THE ROLE OF R.E.N.A.L NEPHROMETRY SCORE TO PREDICT PERIOPERATIVE OUTCOME FOLLOWING PARTIAL NEPHRECTOMY IN A NATIONAL REFERRAL HOSPITAL

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ABSTRACT

Objective: *This study aim to see the significance of R.E.N.A.L-NS in our center.* ***Material & Methods:*** *We retrospectively collected all the data of RCC patients that underwent partial nephrectomy (PN) in Cipto Mangunkusumo Hospital from January 2010-January 2018, with complete CT-scan examination. Patients with single kidney were excluded from our study. We evaluated intraoperative blood loss, length of operation, post operative length of stay, post operative kidney function, and complications as the perioperative parameters. Patients were categorized into 3 category based their complexity from RENAL-NS into: low (4-6), moderate (7-9), and high (10-12). Complications were based on Clavien-Dindo classification. Perioperative outcomes were analyzed based on the stratification of the patients and analyzed using ANOVA and chi-square.* ***Results:*** *We evaluated 25 partial nephrectomy cases which are suitable with inclusion and exclusion criteria. There were 8 (32%) low, 14 (56%) medium, and 3 (12%) high complexity cases. Median age of patients were 61 (46-71) years old, with mean tumor diameter 72.07 (± 38.9) mm. Nine (36%) patients underwent open procedure and 16 (64%) underwent laparoscopic procedure. The laparoscopic procedure was tend to the lower complexity of R.E.N.A.L score (p=0.048). Higher complexity of R.E.N.A.L score correlated with higher blood loss (p<0.001), length of stay (p<0.001), complication rate (p<0.001), and length of operation (p=0.033).* ***Conclusion:*** *R.E.N.A.L-NS has a role for a selection of type of procedure and a prediction of perioperative outcome in partial nephrectomy. R.E.N.A.L-NS can be used in daily basis as it could determine the procedure and several outcomes of the partial nephrectomy procedure.*

Keyword: *Partial Nephrectomy, R.E.N.A.L- Nephrometry Score, RCC.*

ABSTRAK

Tujuan: *Penelitian ini bertujuan untuk menilai signifikansi skor R.E.N.A.L – Nephrometry di center kami.* ***Bahan & Cara:*** *Data pasien dengan karsinoma sel ginjal yang menjalani nefrektomi parsial dan memiliki data CT-Scan lengkap di RS Ciptomangunkusumo periode Januari 2010 – Januari 2018, dikumpul secara retrospektif. Pasien dengan kondisi ginjal tunggal diekslkusikan dari penelitian. Dilakukan evaluasi terhadap perdarahan intraoperatif, lama operasi, lama rawat inap paska operasi, fungsi ginjal pasca operasi, dan komplikasi sebagai parameter perioperative. Berdasarkan skor R.E.N.A.L – Nephrometry, pasien diklasifikasikan menjadi 3 kelompok yaitu rendah (4-6), sedang (7-9) dan tinggi (10-12). Komplikasi dinilai berdasarkan klasifikasi Clavien-Dindo. Hasil perioperatf dianalisis berdasarkan klasifikasi pasien. Pemeriksaan ANOVA dan Chi-Square digunakan sebagai metode analisis statistika.* ***Hasil:*** *Kami mengevaluasi 25 pasien paska nefrektomi parsial yang cocok dengan kriteria inklusi dan eksklusi. Berdasarkan kompleksitasnya, terdapat 8 (32%) pasien dengan komplksitas rendah, 14 (56%) pasien sedang dan 3 (12%) pasien dengan kompleksitas tinggi. Median umur pada pasien adalah 61 (46-71), dengan rata-rata diameter tumor 72.07 (±38.9) mm. Sembilan pasien (36%) menjalani operasi terbuka dan 16 (64%) pasien menjalani operasi laparoskopi. Prosedur laparoskopi lebih menyebabkan penurunan nilai kompleksitas berdasarkan skor R.E.N.A.L (p=0.048). Kompleksitas lebih tinggi dari skor R.E.N.A.L berkorelasi dengan tingginya perdarahan (P<0.001), lama rawat inap (p<0.001), komplikasi (p<0.001) dan durasi operasi (p=0.033).* ***Simpulan:*** *Skor R.E.N.A.L – Nephrometry memiliki peran dalam pertimbangan pemilihan prosedur operasi dan prediksi hasil perioperative paska nefrektomi parsial. R.E.N.A.L – Nephrometry dapat digunakan sehari-hari, mengingat skor tersebut dapat menentukan jenis teknik yang digunakan dan luaran paska prosedur nefrektomi parsial.*

