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Utility of the R.E.N.A.L.-Nephrometry Scoring System in Objectifying Treatment Decision-Making of the Enhancing Renal Mass

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Abstract

Objectives—The treatment of localized renal cell carcinoma remains overly subjective. The R.E.N.A.L.- Nephrometry Score (NS) quantifies the salient characteristics of renal mass anatomy in an objective and reproducible manner. We evaluated treatment patterns of solid renal masses based on quantifiable anatomic features using Nephrometry.

Methods—Nephrometry scores were available in 615 patients in our prospective kidney tumor database (2000-2010). The NS sum and its individual component scores were analyzed to determine their relationship to treatment approach.

Results—Median age, age-adjusted Charlson Co-Morbidity Index (CCI), and estimated GFR were 60 years (25-89), 2 (0-10), and 80.5 ml/min (5.1-120.0), respectively. Increasing tumor complexity as measured by a higher overall Nephrometry Score was associated with both radical nephrectomy (RN) and open partial nephrectomy (PN) ($p<0.0001$). Compared to patients who underwent PN, patients treated with RN had significantly higher size (R), central proximity (N), and location (L) component scores ($p<0.001$). Furthermore, tumors treated with a RN were more often hilar ($p<0.001$). Similarly, compared to minimally-invasive PN (laparoscopic or robotic), open PN was associated with an increasing individual component score for size, endophycity and central proximity to the collecting system ($p<0.001$) and non-polar location ($p=0.016$).

Conclusions—The R.E.N.A.L. – Nephrometry score standardizes reporting of solid renal masses and appears to effectively stratify by treatment type. Although only one part of the treatment decision-making process, Nephrometry aids in objectifying previously subjective measures.

Keywords

kidney cancer; Nephrometry; small renal mass (SRM)

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INTRODUCTION

The biology of renal cell carcinoma (RCC) is heterogeneous. Although approximately one-third of all renal masses present with systemic disease, many localized renal masses, appear to follow a relatively slow growing clinical course.[1] Options for the management of small renal masses (SRMs) include excision by partial or radical nephrectomy, ablation or active surveillance (AS) in the elderly or infirmed.[2] According to recent AUA guidelines for the clinical T1 renal mass, each of these therapeutic options are reasonable treatment approaches depending on the clinical scenario with recurrence-free survival rates ranging from 87.0% to 99.2% for ablative and surgical techniques.[3]

Due to the myriad treatment options available to the patient and treating urologist, clinical decision-making is overly subjective and is based on numerous often subjective factors including competing health risks (real or perceived), the interpreted tumor anatomy, physician experience/comfort and patient preference/perceptions of the ease/efficacy of various treatment modalities. Only recently have attempts been made to standardize treatment decision-making processes including objective risk quantification and treatment trade-off decisions[4], especially as large cohort series have demonstrated the deleterious effects of radical nephrectomy (RN) on long-term renal function and its attendant worsening of overall and cardiovascular health.[5-8] Furthermore, there has been increasing recognition that nephron sparing approaches are largely underutilized.[9,10]

We recently introduced the R.E.N.A.L.-Nephrometry score (NS) as a means to objectify the salient anatomic features seen on cross sectional imaging of a given renal mass in an effort to compare outcomes and develop metrics for treatment decision-making.[11] In the absence of a common nomenclature to describe the anatomical attributes of a renal tumor, treatment decision-making is subject to a physician’s biases and individual experience. A tumor’s Nephrometry Score is a structured and quantifiable method to describe the tumor’s relevant anatomical features as they relate to the complexity of a tumor. Here we evaluate the relationship between a tumor’s Nephrometry Score and the treatment rendered.

