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Original Research Article

Role of R.E.N.A.L Nephrometry Scoring System in Objectifying Treatment Decision

Alpana Pathak[1], A.N.D. Dwivedi[2], Pramod Kumar Singh[3], U.S. Dwivedi[4], Rupesh Kumar Sriwastawa[5]

[1]MD, Radio-diagnosis, IMS BHU, Varanasi, Senior Resident, Dept of Radiodiagnosis, PMCH Patna
[2]Professor Dept of Radiodiagnosis, IMS BHU, Varanasi.
[3]Associate Professor Dept of Radiodiagnosis, IMS BHU, Varanasi.
[4]Professor Dept of Urology, IMS BHU, Varanasi.
[5]MD, Anatomy IMS BHU, Varanasi.

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Corresponding Author: Rupesh Kumar Sriwastawa
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Abstract

Background and Objective: Renal cell carcinomas are thought to be the 8th commonest adult malignancy, representing 2% of all cancers, and account for 80-90% of primary malignant adult renal neoplasms. Earlier small renal masses were seen mainly as incidental findings at autopsy or in nephrectomy specimens.

To evaluate the utility of the RENAL scoring system in predicting operative approach of renal masses.

Methods: Nephrometry scoring was done in 50 patients in the tertiary care centre from 2018 to 2020 and the score sum along with its individual component scores was evaluated to assess its their relationship to surgical approach.

Results: Increasing tumor complexity as given by total nephrometry score was associated increased incidence of both radical nephrectomy and open partial nephrectomy (P =0.0001). Patients who underwent radical nephrectomy had a significantly larger size, proximity to pelvicalyceal system, and location component as compared to those of partial nephrectomy.

Comparatively those who underwent open partial nephrectomy had higher values of individual components (R, E and N mainly).

Conclusion: The R.E.N.A.L nephrometry score has standardized, objectified decision making and made the assessment and reporting of renal masses very reproducible.

Keywords: Renal masses, Nephrometry scoring, Tumor.

Introduction

Renal cell carcinomas are thought to be the 8th commonest adult malignancy, representing 2% of all cancers, and account for 80-90% of primary malignant adult renal neoplasms [1,2]. Earlier small renal masses were seen mainly as incidental findings at autopsy or in nephrectomy specimens. Today modern diagnostic imaging techniques, especially CT and sonography, have increased incidence and also the clinical recognition of such lesions, specifically, renal neoplasms 3 cm or less in diameter" [3].

The options for the management of small renal masses include excision by Partial Nephrectomy Or Radical Nephrectomy, ablation or active surveillance within the elderly [4]. As a number of treatment options are available to the urologist and patient, decision-making has become subjective and gets affected by factors like the interpreted tumor anatomy, physician expertise and patient's outlook on the treatment modalities.

Renal Nephrometry score (Radical Nephrectomys) was developed by Kutikov and Uzzo [5] to standardize the assessment of anatomical features of renal tumor. Nephrometry systems achieve two primary goals: epistemology of tumor location and standardization of reporting of tumor data. Secondary goals of nephrometry scoring is to predict success of partial nephrectomy, risk of postoperative complications, and functional and oncologic outcomes [6,7].

R.E.N.A.L. score consists of the anatomical parameters of the renal mass. These are radius, exophytic/ endophytic properties, nearness of tumor to the collecting system or sinus in millimetres, anterior/posterior, location relative to polar lines. The RENAL Nephrometry scoring system categorizes renal masses into low, intermediate and high complexity and provides standardized information and reproducible and objective communication regarding the anatomical features of solid renal masses and effectively stratifies treatment type.

Materials and Methods

It was prospective, ethical committee-approved, observational study conducted from July 2018 to august 2020 and consisted of 50 patients with renal masses referred from Department of UROLOGY to Radiology department for evaluation.

