



Hierarchical Radical Resection of Pancreaticoduodenectomy (HRR-PD). A New Classification to Guide Operative Decisions for Cancer

Sun J^{1**}, Zhang P^{2#}, Lu W¹, Zhang F¹ and Wu D¹

¹Department of Hepatic & Biliary & Pancreatic Surgery, Hubei Cancer Hospital, Tongji Medical College, Huazhong University of Science and Technology, China

²Department of Radiation Oncology, Hubei Cancer Hospital, Tongji Medical College, Huazhong University of Science and Technology, China

*These authors contributed equally to this work and share first authorship

Abstract

For periampullary cancer and pancreatic head cancer, pancreaticoduodenectomy has always been a standard surgical method. The scope of its resection seems to be clear, but its detailed anatomical locations are not clearly defined. At the same time, although its surgical methods have been improving, surgical methods are constantly being redefined from the perspectives of lymph node dissection, lacunar anatomy, and mesentery. However, these improved theories are mostly mutually exclusive, cannot be thought of under a unified theoretical framework, and lack hierarchical and en bloc resection thinking. It is obvious that a single surgical resection range cannot adapt to the characteristics of cancers with different biological behaviors. Based on this, we proposed a theory of "hierarchical radical cure with pancreaticoduodenectomy". It has three levels of surgical resection range, and this concept emphasizes the principle of block resection. It can meet the needs of different levels of resection range and ensures the principle of resection of malignant tumors.

Keywords: Hierarchical radical resection; Pancreaticoduodenectomy; Cancer

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*Correspondence:

Junwei Sun, Department of Hepatic & Biliary & Pancreatic Surgery, Hubei Cancer Hospital, Tongji Medical College, Huazhong University of Science and Technology, Wuhan, China,

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Introduction

Pancreatoduodenectomy (PD) has always been a standard surgical method for periampullary cancer and pancreatic head cancer. In recent years, concepts such as "standard pancreaticoduodenectomy and extended pancreatoduodenal surgery" [1,2], "mesopancreas" [3,4], "arterial priority approach" [5], and "lacunar anatomy" have been proposed to redefine understanding from different aspects of PD [6]. However, due to the intricate anatomy there and the unique metastatic characteristics of cancer, there are several modified versions of PD. The extent of surgical resection varies greatly among different centers. This is due to the lack of clarity in the precise resection boundaries of the present PD. These versions of PD have not developed into a criteria for selection, despite the fact that they have adapted to the different choices of individual tumors. Even in practice, we frequently contrast the advantages and disadvantages of different versions of PD, highlighting their differences while ignoring their identity.

Current research show that the survival benefit advantages of various existing surgical methods for PD are not obvious, as each surgical method has its own suitable group of people. We should maintain a more progressive attitude towards any improvement of PD under the current surgical-based therapeutic paradigm. Therefore, it is necessary for us to establish a multi-level thinking and behavioral decision-making selection model to standardize this surgical procedure from many perspectives and enable surgeons to determine the extent of resection based on various individual requirements. With this set of thinking, as it called "Hierarchical radical theory of pancreaticoduodenectomy" by us, we can continue to incorporate new surgical improvements in the future as new factors until there is a major improvement in the treatment model of pancreatic cancer or periampullary cancer.

Compared with Total Mesopancreatic Excision (TMpE) [7], Inoue's study in 2015 proposed three levels of pancreaticoduodenectomy based on the radical resection of the mesopancreas [8,9]. And it is called Systematic Mesopancreas excision of Pancreaticoduodenectomy (SMD-PD). Inoue's