Kata Kunci: *Nefrektomi parisal, skor R.E.N.A.L – Nephrometry, karsinoma sel ginjal.*

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INTRODUCTION

Renal cancer is one of the most common forms of cancer in Indonesia, ranked third of all urogenital tumors with incidence of 2.093 per 100.000 population and estimated 5-years prevalence of 4.444 per 100.000 population in 2012.[1-6] Surgical treatment remains the golden standard care for patients with localized renal cancer.[1,3,8,13-15] The variation of sizes, shapes, and location of the tumor complicates the choice of surgical treatment for patients with renal cancer which give challenges for the urologist to determine which technique to be used for exciting localized renal tumors.[7-8]

In the last three decades, the option for surgical treatment is not only limited to radical nephrectomy (RN), partial nephrectomy (PN) or nephron sparing surgery (NSS) has emerged as one of the oncological equivalent alternative to RN in most cases of localized renal tumors.[1,13,14] Partial nephrectomy nowadays remains the established standard for removal of T1 tumors, however, it is also reported to be demanding and technically challenging for complex renal tumors.[1,16-17]

To help objectify renal masses and help urologists to determine which technique to be used, several scoring systems were established.[17] These several scoring systems are nowadays used for treatment decision-making for urologists worldwide. The most commonly used scoring system is R.E.N.A.L. Nephrometry Score (R.E.N.A.L.-NS), The Preoperative Aspects and Dimensions Used for an Anatomical (PADUA) Score, and C-Index Score.[16-17]

From all those scoring systems, R.E.N.A.L. – NS was proven to be superior to other scoring systems and was also the most commonly used compared to other scoring systems.[1,17] R.E.N.A.L.-NS was the first published scoring system for renal complexity, published by Kutikov and Uzzo in 2009, and have been used worldwide to determine treatment options for RCC.[1] This R.E.N.A.L.-NS is based on the five most reproducible and pertinent features that characterize renal tumor anatomical features which are (R) Radius (maximal diameter in cm), (E) Exophytic/Endophytic properties, (N) Nearness of the tumor to the collecting, (A) Anterior/posterior (L) Location relative to the polar lines.[1,17]

Several previous studies have demonstrated that R.E.N.A.L-NS has a role in predicting perioperative outcomes[18-20], but there are still no studies that showed the clinical significance of R.E.N.A.L-NS to predict the perioperative outcome of partial nephrectomy in our center.

OBJECTIVE

This study aims to see the significance of the usage of R.E.N.A.L-NS in our center.

MATERIAL & METHODS

In this study, we retrospectively collected all the data of RCC patients that underwent PN in Cipto Mangunkusumo Hospital from January 2010-January 2018, with complete CT-scan examination. Patients with solitary kidney were excluded from our study. Patients' data including age, sex, body mass index (BMI), and laterality of tumor were collected and recorded. Intraoperative and postoperative data including intraoperative blood loss, length of operation, post operative length of stay, post operative kidney function, and complications were also collected as the perioperative parameters.

R.E.N.A.L-NS was collected and used to evaluate tumor complexity in our study. R.E.N.A.L-NS data was collected and reviewed retrospectively using imaging of the patients, including KUB X-ray and computed tomography (CT) of patients. All KUB and CT data were evaluated by the urologist in this study. As described by Kutikov and Uzzo1, the five components of R.E.N.A.L-NS we used n this study include radius (maximal diameter in cm), exophytic/endophytic properties, nearness of lesion to the collecting system of sinus, anterior or posterior location of lesion ("x" suffix were used if the location of tumor cannot be categorized into anterior or posterior), and location of the lesion relative to the polar lines.