MATERIALS AND METHODS

Our prospectively maintained, IRB approved, institutional kidney tumor database (2000-2010) was queried. Of the 1610 surgically treated patients, we identified those with available Nephrometry Scores, which represent 615 consecutive patients presenting to our institution for evaluation of an enhancing renal mass. Nephrometry Scores were generated and verified by two physicians familiar with the R.E.N.A.L.-Nephrometry scoring system (www.Nephrometry.com).[11] Briefly, the scoring system is based on the 5 most reproducible features that characterize the anatomy of a solid renal mass: (R)adius (scores tumor size as maximal diameter), (E)xophytic/endophytic properties of the tumor, (N)earness of the deepest portion of the tumor to the collecting system or renal sinus, (A)nterior (a)/posterior (p) descriptor and the (L)ocation relative to the polar line. 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 totaling 4-6 were considered low complexity for resection, 7-9 were considered moderate complexity, and 10-12 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).[11] Patient’s estimated glomerular filtration rates were calculated using the the MDRD equation GFR (ml per minute per 1.73 m^2) = 186 × $sCr^{-1.154}$ × $age^{-0.203}$ × (0.742 if female) × (1.210 if black).

We retrospectively compared the anatomic complexity of a given renal mass using Nephrometry Score in patients who underwent surgical excision (radical versus partial; open versus MIS). Patients treated with ablative therapy were not included in this analysis. We used Fisher's exact tests, T-tests, multiple linear regressions, and exact binomial tests of equal proportions to define the most predictive components of Nephrometry Score (largest coefficients of determination (R^2) from linear regressions) used to determine which type of surgical procedure was employed for a given renal mass.

RESULTS

615 patients were identified with an available Nephrometry Score. Median age, age-adjusted CCI, and estimated GFR were 60 years (25-89), 2 (0-10), and 80.5 ml/min (5.1-120.0), respectively. Of those with an available Nephrometry score, 116 (19.7%) patients had chronic kidney disease (CKD) stage III or higher. 60% of the patients with CKD stage III or higher underwent nephron-sparing surgery (NSS) to treat their renal mass, regardless of their Nephrometry Score, in an effort to preserve as much functional renal parenchyma as possible. 533 (85.7%) patients had RCC confirmed on pathology with clear cell RCC being the most prevalent histology (62.4%). Table 1 displays the clinical and pathological characteristics of our cohort of patients.

Of the 615 patients that comprised our study, 128 (20.8%) patients had a low complexity (Nephrometry Score 4-6) tumor; 281 (45.7%) patients had a moderate complexity (Nephrometry Score 7-9) tumor, and 206 (33.5%) patients had a high complexity (Nephrometry Score 10-12) tumor. Stratified by Nephrometry Score, RN was performed in 6%, 23%, and 66% of low, moderate, and high complexity lesions (Table 2). The overall partial nephrectomy (PN) rate in the entire cohort (n=615) was 66% (407/615) of which nearly half (183/407) were performed using a minimally invasive (MIS) approach including 70%, 29%, and 6% of low, moderate, and high complexity lesions. Most patients (194/206) with high complexity lesions underwent either a RN or open PN (p<0.001). In fact, two-thirds (n=137) of all patients to undergo a RN had a highly complex enhancing renal tumor as measured by Nephrometry Score. The moderate complexity group (n=281) also revealed important surgical trends. In this subset, only 23% (63/281) patients were treated by RN while 77% (218/281) of patients underwent PN. In fact, 48% of all moderately complex tumors were treated with an open PN while 29% of moderately complex tumors were excised by a MIS-PN. Furthermore, the descriptor (A) provided important predictive ability. Tumors that could be described with the suffix (A) or (P) were more likely to be treated with a PN (p<0.001). Thus, the (X) descriptor describes a tumor that is large and less anatomically definable and was more likely to be approached with a RN.

Using Nephrometry Scores, we analyzed which components were more likely to predict whether an enhancing renal mass was be treated by RN or nephron-sparing surgery. Tumors with increasing Nephrometry Score sums as well as increasing individual component scores were more likely to undergo RN than PN (p<0.0001). Tumors treated by RN had a mean Nephrometry sum of 9.67 (median=10, SD=1.53); while, tumors treated by a PN had a mean Nephrometry Score of 7.49 (median=8, SD=1.89). Examination of the individual components of Nephrometry Score reveals that as a tumor's size (R), central proximity/nearness (N), and location (L) scores increase, RN was more likely utilized (all p<0.001). Also, tumors with the descriptors (X) and (h) were also more often associated with RN (p<0.001). For example, 81.1% of RNs had tumors greater than 7 cm (R=3) whereas only 18.9% of PNs had tumors greater than 7 cm (Table 3A).

