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ESCORE R.E.N.A.L - UMA FERRAMENTA PARA PLANEJAMENTO CIRÚRGICO: ESTUDO RETROSPECTIVO

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ABSTRACT

OBJECTIVE: This study aimed to demonstrate the proportion of partial and radical nephrectomy based on preoperative staging of the R.E.N.A.L score, in a 7-year period of a single institution, and its impact on postoperative margin compromise.

METHODS: Longitudinal retrospective cohort study by reviewing medical records of patients operated on for renal mass from 2017 to 2023. R.E.N.A.L nephrometry was analyzed both in its entirety and in individual components according to the treatment used, and descriptive and multivariate inferential statistical analysis was applied.

RESULTS: In the period evaluated, 56 medical records were included, 60.7% men and 39.3% women, mean age of 59.2 years. According to the R.E.N.A.L. 14.3%, 53.6% and 32.1% were of low, moderate and high complexity, respectively. 53.6% were treated with partial nephrectomy. Approximately 71% of the masses were clear cell carcinoma. The components “R” and “L” were shown to be greater predictors of radical conduct as well as the higher the sum of the score ($p<0.05$). The mean R.E.N.A.L. scores of the group treated with partial and total nephrectomies were: 7.40 ± 1.43 and 9.54 ± 1.39 ($p<0.05$). Those who underwent partial nephrectomy presented margin involvement in 37.5% of low complexity and 42% of moderate complexity.

CONCLUSION: The R.E.N.A.L. score is a complementary tool with significant contribution in the decision of surgical conduct. Despite this, in our case series, partial nephrectomy proved to be safe and feasible in 42.3% of moderately complex tumors, after collegiate evaluation, with only a slight increase in margin involvement, from 37.5% to 42%.

Keywords: Carcinoma, Tumor; Kidney Diseases

INTRODUCTION

The R.E.N.A.L score is a tool applied in complementary exams such as computed tomography and allows categorizing renal cell carcinoma. This tool helps in deciding the most appropriate surgical approach and predicting possible complications, due to the complexity of the tumor. Nephrometry using the R.E.N.A.L. was published in 2009 aiming to standardize the most frequent characteristics of kidney tumors, including them in the mnemonic "R.E.N.A.L." - R – "Radius-score"/ tumor size; E – "Exo/endophytic" Location if endophytic or exophytic; N- "Nearness" Proximity to deep portions of the collecting system or to the renal sinus; A – Anterior or posterior; L- Location in relation to the polar line – each item was assigned 1 to 3 points and the suffixes "a" and "p" for anterior or posterior location, and "h" in case of contact with vessels of the renal hilum. Through this, a complexity classification was constructed into 3 levels: low (score between 4 and 6), medium (7 to 9 points) and high (10 to 12 points) (1). The "h" configuration is inevitably categorized with greater complexity, while the anterior or posterior location does not confer complexity, but influences the choice of access route (2; 3).

The R.E.N.A.L. has some characteristics and applications to predict possible outcomes. It is a tool that has shown good interobserver agreement, is quick and practical, even in professionals with less experience (3). Some outcomes described in the literature concern ischemia time, operative time, blood loss, rate of conversion to open surgery, complications, length of stay and surgical margin (2).

The score helps urologists predict possible technical difficulties in partial resections. Partial nephrectomy has become a gold standard approach in the treatment of tumors smaller than 4 cm and has expanded to larger masses. It is with this in mind that some scores were designed to assist in the safety of this procedure in larger kidney tumors such as those measuring 7 cm (4).

Renal cell carcinoma is responsible for approximately 3% of neoplasms in adults and mainly affects men and the elderly (5). These tumors are urological concerns, especially regarding the surgical approach, which is often the only curative therapy. Partial nephrectomy proved to be a viable procedure with survival rates similar to those undergoing radical nephrectomy and with lower morbidity for the patient, as it spares nephrons, reducing the impact of surgery on the progression of chronic renal dysfunction.