Inclusion Criteria

Tumor confined to renal, no metastasis or local invasion with normal renal function tests. The nephrometry scores were generated which consists of the five most objective attributes of the solid renal masses: RADIUS (R) gives the tumor size in the maximal diameter in any axis as seen in FIGURE 1, the EXOPHYTIC/ENDOPHYTIC (E) properties of the tumor, the NEARNESS (N) of the deepest portion of the tumor to the collecting system or renal sinus (depicted in figure 2), (A) Anterior (a)/ posterior (p) descriptor, and the LOCATION (L) relative to the polar line (seen in figure 3). All components except for the (A) descriptor are scored on a 1-, 2-, or 3-point scale. The (A) describes the principal mass location to the coronal plane of the kidney. The suffix "x" is assigned to the tumor if an anterior or posterior designation is not possible. An additional suffix "h" is used to designate a hilar location of the tumor (abutting the main renal artery or vein). Masses with nephrometry scores equal to 4-6 were considered of low complexity for resection, 7-9 were considered of moderate complexity, and 10-12 were considered high complexity. These patients were followed up for type of surgery such as radical vs partial and the particular approach opted i.e. open vs minimally invasive surgery [MIS]. The SPSS (Statistical Package for the Social Sciences) software was used for the statistical analysis and analysis was done using student's t test and ANOVA when appropriate. A p-value of 0.05 was considered to be statistically significant.

Results

50 patients with renal masses with the mean age being 54.8 years, age ranging between 30 years to 74 years, age-adjusted Charlson co-morbidity index equal to 4.8 and a male predominance (70 %) noted (TABLE 1). The Charlson comorbidity index (8) predicts the one-year mortality for a

patient who may have a range of comorbid conditions, such as heart disease, AIDS, or cancer (a total of 22 conditions), each condition is assigned a score of 1, 2, 3, or 6, depending on the risk of dying associated with each one (8). Of the 50 cases most, common subtype found was clear cell subtype in 60% cases followed by papillary subtype in 16% cases followed by oncocytomas, chromophobes and others. 9 (18 %) were of low complexity (nephrectomy score 4-6) group,

21 (42 %) of moderate complexity (nephrectomy score 7-9), and 20 (40 %) of high complexity

(nephrectomy score 10-12) group. Radical nephrectomy was performed for 33% and 85% of the moderate and high complexity cases, with predominant approach being open route in 54 % cases.

The overall Partial nephrectomy rate for the entire group was 52% (26 out of 50) of which nearly one half (42.3%) were performed using a Minimally invasive approach, including 6 (66.67%) and 5 (23.81) of low and moderate complexity lesions respectively. Most patients (20 out of 50) with high complexity lesions underwent either Radical nephrectomy or open Partial nephrectomy (P ~.001). The moderate complexity group (21 out of 50) showed that

33% of these underwent RADICAL NEPHRECTOMY and 66 % underwent PARTIAL NEPHRECTOMY. Of all moderately complex tumors, 23% were treated with open PARTIAL NEPHRECTOMY and 42% of moderately complex tumors were excised using MIS-PARTIAL NEPHRECTOMY. Tumors with the suffix (A) or (P) were more likely to be treated with PARTIAL NEPHRECTOMY (P ~0.02) and, the suffix (x) described that the tumor is large and less anatomically definable and was more likely to be approached with RADICAL NEPHRECTOMY. Using the nephrectomy scores, individual components were also analysed to

assess as to what all parameters were more likely to determine the surgical outcome. The tumors treated by RADICAL NEPHRECTOMY had a mean nephrometry score of 10.0 (median 10.5 SD 1.2); and tumors treated by PARTIAL NEPHRECTOMY had a mean nephrometry score of 7.1 (median 7.0 SD 1.7). In our study, 50% of radical nephrectomy was performed for tumors >7 cm and only 11.5% of PARTIAL NEPHRECTOMYs had tumors >7 cm. All the renal masses that were entirely endophytic underwent radical nephrectomy and 73 % of cases with more than 50 % exophytic components underwent partial nephrectomy (p-value <0.05). 66.67% of renal masses < 4 cm from the collecting system underwent radical nephrectomy while 88% of renal masses showing distance > 4 cm from the central sinus underwent partial nephrectomy (p-value=0.0079). 38 % of masses with suffix (x) underwent partial nephrectomy and 79 % underwent radical nephrectomy. 72 % of cases in which >50% of mass lies across the polar line or is entirely between the polar lines or crosses the axial midline underwent radical nephrectomy whereas 100 % of cases entirely polar underwent partial nephrectomy. H assigned as a suffix if the mass touches the main renal artery or vein. 66 % cases with hilar contact underwent radical nephrectomy and 53 % of non-hilar cases underwent partial nephrectomy. The examination of the individual components of the nephrectomy score revealed that as a tumour's size (R),

