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ROLE OF R.E.N.A.L NEPHROMETRY IN PREDICTING TUMOR HISTOLOGY AND GRADE OF RENAL MASS.

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Abstract

Background: The R.E.N.A.L.(radius, exophytic/endophytic properties, nearness of tumor to the collecting systemor sinus in mm, anterior/posterior location relative to polar lines) nephrometry scoring system was recently introduced as an objective reproducible means to describe salient renal tumor anatomy. Objective of this study is to evaluate the role of R.E.N.A.L. Nephrometry score in predicting tumor histology and grade.

Methods: It is a prospective study carried out in Lilawati Hospital and Research Centre, a tertiary care centre consisting of 40 patients including male and female who had T1 renal mass. Preoperative R.E.N.A.L. Nephrometry scoring done for every patient and after treatment (Open Partial Nephrectomy, Laproscopic partial Nephrectomy, Radical Nephrectomy) tumor sent for histopathology to predict tumor histology and grade for solid renal mass.

Results: Clear cell histology also increased with R.E.N.A.L score, from 2/6 (33.3%) in patients with low R.E.N.A.L scores (4–6) up to 15/17 (88.24%) for patients with high R.E.N.A.L scores(10–12) . Conversely, the probability of the potentially more indolent papillary RCC decreased with increasing lesion complexity (from 66.67% in low score to 11.76% in moderate score).The Fuhrman grade is an important prognostic indicator for RCCs. In our study Fuhrman grade 1 tumours represented 4/40 (66.7%) low and 2(13%)high- complexity lesions . Conversely, there is no grade 3 lesion in low score (0.0%) compared with 5/40 (33.3%%) moderate complexity lesions, respectively showing more the nephrometry score higher will be Fuhrman grade.

Conclusions: Proportion with clear cell histology also increases with R.E.N.A.L score and the probability of the potentially more indolent papillary RCC decreased with increasing lesion complexity. The Fuhrman grade also increases with increase in nephrometry score

Keywords: R.E.N.A.L Nephrometry score, Fuhrman grade, Tumor histology

Introduction:

The biology of renal cell carcinoma (RCC) is hetttrogenous. Although approximately one third of all renal mass presesent with systemic disease, many localized renal masses appear to follow a relatively slow growing clinical course(1).Option for the management of renal masses includes excision by partial or radical nephrectomy, ablation or active surveillance (AS)in the elderly or infirmed(2).

The R.E.N.A.L.(radius, exophytic/endophytic properties, nearness of tumor to the collecting systemor sinus in mm , anterior/posterior location relative to polar lines) nephrometry scoring system was recently introduced as an objective reproducible means to describe salient renal tumor anatomy(3). Although there are other reported renal tumor methodologies, such as the PADUA (preoperative aspects and dimentions used for anatomic [classification]) and CI(centrality index) systems, the Nephrometry score is the first objective system that quantifies the complexity of the renal tumor(4,5). Since its introduction, the R.E.N.A.L. nephrometry scoring system has been shown to provide important preoperative and perioperative information used to predict long term outcomes and is increasingly being incorporated into clinical trials similar to the Response Evaluation Criteria In Solid Tumors guidelines(RECIST) (6). Increasing evidence suggests a relationship may exist between renal mass anatomy and pathology;(7,8,9) however, only recently have objective measures of defining renal mass anatomy been described.(10,11,12)

Objective of this study is to evaluate the role of R.E.N.A.L. Nephrometry score in predicting tumor histology and grade.

Methods:

It is a prospective study carried out in Lilawati Hospital and Research Centre, a tertiary care centre

consisting of 40 patients including male and female who had T1 renal mass. Statistical analysis was carried out with the help of SAS 9.2 and SPSS V15.0 (Statistical Package for Social Sciences, Version 15.0). Sample size of 40 was calculated with SAS 9.2 software. Renal Nephrometry study where incidence was 5% and anticipated incidence rate=20%, alpha =0.05, minimum sample size of 40 will have 90% power by Z test for Binomial proportion.

After obtaining approval from our local ethics committee, the charts of 40 patients having solid renal masses between feb 2013 to feb 2015 at Lilavati hospital and research centre (Mumbai) reviewed prospectively.