Suffix "h" was used as designation of hilar tumor. There are point criteria in each component as described previously. Then all points were accumulated and categorized into 3 groups based on its complexity from RENAL-NS which are low (4-6), moderate (7-9), and high (10-12).[1] Complication was based on the Clavien-Dindo classification.[22] Perioperative outcomes were analyzed based on the stratification of the patients and analyzed using ANOVA and chi-square. All analysis were performed using SPSS 22.0 statistical software package.

RESULTS

From January 2010 to January 2018, our center performed 30 Partial nephrectomy cases. There was total of 25 patients which suitable with inclusion and exclusion criteria. Basic demographic and perioperative data of cases can be seen in Table 1.

According to the R.E.N.A.L-NS, total of 25 partial nephrectomy (PN) was performed. Among these patients, tumor complexity was low in 8 (32%) patients, moderate in 14 (56%) patients, and high in 3 (12%) patients. The median age of patients was 61 (46-71) years old, with mean BMI 25.7 ± 3.2. Eight patients (42%) had renal tumor on the left side, while 17 patients (68%) had renal tumor on the right side.

From 25 patients that were analyzed on our study, the overall mean tumor diameter was 72.07 (±38.9) mm. Nine (36%) patients in our study underwent the open procedure and 16 (64%) underwent laparoscopic procedure. The overall median operation time was 180 minutes (180-300 minutes), the overall estimated blood loss was 500 ml (150-4100 ml), and the overall median postoperative hospital stay was 6 days (4-12 days). The post operative complications were categorized according to the Clavien-Dindo classification system. Ten patients (40%) had elevated kidney function >1.5 mg/dL and 5 patients (20%) patients underwent blood transfusion after procedure. Table 2 shows the multivariable analysis of perioperative variables of partial nephrectomy in our study.

Table 1. Demographic dan Perioperative Data of PN patients.

Characteristics	Mean ± SD/ Median (range)/N, percentage
Age, years	61 (46-71)
Gender	
Male	15 (62.5%)
Female	10 (37.5%)
BMI (kg/m^2)	25.7 ± 3.2
Laterality of renal neoplasm	
Left	8 (42%)
Right	17 (68%)
R.E.N.A.L-NS	
Mean Renal Score	7.06 ± 1.88
• a	• 14
• p	• 6
• x	• 5
Tumor Complexity	
Low	3 (32%)
Moderate	14 (56%)
High	3 (12%)
Approach	
Open	9 (36%)
Laparoscopy	16 (64%)
Tumor Radius/Diameter (mm)	72.07 ± 38.9
Operation time (min)	180 (180-300)
Estimated blood loss (ml)	500 (150-4100)
Postoperative hospital stay (days)	6 (4-12)
Complications	
Grade I	
Elevated kidney function (creatinine)	10 (40%)
Grade II	
Blood transfusion	5 (20%)

Table 2. Multivariable analysis of perioperative variables of partial nephrectomy.

Variables	Low (n=8)	Moderate (n=14)	High (n=3)	P value
Approach				
Open	2 (25%)	4 (28.5%)	3 (100%)	0.048
Laparoscopic	6 (75%)	10 (71.5%)	0 (0%)	
Operation time (min)	180 (180-210)	190 (180-300)	300 (180-300)	0.033
Estimated blood loss (ml)	450 (150-600)	425 (200-800)	2000 (2100 - 4100)	<0.001
Post operative stays (days)	4.5 (4-7)	6.5 (4-8)	11 (7-12)	<0.001
Complications				
Grade I				
Elevated kidney function (creatinine)	1 (12.5%)	6 (43%)	3 (100%)	<0.001
Grade II				
Blood transfusion	0 (0%)	2 (14%)	3 (100%)	

From our study, it was shown that the stratification of complexity correlates with the procedure taken, the lower the complexity, the procedure moved towards laparoscopic procedure (p=0.048), Higher stratification correlates with higher blood loss (p<0.001), length of stay (p<0.001), complication rate (p<0.001), and difference in length of operation (p=0.033). There is no statistically significant difference between low and moderate complexity regarding estimated blood loss (p=0.678).