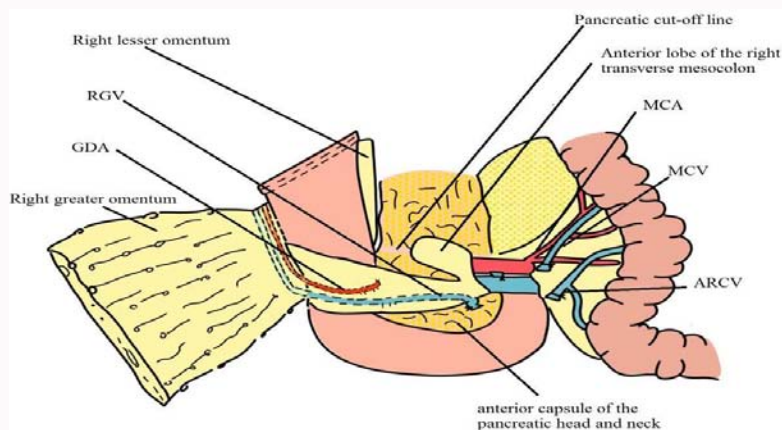


Figure 1: Resection of the right omental bursa and right greater omentum.

The right anterior lobe of the mesocolon, the anterior capsule of the pancreatic head and neck, the lymphatic tissue area around the right gastroepiploic artery and vein, the distal stomach and the right lesser omentum are connected together.

GDA: Gastroduodenal Artery; RGV: Right Gastroepiploic Vein; MCV: Middle Colic Vein; MCA: Middle Colic Artery; ARC: Accessory Right Colic Vein

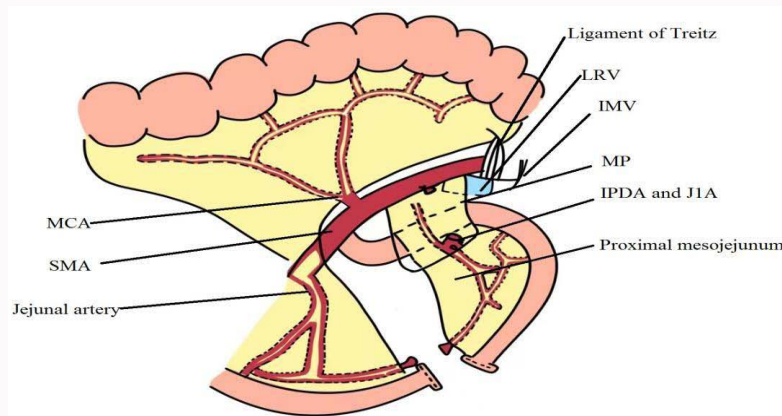


Figure 2: Resection of proximal jejunal mesocolon.

Find and ligate IPDA, J1A and J1V at the root of SMA and then resect together with the jejunum.

Search at the root of SMA, ligate IPDA, J1A and J1V at a high position and then resect together with the jejunum.

MCA: Middle Colic Artery; LRV: Left Renal Vein; IMV: Inferior Mesenteric Vein; IPDA: Inferior Pancreaticoduodenal Artery; J1A: First Jejunum Artery; MP: Mesopancreas

study clarified the resection boundary of PD on the mesopancreas. His theory establishes mesopancreatic resection as a definitive standard for resection. When performing PD surgery and completing lymph node dissection, we should also pay attention to mesangial resection within the tumor burden range. This concept of hierarchical radical surgery is consistent with the different biological characteristics of periampullary cancer and pancreatic head cancer in reality. This concept of hierarchical resection is very philosophical and gives us great inspiration.

However, his study also has the following shortcomings: 1) Only the hierarchical radical treatment within the mesopancreas was considered, and there was a lack of consideration of different sub-anatomical locations and other possible directions of invasion, such as how to perform radical treatment at what level in the direction of the omental sac, No. 16 lymph nodes, and pancreatic dissection, the upper edge of the pancreas (No. 8/9/12 lymph nodes) and proximal mesojejunum; 2) Although the author clearly stated resection of the right half of the Superior Mesenteric Artery (SMA) in the third level of SMD-PD, based on the anatomy of the celiac plexus and the neurotropic properties of the pancreas, the celiac ganglion, aortic

ganglion and superior mesenteric ganglion should also be included in the grading assessment [10-12]; 3) In addition to the above principles of individualized surgical resection of cancers, the principle of en bloc resection of cancers should also be considered. Although the principle of en bloc resection was considered in other studies by Inoue, it was not clearly stated in the theory of systematic mesangial resection. For example, the omental sac, upper edge tissue of the pancreas, mesojejunum, and mesopancreas are dissected as a whole.

