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Многие годы существовала общепринятая точка зрения, согласно которой панкреатодуоденальная резекция показана только при локализованных опухолях поджелудочной железы опухолях без вовлечения магистральных сосудов. Учитывая распространенность данной патологии, в последние годы многие авторы указывают на необходимость выполнения резекции опухоли поджелудочной железы интактным блоком с вовлеченными сосудами, что дает шанс повысить резектабельность больному числу пациентов. **Цель.** Анализ резектабельности опухолей поджелудочной железы по данным современных клинических исследований. Множество различных хирургических подходов за последние десятилетия было усовершенствовано, что позволяет увеличить шансы на успешное и безопасное оперативное вмешательство. Данные проведенного анализа источников литературы по проблеме сосудистых реконструкций в хирургии опухолей печени, по данным современных клинических исследований, что резекции и реконструкции мезентериопортального венозного сегмента позволяют повысить резектабельность опухоли и должны соответствовать основополагающим принципам хирургической онкологии. На сегодняшний день по частоте послеоперационных осложнений и летальности статистически значимых различий между больными, которым резекция сосудов выполнялась, и больными со стандартной панкреатодуоденальной резекцией не выявлено. Тщательный предоперационный отбор больных наряду с правильной стратегией венозной реконструкции одинаково важны для правильной и успешной резекции сосудов en bloc.

**Ключевые слова:** панкреатодуоденальная резекция; рак поджелудочной железы; резектабельность; сосудистые реконструкции.

THE ROLE OF VASCULAR RECONSTRUCTIONS IN SURGERY OF TUMORS OF THE HEPATOPANCREATOBILIARY ZONE

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According to the point of view that has been dominating for many years, pancreaticoduodenal resection was indicated only for localized tumors of the pancreas without involvement of the major vessels. In view of the prevalence of this pathology, many authors have recently pointed out the need to perform resection of a pancreatic tumor in a single bloc with the vessels involved, which gives a chance to increase the resectability in a larger number of patients. **Aim.** Analysis of resectability of pancreatic tumors on the basis of the data of current clinical research. In recent
decades many different surgical approaches have been improved which increases chances for successful and safe surgical intervention. The data of the analysis of literature on vascular reconstructions in surgery for tumors of the hepatopancreatobiliary zone showed that resections and reconstructions of the mesenteric portal venous segment permit to increase resectability of tumor and should correspond to the fundamental principles of surgical oncology. To date, in terms of the incidence of postoperative complications and mortality, no statistically significant differences were found between the group of patients in whom vascular resection was performed, and the group with a standard pancreatoduodenal resection. A thorough preoperative selection of patients along with the correct strategy of venous reconstruction is equally important for correct and successful resection of the blood vessels en bloc.

**Keywords:** pancreatoduodenal resection; pancreatic cancer; resectability; vascular reconstructions.

According to statistical data, pancreatic cancer (PC) in Russia causes 13,000 deaths per year. Approximately the same amount of newly diagnosed cases of PC is annually reported. Gender analysis of PC mortality showed a higher incidence of the disease in men: 10 cases per 100,000 of male population, while the incidence in women is 8.1 per 100,000 of female population. PC is the fourth leading cause of death from neoplastic diseases in men and the sixth cause in women (4.1 and 4.7%, respectively).

The aim of this work was to analyze resectability of pancreatic tumors (PT) based on the data of modern clinical studies (CS).

**History of development of extended pancreatoduodenal resection (PDR).** There are no principal differences as to the methods and stages of implementation of standard PDR, since they are well developed both in Russia, Western Europe, USA and Japan. Differences concern indications for standard PDR at suspicion on tumor invading the major vessels of hepatopancreatobiliary region (HPBR).

According to the commonly accepted point of view existing for many years, PDR is indicated for localized PT without involvement of the major vessels. In 1952, C.G. Child et al. for the first time performed ligation of the portal vein in case of tumor of HPBR. It was shown in the experiment that ligation of the portal vein led to shock and rapid death of experimental animals. In the meanwhile, the maximal time of compression of the portal vein in a human is 30 min [2,3].

G.E. Moore, et al. (1951) first performed resection of the superior mesenteric vein in PC. In 1973 J.G. Fortner formulated the concept of «regional pancreatectomy» which suggested the extended PDR to be supplemented with systematic resection of the main vascular peripancreatic structures together with a wide lymph node dissection.

