Editorial

Editorial on "*Short- and long-term outcomes after hemihepatectomy for perihilar cholangiocarcinoma: does left or right side matter?*"

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Perihilar cholangiocarcinoma (PHC) is a malignant tumor known for its aggressive tumor biology (1). The only curative therapeutic approach is major hepatectomy with extrahepatic bile duct resection. However, these procedures are associated with a very high postoperative mortality of up to 20% (1,2). And even after successful surgical tumor resection, tumor recurrence occurs in the course of many patients resulting in low overall survival (OS) rates (3).

Major hepatectomy can be performed either as an (extended) left-sided hepatectomy (LH) or right-sided hepatectomy (RH). In some cases, the choice of resection side is determined by tumor growth behavior. In patients with centrally located tumors, there continues to be a controversial academic discourse on the preferred resection procedure (3-5). Neuhaus *et al.* (1) demonstrated oncologic superiority of right trisectionectomy with hilar en bloc resection with a 5-year survival rates of nearly 60%. However, some authors criticise this approach due to the high rate of major complications as well as a 90-day mortality of approximately 13% and thus prefer less radical surgical approaches such as extended left hepatectomy where more healthy liver parenchyma is spared (6).

Since then, there has been much debate about the pros and cons of the "superior" surgical approach. It has to be noted that perioperative management has greatly improved with the routine use of preoperative portal vein embolization, better imaging including preoperative volumetry as well as improved general perioperative management (7). Nevertheless, right trisectionectomy has been criticised mainly because of the high rate of posthepatectomy liver failure (PHLF) and overall high rate of major complications often leading to failure to rescue and postoperative mortality (4,8). Some authors also failed to demonstrate the oncologic superiority of RH compared with LH, further fueling the controversial debate (9).

The article published by Franken *et al.* (10) therefore aimed to further clarify this difficult issue. To this end, their retrospective study aimed to investigate both short-term and long-term outcomes of patients with PHC who underwent either RH or LH. In summary, the authors found no significant differences between patients who underwent LH compared with RH procedures, although the rate of PHLF was higher in the right-sided group.

In their retrospective analysis, Franken *et al.* (10) studied the course of 178 patients after either RH or LH for PHC. With regard to perioperative outcome, they found no difference in major complications, but interestingly showed an increased number of grade IIIa complications in the right-sided group, whereas grade IIIb and IV were significantly more frequent in the left-sided group. The reason for this remains unclear, and the authors do not provide a more detailed analysis or explanation. A more detailed breakdown of complications shows no differences with regard to bile leaks or anastomotic leaks. The 90-day mortality in their cohort is 14% with no differences between RH and LH, which is similar to the average of

western centers although usually left-sided resections are linked to lower overall morbidity and mortality (3,7).

With regards to the oncological radicality and long-term outcome, Franken *et al.* found no difference with regards to R0 status in both groups (39% *vs.* 40%). Of note, the overall R0 rate, however, in their cohort is slightly lower than in other western series (usually around 70–80%) (2,3). Five-year OS was ~40% independent of the resection group. The authors also analyzed whether simultaneous portal vein resection (PVR) had an impact on survival—their findings show that this is not the case. Patients without PVR had a slightly better OS than those who underwent PVR although the differences were not statistically significant (51 *vs.* 58 months, P=0.667).

There are several conclusions that can be drawn from their analysis:

(I) The oncological long-term outcome appears to be independent of the chosen surgical approach (RH *vs.* LH);
(II) Postoperative complications and mortality does not differ between RH and LH;
(III) PVR can safely be performed during either RH or LH.

These data are very interesting, but need to be considered in a larger overall context. Overall short- and long-term outcomes are well in line with previous analyses (8,11,12). However, some points differ from previous analyses. It is well known that the rate of PHLF is higher after (extended) RH than after LH (13). This is usually reflected in a significantly higher postoperative morbidity and mortality in these patients (13). With regards to the differing findings from the present study presented by Franken *et al.* (10) we may hope for additional analysis from their center to further elucidate these interesting findings. A possible explanation for that may be patient selection, although this is not reflected in their Eastern Cooperative Oncology Group (ECOG) and American Society of Anesthesiologists (ASA) data.

To be able to classify the long-term data, additional data such as histopathological results including TNM and Union for International Cancer Control (UICC) stage would also be helpful. The question of whether LH or RH should be performed does not arise in a certain proportion of patients, as this is already dictated by the anatomical tumor growth patterns (3,9). In centrally located tumors, where both are feasible, an increasingly tailored approach is now being adopted. Adjuvant chemotherapy appears to be a decisive factor, especially for lymph node-positive patients. The probability of receiving this is much higher after LH than after RH (3).

The discussion will also continue with regard to PVR. First joint data from Berlin and Amsterdam could already show that selective PVR *vs.* routine PVR are both feasible although the comparison of data is difficult due to baseline differences in the patient cohorts (12).

In summary, the evidence on this rare disease is growing and the article presented by Franken *et al.* is an important piece of the puzzle. Prospective randomized trials are difficult to implement due to the number of cases. However, in the future, retrospective multicenter projects, which have been published in large numbers in the last two years, will provide further insight into the appropriate treatment of these complex patients (7,14,15). In particular, this will help to better stratify this apparently very heterogeneous group and contribute to an improved, individualized holistic therapy.

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