For many cancers, such as gastric cancer and colon cancer, when the lymph node dissection is clear, "complete mesangial resection" within the tumor burden range (within the range of a certain segment of the gastrointestinal tract and within the range of a certain level of lymphadenectomy) is often performed when the tumor location is clear. Although the theory of "standard pancreaticoduodenectomy and extended pancreaticoduodenectomy" is partly similar to the concept of hierarchical radical surgery, in reality the two are often antagonistic, and they only consider the factor of lymph node metastasis [11,13].

Considering the anatomical complexity of the pancreatic head, we should not only consider lymph node metastasis factors when

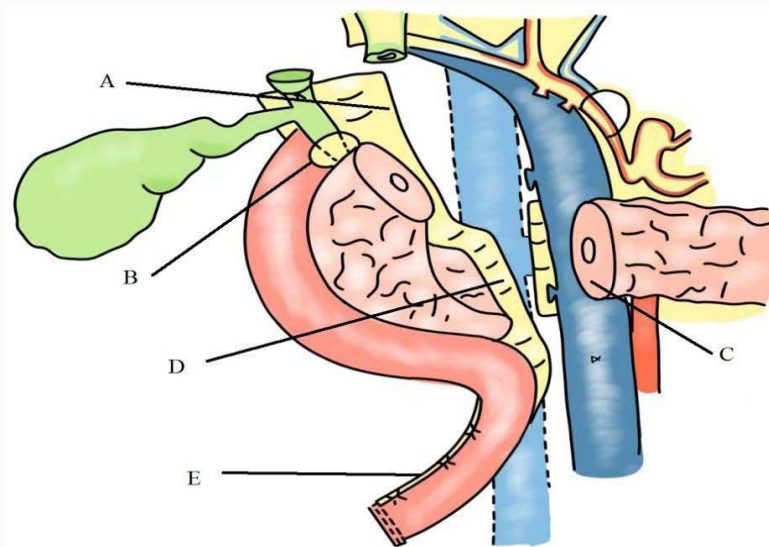


Figure 3: Resection of the pancreas/Suprapancreatic lymph node/mesopancreas at the level of the SMV.

A: No. 12b/c/p lymph node behind the upper edge of the pancreas; B: No. 8a lymph node in front of the upper edge of the pancreas; C: Pancreas cut off in front of SMV; D: Mesopancreas cut off behind SMV; E: Without proximal mesojejunum resection

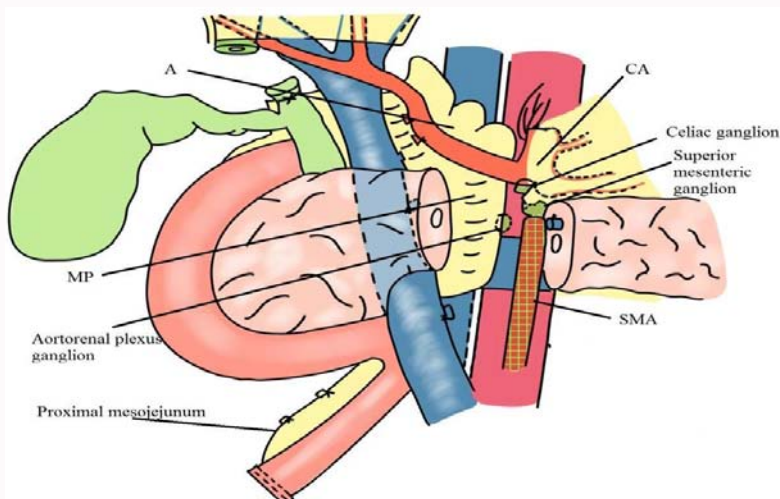


Figure 4: Resection of the pancreas/Suprapancreatic lymph node/mesopancreas at the level of the right side of the celiac ganglion and SMA.

