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Long-term Survival After Minimally Invasive Resection versus Open Pancreaticoduodenectomy for Pancreatic Cancers: A Systematic Review and Meta-analysis

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Introduction: It remains unclear whether minimally invasive pancreaticoduodenectomy (MIPD) and open pancreaticoduodenectomy (OPD) influences long-term survival in periampullary cancers. This review aims evaluate long-term survival between MIPD and OPD for periampullary cancers.

Methods: A systematic review was performed to identify studies comparing long-term survival after MIPD and OPD. The I2 test was used to test for statistical heterogeneity and publication bias using Egger test. Random-effects meta-analysis was performed for all-cause 5-year (main outcome) and 3-year survival, and disease-specific 5-year and 3-year survival. Meta-regression was performed for the 5- year and 3- year survival outcomes with adjustment for study (region, design, case matching), hospital (centre volume), patient (ASA grade, gender, age), and tumor (stage, neoadjuvant therapy, subtype (i.e. ampullary, distal

bile duct, duodenal, pancreatic)). Sensitivity analyses performed on studies including pancreatic ductal adenocarcinoma (PDAC) only.

Results: The review identified 31 relevant studies. Among all 58,622 patients, 8716 (14.9%) underwent MIPD and 49,875 (85.1%) underwent OPD. Pooled analysis revealed similar 5-year overall survival after MIPD compared with OPD (HR: 0.78, 95% CI 0.50–1.22, $p=0.2$). Meta-regression indicated case matching, and ASA Grade II and III as confounding covariates. The statistical heterogeneity was limited ($I^2 = 12$, $c^2 = 0.26$) and the funnel plot was symmetrical both according to visual and statistical testing (Egger test = 0.32). Sensitivity subset analyses for PDAC demonstrated similar 5-year overall survival after MIPD compared with OPD (HR 0.69, 95% CI: 0.32–1.50, $p=0.3$).

Conclusion: Long-term survival after MIPD is similar to OPD. Thus, MIPD can be recommended as a standard surgical approach for periam-pullary cancers.