Preoperative R.E.N.A.L. Nephrometry scoring done for every patient and after treatment rendered (Open Partial Nephrectomy, Laproscopic partial Nephrectomy, Radical Nephrectomy) tumor sent for histopathology to predict tumor histology annd grade for solid renal mass.

R.E.N.A.L. Nephrometry scoring system was developed using images obtained from MDCT, although MRI can also be used. Nephrometry score is based on the 5 most reproducible features that characterize the anatomy of a solid renal mass

- Radius (scores tumor size as maximal diameter)

- Exophytic/Endophytic properties of the tumor

- Nearness of the deepest portion of the tumor to the collecting system or renal sinus

-Anterior/Posterior

R.E.N.A.L. NEPHROMETRY SCORING SYSTEM

Table 1

Component	SCORE		
	1 Point	**2 Points**	**3 Points**
R (radius, maximal diameter) (cm)	≤ 4	> 4 but < 7	≥ 7
E (exophytic/endophytic)	≥ 50 % exophytic	< 50% exophytic	Completely endophytic
N (nearness to collecting system/renal sinus) (mm)	≥ 7	> 4 but < 7	≤ 4
A (anterior/posterior locator)	No points given. Descriptor of “a,” “p,” or “x” assigned to describe mass location.		
L (location relative to polar lines)	Entirely below lower polar or above upper polar line	Mass crosses polar line	50% of mass is across polar line or mass is entirely between polar lines or mass crosses axial midline

All components except for the (A) descriptor are scored on 1,2,or 3,- scale.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 totaling 4-6 were considered low complexity for resection, 7-9 were considered moderate complexity, and10-12 were considered high complexity. The range of complexity of a renal tumor’s Nephrometry score is from the simplest 4a(1+1+1+a+1) to the most complex 12ph(3+3+3+ph+3)(6).

OBSERVATIONS AND RESULTS

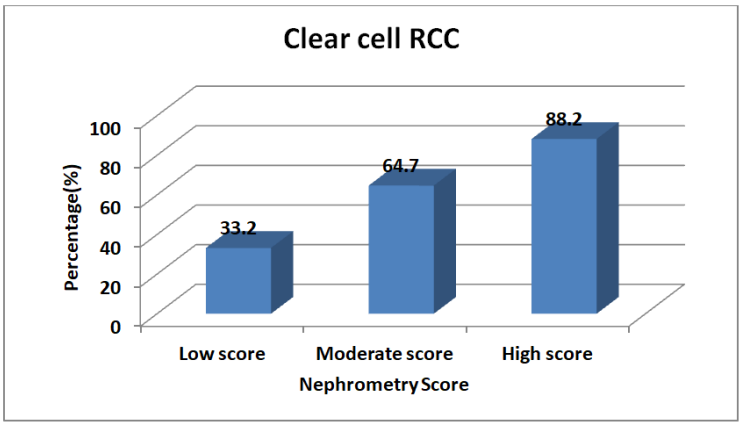
Table 2: Histological findings by R.E.N.A.L Nephrometry score

Data: Number (Percentage)

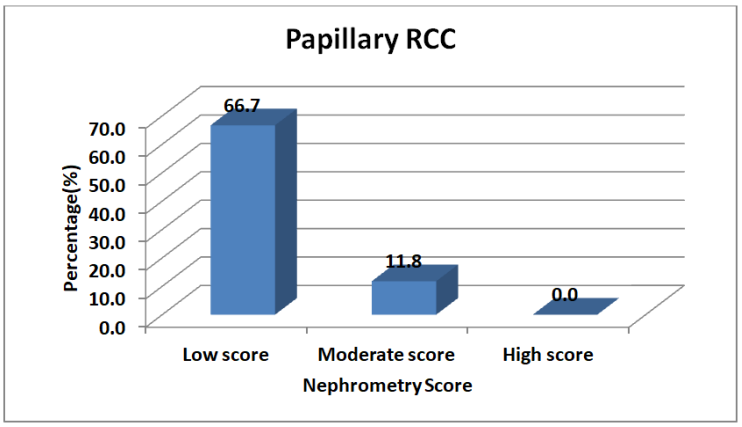
Complexity of mass	Low score 4-6 (n=6)	Moderate score 7-9 (n=17)	High score 10-12 (n=17)	Stat. test, Sign. & P value
Clear cell	2(33.3%)	11(64.71%)	15(88.24%)	Chi sq.=6.8,DF=2,S,P=0.03
papillary	4(66.67%)	2(11.76%)	0(0.0%)	Chi sq.=15.7,DF=2,S,P=0.0004
chromophobe	0(0.0%)	2(11.76%)	0(0.0%)	Chi sq.=2.84,DF=2,NS,P=0.24
oncocytoma	0(0.0%)	1(5.88%)	1(5.88%)	Chi sq.=0.37,DF=2,NS,P=0.83
angiomyolypoma	0(0.0%)	1(5.83%)	1(5.83%)	Chi sq.=0.37,DF=2,NS,P=0.83

