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2022 AIUM Award Winners

Interventional-Intraoperative Ultrasound

CEU Appearance of the Ablated Small Renal Mass in the Immediate Post Procedural Period

Presenter: Dev Butani, MD, University of Rochester Medical Center
Author: Andrew Cantos, MD, University of Rochester
Author: Nami Azar, MD, FAIUM, University Hospitals/Case Western Reserve University
Author: Tracy L. Apeland, BS, RDMS, RVT, University of Rochester Medical Center

Objectives: Present the CEU appearance of ablated small renal masses in the immediate periablative period.

Methods: Percutaneous ablation is a widely accepted treatment for small renal masses. Post ablation follow up consists of surveillance imaging, either with CT or magnetic resonance imaging (MRI), which can be potentially nephrotoxic in renally impaired patients. CEU has been used favorably in these patients. Sometimes, minimal enhancement patterns on follow up CEU can be confusing.

We used CEU approximately 4 hours after cryoablation to establish efficacy of ablation and a baseline for future follow up.

Results: The appearance ranged from complete non enhancement, to enhancement of some hyperemic tissue. In a few cases there was also some contrast visualized in the blood vessels, but not of the parenchyma.

Conclusions: While CEU in surveillance of post ablative lesions is well described, it has not been explored in the immediate period. The appearance can be quite variable, and can serve as a baseline, making future interrogations with CEU more confident.

Efficacy of Combined Fine-Needle Capillary Sampling and Core Needle Biopsy in Evaluation of Thyroid Lesions

Presenter: Nami Azar, MD, FAIUM, University Hospitals/Case Western Reserve University
Author: Hamza Gokozan, Weill Cornell Medical College
Author: Amir Ata Rahnemai Azar, Case Western Reserve, University Hospitals
Author: Abdullah Osme, University Hospitals, Case Western Reserve
Author: Jay Wasman, University Hospitals, Cleveland Medical Center

Objectives: Ultrasound guided biopsy of thyroid lesions is imperative in management of patients with thyroid lesions. Fine-needle capillary sampling (FNC) is an generally the first line biopsy method of thyroid lesions, however tissue samples obtained with this technique may not be adequate for pathological diagnosis. Rapid on-site cytological evaluation (ROSE) by a pathologist at the time of biopsy allows immediate real time assessment of the samples for adequacy of the obtained tissue. Nevertheless, ROSE is associated with additional personnel, costs and procedure time, and is not available in all centers. Core needle biopsy (CNB) has been suggested as an adjunct or alternative modality to improve the diagnostic yield. The aim of this study is to evaluate added value and complications of CNB in evaluation of thyroid lesions when performed simultaneously with FNC sampling.

Methods: Between January 2019 and December 2020, 207 consecutive patients (Age range: 21–90 years, median: 63 years) with 254 nodules underwent simultaneous ultrasound-guided FNC and CNB by an interventional radiologist at a tertiary care hospital. FNC was obtaining by repetitively moving a 22–25 G needle through the thyroid lesion. Direct smears were stained with Papanicolaou and Diff-Quik methods. One ThinPrep slide was made for every case off of liquid based media. FNC was performed 3 times for each lesion. CNB was followed by FNC and utilizing an 18–21 G needle. All samples were evaluated by board-certified pathologists of the same institution for adequacy of samples for diagnosis and type of the pathology.

Results: A total of 254 nodules were sampled (55 from men, 199 from women). No complications were reported related to CNB or FNC. The adequacy rate for FNC alone (222/254, 87.4%) was not significantly different compare to CNB alone (212/254, 83.5%, $P = .2$). The adequacy rate of combined FNC and CNB was significantly higher than those for FNC or CNB alone (240/254, 94.5%, $P < .01$).

Final surgical pathology was available in 24 cases (24/254, 9.5%). CNB and FNC results were concordant in 191 of the cases (191/254, 75.2%). Among the 63 discordant cases, 13 underwent surgical resection (13/63, 20.6%). The final diagnoses of eight and four of these cases were concordant with CNB and FNC, respectively. One remaining nodule was diagnosed as papillary thyroid carcinoma, which was called atypia of undetermined significance in FNC, and benign follicular nodule in CNB.

Conclusions: The adequacy rate of FNC alone was not significantly different when compared to CNB alone. A combined technique however, yielded significantly higher adequacy rate compared to either techniques alone. A Combined technique could improve management of patients with thyroid lesions by providing adequate tissue diagnosis with no increased complications. This technique could be particularly useful when ROSE is not available.

