LEADERS IN ONCOLOGIC INTERVENTIONS

ECIO 2018

European Conference
on Interventional Oncology

April 22-25, Vienna, Austria

www.ecio.org

ABSTRACTS AND AUTHOR INDEX

CIRSE

Cardiovascular and Interventional Radiological Society of Europe

Content

ECIO 2018 Abstracts and Author Index
In case of any enquiries or comments, please contact us at **info@cirse.org**

The European Conference on Interventional Oncology is organised by CIRSE (Cardiovascular and Interventional Radiological Society of Europe).

The official congress website is: **www.ecio.org**

Cover: Schönbrunn Palace | Vienna, Austria | © www.istockphoto.com

GraphX by L O O P . E N T E R P R I S E S media
www.loop-enterprises.com

Online Publication Number: 10.1007/s00270-017-1852-5

Free Paper Session 1

902.1

Renal tumour cryoablation beyond T1a: outcomes for 56 T1b biopsy-proven RCC lesions

T. Gibson[1], N. Patel[2], A.J. King[1], D.J. Breen[1]
[1]Department of Radiology, University Hospital of Southampton, Southampton, UK, [2]Department of Radiology, St George's Hospital, London, UK

Purpose: Percutaneous image-guided renal cryoablation (CRA) represents an alternative nephron-sparing technique for renal tumours. The majority of published data has focused on its application specifically to T1a disease. Hence, our purposes are to: a) Provide results of a single-centre prospective study of the technical and oncological outcomes of CRA for T1b (<7cm) lesions and b) Compare these results with our equivalent data for T1a (</= 4cm) renal masses.
Material and Methods: 433 patients with 486 T1 renal lesions treated between 2008 and 2016 were identified from a prospectively maintained tumour registry. A subset of 56 patients with stage T1b (4-6.9cm) sporadic biopsy-proven RCC were selected for further analysis. Exclusion criteria: Previous history of RCC or heritable disease; <3 months follow-up.
Results: a) Demographics: 39 Male, 17 Female; average age = 70yrs; average tumour size = 4.8cm. b) Technical outcomes: Technical success i) primary ablation rate = 51/56 (91.1%), ii) secondary ablation rate (where performed) = 2/2 (100%); complications (Clavien-Dindo grade III+) = 3/56 (5.4%). c) Oncological outcomes: Mean length of follow-up = 26 months. No significant difference between T1a and T1b cohorts in overall survival (p= 0.43), late local recurrence-free survival (p = 0.45), or metastasis-free survival (p = 0.50).
Conclusion: Our findings of no statistical difference for CRA in the treatment of T1a or T1b renal masses concur with those of other studies in the literature. CRA therefore seems a reasonable treatment option for sporadic RCC tumours of <7cm. Further (follow-up) data is needed for comparison with partial nephrectomy.

902.2

Renal function outcome after radiofrequency ablation or laparoscopic partial nephrectomy for renal tumors – evaluation using the split renal function

V. Acosta Ruiz[1], P. Dahlman[1], E. Brekkan[2], A. Magnusson[1], M. Lönnemark[1]
[1]Dept of Surgical Sciences, Radiology, Uppsala University Hospital, Uppsala, SE, [2]Dept of Surgical Sciences, Urology, Uppsala University Hospital, Uppsala, SE

Purpose: Nephron-sparing techniques are used to treat small renal masses (SRM, ≤4cm). Previous evaluation of GFR and creatinine changes shows no difference between ablative treatments and surgical resection in preserving renal function. However, considering the kidneys' compensatory mechanisms, blood tests may be a crude method to evaluate renal function. We aim to compare renal function outcome after percutaneous CT guided radiofrequency ablation (RFA) and laparoscopic partial nephrectomy (LPN) by evaluation of the split renal function (SRF).
Material and Methods: Single (≤ 4 cm) renal tumors successfully treated (without tumor progression, mean follow up 3.5 years) with RFA (n=74) or LPN (n=39) were retrospectively compared. Data collection included patient demographics (age, BMI, co-morbidity), tumor data (modified-R.E.N.A.L score (m-RNS), size, histopathological diagnosis) and follow-up results (success rate). Patients underwent contrast enhanced CT scans (CE-CT) within a week prior treatment and followed with CE-CT 6 months and yearly thereafter. The SRF was calculated on baseline images and the first follow-up image after treatment using a MultiModality workstation.
Results: RFA- and LPN-treated tumors did not differ in m-RNS (median score 7 points), patient age (p = 0.07) or gender (p = 0.23). Both groups showed a decline in SRF in the affected kidney; however, the reduction was significantly greater in the LPN group (-2.2%, p=0.009). Tumor location correlated with the change in SRF in both groups (r = 0.23, p=0.014).
Conclusion: Kidneys treated with RFA (for SRM) are associated with a less decline in renal function, in comparison to treatment with LPN.

902.3

Evaluation of factors affecting percutaneous cryoablation outcome of renal cell carcinoma

L. Colleter[1], C. de Margerie-Mellon[2], A. Masson-Lecomte[2], P. Mongiat Artus[2], F. Desgrandchamps[2], **E. de Kerviler**[2]
[1]Radiology, Saint-Louis Hospital, Paris, FR, [2]Urology, Saint-Louis Hospital, Paris, FR

Purpose: To evaluate factors affecting local tumour control and complications after cryoablation of renal cell carcinomas (RCCs).
Material and Methods: Retrospective analysis of 169 patients who underwent CT-guided percutaneous cryoablation (PCA) of 181 biopsy-proven RCCs was performed. Patients with a mean age of 69 years (range 44–89 y) were followed for 6 months or longer with MRI. All patients underwent MRI at day 1 to assess ablative margins. Factors affecting local tumour control and complications were evaluated: tumour size, RENAL score, histology and Fuhrman grade, enhancement pattern and ablative margins.
Results: Median follow-up was 33 months (range 6-86 m). Mean tumour diameter was 26 mm (range 10-60 mm). Recurrences were observed in 17 patients with clear cell RCC (ccRCC) and in 1 with non-clear cell RCC. All controlled tumours had ablative margins of 5 mm or more on MRI at day 1. Recurrence rate was significantly correlated with low ablative margins (p<0.0001) and ccRCC subtype (p=0.046). On multivariate analysis, only ablative margins remained significant (p<0.0001). Complications were rare (15% Clavien 1; 0,006% Clavien 2 and 4; 0,2% Clavien 3). Complication rate correlated with tumour size (p=0.03) and tumour nearness to collecting system (p=0.014).
Conclusion: MRI at day 1 is highly predictive for recurrence. Insufficient ablative margins and clear cell histologic subtype were associated with incomplete local tumour control following cryoablation. Tumour biopsy should be obtained in a different session prior to cryoablation of RCCs as margins seem more critical for ccRCC subtype. Although low, complication rate of PCA increases when large and endophytic tumours are treated.

Free Paper Session 2

1902.1

Safety of holmium-166 microsphere scout dose during radioembolization work-up

A.J.A.T. Braat, J.F. Prince, R. van Rooij, M.A.A.J. van den Bosch, M.G.E.H. Lam
Radiology and Nuclear Medicine, University Medical Center Utrecht, Utrecht, NL

Purpose: A holmium-166 scout dose (166Ho-SD) is superior in calculating the lung shunt fraction compared with technetium-99m-macroaggregated albumin (99mTc-MAA). The isotope has both beta and gamma emission, allowing 166Ho loaded microspheres to be used as a scout dose (250 MBq) as well as a therapeutic dose (>4 GBq) for radioembolization treatments. However, the beta emissions of 166Ho may cause concerns on the safety of using a 166Ho-SD (250 MBq). All patients who received work-up with a 166Ho-SD in our institute were reviewed for safety.
Material and Methods: A total of 90 patients were included in prospective phase 1-2 studies on 166Ho radioembolization. In patients with an extrahepatic deposition of the 166Ho-SD, the radiation absorbed dose to extrahepatic tissue was calculated and medical records were reviewed for potential complaints related to the extrahepatic deposition of the 166Ho-SD. Based on a phantom study, a threshold value of 30% of the maximum activity in the deposition was chosen to conservatively underestimate the volume of the deposition on SPECT/CT, thus conservatively overestimating the radiation absorbed dose on extrahepatic tissue.
Results: Six patients had an extrahepatic deposition of a 166Ho-SD, which were located in duodenum (three times), gastric fundus, the lesser curvature of the stomach and falciform ligament, resulting in an estimated median absorbed dose of 3.6 Gy (range 1-14 Gy). No (clinical) complications related to the extrahepatic deposition of the 166Ho-SD occurred after a median follow-up of 4 months.
Conclusion: These results support the safety of a 250 MBq 166Ho-scout dose in a clinical setting.

1902.2

Tumor targeting and 3D voxel-based dosimetry to predict tumor response, toxicity and survival after Y-90 resin microsphere radioembolization in HCC

C. Allimant[1], M. Kafrouni[2], J. Delicque[1], D. Ilonca[2], C. Cassinotto[1], L. Escal[1], M.-A. Pierredon[1], J. Lonjon[1], V. Schembri[1], D. Mariano-Goulart[2], **B. Guiu**[1]
[1]Radiology, St-Eloi University Hospital, Montpellier, FR, [2]Nuclear Medicine, University Hospital, Montpellier, FR

Purpose: To evaluate the impact of complete targeting and 3D-voxel-based dosimetry on post-treatment Y90-PET/CT to predict tumor response, survival and toxicity in patients with advanced HCC treated with Y90-resin microspheres.
Material and Methods: 42 SIR-Sphere® treatments administered in our center from February 2012 to December 2015 were retrospectively analyzed. 3D-dosimetry was calculated using a treatment planning system to obtain Dose-Volume Histogram (DVH) and the area under the DVH (AUDVH, in Gy) to measure Y90 dose deposition in different liver volume (tumor, non-tumoral). Tumor control was defined upon mRECIST criteria at 6 months. We documented toxicity by radioembolization-induced liver disease (REILD) occurences. Uni- and multivariate logistic regression was used to compute odds ratios according to tumor complete targeting and AUDVHTumor. Secondary endpoints were: survival analyses using the Kaplan-Meier method and compared using log-rank tests and toxicity analysis comparing mean dose deposition in non-tumoral irradiated liver in REILD versus non-REILD patients using Mann-Whitney test.
Results: The 6-month tumor control rate was 40,5%. Complete targeting was observed in 60% of the cases. By univariate logistic regression, tumor targeting and AUDVHTumor were significantly associated with tumor control ($p<0,001$ and $p=0,008$ resp.). By multivariate analysis, both factors independently predicted tumor control (OR=36,97[1,83-747], $p<0,001$ and OR=1,027[1,002-1,071], $p=0,0325$ resp.). OS and PFS were significantly longer in patients with complete targeting and/or higher AUDVHTumor. We observed 4 REILD (9,5%) with higher doses to the non-tumoral irradiated liver ($p=0,04$).
Conclusion: Complete targeting and Y90-dose to the tumor represented by AUDVHTumor are independent factors associated with tumor control and survival. Dose to non-tumoral irradiated liver is higher in REILD.

1902.3

Phase 1 open-label multicenter clinical trial of Talimogene Laherparepvec (T-VEC) injected into liver tumors: early safety data

S. Raman[1], M. Pless[2], A. Cubillo[3], A. Calvo[4], J.R. Hecht[1], C. Liu[5], E. Chan[5], J. Chesney[6], A. Prat[7]
[1]David Geffen School of Medicine, University of California, Los Angeles, CA, US, [2]Department of Oncology, Kantonsspital Winterthur, Winterthur, CH, [3]CIOCC, HM Universitario Sanchinarro, Madrid, ES, [4]Medical Oncology Department, Hospital General Universitario Gregorio Marañón, Madrid, ES, [5]Amgen, Inc., Thousand Oaks, CA, US, [6]James Graham Brown Cancer Center, University of Louisville, Louisville, KY, US, [7]Hospital Clínic, University of Barcelona, Barcelona, ES

Purpose: Evaluation of safety of intrahepatic injection of T-VEC (oncolytic immunotherapy designed to preferentially replicate in tumors, produce GM-CSF, and stimulate anti-tumor immune responses) in patients with liver metastases from selected solid tumors (non-HCC; Group A) or hepatocellular carcinoma (HCC; Group B).
Material and Methods: Eligible patients were ≥18 years with measurable, injectable liver tumors. T-VEC was administered at 106 plaque-forming units (PFU)/mL, followed by ≤4 mL x 107 PFU/mL (cohort 1) or 108 PFU/mL (cohort 2) every 21 (+/-3) days (Q21D), or ≤8 mL of the maximum tolerated concentration (MTC) Q21D (cohort 3). Volume injected depended on lesion size.

Results: Data from cohorts 1-2 of group A (non-HCC patients) are presented. Of 14 patients treated, 12 (3 breast cancer/9 colorectal cancer) were DLT-evaluable, with a median age of 65.5 years (range: 33-73). One patient received all 12 injections; median number was 3. MTC was 108 PFU/mL (primary objective). There was 1 DLT: grade 3 AST/grade 2 bilirubin increase after initial dose. Overall, 4/14 (28.6%) patients had grade 3/4 treatment-related (TR) AEs: anemia, increased gamma-glutamyltransferase, ALT and AST. Two deaths were attributable to disease. Six subjects had SAEs; 2 were TR SAEs (AST/ALT increase and nausea). One patient experienced procedure-related SAEs (liver cholestasis from hematoma and transient hepatic hemorrhage); predisposing factors included anticoagulation and multiple prior intrahepatic procedures.
Conclusion: MTC was 108 PFU/mL Q21D after initial 106 PFU/mL injection. Repeated intrahepatic T-VEC injection at the approved dose for melanoma appears tolerable and feasible for patients with liver metastases. T-VEC combined with PD-1 inhibition is planned.

1902.4

Pickering-emulsion for liver transarterial chemoembolization with oxaliplatin

F. Deschamps[1], L. Moine[2], K. Harris[3], L. Tselikas[1], W. Li[3], T. Isoardo[2], R. Lewandowski[4], A. Paci[5], R. Salem[4], T. de Baère[1], A.C. Larson[3]
[1]Department of Interventional Radiology, Gustave Roussy Cancer Campus, Villejuif, FR, [2]Institut Galien, Paris Sud, Faculté de Pharmacie, Chatenay-Malabry, FR, [3]Biomedical Engineering, Northwestern University, Chicago, IL, US, [4]Interventional Radiology, Northwestern Hospital, Chicago, IL, US, [5]UMR 8203, Université Paris-Saclay, Villejuif, FR

Purpose: Polylactic-co-glycolic acid (PLGA) nanoparticles (Nps) can adsorb at the water/oil interface to stabilize the Lipiodol-emulsion (forming Pickering-emulsion). The purpose of this study was to compare the release profiles of oxaliplatin from Pickering-emulsion and conventional-emulsion.
Material and Methods: Pickering-emulsions and conventional-emulsions were both formulated with oxaliplatin (5mG/mL) and Lipiodol (Water/oil ratio: 1/3). For Pickering-emulsion only, PLGA-Nps (15mG/mL) were dissolved into oxaliplatin before formulation. In-vitro release of oxaliplatin from both emulsions were evaluated. Then, oxaliplatin was injected in left hepatic arteries of 18 rabbits bearing VX2 liver tumors using either 0.5 mL Pickering-emulsion (n=10) or 0.5 mL Conventional-emulsion (n=8). In each group, half of the rabbits were sacrificed at 1h and half at 24h. ICP-MS mass-spectrometry was used to quantify drug pharmacokinetics in blood plasma and resulting tissues (tumors, right- and left-liver lobes) oxaliplatin concentrations.
Results: Pickering-emulsion demonstrated a slow oxaliplatin release compared to Conventional-emulsion (1.5 ± 0.2% vs. 12.0 ± 6% at 1 h and 15.8 ± 3.0% vs. 85.3 ± 3.3% at 24h) during in vitro comparison studies. For animal model studies, the plasmatic-peak and the area under the curve were significantly lower with Pickering-emulsion, 0.49 ± 0.14 nG/mL vs. 1.08 ± 0.41 nG/mL, p=0.01 and 19.8 +/- 5.9 vs. 31.8 +/- 14.9, p=0.03, respectively. This resulted in significantly lower oxaliplatin concentrations in tissues at 1h and higher ratio between tumors and left-liver lobes at 24h (44.1 vs. 11.8 p=0.02) with Pickering-emulsion compared to Conventional-emulsion.
Conclusion: Slow release of oxaliplatin from Pickering-emulsion results in a significant decrease in systemic drug exposure and higher ratio between tumors and left-liver lobes oxaliplatin concentration at 24h.

1902.5

Portal vein embolization, simple and extended liver venous deprivation before major hepatectomy: which is the best technique for liver preparation?

B. Guiu[1], F. Quenet[2], E. Schadde[3], C. Cassinotto[1], L. Escal[1], J. Delicque[1], C. Allimant[1], V. Schembri[1], E. Deshayes[4]
[1]Radiology, St-Eloi University Hospital, Montpellier, FR, [2]Surgery, ICM, Montpellier, FR, [3]Surgery, Rush University, Chicago, IL, US, [4]Nuclear Medicine, ICM, Montpellier, FR

Purpose: The increase in liver function of the future liver remnant (FLR) is a desirable endpoint for any technique of liver preparation before hepatectomy. Portal vein embolization (PVE) is the standard technique. The objective of this retrospective study was to compare the liver function of the FRL after PVE, simple (LVD = PVE + right hepatic vein embolization) and extended (eLVD = PVE + right and median hepatic vein embolization) liver venous deprivation.
Material and Methods: We performed liver preparation in 38 patients (PVE [n=12], LVD [n=8], eLVD [n=18]) before major hepatectomy. Function of the FRL was evaluated at baseline, day 7, day 14 and day 21 after embolization using 99m-Tc mebrofenin scintigraphy.
Results: After PVE, function of the FRL increased by 44.4%, 32.4%, and 49.7% at day 7, 14 and 21 respectively. After LVD, function of the FRL increased by 41.6%, 42.1%, and 61.7% at day 7, 14 and 21 respectively. After eLVD, function of the FRL increased by 58.9%, 59.5%, and 71.7% at day 7, 14 and 21 respectively. FRL functional increase was greater after LVD than after PVE at day 21 (p=0.04). FRL functional increase was greater after eLVD than other techniques at any point in time (p=0.01).
Conclusion: FRL function increase is greater and faster after eLVD than any other techniques of liver preparation, including ALPPS. A multicentric randomized phase II trial is scheduled to confirm these findings.