Above table shows that,the proportion with clear cell histology also increased with R.E.N.A.L score, from 2/6 (33.3%) in patients with low R.E.N.A.L scores (4–6) up to 15/17 (88.24%) for patients with high R.E.N.A.L

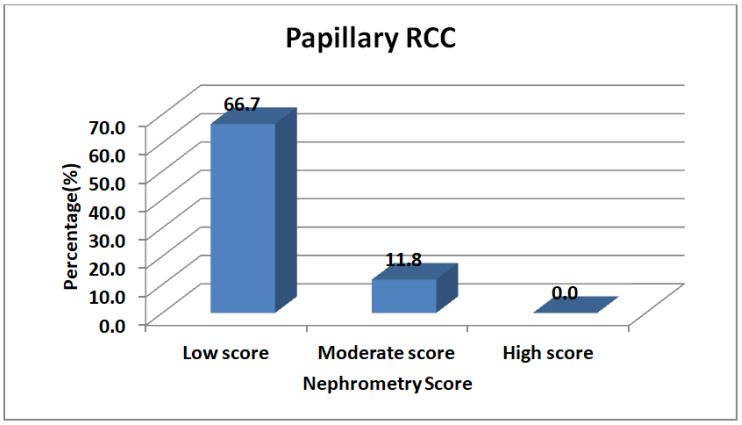
scores(10–12) . Conversely, the probability of the potentially more indolent papillary RCC decreased with increasing lesion complexity (from 66.67% in low score to 11.76% in moderate score).



Graph no: (1)



Graph no: (2)



Graph no: (3)

Table 3: Grades stratified by Nephrometry Score

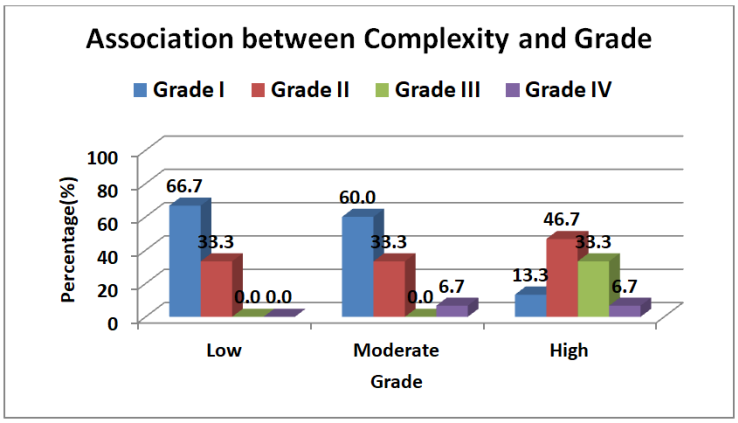
Data: Number (Percentage)

Fuhrmans Grades

Complexity	Low score 4-6 (n=6)	Moderate score 7-9 (n=15)	High score 10-12 (n=15)
Grade I	4(66.7%)	9(60.0%)	2(13.3%)
Grade II	2(33.3%)	5(33.3%)	7(46.7%)
Grade III	0(0.0%)	0(0.0%)	5(33.3%)
Grade IV	0(0.0%)	1(6.7%)	1(6.7%)
Total	6(100.0%)	15(100.0%)	15(100.0%)

Calculated Chi sq.=12.8, DF=6,NS,P=0.046

The Fuhrman grade is an important prognostic indicator for RCCs.In above table Fuhrman grade 1 tumours represented 4/40 (66.7%) in low and 2(13%) in high complexity lesions . Conversely, there is no grade 3 lesion in low score (0.0%) compared with 5/40 (33.3%%) moderate complexity lesions, respectively (Table 2).



