

## Symposium 5. ALPPS vs. PVE

# Single center experience of the ALPPS

## Background

To minimize the risk of post-hepatectomy liver failure in patients with a marginal future remnant liver (FRL), portal vein embolization (PVE) with or without two-stage procedure have been widely used. However, this conventional procedure is associated with several limitations such as need long waiting time up to 8 weeks, inadequate enlargement of FRL, and disease progression for the waiting period. These are known to be the leading cause of stage 2 surgery failure and are known to reach up to 34 %. In order to overcome this disadvantage of PVE, the associating liver partition and portal vein ligation for staged Hepatectomy (ALPPS) has recently emerged and has been used as an advantageous strategy to induce a rapid and prominent increase in FRL, thereby reducing the risk of tumor progression and early applicability of chemotherapy. On the other hand, there is a disadvantage in that a considerable number of patients are accompanied by complications and mortality. In this context, we review the case of ALPPS and compare it with the PVE results of various diseases and compare it with the results of simple liver resection for colorectal cancer liver metastasis (CRLM).

## Method

From Sep. 2014 to Dec. 2016, we performed ALPPS in 20 patients. Preoperatively, all of the ALPPS group was planned to achieve R0 resection and to perform the major hepatic resection in the patients with the marginal FRL. The ALPPS group was compared with the PVE group (26 cases) in terms of surgical outcome and change and duration of the FRL volume. Additionally, survival and surgical outcomes were retrospectively analyzed between the ALPPS group and conventional surgery group in CRLM patients.

## Results

90 days mortality was 0 % and morbidity greater than Clavien–Dindo classification IIIa was 15 % in 20 ALPPS patients. All patients of ALPPS achieved successful volume increases and the mean FRL volume of the second-stage operation was 545.7 ml (370–876 ml) and the mean FRL volume difference was 219.1 ml, while the degree of FRL hypertrophy was 74.8 % (13.9–177.2 %). The FRL volume of the first and second stages was significantly different ( $p<0.001$ ). The mean FLR/TLV and FLR/BW were significantly increased to 42.7% (30–74.6 %) and 0.87 % (0.6–1.43 %), respectively ( $p=0.001$  and  $p<0.001$  compared to those of the first-stage operation). Comparing to the PVE group, there were significant differences in hypertrophy rate of the FRL (ALPPS  $68.56\pm40.40$  vs. PVE  $27.39\pm22.01$ ,  $p<0.001$ ) and volume differences in the FRL (ALPPS  $198.9\pm91.23$  vs. PVE  $75.50\pm42.37$ ,

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$p < 0.001$ ). And the PVE group showed significant waiting times (ALPPS  $9.4 \pm 4.018$  vs. PVE  $26.05 \pm 7.911$ ,  $p < 0.001$ ). From Feb. 2010 to Dec. 2016, 125 cases of the CRLM underwent liver resection and ALPPS was performed in 12 out of them. 5 year survival rate and 5 year disease free survival rate in all CRLM patients were 85.3 % and 70.8 % respectively. 90 days mortality was 0.008 %. Median overall survival and median disease free survival were 30.3 months and 23.5 months respectively. In the comparison between the ALPPS group and the conventional surgery group, there was no difference in 3 year overall and disease free survival but 3 year disease free survival of the ALPPS group was lower than that of the conventional surgery group (55.6 % vs. 72.4 %,  $p = 0.179$ ). There were statistically significant differences regarding presence of bilobular tumor location, the tumor number, size, and major resection. Repeated hepatectomy was more common in the ALPPS group (41.7 % vs 19.5 %).

### Conclusion

Given that ALPPS is known as a highly invasive and somewhat risky procedure, it is a strategy that is not easy to apply. However, ALPPS offers the only opportunity for a cure for the patients with unresectable and advanced liver disease especially combined with the marginal FRL. In our limited series, compared to PVE, ALPPS induced more rapid hypertrophy of the FRL and it resulted in a shorter waiting time interval than PVE. Of course, we need to identify long-term outcomes, but initial results with ALPPS have shown promising and applicable results, which may be induced by many sophisticated and delicate surgical experiences including living donor liver transplantation.