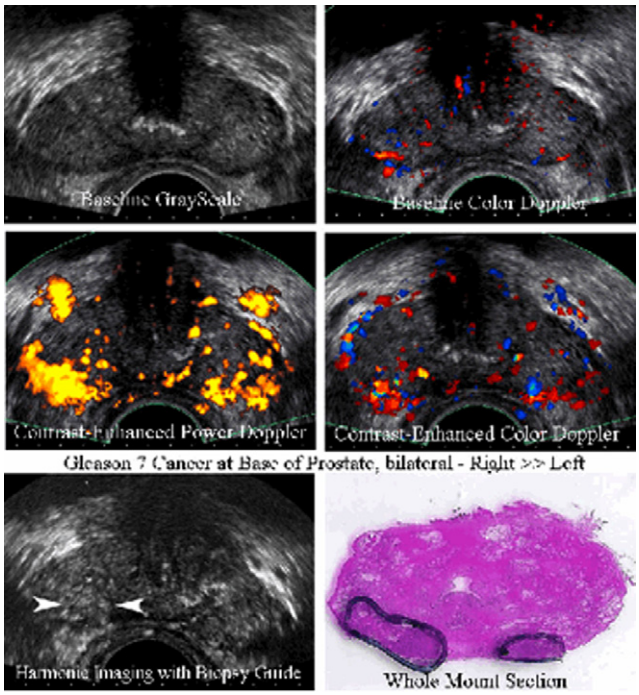
creases in Az with the highest Az for CE-power Doppler (0.66) and flash replenishment imaging (0.64) ($p=0.04$ for comparison to baseline). When the evaluation was limited to subjects with >2% gland involvement, Az values were slightly higher for CE-TRUS, with the highest Az for CE-power Doppler (0.69) and flash replenishment imaging (0.65). The combination of CE-power Doppler and flash replenishment imaging resulted in improved Az as compared with baseline imaging (0.70 vs. 0.59, $p=0.006$).

CONCLUSIONS: Contrast-enhanced ultrasonography demonstrates greater diagnostic accuracy than baseline imaging. Diagnostic accuracy is further improved for "clinically significant" tumor volumes >1cc.



Source of Funding: None

2021

CONTRAST-ENHANCED ULTRASOUND OF SOLID RENAL MASSES: NON-INVASIVE DISCRIMINATION BETWEEN RENAL CELL CARCINOMA AND BENIGN RENAL TUMORS

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INTRODUCTION AND OBJECTIVES: Contrast-enhanced ultrasound (CEUS) is an emerging dynamic imaging modality for the diagnostic workup of renal masses. CEUS avoids ionizing radiation for patients and avoids contrast-related toxicity associated with conventional imaging modalities such as computed tomography (CT) or magnetic resonance imaging (MRI). We evaluated the utility of CEUS in predicting the histopathology of solid renal masses.

METHODS: We assessed the ability of CEUS to predict tumor pathology in 32 solid renal masses in 31 patients (mean age 65 years, 17 males: 14 females) undergoing extirpative therapy at our institution. The presence of four main CEUS characteristic were evaluated in each mass including level of arterial enhancement compared to adjacent renal parenchyma (either hypoenhancment, isoenhancement, or hyperenhancement), enhancement pattern (either homogenous or heterogeneous), washout, and peri-lesional rim enhancement. Two radiologists assessed radiographic findings. The findings for each mass were compared with surgical pathology in order to determine predictive CEUS characteristics.

RESULTS: Our series consisted of 24 renal carcinomas (19 clear cell, 3 chromophobe, and 2 papillary tumors) and 8 benign tumors (6 oncocytomas, 1 angiomyolipoma and 1 metanephric adenoma). Mean tumor size was 3.1 cm (range 1.2 to 5.7cm). Heterogeneous enhancement alone had a 94% positive predictive value (95% CI 69-99), 44% negative predictive value (95% CI 19-70), 63% sensitivity (95% CI 40-81) and 88% specificity (95% CI 47-99) in predicting malignancy. The combination of isointense or hyperintense enhancement and homogeneous enhancement had a 67% positive predictive value (95% CI 29-92), 91% negative predictive value (95% CI 71-98), 75% sensitivity (95% CI 34-96) and 88% specificity (95% CI 67-97) for a benign tumor.