Musculoskeletal Ultrasound

Comparison of Flexible Tape-Measure and Operator-Independent, High-Resolution Ultrasound in Assessment of Diasthesis Recti Abdominis

Presenter: Inder Raj S. Makin, MD, PhD, A.T. Still University, School of Osteopathic Medicine in Arizona

Author: Jeannine Noble, PT, MS, RMSK, A.T. Still University
Author: Tamara L. Roehling, PT, DPT, PhD, A.T. Still University

Objectives: Diasthesis recti abdominis (DRA), presents itself as excessive separation of the medial borders of the rectus abdomini muscles (>2.0 cm), at or above the umbilicus. This widening of the linea alba occurs in 66–100% women during pregnancy, reducing to 53% immediately postpartum. Parous women later in life often present with DRA (42%), as well as a substantive percentage of male population, resulting frequently from increased weight changes, weight lifting, and weakness of abdominal muscles. Associated sequalae from DRA are, compromised quality-of-life complaints such as urinary and fecal incontinence, organ prolapse, and low-back pain. The current clinical techniques for diagnosing DRA are finger width, flexible tape-measure, and caliper measurements, among which tape-measurements appear most promising. Each of these techniques suffer from issues with reliability, accuracy and intra- and inter-rater variability. Ultrasound imaging is the current gold standard for measurement of the inter-recti distance (IRD). The current study aims to compare IRD measured with high-resolution ultrasound imaging using a wide, 50-mm aperture linear transducer, with flexible tape-measurements. The wide field of view of the transducer enables reliable sonographic IRD measurements, while its comparison to tape-measurement enables evaluating the reliability of a more accessible approach for DRA assessment.

Methods: Participants recruited via convenience sampling, filled out a personal data questionnaire. From the original 51 recruited subjects, 49 completed the study; age: 18–64 years; 35 female; 14 male; BMI 18.5–33.8 kg/m^2. The subjects were instructed to lie supine, or attain a semi-crunch position. Subjects were assessed for IRD at the umbilicus as well as 4.5 cm superior to the umbilicus, by two experienced physical therapists (PT), using a tape-measure. Each PT was individually masked to other's measurements. Ultrasound IRD measurements replicated the tape-measured locations and subject positions. A high-resolution, 50 mm aperture, 20 mm azimuth, 15 MHz matrix array was used for acquiring images of the linea alba. Ultrasound imaging transducer was placed transversely across the linea alba until the medial recti abdominis muscle borders were visualized. A custom transducer template with fixed slots was used to ensure that the image frames could be obtained at discrete locations with respect to umbilicus, additionally this approach minimized operator variability through free-scanning. All ultrasound scanning was performed by the same MSK-accredited sonographer. The IRD was measured in real-time, and independently validated offline from acquired images, by two reviewers. In order to better understand the IRD change with location, its width was measured at six distinct midline positions of the linea alba. Comparison of standard ultrasound IRD measurements with other techniques however, were made only at two supra-umbilical locations.

Results: Using controlled, high-resolution ultrasound imaging measurements, DRA was diagnosed in 57% individually for both, female and male subjects. Of the positive DRA cases, 86% were mild (2.01–3.5 cm), and 14% were moderate (3.6–5.0 cm). Measurements recorded at several linea alba locations, showed a wider average IRD supra-umbilically compared to the infra-umbilical IRD, indicative of a propensity of the supra-umbilical linea alba to stretch abnormally. In correlating DRA with concomitant clinical symptoms, urinary incontinence showed statistically significance (P = .014), with a 4.9 odds ratio. Flexible tape measures for IRD demonstrated a moderate interrater reliability with interclass coefficient (ICC), of 0.49–0.53, depending on whether the subject was at rest or in a semi-crunch position, respectively. Intra-rater reliability of tape measure however, was high (ICC = 0.80). Tape-measurements were moderately correlated, with an ICC of 0.53 when compared to high-resolution ultrasound measurements at the umbilicus as a benchmark. Measurement of IRD using a flexible tape is highly specific (96.3%), thereby accurately confirming individuals who did not have DRA. In contrast, tape-measurement used to reliably predict DRA had a sensitivity of 13.6%.

Conclusions: Using a 50-mm aperture, high-resolution, 15 MHz transducer, enables simultaneous visualization of both medial margins of recti for reliable IRD measurement within a single image frame. Further, use of a controlled technique to place the transducer within a pre-cut template at fixed midline locations of the abdomen helps achieve accurate IRD measurements, while minimizing user-dependence during scanning. Assessing linea alba width using a flexible tape for IRD measurements has moderate correlation to ultrasound technique, a low sensitivity and a high specificity in diagnosing DRA. The tape-measure approach has a moderate interrater reliability. Ultrasound-based multi-level IRD measurement is a promising method to diagnose DRA.

Quantification of Finger Vascularity in Scleroderma Patients With Raynaud's Phenomenon Using Ultrasound Imaging

Presenter: Kibo Nam, PhD, Thomas Jefferson University
Author: Fabian Mendoza-Ballesteros, MD, Thomas Jefferson University
Author: Corinne E. Wessner, MBA, RDMS, RVT, Thomas Jefferson University
Author: Tanya C. Allawh, MD, Thomas Jefferson University
Author: Flemming Forsberg, PhD, Radiology

Objectives: Raynaud's Phenomenon (RP) is a disorder of the blood vessels, caused by exaggerated peripheral vasospasm in response to cold or stress. Vasculopathy causing RP is almost universal in patients with Systemic Sclerosis (SSc) and assessment of vasculopathy/microangiopathy is part of the diagnostic criteria for SSc. Currently, there are very few direct methods of assessment and clinically only nailfold capillaroscopy is employed. However, the vascularity evaluation with nailfold capillaroscopy is limited to the nail fold area and is mainly qualitative based on the shape, size, and density of