Graph 4:

DATA ANALYSIS: Data were summarized as Mean ± SD for quantitative data and Number (Percentage) for qualitative data. Data were analysed with Student's unpaired t test for comparison of means of quantitative data. Chi square test, Chi square test with continuity correction and Fisher Exact Probability tests were applied to compare percentages. One way ANOVA (F test) was applied to compare means of more than 2 groups. Scheffe post hoc test was applied to compare 2 means. All statistical tests were 2 tailed, Level of Significance (α) was taken as P=0.05.P=Probability, S=Significance, NS=Not Significance, Chi sq.=Chi square, F=F test value, DF=Degrees of Freedom, Stat.=Statistical, NA=Not Applicable.

DISCUSSION

1. In our study the proportion with clear cell histology also increased with R.E.N.A.L score from 2/6 (33.3%) in patients with low R.E.N.A.L scores (4–6) up to 15/17 (88.24%) for patients with high R.E.N.A.L scores (10–12) . Conversely, the probability of the potentially more indolent papillary RCC decreased with increasing lesion complexity (from 66.67% in low score to 11.76% in moderate score). (Table no:1)

Similarly Satasivam P, Sengupta S , Rajarubendra N et al in 2011 also showed that proportion with clear cell histology also increased with R.E.N.A.L score, from 29/45 (64.4%) in patients with R.E.N.A.L scores of 4–6 up to 10/13 (76.9%) for patients with R.E.N.A.L scores of 10–12 . Conversely, the probability of the potentially more indolent papillary RCC decreased with increasing lesion complexity.(13)

Similarly Ball M,.Gorin M,. Bhayani S, Rogers C, et al in 2014 studied a total of 771 (76.4%) patients were found to have RCC and 198 (19.6%) had unfavorable pathology. On multivariate, bootstrap-adjusted logistic regression analysis, factors associated with the presence of malignancy were imaging tumor size≥3 cm (odds ratio [OR] = 1.46; P = 0.040), male sex (OR = 1.88; P<0.0001), and nephrometry score≥8 (OR = 1.64; P= 0.005). These same factors were independently associated with risk of unfavorable pathology: size≥3 cm (OR = 1.46;P = 0.021), male sex (OR = 2.35; P<0.0001), and nephrometry score≥8 (OR = 1.49; P = 0.015). The c statistic was 0.62 for the predicting malignancy and 0.63 for unfavorable pathology.(14)

2. In our study Fuhrmans grade 1 tumours represented 4/40 (66.7%) in low and 2(13%) in high complexity lesions. Conversely, there is no grade 3 lesion in low score (0.0%) compared with 5/40 (33.3 %) moderate complexity lesions, respectively. (Table 2)

Similarly Satasivam P, Sengupta S , Rajarubendra N et al in 2011 also showed that Fuhrmans grade 1 tumours represented 6/45 (13.3%) low-, 3/30 (10.0%) moderate- and no high-complexity lesions . Conversely, 1/45 (2.2%) low-complexity lesions were grade 4, compared with 6/30 (20.0%) moderate- and 2/13 (15.4%) high- complexity lesions respectively, concluding that Fuhrmans grade increases as the Nephrometry score increase.(13)

SUMMARY

1. Clear cell histology also increased with R.E.N.A.L score, from 2/6 (33.3%) in patients with low

R.E.N.A.L scores (4–6) up to 15/17 (88.24%) for patients with high R.E.N.A.L scores(10–12) . Conversely, the probability of the potentially more indolent papillary RCC decreased with increasing lesion complexity (from 66.67% in low score to 11.76% in moderate score).

2. The Fuhrman grade is an important prognostic indicator for RCCs. In our study Fuhrman grade 1 tumours represented 4/40 (66.7%) low and 2(13%)high-complexity lesions . Conversely, there is no grade 3 lesion in low score (0.0%) compared with 5/40 (33.3 %%) moderate complexity lesions, respectively showing more the nephrometry score higher will be Fuhrman grade.

CONCLUSION

1. Proportion with clear cell histology also increases with R.E.N.A.L score and the probability of the potentially more indolent papillary RCC decreased with increasing lesion complexity.

2.The Fuhrmans grade also increases with increase in nephrometry score.

Thus patients with higher nephrometry score have higher probability of Clear cell histology and high Fuhrmans grade, so having poor prognosis.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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