1902.6

Portal vein malignant thrombus percutaneous recanalization by endoluminal RFA and stenting – VesOpen procedure

M. Mizandari[1], T. Azrumelashvili[1], N. Habib[2]
[1]Diagnostic and Interventional Radiology, New Hospitals LTD, Tbilisi, GE, [2]Department of Biosurgery & Surgical Technology, Imperial College London, London, UK

Purpose: This paper presents the novel technique of PV thrombus recanalization for advanced HCC patients, complicated by PV thrombosis (PVT).

Material and Methods: 19 patients underwent 20 percutaneous endoluminal RF treatment attempts. PV tributary puncture was performed under US guidance; guidewire was manipulated across the blocked segment and portography was performed. 15 Watts power was applied for 2 minutes using bipolar endoluminal RF device (Habib™ EndoHPB, EMcision Ltd., London, UK), placed in PV blocked segment according to the guidewire. The number of RF application sessions depended on the extent of the tumour thrombus. 14 mm diameter vascular stent was positioned. This was followed by portography to confirm the PV patency restoration. The procedure was completed by working track RF ablation and embolisation by coils and gelfoam.
Results: The procedure was completed in 16 (80.0%) cases; in 3 (15.0%) cases the wire could not be conducted across the thrombus; in the rest 1 (5.0%) case we failed to conduct the RF device and procedure was completed by stenting alone. Portal vein blood flow was restored in all completed cases as documented by postprocedure portography, follow-up Doppler and CT studies; this resulted in liver function improvement in 10 (62.5%) of procedure technical success cases. PV patency varied from 3 weeks to 22 months; in 4 cases patients underwent successful TACE procedure after PV recanalization.
Conclusion: PV thrombus percutaneous recanalization by endoportal RFA with subsequent stenting is an effective technique and should be suggested as a possible treatment option of HCC patients with PVT.

1902.7

Transperineal ultrasound-guided laser ablation for the treatment of benign prostatic hyperplasia: preliminary results

G. Patelli[1], A. Ranieri[2], G.A. Paganelli[2], A. D'Alessio[3], F. Besana[1], G. Mauri[4], C.M. Pacella[5]
[1]Radiology Department, ASST-Bergamo est, Seriate, IT, [2]Urology, ASST-Bergamo est, Seriate, IT, [3]Oncology and Medical Department, Policlinico San Marco, IOB, Osio Sotto, IT, [4]Division on Interventional Radiology, European Institute of Oncology, Milan, IT, [5]Diagnostic Imaging and Interventional Radiology, Regina Apostolorum Hospital, Albano Laziale, IT

Purpose: To assess safety and efficacy of ultrasound-guided (US-g) transperineal laser ablation (TPLA) in treating benign prostatic hyperplasia (BPH).
Material and Methods: Fifty-five patients (age 72.6±10.4 years, range 58-93) suffering from obstructive syndrome secondary to BPH underwent TPLA using continuous wave (CW) diode laser source operating at 1064nm (Echolaser SoracteLite, Elesta s.r.l., Calenzano (FI), Italy). Under US-g depending on basal volume up to two 21G introducer-needles for each lobe were inserted via transperineal approach. Each treatment was performed with a fixed power protocol (3W) changing the illumination time case by case according to prostate volume. The efficacy of the treatment was evaluated considering the changes of international prostate symptoms score (IPSS), quality of life (QoL), post-void residual (PVR), peak urinary flow rate (Qmax) and prostate volume. Mean hospital stay and mean catheterization time were measured.
Results: In all patients the treatment was successful without intraoperative and perioperative complications. Mean operation time was 43.3±8.7 min, mean ablation time 15.9±3.9 min, mean energy deployed 11,470.0±3,570.6 J, mean hospital stay 1.5±0.4 days and mean catheterization time after the procedure 14.4±7.7 days. Mean follow-up was 11.5 months (range 4-36). IPSS improved from 22.2 to 7.7 (P<0.001), QoL from 4.5 to 1 (P<0.001), Qmax from 7.6 to 13.3 ml/s (P=0.001), PVR from 148.0 to 58.2 ml (P<0.001), mean prostate volume from 80.6 to 52.6 ml (P<0.001). No major complications occurred.
Conclusion: TPLA is a novel option to treat patients affected by BPH. The study demonstrated that this approach is efficacious and safe with significant and durable results.

1902.8

Accuracy of histopathologic sampling in lung biopsies: intraindividual comparison between 10G helical Spirotome and 18G Unicut needle

J.C. Apitzsch, S. Viniol, W. Hundt, A.H. Mahnken
Diagnostic and Interventional Radiology, Marburg University Hospital, Marburg, DE

Purpose: To evaluate the diagnostic accuracy of histopathologic findings using 10G and 18G samples of the same tumor lesion.
Material and Methods: 29 consecutive patients underwent CT-guided biopsy of pulmonary lesions. Samples were obtained using a 10G biopsy needle (10G SpirotomTM, Medinvents, Hasselt, Belgium) and 18G needle (Cook, Winston-Salem, NC, USA). One sample was taken with each needle. The TruCut needle was inserted through the sheath of the Spirotom needle. Samples were thereafter examined separately by pathology. The results were compared with regard to sample size, accurate tumor diagnosis and false negative and false positive results.
Results: The 10G needle provided the correct diagnosis in 28 out of 29 cases (accuracy: 97%, sensitivity 100%, specificity 100%). The 18G needle provided the correct diagnosis in 21 out of 29 patients (accuracy: 72%, sensitivity 69%, specificity 100%). The 10G needle provided 3% false negative and 0% false positive results. The 18G needle provided 0 false positive and 28% false negative results. Pneumothorax rate was 36%. One major complication (3%) occurred in the form of acute bleeding. The gold standard was histology from operation if available and clinical follow-up.
Conclusion: The 10G Spirotom biopsy needle offers larger samples with a higher probability of obtaining a sufficient sample. Complication rates were rather high but could always be managed on site by the radiologist if necessary.

1902.9

Effectiveness and safety in radiofrequency ablation of pulmonary metastases from HCC: a five years study

G. Lassandro[1], S.G. Picchi[1], F. Lassandro[2], A. Brunetti[1]
[1]Department of Advanced Biomedical Sciences, University Federico II, Naples, IT, [2]Department of Radiology, Monaldi Hospital, Naples, IT

Purpose: The goal of our study was a retrospective evaluation of overall survival, local tumor progression and complication rates of percutaneous CT-guided radiofrequency ablation of pulmonary metastases from hepatocellular carcinoma (HCC).
Material and Methods: Data were collected from 36 CT-guided ablation sessions performed on 38 lesions in 23 patients (13 M and 10 F; mean [± SD] age, 63.3 ± 9.2 years; range, 36-78 years) with pulmonary metastases from HCC (size range 0.3-4 cm, mean [± SD] diameter, 1.4 ± 0.98 cm) from February 2012 to September 2017. All patients had no active HCC foci in the liver, no more than three metastases in the lung and pulmonary relapses were treated up to three times. In two patients two lesions were treated during the same procedure. Each lesion was ablated under CT guidance. Follow-up contrast-enhanced CT were reviewed.
Results: A total of 38 metastatic lung lesions from HCC in 23 patients (57% male, 43% female) were treated with CT-guided radiofrequency thermal ablation procedures. Immediate radiofrequency ablation-related complications (subtle pneumothorax) were observed in 6 of 37 procedures (16%). Only one patient developed a pneumothorax requiring drainage tube insertion (2,7%). No other major complications occurred. No significant worsening of pulmonary function was noted. In all patients, the overall survival rates were 87% at 1 year, 67% at 3 years and 44% at 5 years.
Conclusion: Our retrospective assessment confirmed that percutaneous CT-guided radiofrequency thermal ablation in 23 atients with pulmonary metastases from HCC is an effective and safe alternative treatment option in patients that cannot be considered potential candidates to surgery.

Posters

Kidney

P-1

Percutaneous cryoablation of central renal cell carcinoma: technical considerations, complications, and short-term outcomes

F. Tradi, A. Sarran, N. Daidj, J. Walz, S. Rybikowski, G. Pignot, G. Gravis, **G. Piana**
Bouches du Rhone, Institut Paoli Calmettes, Marseille, FR

Purpose: To compare technical success, safety and oncologic efficacy of percutaneous cryoablation of central versus peripheral renal cell carcinoma (RCC).
Material and Methods: A retrospective review of a CT-guided percutaneous ablation registry was used to identify 59 consecutive non-metastatic RCC treated with cryoablation between 2013 and 2017, in 56 patients (36 men and 20 women with a mean age of 69 years [range 37-91]). Twenty-five patients (45%) were treated for a central tumor, involving the renal sinus; 31 patients (55%) for a peripheral tumor. The mean follow-up period was 20 months [range 6-56]. Parameters assessed were technical success, complications (Clavien-Dindo criteria) and cancer-specific survival rates.
Results: Central RCC were larger with an average diameter of 37 mm [range 23-54] versus 25 mm [10-41] (p<0,0001) and had a higher complexity R.E.N.A.L. nephrometry score (8 [7-11] vs 5 [4-8], p<0,0001). Local control tumor for central RCC was 86% (n=21) after a single procedure and 96% (n=24) after a repeated ablation, while it was 100% (n=34) for peripheral RCC after a single procedure (p=0.03). There was no significant difference in technical success rate (96% vs 100%, p=0.4), global complication rate (20% vs 12%, p=0.1), grade ≥ 3 complication rate (4% vs 0%, p=0.25), postoperative length of stay, in days (1 [1-6] vs 1 [1-2], p=0.3), disease-free survival rate (96% vs 100%, p = 0.22) and overall survival rate (100% vs 93%, p=0.24). Renal function remained unchanged for both central and peripheral groups (p=0.2).
Conclusion: Percutaneous cryoablation for central RCC appears to be safe and effective.

P-2

Radiofrequency ablation (RFA) of kidney tumors with high frequency jet ventilation (HFJV) and real time US-CT image fusion/virtual needle-track (US-CTfusion/VNT) guiding: a single center experience

A. Michos[1], V. Grozman[1], T. Josephson[2]
[1]*Radiology, Karolinska University Hospital, Stockholm, SE,*
[2]*Radiology, Danderyd Hospital, Stockholm, SE*

Purpose: In this study we aimed to present the short-term results as well as to assess the efficacy and safety of the US-CTfusion/VNT percutaneous RFA of kidney tumors.
Material and Methods: We have retrospectively reviewed all the patients who were treated with US-CTfusion/VNT guided percutaneous RFA at Danderyd hospital for kidney tumors between September 2014 and November 2015. Our study includes 19 patients (13 males and 6 females). General anesthesia with muscle paralysis and high frequency jet ventilation was used in all cases. In 1 patient with lesions in close proximity to the ureter, a ureteric stent was placed immediately before RFA. In 2 patients hydrodissection was required.
Results: In total ablation of 19 lesions was performed, 11/19 (57.9%) of the tumors were exophytic, 8/19 (42.1%) of the tumors were non-exophytic. The diameter of the lesions ranged between 0.8 and 4.0 cm. According to percutaneous biopsy, 14/19 (73.7%) of lesions were malignant, 2/19 (10.5%) were angiomyolipom and 3/19 (15.8%) of biopsies were inconclusive. Per-operative mortality and mortality at 6 months was 0%. Of 19 tumors, 2 tumors (10.5%) required retreatment because of incomplete ablation. All residual tumors were successfully ablated in an additional session of RFA. Recurrence-free survival at 6 months was 94.7%.
Conclusion: Real time US-CT image fusion/virtual needle-track guided percutaneous RF ablation is an effective and safe method for treatment of kidney tumors that can be repeated several times.

P-3

Short, medium and long-term follow-up for percutaneous, minimally invasive irreversible electroporation (IRE) of renal tumours: a prospective single centre study

S.-L. Lai, H. Kavnoudias, G. Goh, W. Cheung, S. Ellis
Radiology, Alfred Hospital, Prahran, VIC, AU

Purpose: IRE, a non-thermal nephron-sparing technique offers an alternative treatment for renal tumours not suitable for other therapies. AIM: To evaluate the safety and efficacy of IRE for the treatment of renal tumours and to report on short, medium and long-term follow-up data.
Material and Methods: Ethics approval was obtained for a prospective non-randomised trial to investigate treatment safety in IRE of solid tumours. 19 patients with renal tumours deemed surgically unresectable and unsuitable for thermal ablation were treated between December 2008 and October 2015. 2-6 needle electrodes were inserted under anaesthesia with neuromuscular blockade and pulse delivery synchronised to cardiac rhythm. Patients were followed up clinically and with CT for adverse events and recurrence-free survival.
Results: 19 patients underwent 29 episodes of ablation for 27 tumours. 84% (n=16) were treated for renal cell carcinoma, 42% (n=8) had a solitary kidney and 94% (n=18) had lesions adjacent to thermally-sensitive structures. Success was highly correlated to tumour size, with 94% of lesions initially measuring <3 cm (15/16) successfully ablated after ≤2 rounds of IRE versus 63% in lesions ≥3 cm in diameter (7/11). Stratification by follow-up duration showed complete ablation post ≤2 rounds of IRE in 100% of short- and medium-term patients and 58% of long-term patients. Partial ureteric stenosis was seen post-IRE in 1 patient, thought to be related to previous thermal ablation. No other major complications were observed.

Conclusion: Renal IRE is a safe alternative treatment for renal tumours. Better results are seen in tumours <3 cm, with ablation rates comparable to thermal ablation.

P-4

Percutaneous microwave ablation of renal cell carcinoma: a single center's experience upon safety and efficacy

M. Tsitskari, D. Filippiadis, C. Konstantos, K. Palialexis, A.D. Kelekis, E. Brountzos, N. Kelekis
Attikon University Hospital, 2nd Radiology Dpt, National and Kapodistrian University of Athens, Athens, GR

Purpose: Percutaneous ablation is an expanding, minimally invasive approach for small- to medium-sized renal masses. Purpose is to review safety and mid-term efficacy of percutaneous microwave ablation (MWA) for renal cell carcinoma (RCC) treatment using high-power microwave system.
Material and Methods: Institutional database research identified 48 consecutive patients with single RCC (biopsy proven) who underwent percutaneous MWA. Inclusion criteria included peripheral solitary tumours, maximum diameter of 7.0 cm, without bowel or ureter infiltration, absence of vein thrombosis and extrarenal metastasis. Contrast-enhanced computed tomography or magnetic resonance imaging used for post-ablation follow-up. Patient and tumour characteristics, microwave technique, complications, and pattern of recurrence were evaluated.
Results: Mean patient age was 74 years. Average lesion size was 3.1 cm (range 2.0-4.3 cm). RCCs included clear cell carcinoma in 22/48 cases (45.8%), papillary carcinoma in 10/48 (20.8%), whilst 16/48 (33.4%) cases reported RCC without further specification. Fuhrman grade 1 was reported in 15/48 cases (31.2%), grade II in 14/48 (29.1%), whilst 19/48 cases (39.7%) were ungraded. Two patients died during 3-year follow-up period due to causes unrelated to MWA and RCC. Minor complications including hematomas requiring nothing but observation occurred at 4% (2/50) of cases. Local recurrence of 6.25% (3/48) observed; 2/3 cases retreated achieving total clinical success of 97.9% (47/48 lesions).
Conclusion: Percutaneous MWA of RCCs using a high-power microwave system is a safe and efficacious technique for the treatment of small- to medium-sized renal masses.

P-5

The early clinical experience of image-guided irreversible electroporation (IRE) of renal tumours at a regional cancer centre

T.M. Wah[1], J. Cartledge[2], S. Whiteley[3]
[1]Diagnostic and Interventional Radiology, Institute of Oncology, Leeds Teaching Hospitals Trust, Leeds, UK, [2]Department of Urology, Institute of Oncology, Leeds Teaching Hospitals Trust, Leeds, UK, [3]Department of Anaesthesia, Institute of Oncology, Leeds Teaching Hospitals Trust, Leeds, UK

Purpose: To present our early clinical experience of CT-guided IRE of renal tumours at a regional cancer centre.
Material and Methods: This study had approval from the Institutional Review Board. CT-guided IRE under general anaesthesia was performed on 20 renal tumours in 19 patients from 2015-2017. Prospective documentation of the patients' demographic, renal function, treatment details and outcomes were reviewed.
Results: Twenty renal tumours (mean size of 2.7cm) in 19 patients were treated with age ranged from 49 to 81 years (mean = 67 years). The primary and overall technical success rate was 80% and 100% respectively. Four renal tumours had residual disease and successfully had repeated treatment with CT-guided cryoablation. The pre- and post-IRE eGFR were 64 +/- SD 18 ml/min/1.73m2 vs. 60 +/- SD 18 ml/min/1.73m2 with no significant eGFR change (p = 0.46). Within the clinical series, there was no major complication and one minor complication related to contrast extravasation from the pelvi-calyceal system due to the IRE electrode traversing the collecting system during treatment and resolved with conservative management. At our early-term follow-up (mean = 10 months), we have no local disease progression or distant metastasis. One patient died at 4 months post-IRE due to underlying progression of lymphoma.
Conclusion: Our early experience suggests that CT-guided IRE of RCC is safe and offers preservation of renal function for renal tumour sited close to the vital structures with acceptable early treatment outcome allowing for operator's learning curve and has a promising problem-solving role in the treatment of RCC.

