Letter to the Editor

Use of robotics in liver donor right hepatectomy

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We read with great interest the paper by Chen and colleagues entitled "*Use of robotics in liver donor right hepatectomy*" (1). The authors currently represent the leading group performing robotic living donor liver procurements with 15 procedures completed to date (2). Here they provide a review of the current literature demonstrating that robotic procurement of grafts for liver transplantation from living donors is a possible alternative to open and/or laparoscopic/hybrid approaches. Recently published data from our group in Modena concluded that the development of robotic surgery for complex operations should be encouraged, but high-quality standards and safety-driven surgical growth must be guaranteed (3). While, pioneering attempts are necessary in surgery to allow the development of new technologies, the use of such technologies in progressively sophisticated procedures must be carefully monitored and gradually implemented to ensure patient safety. Over the past decade, the role of laparoscopic approaches to the liver have been discussed at three international consensus meetings held in Louisville, Morioka and Seoul (4). As a result, consensus guidelines were produced in an another international meeting held in Southampton in 2017 (5). Although these do not represent an endorsement for all surgeons to perform liver resections laparoscopically without appropriate training, it is widely agreed that a laparoscopic approach is currently the gold-standard for left lateral sectionectomy (LLS) (5). Laparoscopic donor hepatectomy has been applied to both left and right living donors successfully and has been proven safe and effective but only in few expert centers globally (6). Notably, laparoscopic LLS for LDLT provides more favorable conditions for a pure laparoscopic approach compared to right hepatectomy, better access particularly, fewer anatomical variations, easier mobilization and smaller transection planes (7). The outcomes of using left lobe graft are also comparable to right lobe grafts as reported in the largest reported experience in North America (8). The benefits coming from a purely minimally invasive approach are not merely cosmetics: reducing the impact of the open hepatectomy operation on the donor, and an earlier return to work, may increase the pool of potential donors for whom safety is paramount (6).

Robotic approaches to the liver have not gained wide acceptance for several reasons. Firstly, dedicated tools specific to minimally invasive liver surgery are still lacking and tools comparable to open parenchymal transection devices have yet to be developed for the robotic platform. Secondly, no strong evidence on indications have been produced, and while some literature has shown comparable results when robotic hepatectomies are compared to laparoscopic hepatic surgery, these results and these outcomes may not be generalizable (9,10). Experience on the da Vinci® platform (Intuitive Surgical Inc., Milford, CT, USA) is growing among many surgeons, but the learning curve for proficiency has yet to be defined. Thirdly, the robotic platform remains somewhat cumbersome, making undocking and gaining access to the patient quite difficult in emergency settings. This increases the concerns with regards to safety of performing procedures in completely healthy subjects such as donors, in whom there is no room for error. And lastly, complex hepatectomies such as full right lobectomies, require extensive mobilization of

the right lobe and inferior vena cava (IVC)—tasks which are not as easy robotically as they are with laparoscopic or hybrid procedures, often requiring the robotic liver surgeon to perform a right hepatectomy through an anterior approach, which is usually less desirable with donor hepatectomies. Some of the advantages the robot over standard laparoscopy are increased dexterity, improved visualization with high-resolution 3D image, tremor filtration, image fusion and real-time integrated indocyanine green. These technologies will continue to develop, and as liver surgery becomes a more routine procedure, more refined robotic liver tools will become available possibly allowing the more experienced robotic hepatic surgeons to undertake robotic liver donation.

While robotic hepato-pancreato-biliary (HPB) surgery is growing in popularity globally, robotic donor hepatectomy is still in its infancy. We believe this procedure will mature and robotics will be a platform of importance, but this should occur cautiously in highly specialized centers, and will only fully develop once there is widespread consensus among the HPB and liver transplant community as to the specific benchmarks for excellence in robotic liver surgery.

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Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

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