A: Suprapancreatic lymph node (No. 8, 9, and 12 lymph nodes); MP: Mesopancreas; CA: Celiac Artery; SMA: Superior Mesenteric Artery

grading, but also consider factors such as tumor burden range (pancreatic resection scope), nerve metastasis factors [14,15] and the mesangial level of resection. In 2003, Strasberg's team pioneered the Radical Antegrade Modular Pancreatospelenectomy (RAMPS) for the resection of pancreatic body and tail cancer, which effectively solved the above problems [16]. However, this problem still exists for pancreaticoduodenectomy. Inspired by the SMD-PD theory, RAMPS and multi-station lymph node dissection, and in view of the above considerations, we proposed the theory of "Hierarchical Radical Resection of Pancreaticoduodenectomy (HRR-PD)".

Hierarchical Radical Resection of Pancreaticoduodenectomy (HRR-PD)

Resection of soft tissue in front of the pancreas - Right omental bursa and right greater omentum resection. The right anterior lobe of the mesocolon is resected with the Middle Colic Artery (MCA) as the boundary, and the accessory right colic vein and middle colic

vein are divided in the process. After dividing the right gastroepiploic vein, it ends at the superior mesenteric vein/artery plane near the level of the duodenum. The right anterior lobe of the mesocolon, the anterior capsule of the pancreatic head and neck, the lymphatic tissue area around the right gastroepiploic artery and vein, the distal stomach and the right lesser omentum are connected together (Figure 1 shows the right omental bursa and right greater omentum resection). The posterior part of the anterior pancreatic tissue (including the right omental bursa and right greater omentum) is connected to the anterior part of the pancreas. Pylorus-Preserving Pancreaticoduodenectomy (PPPD) is not selected when resecting at the level 2 or 3 resection, because it is necessary to clear the 5/6 group lymph nodes and the posterior wall of the stomach. At the level 1 resection, only the anterior capsule of the pancreatic head and neck and the lymphatic tissue area around the right gastroepiploic artery and vein need to be resected. The right anterior lobe of the mesocolon can be left unresected, and the pylorus can be retained.

Proximal mesojejunal resection

Proximal mesojejunal dissection is the partial removal of 14 lymph nodes (No. 14b, c, 14d and 14V lymph node), including the 14th zone lymph node tissue above the root of MCA and on the left and posterior side of the SMA. After high ligation and cutting of Inferior Pancreatoduodenal Artery (IPDA) and first Jejunal Artery/Vein (J1A/V) at the root of SMA, the jejunum is removed together. The left posterior approach is adopted [5], the ligament of Treitz is cut off in the front and lower part of the left renal vein, the SMA is exposed above the fourth segment of the duodenum, and the proximal jejunum is cut. The IPDA on the right posterior side of SMA can be identified and cut, and J1A is cut along the root of SMA above the middle colic artery. The Superior Mesenteric Vein (SMV) is found on the right side of SMA and J1V. It can be seen that the proximal mesojejunum is connected to the mesopancreas behind the superior mesenteric artery. The proximal jejunal mesentery and proximal jejunum are pulled to the right through the horizontal channel of the duodenum behind the SMA and SMV, so that the proximal mesojejunum and mesopancreas can be removed together (Figure 2). At the level 1 resection, we can choose to resect only the proximal jejunum without removing the related mesentery. The proximal jejunal mesentery can be cut off along the intestinal wall (Figure 3).

Suprapancreatic lymph node dissection

The extent of the resection of the suprapancreatic lymph node is determined by the level of pancreatic resection. In the level 1 resection, the pancreas is cut off in front of the SMV. In this case, the upper edge of the pancreas includes the lymph nodes in front of the common hepatic artery (8a) and part of the hepatoduodenal ligament lymph nodes (12b, 12c, 12p). In the level 2 resection, the pancreas is cut off in front of the SMA. It is the suprapancreatic edge, including the No. 8, 9, and 12 lymph nodes.

In level 3 resection, if the pancreatic resection is the same as the second level, the extent is also the same. However, if the pancreatic resection level is on the left side of the SMA, the upper edge of the pancreas may also include part of the No. 11 lymph nodes tissue. Even in the case of total pancreatectomy, the spleen and No. 10 lymph nodes need to be removed (Figure 4).