central proximity/nearness (N), and location (L) scores increased, RADICAL NEPHRECTOMY was more likely to be used (all P <0.05). Nephrometry's ability to distinguish those patients who underwent RADICAL v/s PARTIAL NEPHRECTOMY is given in Table 3. Regarding the choice between open PARTIAL NEPHRECTOMY versus MIS-PARTIAL NEPHRECTOMY, of the 26 patients who underwent partial nephrectomy, 42.0% and 57.0% were treated with MIS-PARTIAL NEPHRECTOMY and open PARTIAL NEPHRECTOMY, respectively. Patients undergoing open PARTIAL NEPHRECTOMY had more complex lesions, as quantified by nephrometry (mean score 8.6, median 9, SD 1.98). Comparing the individual components of nephrometry revealed that patients treated with open PARTIAL NEPHRECTOMY had an

increasing size (R), endophyticity (E), nearness to the collecting system or sinus (N), and location (L) component score [all P<0.05]. Tumor's relationship to the renal hilum, (h), was not a statistically significant (p=0.86) predictor of the surgical approach (open or MIS) for PARTIAL NEPHRECTOMY. Nephrometry's ability to distinguish those patients who underwent open versus MIS PN is given in Table 4.

Patients with renal masses referred from the department of urology (n=50)

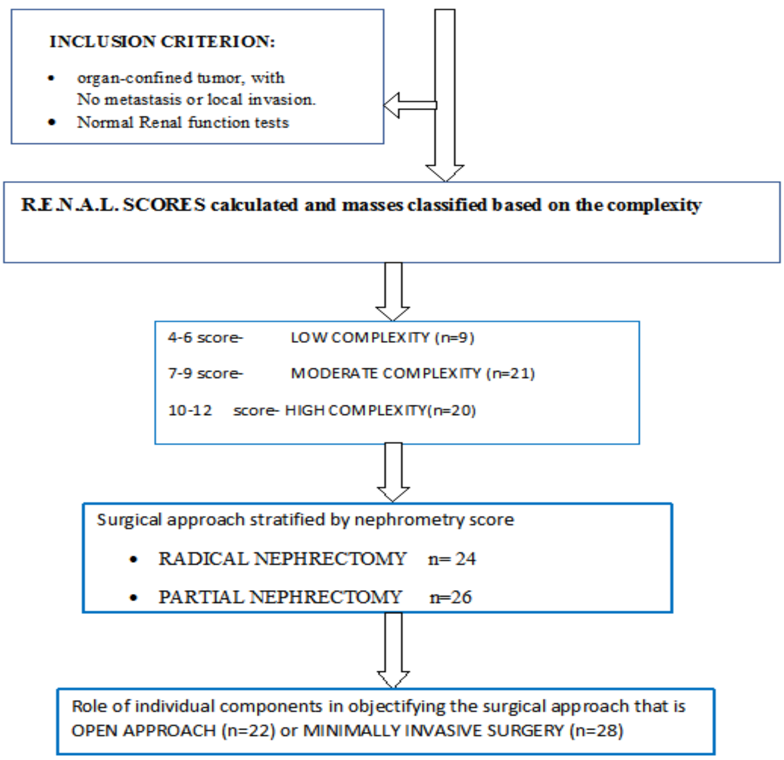

Figure 1: Flow diagram of the study

Discussion

The R.E.N.A.L. nephrometry scoring system represents the first method introduced to attempt to standardize the reporting of salient anatomy of an enhancing renal mass, as well as to provide a platform to objectify treatment decision-making, minimizing individual subjectivity and judgment [5]. the R.E.N.A.L. Nephrometry Score revolves around the 5 most reproducible features of the tumor, quantifying anatomical complexity relative to resection, offering a standardization for treatment by removing subjective variations and judgement. Each element is based on an identifiable and reproducible feature of localized renal masses that has been reported to affect surgical complexity. Out of 50 patients included in our study, 18% had a low complexity tumor, 42% had a moderate complexity tumor, and 40% had a high complexity tumor. Most patients (20 of 50) with high complexity lesions underwent either RADICAL NEPHRECTOMY or open PARTIAL NEPHRECTOMY (p< 0.05). The overall Partial nephrectomy rate for the entire group was 52% of which nearly one half were performed using a MIS approach. [8]Thus, increasing tumor complexity, as measured by a greater overall Nephrometry score is associated with both radical nephrectomy and open partial nephrectomy. Kutikov et.al. in 2011 suggested that Low (Nephrometry sum 4 to 6) and moderate (Nephrometry sum 7 to 9) tumors more often undergo partial nephrectomy, primarily using a minimally invasive approach, while high complexity (Nephrometry sum 10 to 12) lesions are more likely to undergo open partial or laparoscopic radical nephrectomy [9]. Analysing the individual components revealed that as the tumor size (R), central proximity/nearness (N), and location (L) scores increased, RADICAL NEPHRECTOMY was more likely to be used (all P < 0.05).Also, tumors with the descriptors (x) were also more often associated with RADICAL NEPHRECTOMY (P =0.02).1.R (RADIUS) In our study, 50% of radical nephrectomy was performed for tumors >7 cm and only 11.5% of PARTIAL NEPHRECTOMYs had tumors >7 cm. In 88% of cases with size < 7 cm partial nephrectomy was performed out of which 68%