The rate of invasion of pancreatic tumor into the major vessels reaches 7.7%, with this, macroscopic suspicion on tumorous infiltration of the vessel walls is present in 75-100% of patients with this pathology [4]. For a long time invasion of the pancreatic cancer into the major vessels has been considered a contraindication for a radical surgery. After 2007 many researchers showed that immediate and long-term results of surgery with resection of major vessels are not worse than the results of standard PDR [6,7]. Thus, in the recent decade indications for radical and conventionally radical interventions were expanded, that is, resectability rate increased. Here, tumor invading the zone of fusion of the splenic and superior mesenteric veins is not always resectable because of poor conditions for mobilization of the tumor and for retroperitoneal lymph node dissection. Resection and ligation of the splenic vein considerably simplify the technical aspect of the task, but lead to splenic infarction, left-sided portal hypertension and threaten with gastric hemorrhage.

Nowadays, in case of invasion of the major vessels by tumor, there are performed
resection and prosthetic repair of the superi-
or and inferior venae cavae and also of the
aorta. Besides, many clinics perform opera-
tion for removal of tumor thrombi and of
large tumors with hemodynamically signifi-
cant stenoses of major vessels with good
immediate and long-term results [8].

Modern methods and indications for
pancreatoduodenal resection in invasion of
tumor into major vessels. Today different
methods are proposed for recovery of the por-
tal blood flow in case of resection of venous
wall in the zone of confluence [9]. Recon-
struction of resected splenic vein with an
autovein is performed by splenoportal or
splenorenal «end-to-end» anastomosis, but is
associated with a high rate of thrombosis of
the anastomosis due to developing tension,
and use of the autovein makes the interven-
tion longer and more complicated [10-12].

During 5-year period, M.A. Mansour,
et al. perfumed 16 venous resections using
polytetrafluoroethylene prostheses and the
great saphenous vein in case of invasion of
tumor into the inferior vena cava (8 pa-
tients), portal vein (7 patients), and iliac vein
(1 patient). Reconstruction of the portal vein
in 4 patients was performed in the form of
«end-to-end» anastomosis and in 4 patients –
with use of the great saphenous vein. Recon-
struction of the inferior vena cava was per-
formed by application of «end-to-end» anas-
tomosis, and of the iliac vein – by prosthetic
repair with an autovein. Within 9 months all
the anastomoses were patent except one. The
authors made a conclusion that large venous
reconstructions are required in a small num-ber of patients, and «end-to-end» anastomo-
sis or autovenous prosthetic repair are more
preferable than ligation or use of an artificial
prosthesis [13,14].

Standard PDR in combination with re-
section of the superior mesenteric and the
portal vein was performed in N.N. Blokhin
Russian Cancer Research Center of RAMS
in 25 patients – a circular resection with the
length of venous segment from 2.5 to 4 cm
in 17 patients and a marginal resection of
the venous wall in 8 patients. No statistical-
ly significant differences in the rate of post-
operative complications (44%) and mortali-
ty rate (4%) were revealed between the
groups of patients with resection of vessels
and with standard PDR. According to the
data of N.N. Blokhin Russian Cancer Re-
search Center of RAMS, prognostic ally
significant factors were:

- retroperitoneal extra organ invasion
  and invasion into the wall of the superior
  mesenteric and the portal vein;
- degree of differentiation of tumor;
- invasion into the anterior capsule of
  pancreas.

Resection of the superior mesenteric
and the portal vein in PDR did not prolong
life in comparison with patients in whom ve-
nous resection was not performed [15].

M. Shoup, et al. (2003) analyzed the re-
results of distal resections of pancreas with re-
section of vessels and of adjacent organs [27].
The study included 513 patients with lesion of
the body and tail of pancreas. Of them, 57
(11%) were operated on. In 22 patients ex-
tended PDR was performed, in 14 of them the
operation was supplemented with resection of
the adjacent organs, in 8 – with resection of
the portal vein. The median of life duration after
extended PDR was 15.9 months and after
standard PDR – 5.8 months (p<0.0001). Over-
all survival within one and two years after ex-
tended PDR reached 22% and 18%, respec-
tively, after standard PDR – 8 and 8%, and
without resection because of invading of local
structures – 0% in both groups. The authors
showed reasonability of the extended distal
carectomy in case of locally advanced
cancer of the body and tail of pancreas [16].

