following radical nephrectomy in patients with renal cell carcinoma. A total of 70 patients aged 30-80 years undergoing radical nephrectomy were categorised into low Charlson Comorbidity Index score <4 group A and high score >4 group B. Post-operatively, complications were noted in 21(30%) patients, with higher grades more prevalent in the group B patients (relative risk: 1.96, *p*=0.004). The finding underscored the importance of considering comorbidities in assessing the risk of complications following radical nephrectomy.

Keywords: Charlson comorbidity index, Renal tumour, Renal cell carcinoma, Radical nephrectomy.

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Introduction

Worldwide diagnosis of renal cell carcinoma (RCC) has increased in both genders,[1] accounting for 3-5% of adult cancers in the United States[2] and for 5-year cancer-specific mortality of 35%, making it one of the most lethal cancers in urology.[3]

Radical nephrectomy (RN) still remains the treatment of choice for the management of tumours >4cms in size.[4] However, RN is not without complications. Studies have described multiple predictive factors for assessing surgical complications. Patient's clinical characteristics, tumour size, surgical approach and technique are amongst the most common factors associated with outcomes.[5,6]

The age of the patient and their co-morbidities, in addition to tumour features, are crucial criteria for predicting surgical outcomes due to the rising incidence of RCC in the elderly populations.[7] A study[8] reported that pre-operative American Society of Anaesthesiologists (ASA) status and tumour size are risk factor of post-RN complications, with ASA score 3-4 leading to 35.29% complications. Another study evaluated pre-operative risk factors[9] and reported that Charlson Comorbidity Index (CCI) >4 (high co-morbidity) presented with significantly higher post-operative complications (45.45%) than in those with CCI <4 (9.9%).

Literature has reported CCI as a validated predictive tool for post-operative complications in many surgeries, but its significance after RN is has not been established yet.[9,10]

The current study was planned to assess CCI score as a risk factor for post-operative complications in RN cases.

Methods and Results

The prospective, cross-sectional study was conducted at the Department of Urology, Sindh Institute of Urology and Transplantation (SIUT), Karachi, from July 2020 to June 2022. After approval from the institutional ethics review committee, the sample size was calculated using the equation:

"n=[(Z_α/2 + Z_β) ^2 * (p1*(1-p1)+p2*(1-p2))] / (p1-p2) ^2"[9]

The power of the test was kept at 90% and confidence level at 95%. The proportion of complication in lower and higher CCI groups was based on an earlier study.[9]

The sample was raised using non-probability consecutive sampling technique. Those included were RCC patients regardless of gender aged 30-80 years, who were planned to undergo RN. Patients with bilateral renal masses and/or not fit for surgery were excluded.

After taking written informed consent from all the subjects, they were divided into 2 groups pre-operatively. Those with low CCI score of <4 were in group A, and those with high CCI score of >4 were in group B. RN was done in all patients by a consultant urologist who followed the patients for 30 days post-surgery. All the pre-operative risk factors were compared with post-operative complications that were determined using the Modified Clavien-Dindo classification system (MCCS).[8]

Data was analysed using SPSS 20. Continuous variables were presented as mean±standard deviation, while categorical variables were presented as frequencies and percentages. Comparison between CCI and post-operative complications was done using chi-square test, and relative risk (RR) was calculated. Effect modifiers were controlled

Sindh Institute of Urology and Transplantation, Karachi, Pakistan.
Correspondence: Naveed Ahmed Mahar. e-mail: navidmahardowite@gmail.com
ORCID ID: 0000-0002-7834-9099

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through stratification. Chi-square independent test was applied between CCI score and the presence of post-operative complications. P≤0.05 was considered significant.

Of the 70 patients with mean age 49.13±11.53 years, 35(50%) were in each of the 2 groups. There were 38(54.3%) male patients compared to 32(45.7%) females. Post-operative complications were observed in 21(30%) patients, while the remaining 49(70%) patients had no complications.

Among the patients with complications, 11(52.38%) had MCCS grade 1, 8(38.10%) had grade 3 and 2(9.52%) had grade 5 complications.

Intergroup comparison showed post-operative complications in 5(14.3%) group A patients and 16 (45.7%) group B patients. Group B patients were at higher risk of complications (RR: 1.96 [95 confidence interval {CI}: 1.28-3.0; *p*=0.004) (Table 1).

Among patients aged 30-50 years, post-operative complications were seen in 5(20%) group A patients and 13(72.2%) group B patients (RR: 3.61 (95CI: 1.56-8.32; *p*=0.001). Among patients aged 51-72 years, no post-operative complication was observed in group A, while 3(17.6%) patients had complications in group B (RR: 1.71 (95CI: 1.22-2.4; *p*=0.16).

Among the male patients, post-operative complications were seen in 2(23.5%) group A cases and in 10(47.6%) group B cases (RR: 1.55 (95CI: 0.90-2.69; *p*=0.12). Among female patients, post-operative complications were seen in 1(5.6%) group A case and in 6(42.9%) group B cases (RR: 2.67 (95%CI: 1.40-5.11; *p*=0.01) (Table 2).

Table-1: Comparison of post-operative complications in patients with high and low Charlson Comorbidity Index (CCI) score.

Post-op Complications	CCI Groups [n (%)] ≤4 (Low CCI)	>4 High CCI	Relative Risk (95% CI)	*p*-value
Yes	5 (14.3)	16 (45.7)	1.96 (1.28-3.0)	0.004
No	30 (85.7)	19 (54.3)		

CI: Confidence interval.

Table-2: Stratification of age and gender to determine the effects on post-operative complications in patients with high and low Charlson Comorbidity Index (CCI) score.

	Post-op Complications	CCI Groups [n (%)] ≤4 (Low CCI)	>4 High CCI	Relative Risk (95% CI)	*p*-value
Age Group (years)	Yes	5 (20)	13 (72.2)	3.61 (1.56-8.32)	0.001
30-50	No	20 (80)	5 (27.8)		
Age Group (years)	Yes	0 (0.0)	3 (17.6)	1.71 (1.22-2.4)	0.16
51-72	No	10 (100)	14 (82.4)		
Male	Yes	04 (23.5)	10 (47.6)	1.55 (0.90-2.69)	0.12
	No	13 (76.5)	11 (52.4)		
Female	Yes	01 (5.6)	06 (42.9)	2.67 (1.40-5.11)	0.01
	No	17 (94.4)	08 (57.1)		

Conclusion

High CCI score (>4) was found to be a valuable tool for determining the risk of post-operative complications.

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Conflict of Interest: None.

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Author Contribution:

NM: Concept, study design, data acquisition.
NAM: Study design, data analysis, literature search, drafting.
UBS, NA: Data acquisition, literature search, drafting.
HHQ: Data analysis, literature review, drafting.
SRK: Data analysis, data acquisition, literature search and drafting.
AH: Critical analysis and final approval.