We then analyzed the clinical decision regarding the choice between PN versus a MIS-PN. Of the 407 patients who underwent NSS, 183 (45.0%) patients and 224 (55.0%) patients were treated with a MIS-PN and an open PN, respectively. Patients undergoing an open PN had more complex lesions as quantified by Nephrometry ($p<0.0001$), (mean score=8.19, median=8, SD=1.71). The mean Nephrometry Score for lesions treated by MIS-PN was 6.62 (median=7, SD=1.74). Comparing the individual components of Nephrometry reveals that patients treated with an open PN had an increasing size (R), endophycity (E), nearness to the collecting system or sinus (N), and location (L) component score (all p-values < 0.001 except (L), p-value=0.016). A tumor's location, (A), or its relationship to the renal hilum, (h), was not a statistically significant predictor of the surgical approach (open or MIS) for PN. Table 3B demonstrates Nephrometry's ability to distinguish those patients who underwent open versus MIS PN. 88% of tumors larger than 7 cm (R=3) and 85.4% of tumors that were entirely endophytic (E=3) were treated by an open PN when nephron-sparing surgery was employed. Similarly, 62.6% of tumors located within the polar lines (L=3) were excised by an open approach.

COMMENT

As recent AUA Guidelines highlight, surgical excision, thermal ablation, and active surveillance are all viable treatment strategies for appropriately selected patients with a clinical T1 renal mass.[3] Despite the guidelines, the panel's authors concede that "the guideline does not preempt physician judgment in individual cases."[3] As the panel's disclaimer underscores, without a structured and reproducible system for describing the relevant renal mass anatomy, treatment decisions vary depending on an urologist's training, biases, comfort levels, and individual experience. Moreover, without a standardized format to allow for effective comparisons between academic reports, objectifying and comparing treatment decision-making are difficult.

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 provide a platform to objectify treatment decision-making, minimizing individual subjectivity and judgment.[11] Subsequently, the PADUA score was introduced as another objective method to describe the anatomical features of a renal mass.[12] The PADUA score is remarkably similar to Nephrometry with the exception of "the definition of the sinus lines and the evaluation of the anatomical relationship between the tumor and urinary collecting system or renal sinus."[12] Finally, the C-Index Method was introduced to characterize a tumor's centrality. This method requires a complex geometric calculation using cross-sectional imaging to determine the distance from the tumor center to the center of the kidney.[13]

In standardizing the descriptions of a given renal mass in our cohort of 615 patients, we were able to demonstrate that Nephrometry Score may be a valuable tool for objectifying the surgical decision-making process. By creating a reproducible system based on salient renal mass anatomy, we have codified the descriptions of renal masses that previously were simply referred to in terms such as "simple" or "difficult", thereby creating a platform to ascertain the optimal surgical approach. For example, in our cohort, 94% of low complexity masses were treated with a PN, most using an MIS technique. Furthermore, this data provides a benchmark which can be used to measure surgical trends throughout the country and address major variances from what is accepted as the standard of care, such as the under-utilization of PN for pT1a renal masses.

Although other institutions' have reported similar rates of NSS, these data certainly reflect the treatment bias of a tertiary care referral center. Recently published data from the NCDB note that nationally, approximately 27% of all patients with localized renal masses are treated with NSS regardless of their anatomic features.[14] Furthermore, this data have shown that the proportion of patients presenting with stage I renal cell carcinoma between 1993 and 2004 has increased from 43.0% to 57.1%[15] and that mean tumor size has decreased from 4.13 cm to 3.69 cm as assessed by pathological stage ($p < 0.001$).[16] Examining the Surveillance, Epidemiology, and End Results (SEER) data from 1999-2006 for over 18,000 lesions less than 4.0 cm, the rate of PN increased from 20.0% to 40.0%, however many would argue that this rate is still too low.[10] These data are concerning considering the risk of CKD associated with RN, recognition of high rates of baseline CKD[17] and emerging data regarding long-term deleterious health effects from CKD.[8]