DISCUSSION

Nowadays, because of the increasing utility of various kinds of imaging modalities, the diagnosis of small renal masses has increased in recent years. This phenomenon leads to the increase of the use of partial nephrectomy in treating RCC. PN has become the golden standard for small kidney mass management.[21] Many studies have shown that, compared to radical nephrectomy (RN), PN provides preservation of renal function and better cancer control.

Several studies in recent years also correlated PN with lower blood loss and postoperative stays, along with preserved kidney function in patients.[19-20,22] However, the treatment recommendations will vary and depend largely on the anatomical characteristics of the tumor and the experience of the urologist in making the best decision for the treatment.

In recent years, Kutikov and Uzzo promote a novel scoring system called R.E.N.A.L Nephrometry Score to help urologists to determine the optimal treatment for the patients and to determine the characteristics of tumor and categorized them based on their complexity.[1] Several other nephrometry scoring systems have been proposed to predict perioperative outcomes. The centrality index (C-index) uses the Pythagorean theorem to calculate the distance of tumor center to kidney center and later on, this distance is divided by tumor radius to obtain the C-index score.[9] This scoring system was reported to serve as a clinically useful measure, allowing improved radiological assessment of kidney tumor.

Other scoring system that is commonly used is The Preoperative Aspects and Dimensions Used for an Anatomical (PADUA) scoring system, proposed by Ficarra et al. This scoring system evaluates anatomical features such as anterior or posterior face, longitudinal, and rim tumor location, tumor relationships with renal sinus or urinary collection systems, and percentage of tumor deepening into kidney. This scoring system is reported to be a simple scoring system that can be used to predict perioperative complications.

From all these several scoring systems, the latest study showed that R.E.N.A.L Nephrometry Score was superior compared to other studies in determining the complexity of tumor, helping the urologist's decision making, and predicting the postoperative results of PN.[9] R.E.N.A.L-NS could give better understanding in tumor anatomical characteristics compared to other scoring systems.[9]

There are two approaches to PN which are laparoscopic or open. In this study, the laparoscopic

approach was more frequently used in patients with lower tumor complexity. These results were similar to other studies, such as Zhou et al study in China.[22] Zhou et al. stated that the lower the complexity, the tumor will be more likely to be treated with laparoscopic procedure. Higher tumor complexity would correlate with more complicated surgery and increasing perioperative morbidities which are better controlled by open approach. With an open approach, the view of the surgical field are wider, then the manipulation will be easier.

Our study found that higher complexity of RENAL scores related to higher of perioperative. Many studies have similar results as our study. In our study, it was shown that higher tumor complexity would correlate with higher estimated blood loss. These results were similar to Zhou et al study and Hayn et al study[22-23], where they stated that higher complexity will correlate with higher blood loss. This would happen because higher tumor complexity correlates with more complicated surgery and more complicated tumor in anatomical figures, thus correlates with higher blood loss.

In our study, higher tumor complexity also correlates with the longer postoperative length of stay and complication rate, parallel with Zhou et al and Hayn et al study.[22-23] This is also caused by more complicated surgery in higher tumor complexity. The limitation of our study is the small sample size and the retrospective non-randomized single center design, as this could lead to selection bias. This small sample size due to our center is the national tertiary center. Other centers are more likely to refer high complexity tumor here and end-stages tumor to our center. However our center is still a referral for partial nephrectomy by laparoscopic approach.

CONCLUSION

R.E.N.A.L-NS has a role for a selection of type of procedure and a prediction of perioperative outcome in partial nephrectomy. R.E.N.A.L-NS can be used in daily basis as it could determine the procedure and several outcomes of the partial nephrectomy procedure.

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