Level 1 resection

During Level 1 resection, the pancreas is cut off in front of the

SMV, and the mesopancreas is cut off just behind the SMV (for specific cutting steps and precautions [8]). The tissue in front of the pancreas only needs to be removed by the right greater omentum and the surface soft tissue in front of the pancreas (part of the right omental sac), and there is no need to perform resection of the right hemicolectomy. The lymph node dissection range includes para-pyloric lymph nodes (5, 6), lymph nodes in front of the common hepatic artery (8a), hepatoduodenal ligament lymph nodes (12b, 12c, 12p), dorsal pancreaticoduodenal lymph nodes (13a, b), part of the right side of the superior mesenteric artery lymph nodes (14) and ventral pancreaticoduodenal lymph nodes (17a, b). The range of lymph node dissection is similar to the standard resection range recommended by the International Study Group of Pancreatic Surgery (ISGPS) [1,2]. The difference is that, in our Level 1 resection, the para-pyloric lymph nodes (5, 6) can be operated as an option and some part of No. 14 lymph nodes will remain at the root of the SMA (because the SMA is the boundary of No. 14 lymph nodes). At the same time, the lymph nodes in front of the common hepatic artery (8a) should not be removed separately, but connected to the upper edge of the pancreatic head on the resected side. No. 12b/c/p lymph node tissue can be cleared behind the portal vein and connected to the upper edge of the pancreas to ensure the whole piece resection.

Level 2 resection

The pancreas is cut off in front of the Celiac Artery (CA)/SMA. The mesopancreas is cut off on the right side of the celiac ganglion (on the right wall of the CA) and SMA. On the basis of Level 1 resection, the lymph nodes behind the common hepatic artery (No. 8p), part of the lymph nodes around the CA (No. 9, that here refers to the lymph node tissue on the right and below the CA), the lymph nodes around the proper hepatic artery (No. 12a), and the lymph nodes around the SMA (Group 14) are cleared. The right side of the CA is used as the dividing line to remove the suprapancreatic lymph node (8, 9, 12a/b/c/p lymph node tissue). During the operation, the upper edge of the pancreas is opened backwards like a window, and connected to the mesopancreas below. The Proximal mesojejunum is connected to the mesopancreas behind the SMA and SMV. The anterior pancreatic tissue resection range is the right omental bursa and the right greater omentum. Whether to reconstruct the SMV depends on whether the cancer invades the SMV, which is not a reference factor for graded resection. The choice of Level 2 resection determines that arterial approach surgery is the best choice.

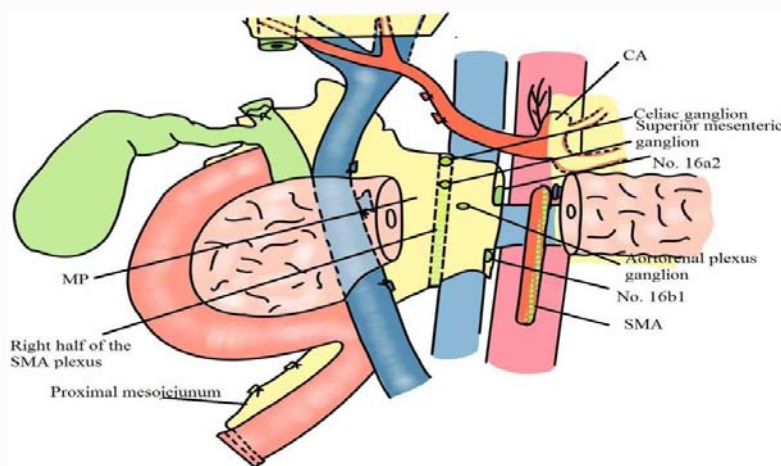


Figure 5: Extended nerve dissection and No. 16a2/b1 lymph node dissection. MP: Mesopancreas; CA: Celiac Artery; SMA: Superior Mesenteric Artery

Level 3 resection

The resection range of Level 1 and 2 is relatively easy to standardize, but the resection of Level 3 is optional. It is an optional resection that continues to expand the resection in different directions based on the resection range of Level 2. During the operation, the expansion of the resection range should be determined according to the possible invasion range of the cancer, while ensuring the whole block resection.