Arterial resections are rarely performed
in case of locally advanced tumor of pancreas
because of a high occurrence of infiltration of
the retroperitoneal nervous plexus, and are
associated with a poor prognosis. Since the op-
eration is technically challenging, the question of
arterial resection in patients with past PDR
was touched upon only in few studies [17,18].

In a study of Yu.I. Patyutko et al. a cir-
cular resection of the tumorous celiac trunk
and the common hepatic artery with resection
of veins was conducted in 10 patients (in 6 – parietal resection, in 3 – circular resection with the primary anastomosis, in 1 – prosthetic repair with polytetrafluoroethylene). In the early postoperative period after distal subtotal resection of pancreas with resection of celiac trunk, complications developed in 10 patients (47.6%). After conducted surgical treatment no lethal outcomes were recorded. In histological examination, the resection edges, including the retroperitoneal edge, did not contain tumor elements (R0 in all cases). Invasion into the celiac trunk and the common iliac vein was identified in 16 patients (76.2%, depth of invasion – adventitia in 11 patients and media in 5 patients). Survival rate within the first two years in patients operated for locally advanced duct carcinoma of the body and tail of pancreas using distal subtotal resection of pancreas with resection of the celiac trunk, was 59.1 and 21.5% with maximal duration of life 57 months. Thus, authors came to the conclusion about distal subtotal resection of pancreas with resection of the celiac trunk and the common hepatic artery as being a safe operation that heightens resectability and considerably extends the range of indications for resection of the body and tail of pancreas [19,20].

The aim of study of S. Mohammed, et al. was to determine perioperational mortality rate in patients with PDR with/without venous resection, and the long-term results concerning patency of the zone of reconstruction of the vein, and also assessment of oncological outcomes for patients with PDR with/without venous resection in adenocarcinoma of pancreas. In case of involvement of segments of the vein, «end-to-end» anastomosis was performed, in case of resection of more than 2 cm of vein – prosthetic repair using the internal jugular vein [21].

In meta-analysis of 27 research works (n=9005), improvement of 1-, 3-, and 5-year survival rate of patients with past PDR with venous resection was recorded (n=1587) [22-25].

According to the results of pathoanatomical examination (N.N. Blokhin RCRC) of the long-term preparations after extended gastropancreato-duodenal resection with resection of mesentericoportal venous segment, invasion of the tumor into the wall of venous segment was histologically confirmed in 72.2% of cases. Besides, different combinations of invasion of the tumor into the wall of vein, artery and also existence of a tumor thrombus in the venous lumen were found. Thus, in cancer of the head of pancreas, extended PDR with resection of a venous segment is indicated irrespective of the size of tumor [26-28].

A group of experts of the American Hepato-Pancreato-Biliary Association and Society of Surgical Oncology (AHPPA/SSO) joined their efforts for development of a consensus document on the problem of resection and reconstruction of veins in PDR (published in 2009). Experts arrived at the conclusion that *PDR with resection and reconstruction of veins should be a variant of treatment for tumor of pancreas located in close proximity to the venous wall on the following conditions: existence of the adequate venous inflow and outflow; non-involvement of the superior mesenteric artery or of hepatic artery; a high probability for R0/R1 resection*. It is also said in the given consensus document that *patients with non-metastatic adenocarcinomas should be assessed and operated on in the institutions that have potential for performing resections and reconstructions of major veins* [29].

So, many researchers show feasibility of venous resection. Nevertheless, the data concerning benefits of the arterial resection are limited, that is why it should be performed only in the context of randomized clinical studies of adequate potential.

**Conclusion**

Analysis of the literature on the problem of vascular reconstructions in the surgery of tumors of hepatopancreatobiliary zone showed that resections and reconstructions of mesentericoportal venous segment permits to high ten resectability of the tumor and should correspond to the fundamental principles of surgical oncology.
In recent years, numerous surgical approaches have been improved that increases the chances for successful and safe surgical intervention.

Only thorough preoperative selection of patients together with a correct strategy of venous reconstruction are equally important for correct and successful resection of vessels en bloc.


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