P-6

5 year single centre experience with percutaneous image-guided radiofrequency ablation (RFA) of renal tumours

A. Shawyer, **L. Bolton**, C. Bent, N. Hennessy
Radiology, Royal Bournemouth Hospital, Bournemouth, UK

Purpose: To evaluate the provision of a renal RFA service at a single centre district general hospital.
Material and Methods: Retrospective analysis of 137 patients (104 males and 33 females) who underwent RFA for a total of 142 renal mass lesions performed between July 2011 and April 2017. Regular post-RFA contrast-enhanced CT follow-up was performed at 1, 3, 6, 12, 36 and 60 months. 6-month f/u data was available for 131 patients. Statistical analyses were performed to evaluate the postoperative survival outcomes. Procedure-related complications were classified on the basis of criteria proposed by the Society of Interventional Radiology.
Results: Technical procedural success was observed in 98% of cases. Mean tumour size was 21mm (range 11-36mm). The overall efficacy was 93.7%. Residual tumour (at 1-month CT) was observed in 8 patients (5.6%), all sucessfully retreated giving overall clinical success at 6 months of 92.3%. Tumour recurrence during sebsequent follow-up was seen in 12 patients (8.4%). There was one death within 30 days of RFA; overall rate of major complications was 4.2% and of minor complications 17%.
Conclusion: Radiofrequency ablation is a safe and effective method of treating small (T1a) renal tumours with high technical sucess rates and good oncological outcomes.

P-7

Outcomes and efficacy of thermal ablation of renal tumours at a tertiary centre

E. O'Mahony[1], F. Parvulescu[1], **N. Kibriya**[2], J. Evans[2]
[1]Interventional Radiology, Royal Liverpool University Hospital, Liverpool, UK, [2]Interventional Radiology, Royal Liverpool Hospital, Liverpool, UK

Purpose: To evaluate the outcomes, efficacy and safety of percutaneous thermal ablations including radiofrequency ablation (RFA) and microwave ablation (MWA) performed for renal tumours at a tertiary referral centre over a 5-year period.
Material and Methods: Retrospective data collection was performed between January 2012 and November 2016. All cases of renal RFA or MWA were included. Standard follow-up imaging with dual phase renal CT (gadolinium enhanced MRI if contraindications to CT) was performed at 6 weeks and 6 months post-procedure and yearly thereafter. Technical success was defined as no residual disease at 1st follow-up scan.
Results: 137 ablations were performed in 115 patients. Mean age was 70 years. A combination of CT (62%) and US (38%) guidance were used. RFA 88% vs. 12% MWA. 113 were primary ablations and 24 repeat ablations. Technical success was achieved in 82.1% of procedures after the first attempt. After repeat ablations, 90.4% of patients had no residual disease. Mean follow-up was 39 months (range 11-69). Recurrence rate was 10.9% at an average time to recurrence of 15.2 months (range 3-41). A total of 17 patients (14.8%) died during follow-up. Eight major complications (5.8%) and 3 minor complications (2.2%) were recorded.
Conclusion: Thermal ablation of renal tumours has good outcomes with low recurrence rate, good overall survival rate and a low complication rate. Although a small proportion of patients experienced residual disease, the majority of these cases were re-ablated to give an overall success rate of 90%.

P-8

How to perform a safe and effective kidney thermal ablation in difficult cases

G. Mauri[1], L. Nicosia[2], S. Di Pietro[2], G.M. Varano[1], P. Della Vigna[1], G. Bonomo[1], S. Sartori[3], F. Orsi[1]
[1]Interventional Radiology, European Institute of Oncology, Milan, IT, [2]Radiology, University of Milano, Milan, IT, [3]Section of Interventional Ultrasound, St. Anna Hospital, Ferrara, IT

Learning Objectives:
- To learn the most frequently used ablative techniques in the treatment of kidney cancer
- To learn the best image guidance setting to perform a successful image-guided thermal ablation
- To learn the most frequently used protective maneuvers used in order to avoid complications associated with ablative techniques

Background: Kidney cancer is among the most prevalent tumors in western countries. Conventional treatment has been historically represented by radical nephrectomy, while, more recently, image-guided thermal ablations have been successfully applied in order to reduce the invasiveness of the treatment. Several different techniques are nowadays available for image-guided thermal ablation, including RFA, MWA, cryo and laser ablation, each one with peculiar characteristics. Some maneuvers (such as external compression, hydro dissection, pyeloperfusion) can be used to increase the success of ablation and to minimize the risk of complications.
Clinical Findings/Procedure: The most widely used ablative techniques used to treat renal tumors are radiofrequency ablation, cryoablation and microwave ablation, while laser ablation is less applied. Several imaging modalities can be used for guiding percutaneous tumor ablation, the two most widely used being US and CT. US/CT fusion is extremely helpful in image-guided renal ablations. Hydro dissection, gas insufflation, electrode torqueing, balloon interposition and cooled pyeloperfusion are the most important protective maneuvers which should be used in clinical practice.
Conclusion: Percutaneous thermal ablation has become a widespread treatment during the last few years. Interventional radiologists should be familiar with all the ablative techniques and protective maneuvers that can be applied to maximize the result and reduce complications.

P-9

Effectiveness of automated tumor-feeder detection software (ATDS) in super-selective arterial intervention for renal tumors

T. Kubo, Y. Arai, M. Sone, S. Sugawara, C. Itou, S. Wada, T. Hasegawa, N. Umakoshi
Diagnostic Radiology, National Cancer Center Hospital Japan, Tokyo, JP

Learning Objectives:
- To explain the mechanism and function of ATDS
- To show how to use ATDS in super-selective arterial intervention for renal tumors
- To discuss the usefulness of ATDS in super-selective arterial intervention for renal tumors

Background: Super-selective arterial intervention for renal tumors is performed as treatment for renal angiomyolipoma (AML) and renal cell carcinoma (RCC), and as pre-procedural preparation for percutaneous cryoablation. In such cases, super-selective catheterization is mandatory to achieve the adequate clinical effect and to avoid complications. However, detecting tumor-feeder of renal tumors is sometimes difficult with digital subtraction angiography (DSA) because of the complexity of tumor location and vascularity.
Clinical Findings/Procedure: We use a newly developed ATDS (Embolization Plan, TOSHIBA MEDICAL SYSTEMS, Ohtawara, Japan) to detect tumor-feeders of renal tumors. First, we perform CT arteriography from the main renal artery. Second, we mark the tumor and the catheter tip on CT arteriography images using the software. Then, the software automatically detects the tumor-feeder and visualizes it on VR images. The whole process completes within approximately 5 minutes. Our initial experience showed the promising results of accuracy of the detected tumor-feeder and shortening of the procedural time.
Conclusion: The ATDS is useful for super-selective arterial intervention for renal tumors.

P-10

Pictorial review of CT appearances post renal radiofrequency ablation

L. Bolton, A. Shawyer, C. Bent, N. Hennessy
Radiology, Royal Bournemouth Hospital, Bournemouth, UK

Learning Objectives: To demonstrate the range of normal and abnormal imaging appearances, including complications following renal RFA.
Background: Thermal ablation using radiofrequency ablation has been increasingly used for the treatment of small renal cell carcinoma. In most centres contrast-enhanced CT is used to assess for complications, residual or recurrent disease. A thorough understanding of the range of post-ablation appearances is essential for evaluating the adequacy of the ablation and guides further management. Post renal RFA complications are usually minor, but rarer major complications should be detected on post-procedural CT imaging.
Clinical Findings/Procedure: We review: 1. The ‚normal' immediate and evolving appearances following RFA 2. The variety of appearances of residual and recurrent tumour 3. CT appearances of major and unusual complications
Conclusion: As small renal tumors are increasingly being treated by RF ablation, a detailed knowledge of the range of appearances on post-procedural CT imaging is vital to provide an accurate assessment of treatment efficacy and potential complications.

Liver

P-11

Does subsequent treatment after initial Yttrium-90 selective internal radiotherapy for locally advanced hepatocellular carcinoma impact survival?

X.T.W. Goh[1], S. Leong[2], B.S. Tan[2], L.T.-E. Cheng[3], R.H.G. Lo[2], F.G. Irani[2], N.K.K. Venkatanarasimha[2], K. Damodharan[2], H.K. Tan[4], D.C.E. Ng[5], P.K.H. Chow[6], C.W. Too[2]
[1]Medical Student, Duke-NUS Medical School, Singapore, SG, [2]Department of Vascular and Interventional Radiology, Singapore General Hospital, Singapore, SG, [3]Department of Diagnostic Radiology, Singapore General Hospital, Singapore, SG, [4]Department of Gastroenterology and Hepatology, Singapore General Hospital, Singapore, SG, [5]Department of Nuclear Medicine and Molecular Imaging, Singapore General Hospital, Singapore, SG, [6]Division of Surgical Oncology, National Cancer Centre Singapore, Singapore, SG

Purpose: To assess survival and time-to-tumour progression (TTP) of hepatocellular carcinoma (HCC) patients who receive subsequent treatment after Yttrium-90 selective internal radiotherapy (Y-90 SIRT).
Material and Methods: We retrospectively analysed 144 patients undergoing Y-90 SIRT for HCC between May 2010 to June 2015. After initial Y-90 SIRT, 55 patients (38.2%) were deemed suitable for further treatment by a multidisciplinary team. Subsequent treatment included locoregional therapy (thermal ablation, transarterial chemoembolization or second Y-90 SIRT) or systemic therapy with sorafenib. Propensity score matching (PSM) was performed to minimize selection bias.
Results: After PSM, 45 patients who received subsequent treatment after initial SIRT were matched with 45 patients who did not. Twenty-eight patients received locoregional therapy, ten patients received sorafenib, and seven patients received both locoregional therapy and sorafenib. Median interval from initial Y-90 SIRT to locoregional therapy or sorafenib was 6.9 months (IQR 4.9-10.4) and 6.7 months (IQR 4.2-15.1) respectively. Median survival for patients with subsequent treatment was significantly longer than those who did not (25.3 versus 14.4 months, p=0.002), with no significant difference in median TTP (both 8.3 months, p=0.686) from the first SIRT. Among patients with subsequent treatment, there was a trend towards longer survival (53.2 months) in patients who received locoregional therapy compared to the other modalities, although this was not significant (p=0.080).
Conclusion: Patients with HCC who received subsequent treatment after Y-90 SIRT had a longer median survival than those who did not. Patients suitable for further treatment after initial Y-90 SIRT should be strongly recommended to do so given the significant survival benefits.

P-12

Real-time CT-guided oblique puncture with 'direct MPR' for liver RFA combined with TACE

R. Sato
Interventional Radiology, Shizuoka Cancer Center, Shizuoka, JP

Purpose: CT-guided liver radiofrequency ablation (RFA) for hepatocellular carcinoma (HCC) is useful especially for invisible nodules on ultrasound. Transpleural approach is feasible for HCC located immediately below diagram but can cause some complications like pneumothorax or hemothorax. The new method of real-time CT-guided oblique puncture was reported on CVIR (Epub 2017 Apr 2017), which was named as 'direct MPR'. In this study we evaluated the usefulness of 'direct MPR' for liver RFA combined with transcatheter arterial chemoembolization (TACE).
Material and Methods: This was a retrospective study of 33 consecutive patients (52 nodules) who underwent CT-guided RFA combined with TACE for invisible HCC on ultrasound from July 2016 to July 2017. We evaluated local recurrence rate within 3 months and complications of the procedure.
Results: We used 'direct MPR' for 36 nodules (69.2%) for avoiding transpleural puncture. When we could avoid transpleural puncture, conventional CT-guided methods were done for the rest of the cases (16 nodules, 31.8%). There were no local recurrence cases within 3 months. Pneumothorax was not seen in all cases. 3 cases have a little pleural effusion without symptom although 'direct MPR' was used in only 1 case (2.8%). Portal vein thrombosis was seen in one 'direct MPR' case, which needed anticoagulant therapy. There were no other complications except fever and pain.
Conclusion: Real-time CT-guided oblique puncture with 'direct MPR' can decrease the rate of complications especially like pneumothorax, even if the HCC is located immediately below diagram.

P-15

Effects of unilobar radioembolization on the portal venous system

S.L. Tchang[1], M. Vouche[2]
[1]Internal Medicine, Hôpital Joseph Bracops, Brussels, BE, [2]Radiology, Institut Jules Bordet, Brussels, BE

Purpose: Radioembolization is an effective treatment option for patients suffering from liver cancer and is associated with a reported contralateral hypertrophy of the non-embolized lobe, for which the underlying mechanism has yet to be determined. The main objective of this study is to evaluate the effect of radioembolization on the portal venous system, which could lead to an explanation of the contralateral hypertrophy observed after treatment. Another objective is to assess the effect on the portal venous system by evaluating the appearance or worsening of an existing portal hypertension.
Material and Methods: We conducted a retrospective study of 33 patients treated by right unilobar radioembolization between January 2005 & December 2016. The variations of portal veins diameter as well as the spleen volume were assessed & compared between baseline/FU1 (6-8 weeks)/ FU2 (median 33 weeks), on portal venous phase imaging studies. Signs of portal hypertension like ascites, esophageal/ perisplenic/perigastric varices & re-canalization of the umbilical vein were searched as well.
Results: Right portal vein diameter decreased between baseline/FU1 ($p<0.0001$) & between baseline/FU1/FU2 ($p=0.065$), while the main & left portal veins diameters did not vary (between baseline/FU1/FU2 $p=0.053$ & $p=0.385$ respectively; between baseline/FU1 $p=0.303$ & $p=0.815$ respectively). Increased spleen volume was also observed (between baseline/FU1/FU2 $p=0.001$ & between baseline/FU1 $p<0.0001$).
Conclusion: Radioembolization has an impact on the portal venous system suggesting a redirection of the portal blood flow from the embolized lobe to the portal venous system and to the spleen. Signs of portal hypertension were also noted, leading us to suggest a careful patient selection for Yttrium 90 radioembolization.

P-18

Percutaneous irreversible electroporation (IRE) of hepatic malignancy: a bi-institutional analysis

S. Mafeld[1], **J.-J. Wong**[2], B. Stenberg[1], T. Aslam[2], D. Manas[3], J. Evans[2], N. Kibriya[2], P. Littler[1]
[1]Interventional Radiology, Freeman Hospital, Newcastle Upon Tyne, UK, [2]Interventional Radiology, Royal Liverpool Hospital, Liverpool, UK, [3]Hepatobiliary Surgery, Freeman Hospital, Newcastle Upon Tyne, UK

Purpose: Irreversible electroporation (IRE) is a non-thermal ablative option in patients unsuitable for standard thermal ablation, due to its potential to preserve collagenous structures (vessels and ducts) and a reduced susceptibility to heat sink effects. In this series from two large tertiary referral hepatobiliary centres, we aim to assess the safety/outcomes of hepatic IRE.
Material and Methods: Bi-institutional (Liverpool/Newcastle) retrospective, longitudinal follow-up a series. Outcome measures included: procedural safety/effectiveness, time to progression and time to death.
Results: Between 2013 and 2017, 52 patients underwent percutaneous IRE of 59 liver tumors in 53 sessions. Tumours treated included primary and secondary malignancy, the majority being hepatocellular carcinoma (HCC) and metastatic colorectal cancer (mCRC). All tumours were deemed unsuitable for thermal ablation. Cases were performed using ultrasound or computed tomography (CT). A complete ablation was achieved in n=44 (75%) of cases with an overall complication rate of 15% (n=8). Of the complete ablation group, median time to progression was 10 months. At 12 months, the percentage that was progression free was 49% (95% CI: 30% to 66%). The data suggests that larger lesion size (>2cm) is associated with shorter time to progression and there is highly significant difference in time to progression between mCRC and HCC. Median survival time was 38 months.
Conclusion: This bi-institutional review is the largest UK series of IRE and suggests this ablative technology can be a useful tool, but appears to mainly induce local tumour control rather than cure with HCC having better outcomes than mCRC.

P-19

Efficacy and safety of DEE-TACE using drug-eluting PEG-microspheres in the treatment of 302 patients with HCC

F. Veloso Gomes, M. Tomé Correia, T. Bilhim, É. Coimbra
Interventional Radiology at Hepato-biliary-pancreatic and Transplant Center, Centro Hospitalar de Lisboa Central, Lisbon, PT

Purpose: To evaluate the efficacy and safety of DEE-TACE using drug-eluting PEG-microspheres in the treatment of 302 patients with HCC.
Material and Methods: A retrospective study of 302 patients with HCC, treated during a 20-month period (September 2015 to April 2017) and followed between 6 to 24 months. 1-month follow-up CT response, based on the mRECIST criteria, clinical and biochemical safety, progression-free and overall survival were analyzed.
Results: 302 patients were treated, 42 (14%) female, with a mean age of 66±12 years, 142 (47%) BCLC A and 134 (44.4%) BCLC B. 174 (57.6%) patients had a single lesion, 65 (21.5%) had two, and 62 (20.9%) had three or more. The mean index lesion was 36.6±24.8 mm. The 1-month FU CT revealed a CR in 178 (62.2%) patients, PR in 66 (23.1%), SD in 16 (5.6%), and PD in 26 (9.1%). A single lesion was predictive of achieving CR (p=0.0761). PE syndrome occurred in 18 (6%) patients, liver abscess in 5 (1.7%), puncture site in 3 (1%), portal vein thrombosis in 2 (0.7%), cholecystitis in 2 (0.7%), alopecia in 2 (0.7%), non-target embolization in 1 (0.3%), cardiovascular in 1 (0.3%), and death in 2 (0.7%). Female gender, Child B or C and total lesion size, predicted PE syndrome (p-values 0.0893, 0.01598 and 0.0343). PFS rate of 65.92% and OS rate of 93.56% at 12 months were observed.
Conclusion: DEE-TACE with PEG-microspheres for the treatment of patients with HCC achieved a CR rate of 62.2% with major complications in 11.6%, in a cohort of 302 patients.