Extended nerve dissection and 16a2/b1 group lymph node dissection

The expanded dissection range includes the celiac ganglion on the right side of the CA, the superior mesenteric ganglion above the SMA, and the right half of the SMA plexus. If necessary, the aortorenal ganglion plexus above the right renal artery root behind the renal vein should also be resected.

No. 16a2/b1 lymph node tissue dissection should be performed together with the expanded nerve dissection. Because of the isolation of the Treitz fusion fascia, the connection position between the soft tissue in front of the abdominal aorta and the inferior vena cava and the resected specimen is on the celiac ganglion, the superior mesenteric ganglion, and the right half of the SMA plexus. After separating the nerves at the connection position, the resected tissue is connected to the Treitz fusion fascia and No. 16a2/b1 lymph node tissue posteriorly (Figure 5). If necessary, the aortic renal ganglion at the root of the right renal artery needs to be removed. No. 16a2/b1 lymph node tissue can also be separated first and fused with the specimen at the connection position.

Extended resection in other directions at Level 3

If the cancer invades the transverse mesocolon or the middle colic artery, the transverse colon and transverse mesocolon need to be removed together; if the cancer is suspected of invading the periphery of the hepatic artery, the hepatic artery extravascular nerve resection needs to be combined; if the pancreatic cancer invades the pancreatic body, the whole pancreas needs to be removed (Table 1).

Discussion

Although standard pancreaticoduodenectomy and extended pancreaticoduodenectomy are also a kind of graded radical surgical concept [1,2], this grading method has fewer levels (only two grades); the focus is on the description of the scope of lymph node dissection, lacking the understanding of the resection boundaries of nerves, cavity anatomy and mesopancreas; lacking the concept of en bloc resection of the cancer (such as the dissection of No. 8a lymph node and suprapancreatic lymph node tissue); the most important thing is that these two different levels of resection methods are always discussed as opposing parties in various studies and practices, ignoring the identity of the two.

Obviously, even if there are two levels of surgical scope reference, it cannot be suitable for the multi-dimensional and complex biological characteristics of pancreatic head cancers. At the same time, lymph node dissection only emphasizes the site, which leads us to often take a biopsy-like method to dissect the enlarged lymph node area in stages. Ignoring the definition of lymph node dissection is to clear the soft tissue within the boundary, and also ignoring the principle of en bloc resection of soft tissue. This is also the need for arterial access not only for safety and convenience, but also for radicality. We should take high-position ligation to cut off the blood vessels and clear the

soft tissue within the boundary of the free blood vessels and put it together with the tumor tissue. Even the skeletonization operation we advocate ignores the continuity of lymphatic drainage. The concept of "skeletonization" itself ignores the concept of en bloc resection of the tumor. We should promptly incorporate many new anatomical theories such as membrane anatomy, mesopancreas, proximal jejunal mesentery, etc. into the concept of en bloc resection [18].

For pancreatic body and tail cancer, Strasberg proposed the modular concept of RAMPS [16], which effectively solved the above problems of selecting the resection range and the en bloc resection of the cancer. It made the intraoperative selection clearer and simpler. Therefore, for periampullary cancer and pancreatic head cancer, we also need to propose a similar modular and graded surgical concept.

Here, we introduce a hierarchical radical surgical approach selection theory, which provides a multi-level, multi-factor resection range, which is very suitable for the complex malignant cancers with various different biological behaviors presented here.

However, regarding the selection of the best-suited tumor, there is obviously a problem of vague definition. Although periampullary cancer usually meets the requirements of Level 1 resection, other options may be available for large periampullary cancer or those with suspected lymph node metastasis.

For benign, borderline or low-grade pancreatic tumors, this surgical grading is obviously not suitable for them. We can choose a resection similar to Level 1, or we can choose local resection, or define another resection standard based on their characteristics [19].

