Globally, it has been observed there to be an increased incidence of pancreatic cancer. Cancer-related mortality for pancreatic cancer ranks fourth in western developed countries. It is predicted that in the next decade, the mortality of pancreatic cancer will rise to second place in the United States and third place in the European Union countries (1). The main reason behind this is that the treatment efficacy of top-ranking cancers as lung cancer and colorectal cancer has improved significantly. However, the treatment of pancreatic cancer is extremely challenging and has been evolving slowly. There is still a long way to go in improving the long-term prognosis of pancreatic cancer patients. This article reviews popular fields in the surgical treatment of pancreatic cancer in the past 20 years and its prospects for future development.

**Tremendous improvements in the field of surgical techniques, in contrast to a stagnant phase in the study of oncology**

In the past two decades, the surgical treatment for pancreatic cancer has witnessed a great improvement on the technical level. The surgical resection rate and surgical safety have been promoted while the perioperative mortality and the incidence of severe complications have shown a remarkable decline. Endoscopic technology is making rapid progress, replacing almost all types of open surgeries through the method of laparoscopy or surgical robot. The minimally invasive concept and technology are increasingly popular. The advancement of technology, however, has not brought significant improvement in the long-term prognosis of pancreatic cancer patients. Compared with breast cancer, lung cancer, colorectal cancer, and other common cancers, our knowledge of the biological behavior of pancreatic cancer is still limited, and the research and development of targeting drugs and its clinical applications still have a long way to go.

**The transformation of the treatment paradigm of pancreatic cancer: from “Surgery First” to “Multiple Disciplinary Team”**

“Surgery First” was the prior standardized treatment paradigm of pancreatic cancer. Under this paradigm, we emphasized the advantages of a specific specialty but turned a blind eye to the difference of the same disease in different stages. This idea might cause overtreatment or undertreatment. The renewal of concepts leads to the progress of behavior. Nowadays, the treatment of pancreatic cancer has shifted from traditional specialty-centered “Surgery First” mode to a more disease-centered “Multiple Disciplinary Team” mode.

**From adjuvant chemotherapy to neoadjuvant chemotherapy: a prior shift of chemotherapy**

Post-operative adjuvant chemotherapy is the standardized treatment after major surgery in the treatment of pancreatic cancer and should be conducted routinely. Some topics around adjuvant therapy have been brought up regarding the details of the regimen; however the efficacy and necessity of neoadjuvant therapy have been pushed to the frontline as a major adjustment to the treatment strategy. The National Comprehensive Cancer Network (NCCN) Guideline of the United States used to provide treatment options of neoadjuvant chemotherapy or direct surgery for patients with borderline resectable pancreatic cancer. Since 2016, however, the NCCN Guideline has revised its treatment strategy for borderline-resectable pancreatic cancer to neoadjuvant...
chemotherapy upfront, and neo-adjuvant chemotherapy is also recommended in patients with resectable pancreatic cancer of high recurrent risks, as a serum CA-199 level exceeding 500 U/mL, large bulk, and suspected lymph node metastasis (2). The idea of comprehensive treatment with a “prior-shift of chemotherapy” is reflected by the application of the neo-adjuvant chemotherapy. Its evidence in improving the prognosis has been accumulating with higher quality. This has reflected an overall direction and trend in the treatment of tumors.

**Personalized precision medicine: from morphological to molecular typing**

The traditional clinical and histological typing of the pancreatic cancer base for both morphology presentations as imaging or microscopic cellular morphologies had limited guidance in a clinical setting. The same treatment has been provided for different subtypes of diseases, which does not underline the individual differences in clinical behaviors as relapses, metastasis, and sensitivity to radiation and chemotherapy from a biology perspective. Personalized treatment is not selected that reflects the precision medicine principle of “treating respectively even for the same disease.” With the ongoing development of high-throughput sequencing technology and systemic biology, the traditional typing of pancreatic cancer is transiting to a more precise one that bases on a molecular level, laying the basis for individualized, targeted therapy. Our current pancreatic cancer molecular typing basing on the next-generation sequencing and proteomics technology is at an overall primary stage with limited clinical guidance. Typing disparities in the number of types and detailed categorization can be secondary to the differences in the sample size, source of the sample, and methodology selection in studies, plausibly revealing an aspect in the molecular and pathological characteristics of pancreatic cancer, respectively. There is still a large gap to a comprehensive interpretation of the molecular biological behaviors of pancreatic cancer, which on the other hand, speaks of the peculiarity and complexity of the biological behaviors in pancreatic cancer (3). In 2019, Golan et al., (4) published the results of POLO (Pancreas Cancer Olaparib Ongoing), a prospective, phase 3 trial, to evaluate the efficacy of olaparib as maintenance therapy in patients who had a germline BRCA mutation and metastatic pancreatic cancer after first-line platinum-based chemotherapy. A significant difference in progression-free survival was observed compared to the control group. The POLO study serves as a milestone where the precision medicine treatment model has been established for the first time, that the targeted therapy was provided with a patient selection based on the biomarker of an individual gene.

From empirical treatment to the individualized regimen, from limit-exploring surgery to perfection-pursuing operation, from anatomical resection to biological cure, we are looking back at a 20-year history of diagnosis and treatment of pancreatic cancer, as well as looking into the future. Based on breakthrough progresses in the treatment of breast cancer, colorectal cancer, and liver cancer, pancreatic cancer treatment will sure transit from anatomical typing based on morphology to the molecular typing stemming in precision medicine. At the same time, surgeons are required to re-shape their guiding principles and mindset, from morphology to biology, and from surgery to oncology.

**Acknowledgments**

None.

**Footnote**

*Conflicts of Interest:* The author has no conflicts of interest to declare.

*Ethical Statement:* The author is accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

**References**