It aims to evaluate the application of nephrometry of the R.E.N.A.L score to help decide the type of surgery for different presentations of renal neoplasms.

METHODS

Patients:

A retrospective study was carried out with data from medical records of patients who underwent nephrectomy treatment for renal neoplasia at a single academic institution from 2017 to 2023. All patients had computed tomography scans with nephrometric study RENAL score and anatomopathological report confirming the neoplastic diagnosis.

The following data must be present for inclusion, namely: Pre-operative computed tomography with RENAL score, post-surgical TNM staging, anatomopathological report with surgical margin analysis, surgical description and post-surgical follow-up. The imaging and anatomopathological reports were retrospectively evaluated. The study was reviewed by the medical ethics committee and approved by CAAE registration 76055223.7.0000.0096.

Imaging Protocol:

The computed tomography exams were evaluated by the institution's group of radiologists. The classification and scoring of

the RENAL score used is standardized as described by Kutikov and Uzzo in which:

Radius (maximum diameter) in centimeters (cm) in any axis:

⩽ 4: 1 point
> 4 but < 7: 2 points
≥ 7: 3 points
Exophytic/endophytic tumor location:
⩾ 50% exophytic: 1 point
< 50% exophytic: 2 points
100% endophytic: 3 points

Nearness to the renal collecting system or renal sinus measured in millimeters (mm) as the shortest distance from the deepest point of the tumor:

⩾ 7: 1 point
> 4 but < 7: 2 points
⩽ 4: 3 points

Anterior or posterior location – assessed on the axial view:
no points are allocated
descriptors: “a” (anterior), “p” (posterior) or “x” (neither)
Location relative to the renal poles
entirely below the inferior pole or above the superior pole: 1 point
mass crosses the polar line: 2 points
>50% of mass lies across the polar line or is entirely between the polar lines or crosses the axial midline: 3 points
H: assigned as a suffix if the mass touches the main renal artery or vein
Masses with a score between 4-6 were considered low resection complexity, 7 to 9 moderate complexity and 10 to 12 high complexity.

STATISTICAL ANALYSIS

Surgical records of nephrectomies since 2017 were retrieved, selecting those indicated for renal neoplasia. They were classified according to the preoperative RENAL score, the type of approach (regarding partial or total nephrectomy), anatomopathological report and evaluation of margin compromise in tumors submitted to partial nephrectomy.

The data were stratified into groups according to the complexity classification by the RENAL score. Performed descriptive analyzes and definition of mean and median scores for partial and total nephrectomy indications. In addition to investigating the frequency of surgical margin compromise in cases of partial nephrectomies.

Fisher’s exact test, Student’s T test, multiple linear regressions and binomial exact test of equal proportions were applied to define the largest predictive components of the nephrectomy score (highest coefficients of determination (R2) of linear regressions) used to determine which type of surgical procedure was used for a given renal mass.

RESULT

During the period evaluated, 56 medical records were included, 60.7% men and 39.3% women, an average of 60.1 years and a median of 59.2 years. The majority of tumors (n=40) were clear cell renal cell carcinoma, followed by papillary carcinoma with 9 cases. According to the RENAL classification, 8 cases were considered low complexity, 30 cases moderate complexity and 18 high complexity. There were 46.4% (n=26) and 53.6% (n=30) cases of total and partial nephrectomy, respectively (Table 1).

Based on the stratification of the R.E.N.A.L score, radical nephrectomies were indicated in 42.3% for moderate complexity and in 57.7% for high complexity. While none were indicated for low complexity. On the other hand, of those masses treated with partial nephrectomy, 26.7%, 67.7% and 10% were indicated for low, moderate and high complexity, respectively (Table 2).

Tumors were evaluated according to each component of the R.E.N.A.L. score. A tendency towards a radical approach was

Table 1 – R.E.N.A.L Score data from 56 medical records.