CONCLUSIONS: Our early experience with CEUS in the evaluation of solid renal masses demonstrates good accuracy in discrimination between malignant and benign tumors. This non-invasive diagnostic modality appears to be better than CT or MRI and may be comparable to percutaneous biopsy. Our initial results have prompted a larger corroborative prospective trial to evaluate the diagnostic accuracy of CEUS in predicting pathology in renal masses. CEUS may have an important role in the management of small renal masses.

Source of Funding: None

2022

EVIDENCE FOR TRAPPED SURFACE MICRO-BUBBLES AS THE ETIOLOGY OF THE TWINKLING ARTIFACT OBSERVED FROM ULTRASOUND IMAGING OF KIDNEY STONES

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INTRODUCTION AND OBJECTIVES: A twinkling artifact (TA) associated with urinary calculi has been described as rapidly changing colors on or behind the stone on Doppler ultrasound. Variation among sequential signals causes TA, but it is unknown from where the variability arises. Bubbles create a variable backscatter signal, because they can nucleate, grow, oscillate, agglomerate, fragment, and dissolve in a sound field. The purpose of this study was to investigate bubbles trapped on the stone surface as the cause for the twinkling artifact.

METHODS: Several experiments were performed to investigate the effect of micro-bubbles on the TA. First, radio-frequency (RF) data were captured using an ultrasound imager from each channel from in vitro human stones. One signal was perfectly replicated and input into the machine to see if the variability arose in the machine's processes or was already present in the received acoustic signal. Second, in vitro stones were imaged in a pressure chamber to determine if elevated atmospheric pressure could suppress the TA. Similarly, stone-producing porcine kidneys were harvested en bloc with a ligated ureter and then placed into a pressure chamber without exposure to air and imaged at elevated atmospheric pressure. Finally, smooth and scratched acrylic stones were immersed in water and ethanol, and the intensity of TA was evaluated.

RESULTS: Suppression of twinkling by an ensemble of computer generated replicas of a single RF received signal demonstrated that the TA arises from variability among the acoustic signals and not from electronic signal capture or processing. This variability was found to be random in nature. Under high static pressure, the TA from stones immersed in water and those from stone-forming porcine kidneys immediately disappeared with high pressure (~1 MPa) and returned with the release of pressure. TA was observed with acrylic spheres with rough surfaces, but not on smooth spheres. The TA was greatly reduced when rough spheres were immersed in ethanol, and returned when placed back into water.

CONCLUSIONS: These findings suggest that micro-bubbles on the surface of stones are the likely source of the twinkling phenomenon. A greater understanding of the TA may allow for enhancement of the signal and contribute towards development of algorithms to improve stone detection. For example, harmonic and pulse inversion imaging

already exist to better detect microbubble contrast agents, and pulses schemes can be devised to excite the surface bubbles before imaging.

Source of Funding: Work supported by NIH DK43881, DK092197 and NSBRI through NASA NCC 9-58.

2023

THE EFFECTIVENESS OF DIFFERENT DIAGNOSTIC METHODS IN DETECTION OF VESICOURETERAL REFLUX IN CHILDREN

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INTRODUCTION AND OBJECTIVES: Evaluate the diagnostic value of direct radionuclide cystography, indirect radionuclide cystography - dynamic nephroscintigraphy with voiding sample in comparing with "gold standard" - micturation cystourethrography (MCUG) in the detecting of the vesicoureteral reflux (VUR). We assess three methods and made the indications for each of them.

METHODS: Two groups of patients with VUR grade 2-4 were conducted. The first group included 72 patients (42 boys, 30 girls) in the age from 4 months to 18 years who were evaluated comparatively according to the results of indirect radionuclide cystography and MCUG; the second - 20 patients in the age from 5 months to 8 years (5 girls, 15 boys) were evaluated with direct radionuclide cystography in comparing of MCUG.

RESULTS: In the first group VUR was detected in 23 cases according to MCUG, in 33 according to indirect radionuclide cystography, in 16 by both methods. It should be noted that the discrepancy between the results was found in 59.7% of children aged from 6 months to 3 years with the VUR grade 2-3. In the second group 16 patients demonstrated matching results for both methods; 4 patients showed a discrepancy between the results: in 3 patients two-sided VUR was detected by direct radionuclide cystography but only one-side VUR by MCUG.

CONCLUSIONS: Indirect radionuclide cystography is the method of choice in children elder than 3 years old. Direct radionuclide cystography in contrast to an indirect one provides a reliable and objective assessment of the presence of VUR in both filling and emptying phases of the bladder, as well as allowing to determine the functional capacity which causes VUR, its intensity and duration.