As the AUA guidelines highlight, appropriate counseling regarding benefits of NSS is the current standard of care.[3] Furthermore, the authors state that the “more widespread application of [MIS] PN is anticipated in the future.”[3] In reaching this conclusion, the Panel relied on a multi-institutional study comparing outcomes among 1,800 patients treated with either a laparoscopic PN or an open PN. In this report, the authors demonstrated that a laparoscopic PN (n=771) was more often performed on smaller and peripheral tumors ($p<0.0001$ and 0.0003, respectively).[18] Unfortunately, a quantitative measure of tumor complexity was not used making meaningful comparisons difficult. Nephrometry Score provides an objective, standardized tool for deciding between tumors that could be treated by a MIS or open approach. In our cohort, 70% of low complexity tumors were treated by an MIS approach, primarily robotic assisted. By definition, these tumors, similar to Gill et al., are smaller (R), mostly exophytic (E), peripheral (N), and polar (L).

Nephrometry has several additional uses beyond aiding in surgical treatment decision-making. Recent investigators have adopted Nephrometry Scores to examine its ability to predict for functional, perioperative, and pathologic outcomes. Cha et al. showed that patients with higher “nephrometric variables”, (R) and (E), were more likely to experience post-operative renal impairment after MIS-PN.[19] Two other groups have shown that higher Nephrometry Scores predict for increased blood loss and longer ischemia time when undergoing either MIS-PN or open PN.[20,21] Finally, despite prior work reporting no significant biological differences between centrally and peripherally located tumors,[22] Nephrometry was recently evaluated to determine its ability to pre-operatively predict the histology and grade of enhancing renal masses. In this work, the authors found a high correlation between Nephrometry score and tumor grade ($p<0.0001$) and histology ($p<0.0001$).[23] Specifically, papillary RCCs had the lowest total Nephrometry Score while clear cell RCCs had higher Nephrometry Scores. Furthermore, benign lesions tended to be smaller, more endophytic, and non-hilar.

The main limitation of this study is that it is a retrospective correlation between a tumor’s Nephrometry score and the treatment modality. Also, in our dataset, there likely exists a treatment bias as a tertiary care referral center. Finally, a tumor’s Nephrometry Score does not capture certain relevant characteristics, for example, the presence of a tumor thrombus, which would affect surgical treatment and approach. While these concerns are valid, Nephrometry creates a platform to objectify clinical decisions. This construct is important as we consider the deleterious long-term health consequences from CKD as well as competing health risks of the aging population.

CONCLUSIONS

The R.E.N.A.L.-Nephrometry scoring system provides a useful, flexible and reproducible tool to objectify salient renal anatomy. In this report we demonstrate that total Nephrometry Score and its individual components correlate with surgical decision-making at a busy tertiary urologic oncology referral center. In particular, anatomic complexity of a renal mass, as described by Nephrometry, predicts application of both NSS and MIS techniques.