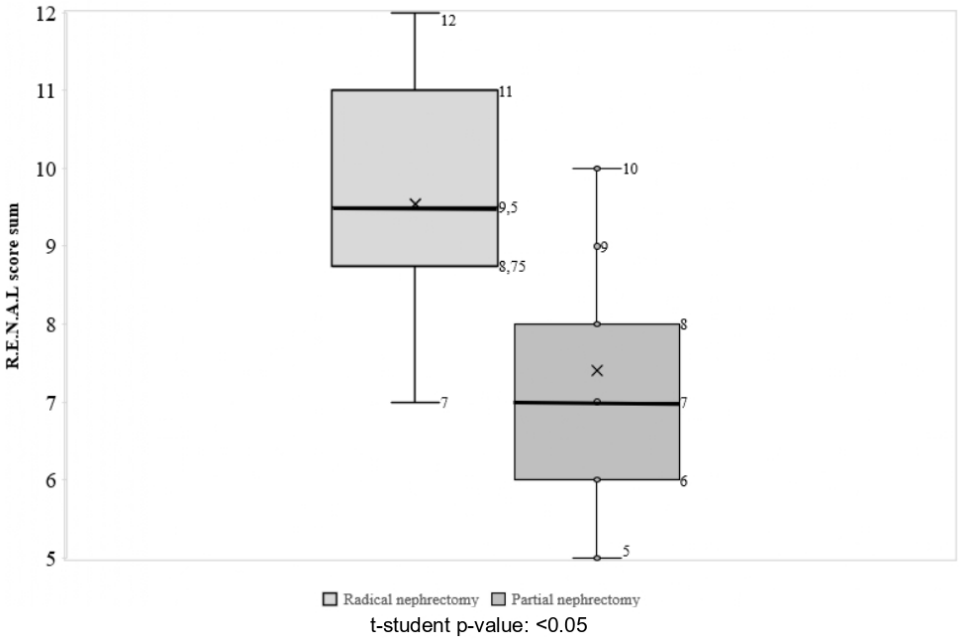
		Absolute number	Proportion
Sex	Masculine	34	0.607
	Feminine	22	0.392
Age (years)			
Mean ± SD	59.2 ± 13.8		
Range	21- 85		
Median	59.2		
Nephrectomy			
	Total	26	0.464
	Partial	30	0.536
Complexity			
	Low (≤6)	8	0.143
	Moderate (7-9)	30	0.536
	High (≥10)	18	0.321
Location (at p x)	a – Previous	21	0.375
	p – Posterior	15	0.267
	x – Both	20	0.357
Histological Type	CLEAR CELLS	40	0.714
	PAPILIFEROS	9	0.161
	CHROMOPHOBE	3	0.053
	ONCOCYTOMA	2	0.035
	ANGIOMYOLIPOMA	1	0.079
	OTHERS	1	0.017

SD: Standard deviation

Table 2 – Comparison of R.E.N.A.L Score data and stratification of each component by type of surgical approach.

Variable	Partial nephrectomy (n=30)	Total nephrectomy (n=26)	p-value
Complexity			<.001
Low (≤6)	8 (26.7%)	0	
Moderate (7-9)	19 (63.3%)	11 (42.3%)	
High (≥10)	3 (10%)	15 (57.7%)	
Radius (diameter)			<.001
1	17	3	
2	13	10	
3	0	13	
Exophytic/endophytic			0.23
1	19	11	
2	9	10	
3	2	5	
Proximity to the collecting system			0.057
1	4	0	
2	2	0	
3	24	24	
(A)nterior or (p)posterior or (x)			0.555
The	13	8	
P	8	7	
x	9	11	
Location relative to polar lines			0.040
1	14	5	
2	8	6	
3	8	15	
Hilar location			0.007
Hilar	0	6	
Don't laugh	30	20	
R.E.N.A.L score			
Mean + SD	7.40 ± 1.43	9.54 ± 1.39	t- student <001
Median	7.0	9.5	
Range	5 -10	7 - 12	

Figure 1 - Box-plot according to the sum of nephrometry and surgical approach of 56 participants.



observed as the score and individual components increased, except in relation to components E, N, A, which had no differences between groups (p>0.05) (Table 2). The R and L components were statistically significant between the two groups, with the larger the diameter and the higher the location score in relation to the polar lines, the greater the indication for treatment with total nephrectomy. Furthermore, hilar invasion was also decisive for radical approaches (p<0.05).

