Clinical and immunologic effect of IORT in Pancreatic Cancer Surgery

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Incidence of pancreatic cancer is increasing and has more than doubled over the past 30 years. In 2018, pancreatic cancer was the 13th most common cancer globally, with 458,918 new cases, and the 7th most common cause of cancer-related mortality, with 432,242 deaths. In the United States, pancreatic cancer was estimated in 2020 to be the third leading cause of cancer related death.

Surgical resection of pancreatic cancer is the mainstay of treatment for patients with non-metastatic disease and includes pancreaticoduodenectomy for tumors in the head or body of the pancreas and distal pancreatectomy for tumors in the tail of the pancreas.

The current treatment options like modified FOLFIRINOX have improved the long-term survival of patients with pancreatic cancer, but more effective systemic therapies and treatment strategies are still needed. The main reason for the high rate of recurrence is that pancreatic cancers often have microscopic residual disease. Therefore, postoperative external beam radiotherapy (EBRT) has been proposed as a method to improve local control for resectable pancreatic cancer patients. Recent advanced radiotherapy techniques, such as intensity-modulated radiotherapy (IMRT), image-guided radiotherapy (IGRT), magnetic resonance (MR)-guided RT and particle therapy, have shown favorable outcomes in pancreatic cancer patients. Most of these treatments were administered to patients with unresectable or borderline resectable pancreatic cancer; their potential clinical use in an adjuvant setting has not been established yet.

The use of intraoperative radiotherapy (IORT) for pancreatic cancer was first reported in Japan in the 1980s, for patients with locally advanced pancreatic cancer. During a surgical procedure, IORT can be used to deliver a single fraction of high-dose radiation to the tumor bed after the tumor has been removed.

We identified differentially expressed cytokines in Peritoneal fluid and and compared the effect of IORT administration on the proliferation and activity of pancreatic cancer cells stimulated by Peritoneal fluid. We also confirmed the anti-cancer immune response induced by IORT through comparison of immune cell populations during the postoperative period. Through this study, we can conclude that various cytokines at the surgical site induce microenvironment changes after IORT, which inhibit the proliferation of remaining cancer cells and recurrence. Therefore, IORT induces an anti-cancer immune response in patients with pancreatic cancer, ultimately aiding local control and prevention of pancreatic cancer recurrence.