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REFERENCES

1. Chow WH, Devesa SS, Warren JL, et al. Rising incidence of renal cell cancer in the United States. Jama. 1999; 281:1628–31. [PubMed: 10235157]
2. 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. [PubMed: 18280512]
3. Campbell SC, Novick AC, Belldegrun A, et al. Guideline for management of the clinical T1 renal mass. J Urol. 2009; 182:1271–9. [PubMed: 19683266]
4. Kutikov A, Egleston BL, Wong YN, et al. Evaluating overall survival and competing risks of death in patients with localized renal cell carcinoma using a comprehensive nomogram. J Clin Oncol. 2010; 28:311–7. [PubMed: 19933918]
5. McKiernan J, Simmons R, Katz J, et al. Natural history of chronic renal insufficiency after partial and radical nephrectomy. Urology. 2002; 59:816–20. [PubMed: 12031359]
6. Huang WC, Elkin EB, Levey AS, et al. Partial nephrectomy versus radical nephrectomy in patients with small renal tumors--is there a difference in mortality and cardiovascular outcomes? J Urol. 2009; 181:55–61. discussion 61-2. [PubMed: 19012918]
7. Thompson RH, Boorjian SA, Lohse CM, et al. Radical nephrectomy for pT1a renal masses may be associated with decreased overall survival compared with partial nephrectomy. J Urol. 2008; 179:468–71. discussion 472-3. [PubMed: 18076931]
8. Weight CJ, Larson BT, Fergany AF, et al. Nephrectomy induced chronic renal insufficiency is associated with increased risk of cardiovascular death and death from any cause in patients with localized cT1b renal masses. J Urol. 2010; 183:1317–23. [PubMed: 20171688]
9. Hollingsworth JM, Miller DC, Daignault S, et al. Rising incidence of small renal masses: a need to reassess treatment effect. J Natl Cancer Inst. 2006; 98:1331–4. [PubMed: 16985252]
10. Dulabon LM, Lowrance WT, Russo P, et al. Trends in renal tumor surgery delivery within the United States. Cancer. 2010; 116:2316–21. [PubMed: 20225227]
11. Kutikov A, Uzzo RG. The R.E.N.A.L. nephrometry score: a comprehensive standardized system for quantitating renal tumor size, location and depth. J Urol. 2009; 182:844–53. [PubMed: 19616235]
12. Ficarra V, Novara G, Secco S, et al. Preoperative Aspects and Dimensions Used for an Anatomical (PADUA) Classification of Renal Tumours in Patients who are Candidates for Nephron-Sparing Surgery. Eur Urol. 2009; 56:786–96. [PubMed: 19665284]
13. Simmons MN, Ching CB, Samplaski MK, et al. Kidney tumor location measurement using the C index method. J Urol. 2010; 183:1708–13. [PubMed: 20299047]
14. Cooperberg MR, Kane CJ, Mallin K, et al. National Trends in Treatment of Stage I Renal Cell Carcinoma. Journal of Urology. 2009; 181:319. (abstract).
15. Kane CJ, Mallin K, Ritchey J, et al. Renal cell cancer stage migration: analysis of the National Cancer Data Base. Cancer. 2008; 113:78–83. [PubMed: 18491376]
16. Cooperberg MR, Mallin K, Ritchey J, et al. Decreasing size at diagnosis of stage 1 renal cell carcinoma: analysis from the National Cancer Data Base, 1993 to 2004. J Urol. 2008; 179:2131–5. [PubMed: 18423754]
17. Canter D, Kutikov A, Sirohi M, et al. Prevalence of baseline chronic kidney disease in patients presenting with solid renal tumors. Urology. 2011; 77:781–85. [PubMed: 21316090]
18. Gill IS, Kavoussi LR, Lane BR, et al. Comparison of 1,800 laparoscopic and open partial nephrectomies for single renal tumors. J Urol. 2007; 178:41–6. [PubMed: 17574056]

19. Cha E, Jeun B, Casey N, et al. Identification of nephrometric variables predictive of renal impairment following partial nephrectomy. J Urol. 2010; 183:e205.

20. Hayn MH, Schwaab T, Underwood W, et al. RENAL nephrometry score predicts surgical outcomes of laparoscopic partial nephrectomy. BJU Int. (in press).

21. Khemees TA, Yuh BJ, Stacey A, et al. Post operative morbidity of robotic versus open partial nephrectomy: the impact of preoperative tumor characteristics. J Urol. 2010; 183:e386.

22. Hafez KS, Novick AC, Butler BP. Management of small solitary unilateral renal cell carcinomas: impact of central versus peripheral tumor location. J Urol. 1998; 159:1156–60. [PubMed: 9507821]

23. Kutikov A, Smaldone MC, Egleston BL, et al. Anatomic features of enhancing renal masses predict malignant and high-grade pathology: a preoperative nomogram using the RENAL Nephrometry score. Eur Urol. (in press).