The masses treated with partial nephrectomy presented the 3rd quartile in the sum of nephrometry equal to 8 and median 7 (mean 7.40, SD 1.43), while those treated with radical nephrectomy presented the 3rd quartile at 10.75 and median 9.5 (mean 9.54, SD 1.39) (Figure 1).

The partial nephrectomy group was analyzed separately regarding margin compromise and the sum of nephrometry (Figure 2). It was observed that there were no significant results based on the score value. The average for those with margin commitment was 7.75 (median 8, SD 1.22) and for those without margin commitment, the average was 7.17 (median 1.54, SD 1.54). Those with margin involvement and nephrometry ≤ 6 corresponded to 37.5% of partial nephrectomies (Table 3).

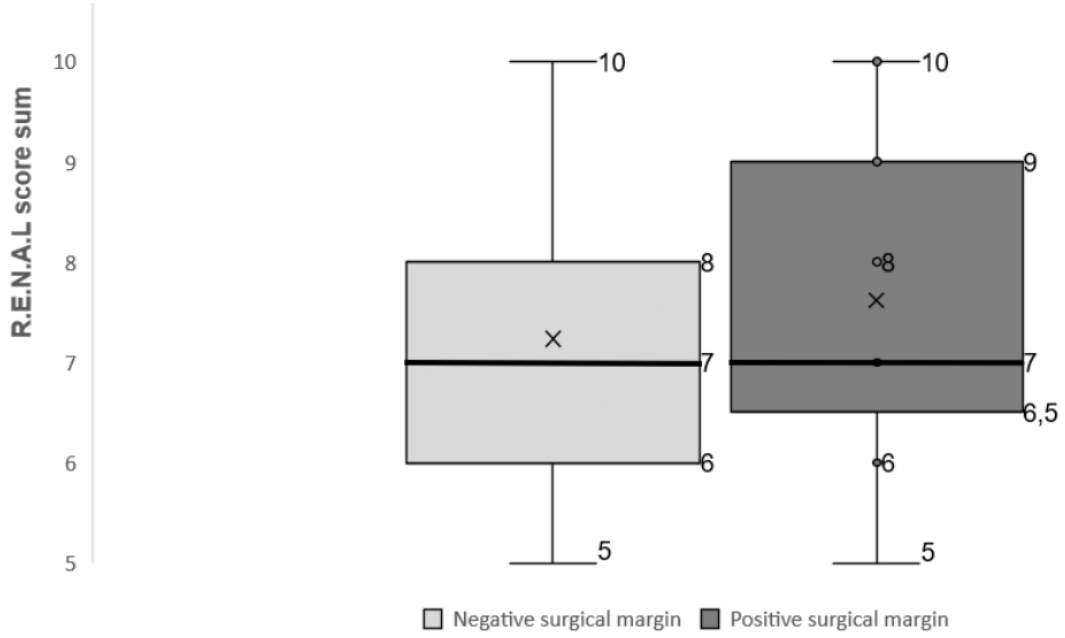
DISCUSSION

In the present study, the male population and those over 60 years of age were the most prevalent group, which is expected given the epidemiology of renal carcinomas affecting men mainly between the ages of 55 and 74 (5).

The most common histological type of renal carcinomas, clear cell carcinoma, was also the most common in our population, followed shortly after by papillary and chromophobes. Therefore, except in cases of benign renal tumors, such as oncocytoma and angiomyolipoma, renal masses need to be adequately evaluated for assertive treatments, given that mortality related to renal carcinomas can reach 40% (3).

In this sense, the decision on the surgical approach is an important urological issue. In renal neoplasms, the gold standard

Figure 2 - Box-plot according to surgical margin and sum nephrometry of 30 patients undergoing partial nephrometry.



t-student valor-p: >0.05

Table 3 - Proportion of compromised margins in partial nephrectomy approaches according to the R.E.N.A.L. classification.

