French Editorial Commentary from the ACHBPT

Feasibility, safety and limits of robotic approach for lymphadenectomy in biliary tumours

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We read with great interest the study of Ratti *et al.* (1) aiming to compare robotic, laparoscopic and open hepatectomies in terms of feasibility, safety and oncological adequacy in surgery for biliary tumours (intrahepatic cholangiocarcinoma, perihilar cholangiocarcinoma and gallbladder cancer). The authors conducted a retrospective monocentric study focusing on the quality of lymphadenectomy, operative time and postoperative morbidity and mortality up to day 90. Using a weighted propensity score analysis by inverse probability of treatment weighting (IPTW), 25 patients operated by robotic approach were compared with 97 patients operated by laparoscopy and 113 by laparotomy. The authors showed a significant advantage of the robotic approach over laparoscopy and laparotomy respectively concerning the rate of adequate lymphadenectomy with a retrieval of at least 6 lymph nodes (96% *vs.* 86.6%; P=0.043 and 76.9%; P=0.032). Operative time for lymphadenectomy (35 *vs.* 50 minutes; P=0.044) and conversion rate (4% *vs.* 8.2%; P=0.043) were significantly reduced with the robotic approach when compared with laparoscopy. Minimal invasive surgery (robotic and laparoscopic approaches) was associated with a reduction in severe morbidity, length of hospital stays and length of recovery compared with open procedures. There was no significant difference in overall and disease-free survival at one year follow-up between the three procedures. Moreover, duration of lymph node dissection, conversion rate and blood loss between the 25 first hepatectomies did not show any learning curve effect in the robotic group whereas a learning curve of 10 cases was identified in the laparoscopic group. The authors concluded that robotic approach granted better results than laparoscopic and open resection for cholangiocarcinoma surgery, but these results were also probably associated with their already advanced laparoscopic experience.

In this retrospective study, selection bias was limited by a propensity score analysis allowing the three groups (robotic, laparoscopic and open resection) to be comparable on prognostic and confusion factors. The study asserts a benefit of minimal invasive surgery for reduction of blood loss and improved post operative outcomes which is in accordance with the existing literature mostly based on retrospective studies and no randomised trial (2). Although the authors suggest a superior quality and duration of lymph node dissection with minimal invasive surgery compared with open surgery and with robotic approach over laparoscopy, this superiority is not observed for the total number of lymph node retrieved and the total operative time which is overall longer (290 *vs.* 260 minutes;

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P=0.176) with the robotic approach. Laparoscopic hepatic pedicle lymphadenectomy is still under debate and was probably not systematically performed before the last American Joint Committee on Cancer (AJCC) recommendations (3,4). Indeed, a French national multicentric study recently reported worse results in laparoscopic lymph node resection quality when compared with open resection (5). However, these results were based on liver resections realised between 2000 and 2012 and therefore, before the publication of the latest AJCC recommendations (6) in which the quality of lymphadenectomy had been clearly established (>6 nodes removed to obtain a correct lymph node staging) and widely spread.

In this study, the authors do not describe any learning curve in terms of time required for lymph node dissection with robotic surgery although several studies describe a shorter learning curve compared with the laparoscopic approach (7,8). One should consider that robotic liver surgery (initiated since February 2021) was developed following laparoscopic liver surgery (initiated since 2005) permitting the authors to acquire expert skills in minimal invasive hepatic resection and thus the results of the learning curve of this study are biased. Furthermore, generalising these results is doubtful given the small number of robotic resections and the major expertise of this team in minimal invasive hepatobiliary surgery. Robotic use in hepatobiliary surgery is steadily growing and although indications are also expanding, its use is only supported by a low level of proof (9) and is still limited in highly specialised centres.

Finally, the scarce proportion of perihilar cholangiocarcinoma included in this study did not allow to evaluate robotic confection of hepaticojejunostomy which is supposed to be one of the major improvements in minimally invasive liver surgery with reported anastomotic fistulae and stenosis rates close to those of open surgery (10). Likewise, vascular resections and arterial or venous reconstructions often realised for perihilar cholangiocarcinoma surgery, and described as safe with the use of robot in selected patients for pancreatic resection in literature (11,12), were not studied. Last but not least, robotic approach may improve accessibility to tumours with a complex localisation compared with laparoscopy and facilitate the performance of difficult hepatectomies (13), which was not investigated by the authors.

In conclusion, minimal invasive surgery appears to provide better short-term outcomes than open approach for surgery of biliary cancers. The benefit of robotic approach over laparoscopy is still yet to confirm.

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Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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