P-21

Transarterial radioembolisation with Rhenium 188 iodized oil in inoperable hepatocellular carcinoma – outcomes in a tertiary care cancer center

P. Santhosh, **S. Nag**, R.K. Ranasingh, M. Cherian, P. Mehta, J.M. Gandhi, S. Elango
Department of Radiology, Kovai Medical center and Hospital, Coimbatore, IN

Purpose: To study the clinico-radiological outcome in terms of tumour response and survival in patients with inoperable hepatocellular carcinoma treated with transarterial radioembolisation (TARE) using Rhenium 188 (188 Re).
Material and Methods: Ninety-two patients with unresectable hepatocellular carcinoma were included, from October 2013 to October 2017. All patients underwent complete clinical evaluation (including assessment of liver status, serum α-fetoprotein [AFP] level, tumour size, portal vein status, Child-Pugh classification, BCLC staging), followed by TARE using 188 Re iodized oil in a dose of approximately 0.5-2.5 mCi per ml of tumour with a minimum of 25 mCi and maximum of 480 mCi, which was based on generator life, elution efficiency and extraction variability in addition to the above dosing pattern. Clinical, laboratory and imaging follow-ups were performed at 6 weeks and 3 months followed by annual surveillance.
Results: The quality of life function was favorable in 20%, fairly favorable in 50.7% and non-favorable in 21.5% of patients. Complete tumour response was seen in 24.6%, partial response in 50.7%, disease progression in 20.7%.
Conclusion: TARE with Rhenium 188 iodized oil is promising in intermediate and advanced stages of inoperable HCC in terms of tumour response, quality of life and in cases with portal venous thrombosis.

P-22

Complications and seeding after percutaneous biopsy of liver lesions

E. Raimondi[1], K.N. De Paepe[2], L. Bonne[3], N. Starling[4], S. Rao[4], M. Gerlinger[5], I. Chong[6], I. Chau[4], D. Cunningham[4], N. Khan[2], N. Fotiadis[2]
[1]Radiology, University of Ferrara, Ferrara, IT, [2]Radiology, The Royal Marsden Hospital, London, UK, [3]Radiology, University Hospital Leuven, Leuven, BE, [4]Oncology, The Royal Marsden Hospital, London, UK, [5]Centre for Evolution and Cancer, Institute of Cancer Research, London, UK, [6]Molecular Pathology, Institute of Cancer Research, London, UK

Purpose: The aim of this study was to evaluate the safety and risk of seeding of percutaneous liver biopsies in an oncological setting.
Material and Methods: All patients who underwent an ultrasound or CT-guided liver biopsy between 2012-2016 were included. Medical records were reviewed retrospectively for post-biopsy complications and all follow-up imaging was re-assessed for the presence of seeding, defined as tumoral deposits in the biopsy needle tract.
Results: A total of 782 biopsies was performed in 550 patients (282 women, 268 men; mean age of 61 years), 43.9% (343/782) for trials and 56.1% (439/782) for diagnostic/molecular purposes, 93.7% (733/782) were diagnostic, revealing malignancy in 96.9% (710/733). Number of biopsies per patient ranged between 1 (n=387) to 7 (n=1), a co-axial system was used in 70.6% (552/782) and multiple passes in 29.4% (230/782). Complications were reported in 8.8% (69/782), namely pain (4.7%) and hypotension/vasovagal (2.3%). Admission and/or re-intervention was needed for more severe complication as bleeding (1.0%), sepsis/fever (1.1%), pulmonary embolism (0.3%) and pneumothorax (0.4%). Seeding was seen in 1.1% (8/782) of cases (2/44 melanoma, 1/11 GIST, 1/39 cholangiocarcinoma, 1/247 colorectal, 1/14 oesophagus, 1/97 breast, 1/31 prostate), mean seeding time was 208 days (range 43-469 d), mean post-biopsy survival time was 495 days and 349 days in seeding and non-seeding group, respectively.
Conclusion: Percutaneous liver biopsy showed to be a highly effective and safe method for tissue collection, with only a minimal risk of seeding.

P-23

Holmium-166 radioembolisation in HCC - feasibility and safety of a new method in clinical practice

C. Radosa[1], J. Radosa[2], S. Grosche-Schlee[3], K. Zoephel[3], V. Plodeck[1], M. Laniado[1], R.-T. Hoffmann[1]
[1]Radiology, University Hospital Carl Gustav Carus Dresden, Dresden, DE, [2]Klinik für Frauenheilkunde, Geburtshilfe und Reproduktionsmedizin, Universitätsklinikum des Saarlandes, Homburg, DE, [3]Nuclear Medicine, University Hospital Carl Gustav Carus Dresden, Dresden, DE

Purpose: Holmium-166 containing microspheres (Quriem-Spheres) received European CE mark in April 2015. In March 2017 this treatment was applied for the first time worldwide outside of a clinical study at our department. To date there are no data available regarding hepatotoxicity of this novel therapy. Therefore, we aimed to study feasibility, technical success and toxicity after Ho166-radioembolisation (Ho166-RE).
Material and Methods: From March to November 2017 six patients suffering from HCC were treated with Ho166-RE. Contraindications were chosen according to these applied for Y90-RE. Two weeks after preoperative work-up (including MRI, SPECT, Tc-MAA, Angiography, liver function) Ho166-RE was performed. SPECT and MRI were performed within the first day after treatment. For evaluation of hepatotoxicity and to rule out radiation-induced-liver disease (RILD) the "Model for End-Stage Liver Disease" (MELD) Score was used one day pre-/post-treatment and after 60 days. After two months we additionally evaluated MRI/CT follow-up.
Results: In all six patients it was possible to administer the prescribed activity (success rate 100%). Administered dose was 3.5 GBq (1.6–4.8). There were no major complications. Five patients suffered from nausea, vomiting and epigastric pain during the first day after radioembolisation. With median MELD-Scores of 8 (7-13) pre-therapeutic and 8 (6–11) post-therapeutic, there was no significant difference in liver function. At two months follow-up (n=4) the median MELD-Score was 8 (7-10) and we found no indicators of a RILD. Three patients showed a partial response and one patient a stable disease.
Conclusion: Radioembolisation with Quirem-Spheres seems to be a feasible and safe treatment option with no clinical significant hepatotoxicity.

P-24

Polyethylene glycol drug-eluting embolics loaded with doxorubicin for the chemoembolization of hepatocellular carcinoma patients

C. Aliberti[1], R. Carandina[1], D. Sarti[2], E. Pizzirani[1], G. Ramondo[1], L. Mulazzani[3], G. Fiorentini[2]
[1]Oncology Radiodiagnostics, Oncology Institute of Veneto, Institute for the Research and Treatment of Cancer (IRCC), Padova, IT, [2]Onco-Hematology, Azienda Ospedaliera Ospedali Riuniti Marche Nord, Pesaro, IT, [3]Diagnostics for Images and Interventional Radiology, Azienda Ospedaliera Ospedali Riuniti Marche Nord, Pesaro, IT

Purpose: To investigate tumor response and tolerability of transarterial chemoembolization (TACE) with polyethylene glycol (PEG) drug-elutable microspheres loaded with doxorubicin for the treatment of hepatocellular carcinoma (HCC).
Material and Methods: This prospective observational study included 60 patients affected by unresectable HCC that were treated with PEG-embolics loaded with doxorubicin. The sample included 45 (75%) males and 15 (25%) females. Median sample age was 65 years (range 42-83). Patients were treated with 50 mg of doxorubicin loaded in 2ml of PEG embolics (diameter 100±25µm) for the TACE. Data collected included previous cancer therapy, tumor size, number of lesions, tumor response (1, 3 and 6 months), type and intensity of adverse events and quality of life (QoL).
Results: Tumor response rate was 80% (complete response [CR]=40%, partial response [PR]=40%) and stable disease [SD]=17%, progressive disease [PD]=5%, 1 month following TACE. At 3 months, CR=50%, PR=22%, SD=22% and PD=5%. At 6 months, CR, PR, SD and PD were 44%, 18%, 31% and 8%, respectively. No procedure complications or systemic drug-related side effects were observed. TACE was well tolerated by all patients, most frequent adverse events were: fever (30%), transaminase rise (17%) and pain (30%); their intensity was mostly mild (G1-2). Median QoL was 78-85.
Conclusion: Data suggest that PEG embolics are efficacious and safe for treatment of HCC, indicated by good tolerability, QoL and high tumor response.

P-26

Transarterial chemoembolization using drug-eluting beads for unresectable hepatocellular carcinoma with arterioportal shunt

Y.-D. Xiao, Z.S. Zhang
Department of Radiology, The Second Xiangya Hospital of Central South University, Changsha, CN

Purpose: To evaluate feasibility and safety of transarterial chemoembolization with doxorubicin-eluting beads (DEB-TACE) in unresectable hepatocellular carcinoma (HCC) with arterioportal shunts (APS).
Material and Methods: Twenty-six unresectable HCC patients with APS who had undergone DEB-TACE were included in this retrospective study. APS was classified into three grades: grade 1, shunt backflow to segmental portal vein; grade 2, shunt backflow into ipsilateral main portal vein of each lobe; grade 3, shunt backflow into contralateral lobe and/or the main portal vein. Liver function and ECOG ps were evaluated before and after DEB-TACE. Complications, survival days and degree of shunts occlusion were also evaluated. Modified Response Evaluation Criteria in Solid Tumors (mRECIST) were used to evaluate tumor response. Survival curves were calculated by Kaplan-Meier method and compared by log-rank test.
Results: Mean and median survivals were 350 and 310 days in overall study population, 408 and 261 days in grade 1 group, 322 and 333 days in grade 2 group, and 272 and 250 days in grade 3 group, respectively. There was no significant difference of survival among different grades of APS ($\chi 2=1.57$, $P=0.456$). Survival rates in the entire study population were 76.9%, 37.3%, and 12.4% at 6 month, 12 month, and 24 month, respectively. Evaluation of tumor response at 1 month after the first DEB-TACE session showed partial response (PR) in 7 patients, stable

disease (SD) in 8 patients, and progressive disease (PD) in 11 patients. The objective response rate (ORR) is 26.9% (7/26). No major procedural-related complications were observed.
Conclusion: DEB-TACE may be feasible and safe in HCC patients with APS.

P-28

Electrochemotherapy of cholangiocellular carcinoma at hepatic hilum: a feasibility study

L. Tarantino[1], A. Nasto[1], G. Busto[2], R. Fristachi[3], L. Cacace[3], S. Bortone[4]
[1]Surgery, A.Tortora Cancer Hospital, Pagani, IT, [2]Oncology, A.Tortora Cancer Hospital, Pagani, IT, [3]Anatomopathology, A.Tortora Cancer Hospital, Pagani, IT, [4]Radiology, A.Tortora Cancer Hospital, Pagani, IT

Purpose: Electrochemotherapy (ECT) is a non-thermal ablation technique able to induce cancer cell necrosis without affecting stromal structures, ducts and vessels next to the tumor. We evaluated the efficacy and feasibility of ECT in a series of patients with cholangiocellular carcinoma at hepatic hilum (hh-CCC).
Material and Methods: 5 patients (4M, 1F; 67-82 years old) with hh-CCC (diameter: 3.0-6.0 cm, mean=4.2 cm; 2 post-surgical recurrence, 3 as first diagnosis) underwent ECT. 2 patients had a Bismuth-corlette-4-CCC, 3 patients showed infiltration of the hepatic hilum and/or inferior vena cava (IVC) without biliary duct dilation. 4 patients underwent percutaneous ECT, 1 patient with a large hh-CCC and a CCC subcapsular nodule in the IV segment underwent laparotomic ECT plus resection. 2 patients underwent permanent double-external biliary drainage. Control of the efficacy was made by contrast-enhanced MDCT 4 weeks after treatment and follow-up CT controls every 6 months thereafter.
Results: No major complication occurred. 4 weeks post-treatment CT showed: complete necrosis in 3 and incomplete necrosis (>90%) in 2 cases. Follow-up ranges from 16 to 30 months (median: 20 months). In 1 patient CT at 6-12-18-24-30 months follow-up showed no local or intrahepatic recurrences and no biliary duct dilation. Other 2 patients are still alive and CT at 6-12-18 months follow-up showed local recurrence. 1 patient died at 12 months follow-up because of disease progression. 1 patient died at 10 months follow-up for cardiovascular failure.
Conclusion: In our experience on this short series, ECT of hh-CCC seems a feasible, effective and safe treatment for local control of the disease.

P-29

Colorectal liver metastases ablation for local disease control: comparison between microwave and radiofrequency ablation treatment

E. Raimondi[1], K.N. De Paepe[2], D.-M. Koh[2], D. Cunningham[2], J. McCall[2], N. Fotiadis[2]
[1]Radiology, University of Ferrara, Ferrara, IT, [2]Radiology, The Royal Marsden Hospital, London, UK

Purpose: To retrospectively analyse the safety and efficacy of radiofrequency ablation (RFA) and microwave ablation (MWA) in the treatment of colorectal cancer liver metastases (CRC-LM).
Material and Methods: 193 patients with unresectable CRC-LM treated with RFA or MWA in a single center between March 2006 and December 2016 were retrospectively evaluated. Medical records and imaging studies were reviewed for demographic data, technical deployment, associated complications, tumour recurrence and overall survival. Rate of tumour recurrence, complication rates and patient survival were compared between RFA and MWA treatments.
Results: 456 procedures were performed in 193 patients (123 male, 70 female) with a median age of 66 years (range 32-91 years). Of these, 343/456 (75.2%) were RFA and 113/456 (24.8%) were MWA. The median number of procedures per patient was 2 (range 1-10). Median lesion size was 17mm (range 3-80mm). The local tumour recurrence rate was 45% for RFA and 28% for MWA, with a hazard ratio of 0.6 in favour of MWA (95%CI 0.4-0.9). Two- and five-year overall survival for RFA vs MWA were 88% vs 89% ($p>0.05$) and 35% vs 66% ($p<0.05$) respectively. Complications were reported in 43/456 procedures (9.4%); in 28/343 (8.1%) of RFA and 15/113 (13.3%) of MWA. One patient died due to multi-organ failure post RFA.
Conclusion: MWA achieved better local tumour control compared with RFA in the treatment of CRC-LM, with a slightly higher complication rate.

P-30

Quantification of perfusion reduction by using 2D-perfusion angiography following transarterial chemoembolization with drug-eluting beads

S.K. Maschke[1], T. Werncke[1], R. Kloeckner[2], T. Rodt[1], J. Renne[1], M. Kirstein[3], A. Vogel[3], F. Wacker[1], B. Meyer[1], J.B. Hinrichs[1]
[1]Institut für Diagnostische und Interventionelle Radiologie, Medizinische Hochschule Hannover, Hannover, DE, [2]Klinik und Poliklinik für Radiologie, Universitätsmedizin Mainz, Mainz, DE, [3]Klinik für Gastroenterologie, Hepatologie und Endokrinologie, Medizinische Hochschule Hannover, Hannover, DE

Purpose: To analyze the feasibility of 2D-perfusion angiography (2D-PA) for the quantification of perfusion reduction following transarterial chemoembolization with drug-eluting beads (DEB-TACE).
Material and Methods: Overall, we included 24 DEB-TACE procedures in 19 patients with hepatocellular carcinoma (HCC). Based on post-processed conventional digital subtraction angiography (DSA) series changes in tumor perfusion following DEB-TACE were quantified using 2D-PA. A reference region-of-interest (ROI) in a main hepatic artery and two distal target ROIs in embolized tumor tissue and in non-target liver parenchyma were placed in corresponding areas on DSA series pre- and post-DEB-TACE. The time to peak (TTP), peak density (PD), and the area under the curve (AUC) were assessed and the ratios reference ROI/target ROIs were calculated.
Results: In the embolized tumor, the 2D-PA ratios changed significantly ($p < 0.05$) after DEB-TACE, whereas no significant change was observed for non-target liver parenchyma ($p > 0.05$). PDtumor/PDinflow differed significantly to PDparenchyma/PDinflow pre-DEB-TACE ($p < 0.0001$), likewise

AUCtumor/AUCinflow to AUCparenchyma/AUCinflow ($p < 0.0001$) with higher values in tumor tissue. The post-DEB-TACE ratios of AUC decreased significantly in the tumor tissue compared to the non-target liver parenchyma ($p < 0.05$).
Conclusion: 2D-PA offers an objective approach to quantify the immediate perfusion reduction of embolized tumor tissue following DEB-TACE and may therefore be used to monitor peri-interventional stasis and to quantify technical success.

