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09:00 - 10:30 Room J2

Scientific Session SS 7

Primary sclerosing cholangitis and cholangiocarcinoma

SS 7.1

Disease severity prognostication in patients with primary sclerosing cholangitis using gadoxetic acid-enhanced MRI: A validation of the ANALI scores and comparison with the potential functional stricture

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Purpose: To validate ANALI scores with and without gadolinium ($ANALI_{Gd}$ and $ANALI_{NoGd}$) and to compare their prognostic ability with the recently proposed potential functional stricture (PFS), all derived from unenhanced and gadoxetic acid-enhanced MRI (GA-MRI) in primary sclerosing cholangitis (PSC) patients.
Material and Methods: Five readers scored intrahepatic bile duct change severity, hepatic dysmorphia, liver parenchymal heterogeneity, and portal hypertension on GA-MRI, including 3D-T2-MRCP to generate $ANALI_{Gd}$ and $ANALI_{NoGd}$. They also evaluated 20-minute hepatobiliary-phase (HBP) images for PFS, i.e., absent contrast excretion in first-order bile ducts [i.e., left hepatic duct (LHD)/right hepatic duct (RHD)/common hepatic duct (CHD)/common bile duct (CBD)] or none at all vs normal biliary excretion, i.e., no functional stricture (NFS). Inter- and intrareader agreements were assessed and Kaplan–Meier curves were generated for survival analysis. Cox regression analyses were performed to evaluate association between $ANALI_{NoGd}$, $ANALI_{Gd}$, PFS and clinical scores, labs and outcomes.
Results: For 123 patients, mean age 40.5 years, Fleiss' kappa agreement was almost perfect-(κ=0.81) for PFS, but only moderate-(κ=0.55) for binary $ANALI_{NoGd}$. For binary $ANALI_{Gd}$, the agreement was slightly better on HBP (substantial-κ =0.64) than arterial phase (AP) (moderate-κ =0.53). Univariate Cox regression showed that hazard ratio (HR) for decompensated cirrhosis, orthotopic liver transplantation (OLT) or death was 3.15 for PFS ($p<0.001$) vs 6.42, ($p<0.001$) for $ANALI_{NoGd}$ vs 3.66, ($p<0.001$) for $ANALI_{Gd}$HBP and 3.79, ($p<0.001$) for $ANALI_{Gd}$AP. The multivariate analysis identified the PFS, three ANALI scores, and Revised Mayo Risk Score as independent risk factors for outcomes (HR 3.12, $p<0.001$; 6.12, $p<0.001$; 3.56, $p<0.001$; 3.59, $p<0.001$; and 4.13, $p<0.001$, respectively).
Conclusion: $ANALI_{NoGd}$ and GA-MRI-derived ANALI scores and PFS can non-invasively predict outcomes in PSC patients.

SS 7.2

An audit of the adequacy of gallbladder surveillance in primary sclerosing cholangitis at our institution: Are we following the guidelines and what were our findings?

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Purpose: All guidelines recommend that patients with primary sclerosing cholangitis (PSC) undergo annual US surveillance for gallbladder cancer. This study's purpose was to audit the surveillance of our PSC patients and to review the findings and histology of any cholecystectomies.
Material and Methods: 138 patients were identified from our PSC database. Their US surveillance rate between 2012 and 2022 was assessed against our standard that all patients should have an annual US of the gallbladder (100%). Cross-sectional imaging including MRCP was deemed unsuitable for gallbladder surveillance and was excluded. The presence of polyps and their size was noted, and any cholecystectomies and subsequent histology reports were recorded.
Results: Of the 138 patients 9.4% (n=13) had regular and complete annual surveillance (one US per calendar year if eligible). The percentage of the population scanned showed a positive trend over the 10-year timespan with an improvement from 27.6% in 2012 to 83.3% in 2022 (mean=66.1%, median=68.4% (27.6%–90.2%)). Overall, 41.3% of the eligible scans were performed over the 10-year time span. 7 patients (5%) with polyps were identified via US surveillance (age 27–74 years, 5 male, 2 female). 4 patients underwent cholecystectomy and all harboured adenocarcinoma (n=3) or high-grade dysplasia (n=1) (mean=17.3mm, median=14.5mm (10–30mm)). 3 polyps (mean=4.7mm, median=5mm (4–7mm)) have not been excised. 25 cholecystectomies were performed for benign pathology and no incidental polyps or dysplasia was found.
Conclusion: Gallbladder polyp surveillance in patients with PSC has improved but remains suboptimal. Over 10 years, 7 patients (5%) developed gallbladder polyps, and of the four removed, all showed malignancy.

SS 7.3

Radiomics features for risk stratification in primary sclerosing cholangitis: A proof-of-concept study

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Purpose: To identify the radiomics features, semi-automatically extracted from MRI-MRCP images, useful to identify patients at higher risk of clinical outcome development.
Material and Methods: Fifty-eight primary sclerosing cholangitis (PSC) patients with an MRI-MRCP study acquired with a standardized protocol were prospectively enrolled from Jan-2020 to Dec-2021. Blood tests and liver stiffness measurement (LSM) were collected close to the MRI-MRCP. Patients were classified into high risk or low risk for disease progression using the Mayo risk score (MRS) and LSM. Radiomics features have been extracted using PyRadiomics in each of the five MRI-MRCP sequences analyzed.
Results: Among the 58 patients, 15 (25.0%) and 17 (30.0%) were considered at high-risk using MRS and LSM, respectively. 107 radiomics features have been extracted from each MRI-MRCP sequence analyzed. The selection process individuated two features associated with high MRS: neighborhood gray-tone difference matrix (NGTDM)-busyness in the apparent diffusion coefficient (ADC) and gray-level run-length matrix (GLRLM)-run entropy in T2-spectral presaturation with inversion recovery (T2spir) showing both a mean cross-validated area under the curve (AUC) of 80%. The multivariable model, including both features, showed an AUC of 87% (SD 11%). When considering LSM (>9.6Kpa) as a stratifier of disease severity, gray level co-occurrence matrix (GLCM)-cluster shade in T1-weighted hepatobiliary phase (T1W HBP phase), GLCM-maximal correlation coefficient in T1W arterial phase, gray-level difference method (GLDM)-large dependence low gray level emphasis in ADC, and GLRLM-run entropy in T2spir showed an AUC of 85%, 83%, 85%, and 92%, respectively. The most accurate multivariable model included three variables: GLDM-large dependence low gray level emphasis in ADC, GLRLM-run entropy in T2spir and GLCM-cluster shade in T1W HBP phase with a median AUC of 96%.
Conclusion: This proof-of-concept study demonstrates the predictive value of the radiomics features in PSC and their potential role in risk stratification.