Regarding the scope of application, it is obvious that the early-stage pancreatic head cancer and invasive pancreatic head cancer here are clearly vaguely defined. This is because the factors in the current TNM staging of pancreatic cancer cannot determine the scope of resection here. This involves a decision-making issue. The idea should be to determine the scope of surgical resection based on the sub-anatomical location of pancreatic head cancer [20], the possible scope and direction of invasion, and the possible scope of invasion to achieve the best resection effect and clarify the patient's stage.

The reason why the Superior Mesenteric Vein (SMV) invasion was not considered is that the resection margin we considered obviously exceeded the SMV. SMV resection and reconstruction can occur at any level. However, SMV resection and reconstruction is not a prognostic factor that should not be considered, SMV resection and reconstruction still need to be clearly recorded and counted [21].

The scope of resection at Level 1 and 2 is relatively easy to standardize. The scope of mesopancreatic resection at Level 2 is the same as the scope of the concept of Total Mesopancreatic Excision (TMpE) [7,22]. TMpE is considered to be a promising surgical method for the treatment of pancreatic ductal adenocarcinoma. The concept of mesopancreas refers to the neurolymphatic tissue located behind the pancreatic head, on the right side of the celiac ganglion and the SMA. In addition, the mesopancreas lacks precise anatomical significance, and even the Japanese Pancreatic Cancer Association defines it as pancreatic head plexus 1 and pancreatic head plexus 2 [23]. In the author's opinion, the area of the mesopancreas is actually part of the area of No. 9 and group 14 lymph node tissue (tissue on the right and below the celiac artery and on the right and above the SMA). Since we are not clear about the anatomical positioning here,

Table 1: 3 levels of hierarchical radical resection of pancreaticoduodenectomy for cancer.

	Level 1	Level 2	Level 3
Best suited tumor	Periampullary cancer, early-stage pancreatic head cancer	Pancreatic head adenocarcinoma	Invasive pancreatic adenocarcinoma
Pancreas disconnection level	Pancreatic neck anterior to SMV*	Pancreatic body anterior to SMA	Pancreatic body anterior to SMA/total pancreatectomy
Gastric rupture	PPPD/PD	PD	PD
Mesopancreas resection level	Right half of SMV	Right side of SMA	SMA right hemi-peripheral nerve plexus
Lymph node dissection range	8a, 12b/c/p [†] , 13, 17, and part of 14	5,6,8,9,12,13,14,17	5, 6, 8, 9, 12, 13, 14, 17 ± 15, 16a2/b1 [‡] , 10, 11
Suprapancreatic lymph node	8a, 12b/c/p lymph node tissue	8, 9, 12a/b/c/p lymph node tissue	8, 9, 12a/b/c/p lymph node tissue
Right omental bursa clearance	Right greater omentum + part of the right omental bursa (pancreatic head capsule and anterior soft tissue)	Right omental bursa + right greater omentum	Right omental bursa + right greater omentum
En bloc resection range	Pancreatic head tissue + right greater omentum + upper edge of pancreas (8a, 12b/c/p lymph node tissue)	Pancreatic head/neck tissue + right omental bursa, right greater omentum + upper edge of pancreas (8, 9, 12a/b/c/p lymph node tissue) + proximal mesojejunal + right pancreatic mesentery along SMA	Pancreatic head tissue + right omental bursa, right greater omentum + upper edge of pancreas (8, 9, 12a/b/c/p lymph node tissue) + proximal mesojejunal + right pancreatic mesentery along SMA + right hemicircle plexus of SMA/hepatic artery plexus + other ganglia
The others	No need to dissect the left side of the SMA, and the proximal mesojejunal (No. 14b, c, 14d and 14V lymph node) can be completely preserved	Biopsy of group 16a2/b1 lymph nodes	Possibly combined with 16a2/b1 dissection, aortorenal ganglion, transverse colon resection, right celiac ganglion, superior celiac ganglion of the mesenteric cavity, plexus hepatic artery, total pancreatectomy*

*SMV: Superior Mesenteric Vein; *PPPD: Pylorus-Preserving Pancreaticoduodenectomy

*Total pancreatectomy should refer to the resection range of the body and tail of the pancreas