P-31

A novel method for imaging pressure and flow in solid tumors of the liver

R. O'Hara
Radiology, Huntsman Cancer Institute, Salt Lake City, UT, US

Purpose: Solid tumors have heterogeneous blood flow, with high pressure regions correlating with poor perfusion on angiography. Traditional low-pressure infusion directs drug only to low-pressure tumor regions. Infusion above systemic arterial pressure may increase delivery into high-pressure tumor regions, increasing contrast enhancement and retention. The purpose of our study was to evaluate the difference in tumor perfusion using the Surefire Infusion System (SIS) vs. standard end-hole microcatheter at 1 min and 5 min from infusion.
Material and Methods: Four patients underwent transarterial hepatic arteriography prior to selective internal radiation therapy (SIRT). Cone beam CT was performed at 1 and 5 minutes after 10 mL infusion of contrast media using a standard end-hole microcatheter (Cantata 2.8 F Cook® Medical, Bloomington, IN) via hand injection and subsequently using SIS 021 (Surefire Medical Inc., Westminster, CO) via power injection. Regions of interest were placed in the tumor, and normalized to non-perfused tissue outside the tumor. Differences in intensity were calculated using a two sample T-test.
Results: In total, 24 3-D image sets of 4 large tumors were reviewed. In poorly enhancing tumor regions, high pressure infusion increased tumor enhancement by 20.6% ($p<0.001$) at 1 min, and 22.5% at 5 min ($p=0.001$) compared to traditional infusion.
Conclusion: Arteriography using the SIS to infuse above systemic arterial pressure resulted in significantly increased tumor perfusion compared to a standard end-hole catheter at both 1 min and 5 min from infusion.

P-32

Transarterial chemoembolization adopting polyethylene glycol embolics loaded with irinotecan for the treatment of metastatic liver cancer

C. Aliberti[1], **R. Carandina**[1], D. Sarti[2], E. Pizzirani[1], G. Ramondo[1], L. Mulazzani[3], A. Felicioli[3], M. Nardella[4], F. Gómez[5], D. Barnes Navarro[6], G. Fiorentini[2]
[1]Oncology Radiodiagnostics, Oncology Institute of Veneto, Institute for the Research and Treatment of Cancer (IRCC), Padova, IT, [2]Onco-Hematology, Azienda Ospedaliera Ospedali Riuniti Marche Nord, Pesaro, IT, [3]Diagnostics for Images and Interventional Radiology, Azienda Ospedaliera Ospedali Riuniti Marche Nord, Pesaro, IT, [4]Radiology, Azienda Sanitaria Locale Matera, Madonna delle Grazie Hospital, Matera, IT, [5]Radiology, Hospital Clínic de Barcelona, Barcelona, ES, [6]Area de Imagen Medica, Radiologia Vascular e Intervencionista, Hospital Universitario y Politecnico La Fe, Valencia, ES

Purpose: To study efficacy and monitor adverse events of transarterial chemoembolization (TACE) with polyethylene glycol embolics (PEG) loaded with irinotecan for the treatment of colorectal cancer liver metastases (CRC-LM). Secondary objectives were to monitor quality of life, time to progression and survival of patients.
Material and Methods: 60 patients were included in the study and responded to the following inclusion criteria: affected by CRC-LM, refractory to systemic chemotherapy, treated TACE using PEG embolics, and liver involvement >50%. Data collected included: tumor response, performance status (PS), tumor marker antigens, and quality of life (QoL) that were monitored at 1, 3 and 6 months after TACE. QoL was assessed with the palliative scale (PSS).
Results: Tumor response one month after chemoembolization was 42% complete response (CR), 50% partial response (PR) and 8% stable disease (SD). Tumor response 3 months' time point was CR 14%, PR 58%, SD 12% and progression disease (PD) 16%; tumor response 6 months after chemoembolization was PR 62%, SD 23% and progression disease (PD) 15%. Median QoL values were > 80% PSS at each time point. No complications were observed during TACE. Most frequent side effects (mild or moderate intensity) included: pain in 20% of patients and fever in 10%; 40% of patients did not complain any adverse event.
Conclusion: Chemoembolization of CRC-LM with polyethylene glycol embolics loaded with irinotecan was effective in tumor response, and resulted in mild toxicity and good QoL.

P-33

Complications from thermal ablation therapy in hepatic malignancies: a pictorial review of 15 years' experience from a single centre

K. Chin[1], N.K.K. Venkatanarasimha[1], C.W. Too[1], R.H.G. Lo[1], K.D. Zhuang[1], K.H. Tay[1], P. Kumar[1], A.Y.F. Chung[2], S. Leong[1]
[1]Department of Vascular and Interventional Radiology, Singapore General Hospital, Singapore, SG, [2]Department of Hepato-Pancreato-Billiary and Transplant Surgery, Singapore General Hospital, Singapore, SG

Purpose: Percutaneous thermal ablation is a potentially curative option for treating early stage liver malignancy. Accurate probe positioning allows electromagnetic energy deposition to destroy the tumour while limiting damage to adjacent normal liver. Although it is considered relatively safe and minimally invasive, complications are not uncommon. As interventional radiologists move toward providing a fully-fledged clinical service, they should become familiar with detecting and managing complications.The aim of this review is to firstly, characterize a broad spectrum of complications related to percutaneous thermal ablation of HCC. Secondly, to describe combinations of percutaneous techniques utilized for successful complication prevention and treatment in complex cases.
Material and Methods: A comprehensive review of liver

RFA cases from morbidity and mortality rounds records over 15 years (2002-2017) was performed. Our centre performs well over 100 hepatic tumour ablations per year. These were classified as vascular and non-vascular complications. The management options and outcomes of these cases were recorded.
Results: The vascular complications discussed included hemorrhage, arterial pseudoaneurysms, fistulas, hepatic infarction and portal vein aneurysms. Non-vascular complications included bowel injury, abscesses, bile leak, diaphragmatic perforation and skin burns. The use of various combinatorial imaging and interventional techniques to better target lesions and prevent complications was discussed. These include hydro-dissection, balloon occlusion, tandem needle placement, fusion and contrast enhanced ultrasound imaging.
Conclusion: Percutaneous thermal ablative therapies play a significant role in the management of early stage HCC. It is imperative for the interventional radiologist to be cognizant of common pitfalls and various adjunct imaging and interventional techniques that can be employed to circumvent these complications.

P-34

Quality of life in patients with liver metastases treated with holmium-166 radioembolization

C. van Roekel[1], M.G.E.H. Lam[2], J.F. Prince[2], M.A.A.J. van den Bosch[2], M. Smits[2], R. Bruijnen[2]
[1]Radiology, University Medical Center Utrecht, Utrecht, NL, [2]Radiology and Nuclear Medicine, University Medical Center Utrecht, Utrecht, NL

Purpose: To evaluate the effect of selective internal radiation therapy with holmium-166 (166Ho-SIRT) on quality of life (QoL) in patients with liver metastases.
Material and Methods: Patients with unresectable and chemorefractory liver metastases of any primary origin were treated with 166Ho-SIRT in the HEPAR I and II trials. The European Organisation for Research and Treatment of Cancer QLQ-C30 and LMC21 questionnaires were used to evaluate QoL at baseline, 6 weeks and 3 months after treatment. In a subgroup of patients, QoL was also evaluated at 1 week and at 6, 9 and 12 months post-treatment. The course of the global health status (GHS) and symptom and functioning scales were analyzed. Patients were categorized into responders and non-responders based on contrast-enhanced CT (RECIST 1.1) at 3 months post-treatment. Outcomes between subgroups were compared using a Mann-Whitney test.
Results: QoL was studied in a total of 53 patients with a compliance of 94%. A significant decline in GHS and role functioning, and an increase of symptoms was seen between baseline and 3 months post-treatment. The most prominent symptoms were fatigue, pain, taste and appetite loss. These changes were most notable in progressive patients. In the subgroup of 26 patients evaluated 1 week after treatment, there was a decline in GHS and functioning scales and an increase of symptoms compared to baseline.
Conclusion: Salvage patients with liver metastases treated with 166Ho-SIRT experienced a decrease in QoL between baseline and 3 months after treatment, but QoL gradually recovered during the course of follow-up. Changes were most notable during the first week post-treatment and most prominent in non-responders.

P-36

The usefulness of 99mTc-SPECT/CT imaging in predicting the effects of the 90Y-radioembolisation for colorectal liver metastases

P. Piasecki[1], K. Brzozowski[1], J. Narloch[1], P. Zięcina[1], A. Mazurek[2], M. Dziuk[2], J. Korniluk[3], L. Bodnar[3]
[1]Interventional Radiology, Military Institute of Medicine, Warsaw, PL, [2]Nuclear Medicine Dept., Military Institute of Medicine, Warsaw, PL, [3]Oncology, Military Institute of Medicine, Warsaw, PL

Purpose: In view of recent reports on 90Y-radioembolisation from SIRFLOX study, it is important to develop a method to select patients who would benefit from the therapy. The aim of the study was to evaluate the usefulness of SPECT/CT imaging in predicting the effects of the 90Y-radioembolisation for liver colorectal metastases using a modified method of calculation of 99mTc-MAA tumor to normal liver ratio uptake (mT/N).
Material and Methods: A total of 103 liver colorectal metastases collected from 21 consecutive patients undergone radioembolisation (June 2009 - October 2015) were evaluated in pre-treatment CT scans and 99mTc-MAA-SPECT/CT scans and follow-up CT scans. A modified method of 99mTc-MAA tumor to normal liver ratio calculation was proposed and assessed in this study. Gamma counts were collected only from ROI marked in SPECT/CT slice with the longest tumor diameter (similar to RECIST 1.1). It was a base for further liver tumors' dosimetric evaluation.
Results: The overall tumors response rate was 36%. The mT/N was higher for tumors with response (2,4 vs 1,9 p=0,003) and showed a positive correlation with predicted 90Y tumor absorbed dose-PAD (R: 0,6, p<0,001). Mean PAD was higher for tumors with response: 113Gy vs 82Gy. Time to progression for tumors with mT/N higher than 1,7 or PAD higher than 70Gy was significantly longer (6,9 vs 1,7 months, p<0,001). The risk of progression for tumors with mT/N1 lower than 1,7 or PAD below 70Gy was higher (HR-2,1, CI:1,4-3,3, p=0,001).
Conclusion: The mT/N and PAD calculated from SPECT/CT imaging can be used as predictors of tumors response after 90Y-radioembolisation.

P-37

Triple chemotherapeutic transarterial chemoembolization in combination with sub-100 µm particles for non-resectable intrahepatic cholangiocarcinoma

F. Fitschek[1], U. Asenbaum[2], C. Schwarz[1], R. Nolz[2], K. Kaczirek[1]
[1]Dept. of Surgery / Div. of General Surgery, Medical University of Vienna, Vienna, AT, [2]Dept. of Biomedical Imaging and Image-guided Therapy / Div. of Cardiovascular and Interventional Radiology, Medical University of Vienna, Vienna, AT

Purpose: Intrahepatic cholangiocarcinoma (ICC) is a primary liver malignancy with a devastating prognosis. Transarterial

chemoembolization (TACE) has shown promising results for the palliative treatment of patients non-eligible for potentially curative surgery. This study's aim is to retrospectively analyze the effectiveness and safety of a sub-100 µm particle embolization in combination with a triple-chemotherapeutic TACE-protocol (Mitomycin C, Oxaliplatin and Gemcitabine) for patients with ICC.
Material and Methods: From September 2012 until March 2017, a total of 19 patients met the inclusion criteria. The TACE consisted of 10 mg Mitomycin C, 50 mg Oxaliplatin and 1500 mg Gemcitabine, followed by a tumor embolization with Embozene® 40 µm and 100 µm particles (1:1 ratio).
Results: 19 Patients, with a total of 33 embolizations (median 1 TACE session per patient, range 1-4), were included in this study. TACE was first-line therapy in nine cases and second-line therapy in ten cases. One patient suffered from severe abdominal pain after the intervention. Median progression free survival (PFS) was 4.5 months (±5.1 months, range 1-21). Eight patients reached the 6-month PFS (8/18, 44.4%), one patient was excluded due to insufficient follow-up data. The median overall survival was 25 months [±10.5, 95% confidence interval, 4.5-45.5 months]. Tumor response was classified as partial response in one case, stable disease in 16 patients and one patient had progressive disease at time of first follow-up.
Conclusion: With a moderate progression free survival, the combination of a triple-chemotherapeutic approach with a sub-100 µm particle embolization may result in a prolonged overall survival.

P-38

Survival analysis and predictive factors of survival of selective internal radiation therapy used as first-line therapy in patients with uveal melanoma

A. Ponti[1], A. Denys[1], A. Digklia[2], N. Schaefer[3], M. Silva-Monteiro[3], A. Hocquelet[1], J.-F. Knebel[4], O. Michielin[2], R. Meuli[1], R. Duran[1]
[1]Radiodiagnostic and Interventional Radiology, Centre Hospitalier Universitaire Vaudois, Lausanne, CH, [2]Oncology, Centre Hospitalier Universitaire Vaudois, Lausanne, CH, [3]Service de Médecine Nucléaire et Imagerie Moléculaire, Centre Hospitalier Universitaire Vaudois (CHUV), Lausanne, CH, [4]Centre for Biomedical Imaging (CIBM), Centre Hospitalier Universitaire Vaudois, Lausanne, CH

Purpose: Assessment of survival outcomes and prognostic factors of patients treated with selective internal radiation therapy (SIRT) with Yttrium-90 as first-line therapy for uveal melanoma liver metastases.
Material and Methods: A retrospective analysis of a prospectively collected database was performed. 22 patients were treated with SIRT as first-line therapy between September 2010 and September 2017. Demographics, radiological, functional and clinical data, SIRT number and characteristics (partition model dosimetry), and subsequent treatments (chemo-/immunotherapy, thermal ablation, transarterial chemoembolization) were analyzed. The effect of those parameters was determined by univariate analysis and overall survival (OS) by Kaplan-Meier analysis.
Results: 22 patients (median age 59 years, range 30-82; 11 male) were treated in 29 sessions. At the time of analysis, 15 (68.2) patients had died and 7 (31.8) were alive. Median OS following the first SIRT was 13 months (95%CI, 8-28). Subsequent post-SIRT liver-specific therapies (thermal ablation and chemoembolization) were significantly predictive of survival (P<0.05). Metabolic tumor volume (hazard ratio (HR):1.01; 95%CI, 1.00-1.01) and tumor to healthy tissue ratio (HR:1.08; 95%CI, 1.02-1.15) were significantly correlated with survival (P<0.05). Other variables such as treatment of the primary cancer, baseline extrahepatic disease at the time of SIRT or development of extrahepatic disease during follow-up were not correlated with survival.
Conclusion: SIRT used as first-line therapy was effective and subsequent post-SIRT liver-specific locoregional therapies correlated with survival. Clinical trials using SIRT as first-line therapy should be performed.

P-41

Transarterial chemoembolisation (TACE) with degradable starch microspheres (DSM) and anthracycline in patients with locally advanced HCC: safety and efficacy

A. Gross, T. Albrecht
Radiologie und Interventionelle Therapie, Vivantes Klinikum Neukölln, Berlin, DE

Purpose: TACE of HCC with degradable starch microspheres (DSM) tends to be used for multifocal or extensive disease, where superselective TACE is not warranted and less selective treatment is required. A potential advantage of DSM-TACE is low toxicity due to shorter ischaemia, but data on toxicity and effectiveness is scarce. We retrospectively reviewed 33 HCC patients undergoing repetitive DSM-TACE for safety and efficacy.
Material and Methods: 33 HCC patients (BCLC stages: 24xB, 8xC, 1xD) were treated with ≥3 DSM-TACEs using a standard dose of 50mg Doxorubicin/Epirubicin and 120-450mg DSM (EmboceptS, Pharmacept). Five HCC were uninodular, 28 multinodular (20 bilobar). Mean lesion size was 7cm (0.8-20cm). Two patients had main portal vein invasion. DSM-TACE was selective in 8, lobar in 11 and bilobar in 14 patients. Response was assessed by CE-CT/CE-MRI every 3-4 months.
Results: 154 DSM-TACEs were performed (3-12/patient, mean 4.7). No deaths and only one possibly procedure-related major complication occurred. Minor adverse events were: pain responsive to analgesics (23%), transient nausea (14%), vomiting (4%), post-embolization-syndrome (4%). Transient and mostly mild laboratory changes were: bone marrow toxicity (8%) and increase of INR (10%), creatinine (7%) or bilirubin (39%). Treatment response was: complete remission in 3, partial response in 17, stable disease in 7 and progression in 3 cases. Overall median survival was 17 months: 21 months for BCLC stage B, 6.7 months for BCLC stages C+D.
Conclusion: DSM-TACE of HCC is safe even in patients with advanced disease stages. Response rates and survival were promising in our series of patients with locally advanced disease.

P-42

Hepatocellular carcinoma abutting large vessels: comparison of four percutaneous ablation systems

A. Hocquelet[1], A. Loriaud[2], N. Vietti-Violi[3], R. Duran[3], A. Digklia[4], A. Denys[1]
[1]Radiology, CHU Vaudois, Lausanne, CH, [2]Radiology, CHU Bordeaux, Pessac, FR, [3]Radiology, CHU Lausanne, Lausanne, CH, [4]Oncology, CHU Lausanne, Lausanne, CH

Purpose: To compare overall local tumor progression (OLTP), defined as the failure of primary ablation or local tumor progression, between single applicator monopolar RFA, microwave ablation (MWA), cluster-RFA and multibipolar radiofrequency (mbpRFA) treating HCC ≤5cm abutting large vessels (≥3mm).
Material and Methods: This study was approved by the ethics review board, and informed consent was waived. This multicenter, retrospective, per-nodule study was performed from 2007 to 2015. Among the 914 HCC nodules treated by thermal ablation, 160 HCC abutting large vessels (40 per treatment group) treated either by monopolar RFA, MWA, cluster-RFA or MbpRFA were matched for tumor size, alpha-feto-protein level and vessel size. OLTP rates were compared with the log-rank test and the multivariate Cox model after matching.
Results: No differences were observed in tumor size, vessel size or alpha-feto-protein levels among the three groups (P=1). The cumulative 4-year OLTP rates were 50.5%, 16.3%, 16.3% and 44.2% following monopolar RFA, cluster-RFA, multibipolar RFA and MWA, respectively, P = 0.036. On multivariate Cox regression, vessel size ≥10 mm, monopolar RFA and MWA were independent risk factors of OLTP compared to cluster-RFA or mbpRFA.
Conclusion: Multi-applicator RFA provides better local tumor control in HCC abutting large vessels than single-applicator technique (monopolar RFA or MWA).