were performed via minimally invasive techniques. The radius component of the score provides a quantitative parameter tumor size. Tumor size has been established as a prognostic indicator for oncological and surgical outcomes [10, 11, 12, 13]. 2. (E) EXOPHYTICITY / ENDOPHYTICITY

In the present study all the renal masses with E score of 3 points (n=6) that is entirely endophytic underwent radical nephrectomy out of which 50 % were by minimally invasive

route and rest by open approach (p-value < 0.05). Thus, with increasing E score the probability of radical nephrectomy increases. 3. (N) NEARNESS COMPONENT Nearness component delineates the proximity of the deepest portion of the tumor to the collecting system or sinus. Present study showed 66.67% of renal masses < 4 cm from the collecting system underwent radical nephrectomy while 88% of renal masses showing distance > 4 cm from the central sinus

underwent partial nephrectomy (p-value=0.0079). In fact, the deepest portion of the tumor is more relevant when assessing resect-ability and is an important variable that affects ease of nephron sparing surgery and postoperative complication rates [7, 14 15]. 4. ANTERIOR/ POSTERIOR(A)nterior/posterior descriptor, designates whether the tumor is anterior or posterior relative to the kidney midline plane on axial images. Our study had 16% anterior renal masses, 26% posterior renal masses and 58% with x configuration (neither anterior nor posterior). 38 % of masses with suffix (x) underwent radical nephrectomy Tumor could be described with the suffix (A) or (P) were more likely to be treated with PARTIAL NEPHRECTOMY (P=.03). Thus, the (x)descriptor describes a tumor that is large and less anatomically definable and was more likely to be approached with RADICAL NEPHRECTOMY. 5. (L) LOCATION Lesions (13%) with score of 1 that is entirely below the inferior pole or above the superior pole underwent nephrectomy with minimally invasive approach and those (57 %) with score of 3 that is when >50% of mass lies across the polar line or is entirely between the polar lines or crosses the axial midline predominantly underwent nephrectomy via open route. However, its relationship to the renal hilum, (h), was not a statistically significant predictor of the surgical approach (MIS or open approach) with p value= 0.867. These are consistent with the study conducted by Canter et al. in 2011 which showed tumour's relationship to the renal hilum, (h), was not a statistically significant predictor of the surgical approach (open or MIS) for partial nephrectomy [9]. Alexander Kutikov and Robert G. Uzzo in 2008 suggested that though