*12a: Lymph nodes around the proper hepatic artery; 12b: Lymph nodes around the bile duct; 12c: Lymph nodes around the cystic duct; 12p: Lymph nodes around the portal vein; 14a: Lymph nodes at the root of the superior mesenteric artery; 14b: Lymph nodes at the root of the inferior pancreaticoduodenal artery; 14c: Lymph nodes at the root of the middle colic artery; 14d: Lymph nodes at the root of the small intestinal artery; 14V: Lymph nodes around the superior mesenteric vein (No. 14v in the 4th edition is included in No. 17b in the 8th edition. No. 12c in the 4th edition is included in No. 12b in the 8th edition. No. 14 lymph node is divided into 14a, 14b, 14c, and 14d in the 4th edition. From the 5th edition, No. 14a is considered as proximal lymph node (14p) and the others are distal lymph nodes (14d). In addition, the boundary between 14p and 14d is the part that divides the root of the SMA and the beginning of the MCA. For the convenience of explanation, the classification formula of the 4th edition is used here)

*Complete para-aortic lymph node (No.16 lymph nodes) dissection was defined as removal of station No. 16a2 (Lymph nodes between the level of the celiac axis and left renal vein) and No. 16b1 (Lymph nodes between the left renal vein and inferior mesenteric artery) [18]

the definition of the mesopancreas is of great clinical significance in reality and is important for guiding our clinical understanding and clearance of this area. The meaning of the proximal jejunal mesentery is similar to that of the mesopancreas. Its range is actually the 14b, c, 14d and 14 V lymph node areas. This concept is proposed to help us better understand this area. Here, Level 2 includes the boundary definition of the mesopancreas, anterior pancreatic tissue, proximal mesojejunal and the superior pancreatic tissue. The scope of our definition is clearer than total mesopancreatic excision, which only defines the edge of the mesopancreas.

However, the resection of level 3 is individualized and selective. This requires the surgeon to make decisions during the operation, such as depending on the possibility of pancreatic mesenteric nerve and lymphatic invasion. Similar choices also apply to whether to resect the colon, whether to resect the right celiac ganglion, whether to resect the aortorenal ganglion, whether to resect 16 groups of lymph nodes, etc. Especially for patients with suspected nerve invasion or pain, the right celiac ganglion on the right side of the celiac artery or the aortorenal ganglion at the root of the renal artery can be resected. Patients with retroperitoneal invasion and suspected invasion of large and small visceral nerves may benefit.

Our hierarchical radical cure theory will also extend an important issue, which is to clarify the possible invasion direction characteristics of the tumor through this grading concept. We not only need to determine the scope of surgical resection according to the hierarchical radical cure concept during surgery, but we should also record our resection scope in a graded manner in the surgical

records and postoperative pathological staging, and it is best to fill it out in a standardized manner. This not only helps doctors and different researchers communicate and pay attention to this key information, but also helps us better verify, improve or propose new treatment concepts and improvements in resection standards.

Our theory has some problems in the scope of resection. If the scope of resection is too large, will the efficacy be improved? Will complications increase? I think we need to make decisions based on the actual situation of each center. But this level does give people a feeling that the scope of resection is too large, which may be related to the author's research perspective. In fact, with the progress of pancreatic cancer drug treatment, the proportion of surgical treatment in comprehensive treatment will decrease. In the future, we do not rule out the possibility of local resection of pancreatic cancer [24]. But under the current drug efficacy, surgical treatment is still the main prognostic factor. When choosing the scope of surgical resection, in research and practice, we should maintain the concept of multi-level surgical radical cure. We grade from an anatomical perspective, and we need to prove or revise the concept of graded radical cure in future practice.

This theory needs further improvement. This standard has not been widely criticized or proven in practice. However, the choice of the hierarchical grading concept of surgical radical cure level should exist in the surgeon's mind.

Due to the current limitations of the development of anatomy and our narrow vision, it is impossible to fully clarify the details of each level. The surgeon should adjust the scope of resection at any

time according to the concept of hierarchical radical cure and the individual tumor biological behavior and invasion of the patient. We hope to propose a pancreaticoduodenectomy that is more suitable for different levels of pancreatic head tumors. At the same time, many details need to be further clarified.

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