P-46

Pharmacokinetic analyses in patients with liver metastases from colorectal cancer treated with unilobar or bilobar drug-eluting microsphere chemoembolization with irinotecan

G. Maleux[1], H. Prenen[2], U. Martens[3], P.L. Pereira[4], T.K. Helmberger[5]
[1]Radiology, UZ Leuven Belgium, Leuven, BE, [2]Oncology, UZ Leuven Belgium, Leuven, BE, [3]Oncology, SLK Kliniken Heilbronn, Heilbronn, DE, [4]Radiology, SLK Kliniken Heilbronn, Heilbronn, DE, [5]Radiology, Klinikum Bogenhausen, Munich, Munich, DE

Purpose: To evaluate the pharmacokinetic (PK) profile, safety and efficacy of LifePearl® microspheres loaded with Irinotecan in the treatment of liver predominant metastatic colorectal cancer (mCRC) by transarterial chemoembolization (TACE).
Material and Methods: LifePearl-IRI is a prospective, single-arm study in patients without portal vein involvement. Primary endpoint is PK, secondary endpoints include safety, efficacy and technical success.

Due to withdrawn abstracts, certain numbers are missing.

Results: Fourteen patients with median age of 66 years were enrolled. All received previous systemic therapy. Median number of lesions was 4, target 3, with a median diameter of 34 mm on MRI and CT. Six patients had extra-hepatic disease, one portal invasion. Six patients received consecutive unilobar and 8 bilobar treatment. In 22 of 35 procedures the total intended dose was delivered, thus obtaining a technical success rate higher than the desired 75%. A short time (5 minutes) to maximal concentration was observed for Irinotecan with a later peak for SN38 (45 to 60 minutes respectively for 200 and 100 mg). Both were almost completely cleared from the body after 24 hours post procedures, regardless of the administered dose. Two patients died, one from necrotic pancreatitis and another from hepatic failure. The other reported adverse events for up to 30 days after the procedure were mild to moderate (grade 1-3), the most frequent being pain, fatigue, nausea and fever.
Conclusion: The preliminary PK results are within the expected range for Irinotecan and SN38. Updated PK, safety and efficacy results will be presented.

P-47

A bi-institutional analysis of outcomes following DEBIRI treatment for colorectal liver metastases: 125 treatments in 53 patients

A. Ngo[1], C. Von Stempel[2], B. Corbo[1], J. Evans[1], N. Kibriya[1], **J.-J. Wong**[1], S. Bandula[2], J. Raja[2], J. Hague[2]
[1]Interventional Radiology, Royal Liverpool University Hospital, Liverpool, UK, [2]Interventional Oncology Service, University College London Hospital, London, UK

Purpose: To retrospectively review outcomes in patients treated for colorectal liver metastases (CRLM) with DEBIRI (transhepatic arterial chemoembolisation with Irinotecan drug-eluting beads).
Material and Methods: A retrospective analysis of patients with CRLM treated with DEBIRI was performed between 2008 and 2017 between two tertiary centres. Primary endpoints were overall survival and time to disease progression. Secondary endpoints included tumour response and safety including technical success and complication rates. Subgroup analyses were performed to assess the impact on outcomes of hepatic tumour burden at time of treatment, the presence of extrahepatic disease, prior systemic chemotherapy and the prior administration of systemic irinotecan containing chemotherapy.
Results: 53 patients received 125 treatments with DEBIRI over the study period. Median age of patients was 73 (range 41-88). Patients were refractory to a median of 1 line of chemotherapy (range 1-5). Median number of DEBIRI treatments was 2 (range 1-6). The median survival from first treatment was 14.5 months (range 1-107). Median time to disease progression was 3.8 months (0-86.5 months). The presence of extrahepatic disease (seen in 45% of patients) correlated with prolonged OS. Prolonged OS was also seen in patients who received previous Irinotecan containing systemic chemotherapy. Technical success rate was found to be 98.4%. Post-procedural complication rate was 5.6%.
Conclusion: Our findings add to the growing body of literature to support the safety profile of DEBIRI in the treatment of CRLM. Further studies will be necessary to help establish the optimum patient group to receive DEBIRI within the context of the growing treatment paradigm for colorectal hepatic metastases.

P-48

HIFU for the treatment of hepatocellular carcinoma

F.B. Tagliaferro, M. Rossi
Radiology, Sant'Andrea Hospital, Rome, IT

Learning Objectives: To describe the current and the potential role of high intensity focused ultrasound (HIFU) in the treatment of hepatocellular carcinoma (HCC) compared to other mini-invasive local therapies.
Background: To date, treatment options for HCC include liver transplantation, resection and ablation, but only 25% of patients are eligible for curative treatments, due to tumor size, location, underlying parenchymal disease or multi-focal lesions. That's why there's a growing interest for mini-invasive local therapies. As a non-invasive modality, HIFU is receiving increasing interest for the local treatment of solid malignancies. HIFU ablation has been used mostly in advanced cases as a co-adjuvant therapy in sequential protocols. However, some prospective comparisons have been performed between HIFU and TACE or radiofrequency ablation (RFA).
Clinical Findings/Procedure: When HIFU alone is compared with RFA alone, in selected cases presenting with recurrent HCC and in cases with small HCC (<3cm), the survival outcome of patients receiving HIFU therapy is similar to that of patients receiving RFA. In the treatment of HCCs sized 3-8 cm, HIFU ablation alone seems to produce better survival outcomes when compared with TACE alone. In studies where HIFU is used as a co-adjuvant of TACE, this combination achieves better disease control as compared to TACE alone.
Conclusion: In the challenging HCC treatment, the HIFU ablation seems to add clear survival advantages over TACE alone and similar results when compared to RFA. It's a safe and well tolerated treatment, but its exact place in the algorithm for the management of HCC has to be defined.

Lung

P-49

CT-guided microcoil placement for video-assisted thoracoscopic surigical (VATS) resection of small pulmonary nodules: a single center experience

N. Su[1], R. Gullipalli[1], C. Russell[2]
[1]Discipline of Radiology, Memorial University of Newfoundland, St Johns, NL, CA, [2]Discipline of Surgery, Memorial University of Newfoundland, St Johns, NL, CA

Purpose: The purpose of this retrospective study is to determine the efficacy of preoperative CT-guided microcoil localization and VATS resection of small pulmonary nodules, in comparison to standard thoracotomy. We also assessed the pathologic diagnosis, intra/post-operative complications, and average length of hospital stay.
Material and Methods: In total, 29 adult patients were enrolled in this study. Microcoils were placed deep to the pulmonary nodule under CT guidance and patients were transferred immediately to the operating room. The coil was subsequently visualized by intraoperative fluoroscopy and VATS resection was performed. The results were compared to those who had thoracotomy without localization.
Results: CT-guided microcoil placement was successful in all 29 cases. Out of these, 18 cases were performed for resection of known or suspected metastatic lesions and 9 for bronchogenic carcinoma. Three patients had benign pathology. One patient (3.4%) had clinically significant pneumothorax requiring chest tube insertion. The incidence of pneumothorax is similar to that of standard CT-guided lung biopsy. Subsequently, 26 patients underwent successful VATS resection, and 3 patients were converted to open thoracotomy due to inability to localize the coil (2) and adhesion from previous surgery (1). None of the patients had clinically significant intra- or post-operative complications, with an average hospital stay of 2.9 +/- 0.6 days.
Conclusion: CT-guided microcoil placement and subsequent VATS resection provides a safe and effective alternative in the diagnosis and treatment of small pulmonary nodules in selected patient population. It also demonstrates lower intra-/post-operative complication rate and shorter hospital stay while maintaining excellent efficacy.

P-50

Solitary fibrous tumors of the pleura with pre-surgical embolization: a multidisciplinary approach (case presentation and literature review)

B. Solis[1], L. Corrales[2]
[1]Radiology and Interventional Radiology, Hospital San Juan De Dios, San Jose, CR, [2]Oncology, Hospital San Juan De Dios, San Jose, CR

Learning Objectives:
- To make a literature review of this uncommon neoplasm
- To review the importance of a multidisciplinary approach of the disease

- To reinforce the value of pre-surgical embolization to minimize operative duration and control blood loss

Background: The solitary fibrous tumors of the pleura (SFTP) are uncommon neoplasms originated from submesothelial tissue, and represent 8% of the intrathoracic tumors. In this article we analyze a 63 year old patient's case with SFTP, describing her symptoms, diagnostic overview and therapy. A literature review of the topic is explained throughout this article.

Clinical Findings/Procedure: Female 63 years old patient presented at our institution with a 6 month history of progressive dyspnea and pleuritic pain. Physical examination revealed a blood oxygen saturation at 85% at rest with an abolished left vesicular murmur. A thoracic x-ray study was requested and thoracic CT scan showed a mass occupying the entire left thoracic space, deviation of the mediastinum, and compression of the left lung. There was no pleural thickening or effusion. A Chamberlain procedure was performed revealing a highly vascularised tumor and the biopsy was complicated by a massive hemorrhage. The pathology reported a solitary fibrous tumor of the pleura (SFTP). A pre-surgical embolization of the tumor was planned given the tumor size and to diminish the risk of profuse hemorrhage during the resection. A main tumoral artery originating from the celiac branch was identified and an embolization was performed with embospheres. Seventy two hours after embolization, a left posterolateral thoracotomy with a complete resection of the mass with minor bleeding was performed. The final histological report confirmed a partially necrotic SFTP weighting 2800 grams and measuring 25.5x8.6x7.3cm. The patient had an adequate left pulmonary expansion been asymptomatic since after the surgery without signs of recurrence.

Conclusion: The SFTP is a low incidence and low growing rate tumor. The diagnosis is completed with a Tru-cut biopsy, after the discovery is made on radiographic studies. The treatment is exclusively surgical. Paying attention to its size, location and extension is truly important for taking the decision on performing a pre-surgical embolization may minimize blood loss and help with an easier dissection. An annual radiologic follow-up is recommended after the surgery.

Musculoskeletal

P-52

Utility of dual-energy CT to improve visualization of the therapeutic iceball during CT-guided cryoablation of musculoskeletal metastases

E. Smuclovisky[1], E.Y. Lin[2], G. Chintalapani[3], R. Sheth[2], S. Huang[2], S. Sabir[2], A. Tam[2], S. Yevich[2]
[1]Diagnostic Radiology, Baylor College of Medicine, Houston, TX, US, [2]Interventional Radiology, UTMD Anderson Cancer Center, Houston, TX, US, [3]Scientist, Siemens Medical Solutions USA Inc, Hoffman Estates, IL, US

Purpose: Evaluation of dual-energy CT (DECT) for enhanced visualization of iceball margins during CT-guided cryoablation of musculoskeletal (MSK) metastases.

Material and Methods: Monoenergetic image analysis was performed on 16 twin beam DECT's (SOMATOM Definition Edge, Siemens Healthineers, Germany) acquired during CT-guided MSK cryoablation in 15 patients from November 2016 to October 2017. Two sets of images at 40, 60, 90 and 120keV generated with standard soft tissue and bone window settings were evaluated qualitatively by three experienced interventional radiologists. Contrast-to-noise ratio (CNR) of iceball was measured in monoenergetic images generated in 10 KeV increments (40-190keV).

Results: Average qualitative scores to visualize iceball margins and critical structures within 1 cm are best between 90-120 KeV in both soft tissue and bone windows. Quantitative CNR analysis varied on a case-by-case basis. In soft tissue window, CNR decreased > 1 in 11 out of 16 patients (68.8%), CNR < ± 1 in 3 out of 16 patients (18.8%) and CNR increased > 1 in 2 out of 16 patients (12.5%) at low KeV. In bone window, CNR decreased > 1 in 4 out of 12 patients (33.3%), CNR < ± 1 in 7 out of 12 patients (58.3%) and CNR increased > 1 in 1 out of 12 patients (8.3%) at low KeV.

Conclusion: Monoenergetic postprocessing of DECT images offers ability to adjust parameters to qualitatively decrease iceball obscuration caused by metal artifact and varied densities of ablated MSK tissue. Metal artifact continues to influence CNR, limiting the potential for quantitative delineation of iceball margins.

P-53

Bipolar radiofrequency ablation for the management of painful spinal metastases

R. Cazzato[1], J. Garnon[2], J. Caudrelier[2], P. Rao[2], G. Koch[2], A. Gangi[1]
[1]Imagerie Interventionnelle, Hopitaux Universitaires de Strasbourg, Strasbourg, FR, [2]Interventional Radiology, University Hospital of Strasbourg, Strasbourg, FR

Purpose: To investigate the analgesic properties and the safety of a new bipolar radiofrequency ablation (RFA) system provided of internally cooled electrodes and applied for the treatment of painful spinal metastases.

Material and Methods: This is a single-centre single-arm retrospective observational study. Electronic records were reviewed to identify all oncologic patients who had undergone bipolar RFA of painful spinal metastases. Patients were treated if they presented a focal pain (≥4/10 on a 0-10 visual analogic scale in the 24-hours period) corresponding to a metastatic vertebra on cross sectional imaging.
Results: Eleven consecutive patients (6 females; 5 males; mean age 61.3 ± 11.6 years) with one-index painful spinal metastasis were treated. Lumbar levels were treated in 72.7% of cases; metastatic epidural involvement was noted in 81.8% of cases. Vertebral augmentation was associated to RFA in all the cases. Two (18.2%) complications (one minor and one major) were noted. Mean baseline pain score was 7.73 ± 1.1 vs 3.6 ± 2 at follow-up (mean 1.9 ± 1.4 months; p <0.0001).
Conclusion: Bipolar RFA performed with internally cooled electrodes and coupled to vertebral augmentation is safe and provides significant pain management in patients affected by painful spinal metastases.

P-54

Role of radiofrequency ablation as a salvage treatment for recurrent fibromatosis: retrospective analysis

P.G. Patel, S.S. Kulkarni, N.S. Shetty, A.M. Polnaya
Interventional Radiology, Tata Memorial Centre, Mumbai, IN

Purpose: To evaluate the safety and efficacy of RFA in managing recurrent fibromatosis.
Material and Methods: A retrospective analysis of 41 fibromatosis patients treated with 103 sessions of RFA from January 2008 to July 2015 was done. Inclusion criteria were recurrent fibromatosis refractory to primary treatment, i.e. surgery, CT or immunotherapy. RFA was done under CT guidance. Patients were followed up after 1 month of session and then 6, 12 and 24 months to assess clinical benefits and radiological response. Response evaluation was done clinically by improvement in the restriction of movements (ROM) by musculoskeletal tumor society scoring system (MSTS) and pain by visual analogue scale (VAS) and radiologically by calculating change in volume of the lesion and percentage of necrosis at follow-up.
Results: A total of 103 sessions of RFA was done in 41 patients with fibromatosis. Mean follow-up was 38 months (range, 1-96 months). 9 patients had involvement of upper limb, 15 lower limb, 6 chest wall, 3 mediastinum and 8 retroperitoneum and pelvis. Mean MSTS score for ROM Upper limb: Pre procedure: 18.60 Post procedure: 23.46 Lower limb: Pre procedure: 20.30 Post procedure: 25.00 Pain score reduced from 6.56 to 2.0. Quantification of reduction of size was 0-25% in 20 patients, 26-50% in 9 patients, 51-75% in 8 patients and 76-99% in 4 patients.
Conclusion: Radiofrequency ablation of recurrent fibromatosis is a safe and effective treatment option. The procedure is well tolerated, with significant improvement in quality of life and good long-term locoregional disease and symptom control.

P-55

Pre-operative transarterial embolization of musculoskeletal tumours: a 5-year experience

K. Chin[1], A. Bangaragiri[1], T.A.J. Urlings[1], S. Wong[2], C.W. Too[1], N.K.K. Venkatanarasimha[1], A. Gogna[1], P. Kumar[1], K.D. Zhuang[1], K.H. Tay[1], M.H. Tan[3], S. Leong[1]
[1]Department of Vascular and Interventional Radiology, Singapore General Hospital, Singapore, SG, [2]College of Medicine and Veterinary Medicine, University of Edinburgh, Edinburgh, UK, [3]Orthopaedic Surgery, Singapore General Hospital, Singapore, SG

Purpose: Surgical resection remains the main curative option for locally advanced musculoskeletal (MSK) malignancies. Significant intra-operative blood loss requiring blood transfusion increases peri-procedural morbidity and mortality, especially in extensive resections and hypervascular tumours. Transarterial embolization (TAE) reduces tumour vascularity, decreasing intra-operative blood loss and subsequent complications, potentially allowing better tissue plane definition for a more complete excision.
Material and Methods: Retrospective analysis of 12 patients with MSK tumours (primary or metastatic) who underwent pre-operative TAE between 2010 and 2015 was performed. The angiographic images were reviewed for technical success (>75% devascularisation after embolization). The patients' records were evaluated; identifying embolization related complications, intra-operative blood loss and peri-operative blood product requirements. A literature review was also performed.
Results: Complete technical success was achieved in all cases (100%). There was 1 (8%) minor complication of small arterial feeder dissection during cannulation but remaining feeding arteries were embolized successfully. The average intra-operative blood loss was 536 ml (range 0-1500ml). Intra-operative packed red blood cell transfusion (PCT) was required in 50% (n=6) of patients. The mean intra-operative blood volume replaced was 426 ml (range 300-617 ml) for the 6 patients. PCT was administered in 50% (6/12) of patients post-operatively. The mean volume of PCT given post-operatively was 650 ml (range 300-1200 ml). No patients required re-exploration or embolization post-operatively for bleeding complications. Literature review confirms pre-operative TAE to be safe, well tolerated and having low complication rates.
Conclusion: Pre-operative TAE for MSK tumours is a safe procedure with potential to reduce peri-operative blood loss, transfusion and bleeding-related complications.