Renal nephrometry scoring system reflects an easy, ideal and reproducible classification system, Unfortunately no scoring system or classification can account for all biological variables. Despite this, Renal nephrometry scoring system provides a basis to optimise operative decisions, remove subjective bias, provides postoperative complication risks assessment and may also predict tumor grade. LIMITATIONS OF THE STUDY Small study population Every 1-point increase in the score doesn't reflects a similar increase in the level of anatomical complexity.

Conclusion

The R.E.N.A.L. scoring system provides a useful, flexible, and reproducible tool to objectify the salient renal anatomy as total score and its individual components significantly affect the with surgical approach.

References

1. Ng C, Wood C, Silverman P, Tannir N, Tamboli P, Sandler C. Renal Cell Carcinoma: Diagnosis, Staging, and Surveillance. American Journal of Roentgenology. 2008;191(4):1220-1232.
2. Sheth S, Scatarige J, Horton K, Corl F, Fishman E. Current Concepts in the Diagnosis and Management of Renal Cell Carcinoma: Role of Multidetector CT and Three-dimensional CT. Radio Graphics. 2001;21(suppl_1): S237-S254.
3. Porena M, Vespasiani G, Rosi P, Costantini E, Virgili G, Mearini E et al. Incidentally detected renal cell carcinoma: Role of ultrasonography. Journal of Clinical Ultrasound. 1992;20(6):395-400

4. Kunkle DA, Egleston BL, Uzzo RG. Excise, ablate or observe: the small renal mass dilemma--a meta-analysis and review. J Urol 2008; 179:1227-33; discussion 1233-4.
5. Kutikov A, Uzzo R. The R.E.N.A.L. Nephrometry Score: A Comprehensive Standardized System for Quantitating Renal Tumor Size, Location and Depth. Journal of Urology. 2009; 182(3):844-853.
6. Lifshitz D, Shikanov S, Jeldres C, Deklaj T, Karakiewicz P, Zorn K et al. Laparoscopic Partial Nephrectomy: Predictors of Prolonged Warm Ischemia. Journal of Urology. 2009; 182 (3):860-865.
7. Porpiglia F, Volpe A, Billia M, Renard J, Scarpa R. Assessment of Risk Factors for Complications of Laparoscopic Partial Nephrectomy. European Urology. 2008;53(3):590-598.
8. Charlson, Mary E.; Pompei, Peter; Ales, Kathy L.; MacKenzie, C. Ronald (1987). "A new method of classifying prognostic comorbidity in longitudinal studies: Development and validation". Journal of Chronic Diseases. 40 (5): 373–83.
9. Canter D, Kutikov A, Manley B, Egleston B, Simhan J, Smaldone M et al. Utility of the R.E.N.A.L. Nephrometry Scoring System in Objectifying Treatment Decision-making of the Enhancing Renal Mass. Urology. 2011;78(5): 1089-1094.
10. Campbell SC, Novick AC, Streem SB et al: Complications of nephron sparing surgery for renal tumors. J Urol 1994; 151: 1177.
11. Patard JJ, Pantuck AJ, Crepel M et al: Morbidity and clinical outcome of nephron-sparing surgery in relation to tumour size and indication. Eur Urol 2007; 52: 148.
12. Belldegrun AS: Renal cell carcinoma: prognostic factors and patient selection. Eur Urol, suppl., 2007; 6: 477.
13. Crispen PL, Boorjian SA, Lohse CM et al: Outcomes following partial nephrectomy by tumor size. J Urol 2008; 180: 1912.
14. Finley DS, Beck S, Box G et al: Percutaneous and laparoscopic cryoablation of small renal masses. J Urol 2008; 180: 492.
15. Weizer AZ, Gilbert SM, Roberts WW et al: Tailoring technique of laparoscopic partial nephrectomy to tumor characteristics. J Urol 2008; 180: 1273.