planning and implantation. Currently MR ultrasound fusion is not widely available limiting the application of functional imaging for the LDR technique. HDR Brachytherapy, in constrast delivers radiation dose through after loading catheters with the planning undertaken after implantation. This offers greater flexibility in defining a focal sub volume to be treated, and if CT or MR based planning is used, then image registration of functional imaging sequences taken in the diagnostic setting prior to implantation can be used to accurately define the volume. It is a more flexible system for dosimetry with each catheter contributing to the total dose within a volume, and the dwell time of the source within each catheter defining on a individualised basis each contribution. In contrast LDR brachytherapy uses seeds of a fixed strength and therefore only by altering the density and distribution of seeds can focal therapy or a focal subvolume boost be achieved.
HDR Brachytherapy therefore may offer the greatest opportunity for accurate focal brachytherapy at a technical level. Its main limitation lies in the limited experience as monotherapy and as yet no consensus over the optimal dose fractionation schedule. LDR brachytherapy is supported by a substantial clinical evidence base using a standard prescription of 145 Gy using the TG43 formalism for dosimetry. Thus HDR has technical advantages in flexibility of dose delivery whilst LDR currently has the greater weight of evidence supporting its role and dose delivery as monotherapy.

286 INVITED
Heat, Ice and Light

Abstract not received

Special Session (Mon, 26 Sep, 13:15–14:15)
Advanced Technology for Radiotherapy

287 INVITED
Clinical Experience With Carbon Ion Radiotherapy

Abstract not received

288 INVITED
Protons for Radiotherapy of Lung Cancer

Abstract not received

289 INVITED
Advanced Photon Therapy

Abstract not received

Special Session (Mon, 26 Sep, 13:15–14:15)
Management of Hilar and Intrahepatic Cholangiocarcinoma

290 INVITED
Surgical Resection of Hilar and Intrahematic Cholangiocarcinoma

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Surgical resection remains the only treatment with curative intent for biliary malignancies and this applies in particular to hilar (by definition extrahepatic) and intrahepatic cholangiocarcinoma.
For intrahepatic cholangiocarcinoma, improvement in the efficacy of surgery has, until recently, been limited by the lack of a specific staging system, relative inefficacy of chemotherapy and very limited indication for surgery in case of recurrence. However, since 2010, the AJCC has implemented a specific staging that has been validated and stresses the importance of satellite nodules, vascular invasion and lymph node metastases as the most significant prognostic factors. In particular a pN+ status has a major impact, but requires lymphadenectomy to be performed routinely to be reliable as the prevalence of lymph node metastases is 40% and preoperative imaging is very inaccurate in identifying them. There is very limited data on the benefit of chemotherapy either in the neoadjuvant or adjuvant setting but results from randomized controlled trials performed in non-resected patients suggest that this issue should be addressed. Ro resection is an independent prognostic factor (and should target a margin width of 5 mm at least) as the benefit of an R1 resection (or of resections achieving margins of less than 1 mm) is questionable.
For hilar cholangiocarcinoma, there is also evidence that an R0 resection is mandatory. R1 resections with submucosal tumour cells has a detrimental impact on 5-years survivals whereas persistence of superficial tumour cells only impacts 10-years survival. Achieving R0 resections requires a major hepatectomy to be performed and may prove particularly difficult. Mortality rates associated with these procedures is close to 10%. A tailored use of preoperative biliary drainage and portal vein embolisation may reduce this risk. In particular, biliary drainage should be routinely performed before right sided livr resections to reduce the risk of liver failure and surgery should be postponed untilserum bilirubin is less than 50–100 μmole/l. It should however e avoided before left-sided resections to reduce the risk o mortality from sepsis.

291 INVITED
Liver Transplantation for Cholangiocarcinoma

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Cholangiocarcinoma has been accepted as an indication for liver transplantation in the beginning of the transplantation era. Due to disappointing long-term results here and in parallel encouraging results in patients with benign disease, cholangiocarcinoma was generally not any more accepted for liver transplantation in recent years. To improve results, more aggressive approaches have been used, the “Abdominal Organ Cluster Transplantation” and the “Extended bile duct resection” (including partial pancreatoduodenectomy), which lead to increased long-term survival rates. However, with improving results after conventional partial hepatectomy, extended procedures in combination with liver transplantation never became a real option in the treatment of cholangiocarcinoma. New awareness for liver transplantation in the treatment of this cancer was raised by patients with hilar cholangiocarcinoma in the context of underlying liver diseases like primary sclerosing cholangitis, precluding liver resection. Current results show increased survival figures, in particular in well selected patients with early tumour stages. Further improvement of the long-term survival may be reached by new adjuvant and neoadjuvant protocols which was successfully introduced into clinical practice by the Mayo Clinic group. Patients with neoadjuvant radiochemotherapy show similar long-term results compared to patients undergoing liver transplantation for other indications. Also photodynamic therapy and the use of new antiproliverative immunosuppressive agents may be an approach for further improvement of the long-term results. Currently, liver transplantation for treatment of cholangiocarcinoma should be restricted to centres with experience in the treatment of this cancer and should be taken into consideration in patients with contraindications to liver resection.

292 INVITED
Adjuvant and Systemic Treatment of Advanced Cholangiocarcinoma

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Surgery with complete tumour resection offers the only chance of long-term survival for patients with hilar and intra-hepatic cholangiocarcinomas. The use of adjuvant therapy varies widely, depending on institutional preference. A number of published case series and retrospective studies exist; however there is only one prospective randomised phase III study available to date (Takada et al, Cancer 2002). In this study, patients with cholangiocarcinomas and cancers of the gallbladder, ampulla or pancreas were randomised to post-op adjuvant mitomycin-C and 5-fluorouracil (5-FU) chemotherapy or surgery alone. An improvement in disease-free survival and 5-year survival was seen only amongst the 112 patients with gallbladder cancer (26% vs. 14.4% respectively, $p = 0.0367$) and not in other subgroups. Two ongoing phase III studies will determine the role of capecitabine (NCT00363584) or gemcitabine and oxaliplatin (NCT01313377) versus surgery alone in patients with resected biliary tract cancers.
Unfortunately, most patients present with inoperable or recurrent disease and significant co-morbidity, advanced age, sepsis usually co-exist. A number of phase III studies have demonstrated a survival advantage of chemotherapy over supportive care alone using different regimens including 5-FU, etoposide leucovorin (FELV) (Glimelius et al. Ann Oncol 1996), 5-FU, doxorubicin and mitomycin-C (FAM) (Takada et al. Hepatogastroenterology 1998) and either 5-FU or the gemcitabine/oxaliplatin combination (Dwary et al. J Clin Oncol 2010). In the largest study to date, for patients with a good performance score, the randomised phase III ABC-02 study has established systemic chemotherapy with cisplatin and gemcitabine as a bench-mark for future studies with a median progression-free time of 8 months and median survival of 11.7 months (Valle et al. NEJM 2010), significantly better than gemcitabine monotherapy. Very similar outcomes were observed in a similar Japanese