P-56

Palliative and pre-operative transarterial superselective embolization in patients with bone and soft tissue malignant tumors

I. Dedes
Interventional Radiology, European Interbalkan Medical Center, Thessaloniki, GR

Purpose: The aim of this study is to present an assessment of transarterial superselective embolization (TAE) as a palliative and pre-operative treatment in patients with bone and soft tissue malignancies.

Material and Methods: In a 12-year period, 22 patients (14 male, 8 female) underwent 31 superselective TAE for bone and soft tissue malignancies. Mean age was 61±11 years. Palliative embolization was performed in 15 patients; 6 patients underwent pre-operative TAE in order to decrease tumor hypervascularity and 1 patient underwent ablation after TAE. Embolization was performed with microspheres (100-700µ) alone or both microspheres and microcoils. Nine patients underwent two TAE. Primary tumors included sarcoma, hepatocellular carcinoma, melanoma, lung cancer, renal cancer, gastric cancer, colorectal cancer, bladder cancer, neuroendocrine tumor, thyroid tumor and adenoid cystic carcinoma of the maxilla. Symptomatic lesions involved humerus, forearm, axilla, ribs, groin, scrotum, femur, tibia and the iliosacral joint. Mean primary tumor size was 10,5±6,3 cm.
Results: In one patient left hemiparesis occurred due to partial embolization of the Adamkiewicz artery, after embolization of 2 intercostal arteries. Minor local complications included palpable hardness in 20, rubor in 14 and sensitivity in 13 patients. According to the Numeric Rating Scale-11, mean pain score before treatment was 8,3 whereas it was 3,9 in 2 months follow-up. Median survival was 7 months from first embolization.
Conclusion: Superselective TAE is a well tolerated and efficient treatment for bone and soft tissue malignancies. As a palliative treatment it provides pain relief rapidly, and as a pre-operative method it leads to reduction of intra-operative blood loss.

P-57

Embolisation in the management of musculoskeletal tumours

A.G. Ryan[1], A. Stroiescu[1], J. Hennebry[1], U. Wegner[1], K. Murphy[2], P. Munk[3]
[1]Division of Interventional Radiology, Department of Radiology, University Hospital Waterford, Waterford City, IE, [2]Dept. of Medical Imaging, Toronto Western Hospital, Toronto, ON, CA, [3]Skeletal Radiology, Vancouver General Hospital, Vancouver, BC, CA

Learning Objectives:
1. To learn the best indications for embolisation in the musculoskeletal system
2. To learn when to combine embolisation and ablation
3. To learn tips and tricks to increase success and limit complications
Background: Musculoskeletal tumours can result in intractable pain, haemorrhagic complications and neurologic compromise, particularly when the spine is affected. Percutaneous and/or open surgery may be used to deal with/prevent these complications. Transarterial embolisation is currently underutilised in the management of musculoskeletal tumours. Palliative, stand-alone embolisation or pre-operative embolisation significantly improves these patients' outcomes. Without pre-operative embolisation, operative resection of hypervascular tumours occasionally has to be abandoned due to haemorrhage. Embolisation may also be performed with curative intent for some benign primary tumours.
Clinical Findings/Procedure: Lesions with histologies known to produce hypervascular metastases understandably respond more favourably (renal cell, thyroid and hepatocellular carcinoma). On pre-embolisation imaging, predictors of a positive outcome post-embolisation are: purely lytic tumours, associated pathological fracture, rapid increase in size, and/or progressive destruction. The embolisation technique will be described, with particular emphasis on achieving optimal success while minimising the risk of devastating non-target embolisation. The technique of flow-diversion with coils to protect tissues distal to the target artery will be described. The outcomes of combining embolisation with percutaneous ablative techniques will be described.
Conclusion: Transarterial embolisation can contribute significantly in the management of musculoskeletal tumours but is currently underutilised. This poster will describe this technique and will define its position in the treatment algorithm, including its combination with ablative techniques.

Novel therapies

P-59

Tandem therapy in bilateral intraocular retinoblastoma

S.S. Kulkarni, N.S. Shetty, A.M. Polnaya, S.N. Panbude, S. Quereshi, G. Chinnaswamy, N. Shettye, M. Thakur
Interventional Radiology, Tata Memorial Centre, Mumbai, IN

Purpose: To assess efficacy of tandem therapy in bilateral intraocular retinoblastoma.
Material and Methods: Retrospective analysis of 8 patients with bilateral intraocular retinoblastoma who received ophthalmic artery chemoinfusion with either Melphalan alone or Melphalan+Carboplatin [Melphalan 0.3-0.4mg/kg (max.7.5mg), Carboplatin 15-30mg]. Cycle repeated after 3 weeks as per tumor response. Investigations done pre- and post-procedure were CBC, coagulation profile, biochemistry, B-Scan, MRI, evaluation under anesthesia, electroretinogram.
Results: We have treated 16 eyes in 8 patients with 61 separate sessions of OAC (30 in right eyes, 31 in left eyes). Technical success rate was 100% (catheterization successful in 61/61 sessions). Mean sessions of OAC per eye was 3.81 (range 3-4 sessions per eye) with mean follow-up period of 21.34 months (range 3-54 months). Out of these, 13 eyes showed complete response, 2 eyes received focal consolidative therapy after downsizing the tumor and 1 eye was enucleated due to disease progression. Globe salvage rate was 93.75% (15/16 eyes saved). No major complications of the procedure noted.
Conclusion: Bilateral SOAC (tandem therapy) in bilateral intraocular retinoblastoma is a safe and effective novel technique for achieving good tumor response. It offers means to salvage globe while preserving useful vision in patients with bilateral intraocular retinoblastoma. When used, globe salvage rate achieved was 93.75% for bilateral intraocular retinoblastoma.

P-61

Advances in percutaneous management of inoperable cancer of the head of pancreas

M. Mizandari[1], T. Azrumelashvili[1], N. Habib[2]
[1]Diagnostic and Interventional Radiology, New Hospitals LTD, Tbilisi, GE, [2]Department of Biosurgery & Surgical Technology, Imperial College London, London, UK

Purpose: Percutaneous image-guided pancreatic duct (PD) drainage and subsequent second-line procedures (duct recanalization and endoluminal biopsy) are presented.
Material and Methods: Percutaneous US (8) or CT (11) guided drainage was performed to nineteen patients. Hydrodissection was used to create the safe needle route in 4 CT guidance cases. Transgastric and transhepatic puncture route was used in 4 and 5 cases respectively. All second line procedures (metal stent placement – 2, endoluminal RFA & metal stent placement – 7, endoluminal biopsy – 2) were performed under fluoroscopy guidance using the PD drainage fistula. Endoluminal RFA was performed by 5 Fr diameter RF device followed by metal stent placement. Endoluminal biopsy was performed using 5 Fr diameter forceps device.
Results: PD was drained in 19 cases. Clinical improvement was documented by the gradual reduction in clinical symptoms and improved blood test results. Four cases of diabetes recent onset showed a dramatic improvement in blood sugar control. Second-line procedures were fulfilled in 10 (90.1%) of 11 attempted cases. Endoluminal biopsy enabled to get tissue material; all patients tolerated the procedures well, there was no 30-day or hospital mortality. No technique specific complications were observed.
Conclusion: PD drainage, stenting, endoluminal RFA & stenting, endoluminal biopsy appear to be safe and effective; drainage might be considered for symptomatic PD occlusion as an alternative to retrograde stent placement and EUS guided antegrade intervention. Percutaneous drainage is the only possible option after previous GI tract surgery or retrograde access failure. PD drainage, recanalization and endoluminal biopsy should be routinely suggested in the management of inoperable pancreatic cancer.

P-62

Percutaneous endoluminal biopsy and recanalisation by RFA and stenting using PTBD track for inoperable intrahepatic CCC management

M. Mizandari[1], T. Azrumelashvili[1], N. Habib[2]
[1]Diagnostic and Interventional Radiology, New Hospitals LTD, Tbilisi, GE, [2]Department of Biosurgery & Surgical Technology, Imperial College London, London, UK

Purpose: Inoperable CCC induced biliary block percutaneous management technique is presented.
Material and Methods: Percutaneous biliary drainage, followed by recanalisation procedure was performed to 73 patients with inoperable intrahepatic CCC; the biliary block was classified as Bismuth I - 35 cases, Bismuth II - 25, Bismuth III - 10 and Bismuth IV - 3 cases. Single biliary drainage (and recanalisation procedure accordingly) was performed to 35 patients, double to 32 and triple to 6 patients (97 drainage procedures in total) using guidewire technique under combined US-fluoroscopy guidance in 94 cases and CT guidance in the other 3 cases. RF was performed using PTBD fistula in a week after drainage appying 15 watts for 2 minutes using 8 Fr diameter bipolar endoluminal RF device, positioned using guidewire technique via percutaneous biliary drainage fistula. Procedure finished with 8 to 10 mm diameter metal stent placement and safety drainage catheter repositioning.
Results: Biliary patency has been restored in all cases, achieving improvement of the quality of life; 3 patients generated stent occlusion in the period of 3 to 7 months after RFA and stenting requiring percutaneous drainage. There was no 30-day mortality, vessel damage or hemorrhage following biliary RFA and stenting.
Conclusion: Endoluminal RFA and stenting is safe and effective in biliary recanalisation; patients with inoperable CCC induced jaundice may benefit having not only restored biliary passage, but also RF induced antitumor immune response.

P-63

Basic physical principles, bioeffects and procedural steps of high intensity focused ultrasound (HIFU)

F.B. Tagliaferro, M. Rossi
Radiology, Sant'Andrea Hospital, Rome, IT

Learning Objectives: To describe the basic physical principles, the bioeffects and the procedural steps of high intensity focused ultrasound (HIFU).
Background: Like any energy wave, US can be focused in a way similar to light that is focused by a magnifying glass. HIFU traverse biologic tissues with energy accumulation maximized in the target and minimized within the tissues in the beam path. At the focal spot, localised areas of high temperature between 60° and 95°C are rapidly generated, resulting in tissue destruction due to proteins denaturation, coagulation necrosis and acoustic cavitation. Other bio-effects include US-mediated tissue sensitization to radiation and chemotherapy and US mediated local drug and gene delivery to tumors. HIFU has been used for the treatment of both malignant and benign lesions.
Clinical Findings/Procedure: Often performed as one day case, usually HIFU requires only one session. The patient may be completely conscious or sedated. Unlike other ablative procedures, HIFU does not need the insertion of a probe in the target lesion, as the HIFU sources are extracorporeal (for liver, kidney, breast, pancreas, uterus, brain and bone) or endo-rectal (for prostate). Both ultrasound and MRI have been used to guide and monitor HIFU treatments: MRI provides morphological images and real-time thermometry, while US are cheaper, provide real-time therapy guide and are widely available. Ordinarily, the patient is discharged the same day of the treatment.
Conclusion: HIFU is an innovative and non-invasive ablation technique with great potential in the field of imaging-guided therapies that has proven to be a valuable resource in treating both benign and malignant lesions.

Other organs

P-64

Initial results of MRI-guided percutaneous transgluteal ablation of focal prostate carcinoma

J.H. Figiel[1], A. König[1], A. Hegele[2], A.H. Mahnken[1]
[1]Diagnostic and Interventional Radiology, Philipps-University Marburg, Marburg, DE, [2]Department of Urology, Philips University, Marburg, DE

Purpose: To assess initial results of MRI-guided percutaneous transgluteal ablation of focal prostate carcinoma in a wide-bore 1.5T MR-scanner and to evaluate safety, periprocedural imaging features and short-term outcome.
Material and Methods: The analysis includes 10 consecutive patients (age 46-75, average 60) with 11 interventions performed between 06/2016 and 07/2017. All patients had histologically proven unilateral prostate carcinoma (5 low risk, 6 intermediate risk). Pre- and postinterventional PSA levels were measured. MRI-guided semi-gland ablation was performed under general anesthesia via a transgluteal access. Real-time imaging was used for positioning of the cryo needle. Periprocedural T2w and bFFE imaging was used to monitor ice-ball formation. Rectum, urethral sphincter and bladder tissue were spared. When appropriate, protective urethral and rectal catheterization was used (n=7). Postprocedural multiparametric MRI was performed to assess results after 1 day, 6 months and 12 months.
Results: Average procedure time was 2:41 h (2:07 h – 3:49 h). There were no major complications. One patient suffered hematuria for 4 weeks requiring no further treatment, one patient had a clinically irrelevant mucosal defect in the rectum and one patient had postinterventional urinary retention requiring prolonged transurethral catheterization. Peri- and postinterventional MRI showed full coverage of 9 lesions. In 1 lesion postinterventional biopsy revealed residual tumor and the intervention was repeated 10 months after initial procedure. PSA levels declined by an average of 71,5% (18,2-99,5%).
Conclusion: Initial results show that percutaneous MRI-guided cryoablation of focal prostate carcinoma is a safe and effective minimal-invasive therapy for a selected group of patients with prostate carcinoma. It may provide a viable alternative in patients under active surveillance.

P-65

Cryoablation for the treatment of lymph node metastasis

K.E. Mandralis[1], R. Duran[2], A. Hocquelet[2], A. Denys[1]
[1]Interventional Radiology, CHUV (Centre Hospitalier Universitaire Vaudois), Lausanne, CH, [2]Radiology, CHUV (Centre Hospitalier Universitaire Vaudois), Lausanne, CH

Purpose: To assess the efficacy, safety, and loco-regional disease control of cryoablation (CA) as a treatment option for lymph node metastasis (LNM).

Material and Methods: Clinical records of 9 patients (5 male, 4 female; median age 60) treated by CA in the department of interventional radiology, CHUV, between May 2014 and December 2016, were retrospectively and consecutively reviewed. Permission from the Swiss Ethics Committee was obtained. PERCIST and RECIST1.1 criteria were applied to assess treatment effectiveness, using follow-up available on PET-CT and MRI.
Results: 13 CA procedures were performed on 17 LNM with minor immediate and periprocedural complications. 14 hypermetabolic lesions were identified on PET-CT and followed up for 13.8 months mean: 14% had Complete Response (n=2), 64% had Partial Response (n=9), 21% were in Stable Disease (n=3), and 0% showed Progressive Disease (n=0). Mean SUVmax decrease was -51%. 17 target lesions were identified on MRI and followed up for 15.6 months mean: 29% showed CR (n=5), 41% had PR (n=7), 24% were in SD (n=4), and 6% was Not Evaluated (n=1). Mean volume decrease was -72%. Overall 44% of patients (p=4) showed global disease control for 11.2 months mean, 11% (p=1) showed local disease control for 20 months, with pre-existing distant tumour deposits, and 44% (p=4) showed locoregional or distant disease progression at 8.2 months mean.
Conclusion: CA of LNM is a safe, effective method, with minimal complications and satisfactory locoregional disease control rate. Treated lesions were controlled 15.6 months mean, and 44% of patients showed global disease control, 11.2 months mean.

P-66

Radiologically inserted venting gastrostomy (RVIG) for the management of malignant bowel obstruction

M. Khan[1], F. Ali[1], L. Wilbraham[2], D. Edwards[2], D. Mullan[1], H.-U. Laasch[1]
[1]Department of Radiology, The Christie NHS Foundation Trust, Manchester, UK, [2]Department of Nutrition and Dietetics, The Christie NHS Foundation, Manchester, UK

Purpose: To assess the technical success, complication profile and clinical outcome of radiologically inserted venting gastrostomy (RIVG) in the management of malignant bowel obstruction (MBO).
Material and Methods: Six-year retrospective review of patients referred for RIVG at our tertiary referral oncology centre. Cases reviewed with patient demographics, complications, diet tolerated, and survival recorded. Patients prospectively followed until death.
Results: 100 patients identified (mean age: 59.9 years; male:female ratio of 21:79) with inoperable MBO, as confirmed by CT, referred for RIVG with 94 undergoing venting tube placement (85 gastrojejunal tubes and 9 gastrostomy tubes); six cases where RIVG abandoned due to serosal disease preventing adequate distension of the stomach or dilated small bowel loop preventing access to the stomach. 99 cases were technically uncomplicated with one case of iatrogenic intra-operative duodenal perforation. 92 patients reported reduction in nausea and vomiting and improvement in diet tolerated. 28 patients noted post-procedure complications with vent blockage being the most commonly reported (n=10), followed by vent dislodgement (n=7) and skin excoriation/infection at the site of vent insertion (n=6). Median survival post RIVG noted to be 36 days (mean: 59 days).
Conclusion: RIVG is a technically feasible and safe interventional oncology procedure in the palliative setting for patients with MBO. Our data highlighted the reduction of nausea/vomiting and improved oral intake post-RIVG procedure. We identified specific, predictable and manageable complications associated with RIVG with early referral, detailed pre-procedural counselling and follow-up critical to improving patient outcome.

P-67

Performance and safety of pancreas biopsy: are there more complications made by routes of risk?

