Editorial

ALPPS and the endless pursuit of hepatic resectability

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Associated liver partition and portal vein ligation for staged hepatectomy (ALPPS) is an established resection strategy well into its teenage years. After initial controversy, it has proven to be an effective and safe approach for primary unresectable liver remnant anatomy in high volume centers (1-5). ALPPS involves portal vein ligation and parenchymal split to obtain rapid, enhanced hypertrophy of the future liver remnant and resection during second stage of the operation (6). This allows for resection with liver remnants as small as 20% of original volume (7,8). It is the most rapid tool in achieving hypertrophy compared to other modalities (9-11). Nevertheless, ALPPS remains a contentious topic in the HPB literature (12-15). We believe that ALPPS is an excellent option for highly selected patients with expanded indications, especially when conducted by experienced surgical teams (5,16).

The ALPPS Registry, developed in 2014, has been a resource for the liver surgeon in decision making for curative resection (14). This tool, along with improved technique and refinement in patient selection, has yielded positive results in hepatocellular carcinoma, cholangiocarcinoma and colorectal cancer liver metastases (1,4,13,17,18). Recent publications have shown that ALPPS can be safely used for a broader range of indications (5,19). Lai *et al.* have conducted an excellent review on some of the less common indications treated with ALPPS. This group explored the literature and ALPPS registry and published an excellent article on outcomes from ALPPS application in neuroendocrine tumor liver metastasis (NELM), gallbladder cancer, gastrointestinal stromal tumor, adult primary and secondary malignant, adult benign and pediatric indications.

This group's findings are especially intriguing in use of ALPPS to treat neuroendocrine liver metastasis (20). NELM are divided into three classes—type I: single metastasis, type II: bilobar metastatic bulk, and type III: disseminated metastases. In this study, 40 patients have been reported in the literature as being treated with ALPPS for NELM, all type II (bilobar). These patients had favorable outcomes with 73–95% 1-year survival and 73–83% 1-year disease free survival. Consistent with other ALPPS indications, this review found a major complication rate of 33% in these patients. The authors also provide a brief review of patient selection and outcomes in liver transplantation for NELM (21)—offering the potential for study focusing on the direct comparison of these modalities.

We would caution the reader from applying the information found in this review towards pediatric and benign indications. For the pediatric patients, the *a priori* search criteria included articles among the adult (age >18) human population and may have restricted this studies ability to report on pediatric outcomes of ALPPS. For benign pathology, given the low power (four patients) and limited follow-up information of the study we would also caution the reader from making any significant clinical decisions with these results. Most importantly, we would encourage the application of these results to patients with good functional status and normal liver function tests (22). In the very rare benign pathologic case with no

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other liver resection strategy, we would encourage ALPPS to be performed by high volume centers with extensive experience.

Our group is encouraged by findings provided by this review and the opportunity for ALPPS to be used for a broader set of indications. Our center is experienced with this procedure and our surgeons have had excellent outcomes in our patients (16). In our practice, more than fifty ALPPS cases have been performed with one single mortality at 90 days with acceptable disease free and overall survival rates. We attribute our success to careful patient selection and the accelerated hepatic hypertrophy. We are confident in the procedure's hypertrophic potential with similar recurrence rates in well selected patients as compared to two-stage hepatectomy (19,23). Most importantly, we are comfortable with the safety and efficacy of this procedure and would be interested in expanding the understanding and clinical use in highly selected patients for a broader range of indications. We would encourage patients and referring physicians to seek second and third opinions with experienced centers regarding the resectability of their disease.

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