Source of Funding: None

2024

CONTEMPORARY TRENDS OF IMAGING AFTER PRIMARY TREATMENT FOR PROSTATE CANCER

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INTRODUCTION AND OBJECTIVES: Previous studies have suggested an over-utilization of imaging in the diagnosis and assessment of newly diagnosed prostate cancer. However, data on utilization of imaging after the primary treatment for the disease are limited. We aimed to characterize trends in the use of imaging after prostate cancer treatment stratified by primary treatment type and time, and to identify patient characteristics associated with increased likelihood of receiving post treatment imaging.

METHODS: Patients in the Cancer of the Prostate Strategic Urologic Research Endeavor (CaPSURE) database with complete data on primary treatment and more then one year of follow up were selected for analysis. Imaging modalities assessed included radionuclide bone scan (BS), computed tomography (CT) and magnetic resonance imaging (MRI) completed within 5 years of primary treatment or before any secondary treatments. Rates of postoperative imaging were compared by primary treatment modality and year of diagnosis. Multivariable logistic regression was used to identify characteristics significantly associated with receiving postoperative imaging.

RESULTS: 9,176 patients comprised the analytic cohort. Less then 10% of patients received imaging after primary prostate cancer treatment and this rate was consistent across years of diagnosis. The use of BS decreased over time while the rates of CT scans increased ($p<0.01$). Patients managed with active surveillance/watchful waiting (AS/WW) or primary androgen deprivation therapy (ADT) had a higher utilization of post treatment imaging, primarily with BS compared to patients treated by other modalities. Being managed with primary ADT (OR 4.66, 95% CI: 3.8-6.4; p-value <0.01) was associated with an increased likelihood of posttreatment imaging compared to surgery, while management with external beam radiotherapy (OR 0.37, 95% CI: 0.2-0.7; p-value <0.01) and brachytherapy (0.57, 95% CI: 0.4-0.9, p-value <0.01) was associated with a decreased likelihood of post-treatment imaging. In addition, receipt of pretreatment imaging was associated with a decreased likelihood of posttreatment imaging (OR 0.56, 95% CI: 0.4-0.7, p-value <0.01).

CONCLUSIONS: Although the overall rates of imaging have remained stable over time, there has been a trend toward decreased BS and increased CT scans. Patients managed with primary ADT were more likely to receive imaging compared to patients managed with more definitive local therapy. These results do not address adequacy or appropriateness of imaging; optimal strategies for post-treatment imaging have yet to be defined.

Source of Funding: None

2025

POPULATION-BASED DETECTION AND FOLLOW-UP OF SMALL RENAL MASSES (<4CM) USING CROSS-LINKED DATABASE METHODOLOGY: INTERMEDIATE OUTCOMES

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INTRODUCTION AND OBJECTIVES: Incidental asymptomatic Small Renal Masses (SRMs) are increasingly discovered on cross sectional imaging. We describe a population-based protocol driven management of these lesions in a defined geographical area.

METHODS: All incidentally identified SRMs were reviewed in Multidisciplinary Cancer Meetings (MCM) between January 2007 to January 2012 in a population of over half a million. Lesions less than 3 cm were offered a repeat imaging every six monthly with review in the MCMs by the same radiologists. Data was obtained for reason for detection, location, morphology, interventions, pathology and survival using multiple healthcare databases by cross-linked methodology. . The reasons for interventions and pathological outcomes were noted.

RESULTS: Over a period of 5 years, SRMs were detected most frequently by CT scan of abdomen for unrelated causes followed by Ultrasound and MRI. Two hundred and ten SRMs were diagnosed during the study period in 190 patients with a mean age: 66.6 $\pm$ 13.13 years. Eighty four patients had surgical intervention and 116 are continuing to on follow-up protocol. The reasons for surgical interventions were: patients' choice and increase in size of masses on serial imaging. Amongst the 40% of patients requiring surgical intervention over median follow-up of 2.6 years; one in five had benign histopathology. The rate of growth on serial imaging of those who were resected was 2.81 ± 3.93 cm/year with no differences between benign and malignant histology. Sixteen percent (7.6%) decreased in size with most in the first year of the follow-up. One hundred and ten lesions are continuing to be under radiological follow-up (sixteen lesions were discharged from follow-up due to other competing causes of morbidity) with 55% showed no change in size.

CONCLUSIONS: Majority of small renal masses (60%) can be safely followed-up safely; however a significant number would require interventions. Role of pre-intervention biopsy should be considered in order to minimise the risk of unnecessary interventions in those with benign histology.

Source of Funding: None