J.M. Sastoque G, J.J. Espejo Herrero, M.S. Lombardo Galeras, M.E. Pérez Montilla, I. Domínguez, **L.J. Zurera Tendero**
Radiologia Vascular, Hospital Universitario Reina Sofia, Cordoba, ES

Purpose: Retrospective analysis of pancreas CNB performance and overall safety assessment comparing biopsies performed through risk routes (liver, gastrointestinal tract) in relation to a direct route (peritoneal or retroperitoneal).
Material and Methods: Biopsies of pancreatic lesions performed between April 2010 and September 2017 were retrospectively analyzed. Biopsies were performed with 16 and 18G needles. The CT images, histopathological results and details of the procedure as route of approach and the associated complications were evaluated. If the biopsy was negative for malignancy, the clinical history was reviewed to evaluate the final etiology of the pancreatic lesion.
Results: BAG was performed on 83 patients (50 men, 33 women) with mean age of 62.65 years through different routes with 16G (n = 35) and 18G (n = 48) needles. The sensitivity, specificity, positive and negative predictive value of the total study were 82.53%, 100%, 100% and 64.51%, respectively. A total of 24 biopsies were performed with transperitoneal approach, 1 retroperitoneal and 58 with risk routes (colon (n = 3), stomach (n = 34), duodenum (n = 1), jejunum = 8), pleura (n = 1) and the remainder combining these routes (n = 10). The rate of major complications was 4.81% (n = 4) and minor 3.61% (n = 3); without finding a significant difference between the direct peritoneal approach (n = 3) and through risk routes (n = 4), neither with the needle size.
Conclusion: Pancreatic percutaneous CNB using the trans-organ approach is a safe and effective technique to diagnose malignant pancreatic lesions.

P-69

Bacterial isolates from urinary cultures obtained during percutaneous genitourinary interventions: are we prescribing antibiotics effectively and appropriately?

M. Khan, S. Abedifarhad, P. Najran, H.-U. Laasch
Department of Radiology, The Christie NHS Foundation Trust, Manchester, UK

Purpose: Percutaneous genitourinary interventions (PGUI) provide therapeutic and palliative benefit in interventional oncology. Presently, antibiotics are routinely administered to minimise the risk of urinary sepsis. However, no national guidance exists on the antibiotic of choice. We identified the common pathogens from urinary cultures in patients undergoing PGUI to determine the optimal antibiotic regimen.
Material and Methods: PGUI conducted within our tertiary referral oncology centre were retrospectively reviewed over a 6-month period as part of an institutional audit. Cases without urinary cultures were excluded with urinary cultures reviewed to determine the commonest pathogens grown and respective antibiotic sensitivities.
Results: 113 PGUI cases identified with 52 (46%) cases with urinary cultures. 20 cultures (38.5%) noted no bacterial growth but 32 (61.5%) were positive with Coliform and Enterococci species representing the commonest organisms. Within 19 (59.4%) positive cultures, the clinical significance of the pathogen isolated was questioned. In 13 positive cultures, gentamycin and amoxicillin were equally the most effective antibiotic (n=5, 38.5%) followed by vancomycin (n=4, 30.8%) and nitrofurantoin and ciprofloxacin equally third (n=3, 23.1%).
Conclusion: Presently, cefuroxime or gentamycin represent our first-line choice of antibiotics for PGUI at our institute. Our preliminary data highlights that cefuroxime may not represent an ideal antibiotic for PGUI due to a lack of sensitivity to this antibiotic in analysed urine samples. Additionally, our data highlights the need to review the clinical appropriateness of administering antibiotics prophylactically, especially with emerging antibiotic resistance globally, as within 59.4% of positive urinary cultures, the identified organism was noted to be insignificant from a microbiological perspective.

P-70

Complications following US-guided core needle biopsy for thyroid nodules: a systematic review and meta-analysis

E.J. Ha
Radiology, Ajou University School of Medicine, Wonchon-Dong, Yeongtong-Gu, Suwon, KR

Learning Objectives: To present the various complications of ultrasound (US)-guided core needle biopsy (CNB) of thyroid lesions, using a systematic review and meta-analysis.
Background: CNB has been introduced to improve the diagnostic accuracy for thyroid nodules and widely applied in clinical practice since 2010. However, safety issues still remain in general use of CNB.
Clinical Findings/Procedure: Ovid-MEDLINE and EMBASE databases were searched for studies on the US-guided CNB for thyroid lesions. Studies from January 1, 1994, to December 13, 2016, were included. Review of 393 potential papers, including a full-text review of 73, identified 39 eligible papers covering a total of 14818 patients for meta-analysis. The pooled proportion of overall complications after CNB for thyroid lesions was 1.11% (95% confidence interval (CI): 0.64-1.51, I2 = 87.2%). The pooled proportion of major complications (0.06% (95% CI: 0.02-0.10), I2 = 0.0%) was lower than that of minor complications (1.08% (95% CI: 0.63-1.53%), I2 = 93.17%). The subgroup analysis revealed that there was no significant difference between studies on Asia vs non-Asia group (P = .7769), radiologist vs non-radiologist group (P = .8607), nodule size < 20 mm vs. nodule size ≥ 20 mm (P = .1591), CNB group vs. CNB plus FNA group (P = .9281) and studies before 2012 vs. after 2012 (P = .6251).
Conclusion: Various complications can occur after US-guided CNB of thyroid lesions. However, it was found to be a safe procedure with a low complication rate in a systematic review with meta-analysis.

Pre-clinical and experimental

P-71

The value of iterative metal artifact reduction (iMAR) during applicator positioning for CT-guided microwave ablation (MWA)

T.D. Do[1], C. Melzig[1], J. Heim[1], F. Slatosch[1], T.L. Gockner[2], P. Flechsig[3], D.F. Vollherbst[4], C. Schlett[1], J. Nattenmüller[1], P.L. Pereira[5], H.U. Kauczor[1], C.-M. Sommer[1]
[1]Clinic of Diagnostic and Interventional Radiology, University Hospital Heidelberg, Heidelberg, DE, [2]Clinic for Diagnostic and Interventional Radiology, University Hospital Mainz, Mainz, DE, [3]Clinic for Nuclear Medicine, University Hospital Heidelberg, Heidelberg, DE, [4]Department of Neuroradiology, University Hospital Heidelberg, Heidelberg, DE, [5]Clinic for Radiology, Minimally-invasive Therapies and Nuclear Medicine, SLK Kliniken Heilbronn, Heilbronn, DE

Purpose: To compare image quality between standard filtered back projection (sFBP) and iterative metal artifact reduction (iMAR) during applicator positioning for CT-guided microwave ablation (MWA).
Material and Methods: A MWA applicator was positioned in livers of 5 pigs applying CT-guidance. D (120kVp/200mAs-120kVp/50mAs) and image reconstruction techniques (sFBP [B30f] and iMAR [I301-ADMIRE-1]; slice thickness of 2/1mm [2/1mm slices] and 8/8mm [8/8mm slices]) were applied. Quantitative analysis included density measurements in different positions (e.g. "liver in extension of the applicator" [APPLICATOR] and “liver >3cm away from the applicator” [LIVER-1]). Qualitative analysis included assessment of image quality (e.g. "artifacts liver tissue" [LIVER-2] on a 4-point Likert scale [1-none; 4-severe]). All analyses were performed twice by two independent observers.
Results: For all exposure settings and both slices, density measurements for APPLICATOR were significantly higher for iMAR compared with sFBP (e.g. for 2/1mm slices +17.2-+8.3HU for iMAR and -129.8--160.0HU for sFBP; p</=0.01, respectively). In contrast, for all exposure settings and both slices, density measurements for LIVER-1 were comparable between iMAR and sFBP (e.g. for 2/1mm slices +49.4-+50.4HU for iMAR and +48.6-+50.7HU for sFBP; n.s., respectively). Respective inter-observer agreement (bias) was -1.9-+8.0HU/-2.0-+1.0HU for iMAR and -7.5-10.5HU/-1.6-+0.4HU for sFBP. For all exposure settings and both slices, LIVER-2 was lower for iMAR compared with sFBP (e.g. for 8/8mm slices 1.2--1.2 for iMAR and 3.0--3.0 for sFBP; p=0.034, respectively).
Conclusion: Over a range of exposure settings and for different slice thickness, iMAR improves image quality during applicator positioning for CT-guided MWA compared with sFBP.

Technical developments

P-72

Using coils and the fixed-catheter-tip method in percutaneous implantation of a port-catheter system via the femoral artery for hepatic arterial infusion chemotherapy

J. Hu, G. Cao, **X. Wang**, R. Yang
Department of Interventional Radiology, Peking University Cancer Hospital & Institute, Beijing, CN

Purpose: Hepatic arterial infusion chemotherapy (HAIC) is an effective treatment for patients with liver malignancy. The purpose of this study was to retrospectively research the duration of port patency, complications and dysfunctions of a port-catheter system implanted by fixed-catheter-tip method via the femoral artery during hepatic arterial infusion chemotherapy.
Material and Methods: Between April 2013 and December 2016, 202 patients (136 men, 66 women; age range, 28-84 years; mean, 59±11.0 years) with unresectable malignant liver tumors underwent percutaneous implantation of indwelling port-catheter systems by the fixed-catheter-tip method via the femoral artery. The duration of port patency, implantation success rate, the time required for the procedure, intra-operative complications, and complications of HAIC were investigated.
Results: The overall technical success rate of port-catheter system implantation with the fixed-catheter-tip method was 98.0% (198 of 202 patients), and the mean time required for the procedure was 51.9 minutes. The predictable patency rates of the port-catheter system at 6, 12, and 24 months were 99.3%, 91.6%, 83.4%, respectively. Catheter dislocation occurred in 0.5% (1/198) of the patients; hepatic artery obstruction in 2.0% (4/198); catheter occlusion in 2.0% (4/198); bleeding at the puncture site and infection related to port-catheter implantation were not observed. The mean number of cycles of HAIC was 4.9 (range, 1-14 cycles).
Conclusion: Implantation of the port-catheter system using coils and the fixed-catheter-tip method via the femoral approach demonstrates simplified and an acceptable range of complications.

P-73

Improved dosimetry in radioembolization using a dual isotope SPECT/CT protocol with 166Ho-microspheres and 99mTc-stannous phytate: a proof of concept

A.J.A.T. Braat, R. van Rooij, H.W.A.M. de Jong, M.A.A.J. van den Bosch, M.G.E.H. Lam
Radiology and Nuclear Medicine, University Medical Center Utrecht, Utrecht, NL

Purpose: Improvements in radioembolization dosimetry are expected to lead to improvements in efficacy and toxicity. However, accurate tumor and healthy liver delineation and

image co-registration is very challenging. A dual-isotope SPECT/CT protocol (DI) was developed to improve dosimetry, using a radiocolloid for normal liver tissue segmentation, and a 166Ho microsphere scout dose for treatment simulation. Image quality of DI was quantitatively compared with the 166Ho-only SPECT/CT, both in a phantom study and patients.
Material and Methods: A phantom study was performed using two phantoms. After initial 166Ho-only SPECT/CT, DI were acquired by adding 99mTc-pertechnetate to water-filled background compartments. Phantom images were analyzed by comparing the recovered activities on SPECT/CT using a volume-of-interest around 166Ho depositions. Thereafter, both 166Ho-only and DI were acquired in 3 patients, using exactly the same imaging parameters. In the analysis of patient scans, 5 clinically significant compartments were assessed: total scan, whole liver, basal lungs and 2 tumors.
Results: With low background concentrations of 99mTc, phantom studies showed a good correlation between the Ho-only and DI. As expected, a high 99mTc-concentration caused contamination due to downscatter, resulting in a less reliable activity recovery. To maintain adequate image quality, 99mTc-radiocolloid to patients after a 166Ho-only scan was limited to 50 MBq. Recovered activities in patients showed a median difference of just +2.8% (range: -15.3%-+7.2%) between 166Ho-only and DI.
Conclusion: A dual-isotope SPECT/CT protocol is feasible. Diagnostic quality is maintained and activity recovery is acceptable. This protocol will allow physicians to rapidly perform image segmentation and automated image-based dosimetry.

P-75

Outpatient insertion of large bore gastrostomy tubes in patients with head and neck cancer: prospective single-center study in 35 patients

H.R. Gouveia, D.R. Paz, H.S. Martin, J.H.M. Luz, R.F. Prosperi
Interventional Radiology, National Cancer Institute – INCA, Rio De Janeiro, BR

Purpose: We performed a prospective study to evaluate the effectiveness, safety and early complications of the percutaneous radiologic gastrostomy technique (PRG) using large bore tubes in patients with head and neck cancer (HNC).
Material and Methods: A prospective interventional study. Between March and October 2017, 35 consecutive HNC patients referred to our institution for fluoroscopically guided feeding gastrostomy were included. This outpatient procedure was performed for symptomatic dysphagia due to HNC. Clinical follow-up was done on days 1, 3, 5, 7, 14, 21 and 30 to record any complications. Three T-fastners gastropexy sutures were routinely used. Large bore gastrostomy tubes (20Fr) were primarily inserted.
Results: Percutaneous radiological gastrostomy (PRG) was performed successfully and safely in 100% of patients. During the first 30 postprocedure days, there were no major complications. Eleven patients had 14 minor complications during the follow-up: leakage of enteral feeding and gastric fluid at the gastrostomy site related to gastroparesis (N = 5), tube dislodgement (N = 3), mild pain (N = 6). One patient (2,9%) died within 30 days of the procedure, but not related to the intervention. All complications were successfully managed and resolved after clinical measures in few days.
Conclusion: Primary insertion of large bore gastrostomy tube is a feasible and safe mean of feeding malnourished patients with head and neck cancer and is associated with a low risk of complications. Outpatient procedures are often preferred by the patients, and also can lead to significant savings, decreasing the financial burden on healthcare.

P-76

Centrally inserted, tunnelled PICC catheters: new hybrid method for venous access in oncology patients

D. Lingegowda
Radiology, TATA Medical Center, Kolkata, IN

Purpose: Patients who don't have any suitable veins in their arms for PICC line insertion need centrally placed catheters. We evaluated feasibility of tunnelled, centrally placed valved and non-cuffed PICC lines.
Material and Methods: Patients who don't have suitable veins in their arms due to previous chemotherapy, were offered placement of the tunnelled PICC lines in the chest. Procedures were done under local anesthesia. USG and fluoroscopy were used for guidance. Using internal jugular vein access, valved 4F PICC catheters were placed with its tips in SVC-RA junction. Proximal end of the catheters was brought out though 10-12 cm length subcutaneous tunnel, so that the exit point of the PICC lay over the upper chest. The device was stabilized with adhesive and sutures.
Results: Out of 12 patients, 9 patients were male (66%). Technical success was achieved in 100% of the cases. No catheter-related blood stream infection was noted within 30 days of placement of PICC. Overall during 917 catheter days, no catheter-related blood stream infection was observed. Initial two patients (16%) reported significant catheter pull-out resulting in unusable PICC lines. One patient reported external catheter fracture (8%). No exit site infection, catheter block, venous thrombosis noted in our series.
Conclusion: Centrally placed, tunnelled PICC catheters are a safe alternative when normal arm PICC line placement is not possible.

P-77

Percutaneous puncture of right innominate vein: an overlooked approach for totally implantable venous access ports in patients with cancer

S. XingWei, J. Yong
Department of Interventional Radiology, Affiliated Second Hospital of Soochow University, Suzhou, CN

Purpose: To evaluate the feasibility and safety of right innominate vein percutaneous puncture for TIVAPs implantation.

Material and Methods: Patients who underwent implantations of TIVAPs via right innominate vein percutaneous puncture from March 2013 to June 2017 were retrospectively evaluated. Technical success, time of operation and complications were analyzed.
Results: 897 cases were included. Technical success was achieved in all patients (100%). The mean operation time was (25.61±6.12) min (from 18 to 42 min). Puncture success rate for the first time was 98.89% (887/897). 6 (0.67%, 6/897) minor complications include artery punctures in 5 cases, pneumothorax in 1 case were encountered. Until this study the mean TIVAPs time was (261.35±48.12) d (from 41 to 1205d). The rate of postoperative complications was 2.90% (26/897), including hematoma in 2 cases, catheter-related infections in 6 cases, pocket infection in 5 cases, part of thrombosis in 3 cases, fibrin sheath formation in 9 cases, catheter fracture in 1 case, no catheter malposition, pinch-off syndrome or other serious complications were observed.
Conclusion: Implanting totally implantable venous access port via the right innominate vein by percutaneous puncture is feasible and safe in patients with cancer, with high success rate and low complications.

P-79

Applications of contrast-enhanced ultrasound (CEUS) in oncological intervention

R. Ahmed, G.T. Yusuf, S. Tran, M. Sellars, P. Sidhu, D. Huang
Radiology, King's College Hospital, London, UK

Learning Objectives: The purpose of this article is to further familiarise readers with the application of contrast-enhanced ultrasound (CEUS), particularly its specific strength over alternative imaging modalities, in oncological intervention.
Background: The introduction of ultrasound contrast agent (UCA) has rendered CEUS a valuable complementary technique to address clinically significant problems and is cost-effective without ionising radiation burden or risk of iodinated contrast-related nephrotoxicity. Visualisation of the vascularity of an abnormality offered by CEUS conveys its use to image-guided intervention through improved localisation of a focal abnormality. There is also accumulative experience on the use of CEUS for a variety of clinical indications including ultrasound-guided intervention.
Clinical Findings/Procedure: This pictorial review of cases demonstrates the use of CEUS guidance in oncological intervention and illustrates such application for a range of indications. CEUS guided procedures discussed include commonly performed oncological diagnostic procedures, such as fine needle aspiration cytology (FNAC) and biopsy, as well as therapeutic procedures such as biliary intervention, abdominal tumour ablation and its subsequent monitoring, and imaging of vascular complications following oncological intervention.
Conclusion: The current state of knowledge suggests CEUS offers a valuable armamentarium for oncological intervention, not only as a credible alternative, but it has the potential to offer tailor-made solutions for complex clinical challenges.