Table 1

Patient clinical and demographic characteristics

Age	
Mean, SD (range)	59.0, 11.8 (25-89)
Median	60
CCI, Age-Weighted	
Mean, SD (range)	2.77, 2.19 (0-10)
Median	2
Pre-operative eGFR	
Mean, SD (range)	80.8, 39.7 (5.1-120.0)
Median	80.5
Pre-operative CKD stage, no. (%)	
I	191 (32.5)
II	281 (47.8)
III	106 (18.0)
IV-V	10 (1.7)
Pre-operative tumor size (cm)	
Mean, SD (range)	4.6, 3.0 (0.7-17.8)
Median	3.7
Pathological distribution, no. (%)	
AML	21 (3.4%)
Chromophobe RCC	40 (6.4%)
Clear cell RCC	388 (62.4%)
Collecting duct	3 (0.5%)
Oncocytoma	51 (8.2%)
Papillary RCC	102 (16.4%)
Other	17 (2.8%)

Table 2

Surgical Approach Stratified by Nephrometry Score

	Complexity (n=615)		
	Low Score 4-6 N (%)	**Moderate Score 7-9 N (%)**	**High Score 10-12 N (%)**
Radical Nephrectomy			
MIS (n=153)	7 (5%)	55 (20%)	91 (44%)
Open (n=55)	1 (1%)	8 (3%)	46 (22%)
Partial Nephrectomy			
MIS (n=183)	89 (70%)	82 (29%)	12 (6%)
Open (n= 224)	31 (24%)	136 (48%)	57 (28%)
Total (n=615)	128 (100%)	281 (100%)	206 (100%)

[^] p-value < 0.001, i.e, as tumor complexity increases, open NSS or radical nephrectomy were more likely to be performed

[*] Suffix ‘A’ and ‘P’ were associated with PN (p<0.001)

MIS indicates both robotic and laparoscopic approaches.

Table 3A

Comparison of Nephrometry Score sum and individual components between patients who underwent radical nephrectomy versus partial nephrectomy

	Partial Nephrectomy (n=407)	**Radical Nephrectomy (n=208)**	**p-value**
Nephrometry sum	7.49 (8, 1.89)	9.67 (10, 1.53)	<0.0001
Mean (median, SD)			
(R)adius (diameter)	1=90.1%	1=9.9%	<0.001
	2=56.3%	2=43.7%	
	3=18.9%	3=81.1%	
(E)xophytic/endophytic	1=65.2%	1=34.8%	0.070
	2=69.7%	2=30.3%	
	3=56.5%	3=43.5%	
(N)earness of the tumor to the collecting system or sinus	1=88.7%	1=11.3%	<0.001
	2=92.2%	2=7.8%	
	3=56.8%	3=43.2%	
(A)nterior or (p)osterior or (x)	a=71.7%	a=28.3%	<0.001
	p=73.2%	p=26.8%	
	x=35.6%	x=64.4%	
(L)ocation relative to the polar lines	1=89.2%	1=10.8%	<0.001
	2=78.2%	2=21.8%	
	3=48.7%	3=51.3%	
“H”ilar location (abutting main artery or vein)	Hilar=42.7%	Hilar=57.4%	<0.001
	Non-hilar=72.4%	Non-hilar=27.6%	

Table 3B

Comparison of Nephrometry Score sum and individual components between patients who underwent MIS partial nephrectomy versus open partial nephrectomy

	MIS Partial Nephrectomy (n=183)	**Open partial Nephrectomy (n=224)**	**p-value**
Nephrometry sum	6.62 (7, 1.74)	8.19 (8, 1.71)	<0.0001
Mean (median, SD)			
(R)adius (diameter)	1=55.3%	1=44.7%	<0.001
	2=20.2%	2=79.8%	
	3=12.0%	3=88.0%	
(E)xophytic/endophytic	1=58.0%	1=42.0%	<0.001
	2=42.6%	2=57.4%	
	3=14.6%	3=85.4%	
(N)earness of the tumor to the collecting system or sinus	1=70.9%	1=29.1%	<0.001
	2=55.3%	2=44.7%	
	3=31.6%	3=68.4%	
(A)nterior or (p)osterior or (x)	a=50.2%	a=49.8%	0.08
	p=39.6%	p=60.4%	
	x=37.8%	x=62.2%	
(L)ocation relative to the polar lines	1=54.8%	1=45.2%	0.016
	2=44.1%	2=55.9%	
	3=37.4%	3=62.6%	
“H”ilar location (abutting main artery or vein)	Hilar=45.5%	Hilar=54.5%	0.937
	Non-hilar=44.9%	Non-hilar=55.1%	