R.E.N.A.L score	n	Compromised margin
5	3	1 de 3
6	5	2 de 5
7	8	4 de 8
8	8	2 de 8
9	3	2 de 3
10	3	2 de 3
≥ 11	0	-

treatment is surgical resection, when in the early stages of the disease (6). Nephrectomy can be radical or partial, depending on characteristics such as location and stage of the tumor. Radical nephrectomy is preferable in T2 or larger tumors, according to the TNM classification - Tumor, Node, Metastasis (7). Total resection of the mass represents a cure, which is why, historically, radical nephrectomy was mostly indicated. Over the years, it has been demonstrated that partial kidney resections are safe approaches for neoplasms, in addition to providing a better quality of life for the patient in some cases, such as those with a single kidney, in accordance with nephron-sparing technique approaches. In this retrospective study of the last 7 years, there was a balance between partial and radical resections, especially in the medium complexity group, where there is greater risk in terms of the type of resection.

The R.E.N.A.L. score classification system. allowed us to provide a reference that can be used to measure surgical decision trends. The American Cancer Society recommends that partial approaches are options

for those with early stages or tumors smaller than 4 cm and up to 7 cm (8). Low complexity masses can usually be treated with partial approaches. Nephrometry allowed the decision to be made objective, minimizing individual judgment and subjectivity, considering several criteria in addition to the size of the tumor (9).

Increasing the complexity, historically there is a greater tendency for open radical or partial nephrectomies. In the study by Canter and Kutikov in 2011, when evaluating 615 patients, those undergoing radical nephrectomy had significantly greater size (R), central proximity (N) and location (L) than those undergoing partial nephrectomy (9). Thus, a higher total score represents a greater focus on radical approaches. However, there is no consensus in the literature for a cutoff score that indicates or represents the most favorable outcomes when indicating a surgical approach following this nephrometry. In our case series, the mean sum of those undergoing partial nephrectomy was 7.40 (median 7, SD 1.43), while that of total nephrectomies was 9.54 (median 9.5, SD 1.39). When compared with the averages in the study by Canter and Kutikov, 7.49 and 9.67, our averages were close, however, more conservative in relation to partial conduct (9).

Nephrometry may be applicable to predict other outcomes such as ischemia time, operative time, blood loss, conversion rate to open surgery, complications, length of stay and surgical margin (2). All low complexity tumors were treated with partial nephrectomy in our study. Compromising the surgical margin is an important parameter when dealing with neoplasms. The study demonstrated margin compromise in 37.5% of low complexities and 42% in moderate complexity. Nephrometry, despite evaluating important nephrectomy criteria, alone was not a good predictor of total tumor resection through partial nephrectomy. Ercan et al. presented in their study with 1025 patients treated with partial nephrectomy that nephrometry using the R.E.N.A.L. was not a predictor for disease-free margin, although the "h" component may be related to local recurrence in partial approaches (10). Despite this, nephrometry is a useful tool for the evaluation of renal masses with quick and practical application and good interobserver agreement, even in professionals with less experience, which adds quality to the future decision of the best approach for the cancer patient (3).

CONCLUSION

In this work, the nephrometry profile of renal masses treated over 7 years in a single public hospital in the south of the country was demonstrated, arranged by each component of the score and type of procedure. Despite the various nephrometry assessments, surgical margin safety is not a parameter for which the score alone has shown to be applicable. As widely reproduced, tumors with low complexity R.E.N.A.L, almost in all cases, can be treated with partial nephrectomy. However, in cases of moderate complexity, individual assessment proved to be essential, so that it was possible to perform partial nephrectomy in almost half of the cases, with a very slight increase in the compromise of margins in relation to tumors of low complexity, of 37.5% to 42%. The R.E.N.A.L score used in isolation did not prove to be a superior tool in deciding on surgical procedures in relation to individual analysis based on the surgeon's experience.

CONFLICT OF INTEREST

None

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