

INVESTIGATION OF VASCULARIZATION OF HUMAN PANCREAS USING METHOD OF SELECTIVE ARTERIOGRAPHY WITH INSIGHT INTO SIGNIFICANCE TO A SURGICAL APPROACH FOR THIS ORGAN

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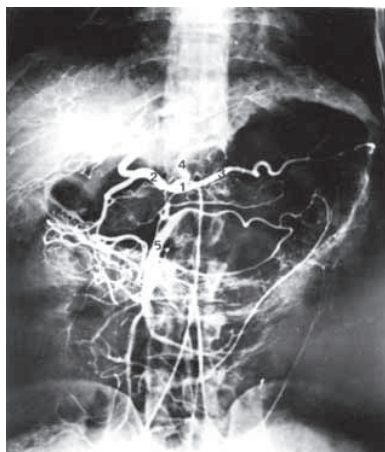
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ABSTRACT

This study explored arterial vascularisation of celiac trunk and superior mesenteric artery using method of selective arteriography in series of arteriogram which were done in 39 patients of Institute for Radiology. There were no pathological findings in a single case at pancreas or duodenum. Arteries which arise for vascularization of pancreas had a common spot of arising, flow and ramification. Pancreatic duodenal arteries arcade, which supply blood to the duodenum and the body of the pancreas, were shown in arteriogram. The branches which provide blood supply to the body and the tail of the pancreas were found. There was one case where lower pancreatic artery arose from gastroduodenal artery and in one case a direct anastomosis for celiac trunk and superior mesenteric arteries, better known as Tandler's anastomosis.

KEY WORDS: pancreas, arteries, arteriography



1. celiac trunk
2. common hepatic artery
3. splenic artery
4. left gastric artery
5. superior mesenteric artery

FIGURE 1. Arteriography of celiac trunk and superior mesenteric artery.

INTRODUCTION

Surgery of celiac trunk and its branches provoked anatomical investigations in a sense of more precise introduction to flow and morphological varieties of arteries in supramesocolic organs (1, 2, 3, 4). Anatomical investigation completed with surgical experiences enabled easier and safer approach to most organs and their accompanying blood vessels. Significance of variation in arterial vascularization was observed in complex surgeries while approaching tail of pancreas in order to achieve retrograde drainage of pancreatic duct via sectioning one part of pancreatic tail. For performing this and similar type of surgeries getting to know pancreas vascularization including start and stream of arterial and venous branches and their variations has a very important role. Another important aspect on knowing distribution of pancreatic blood vessels starts to play significant role in problems of transplantation of pancreas (5). Contrary to other, clinically more suitable for transplantation in a case of pancreas the most optimal technique for transplantation is not established. One of main issues and complica-

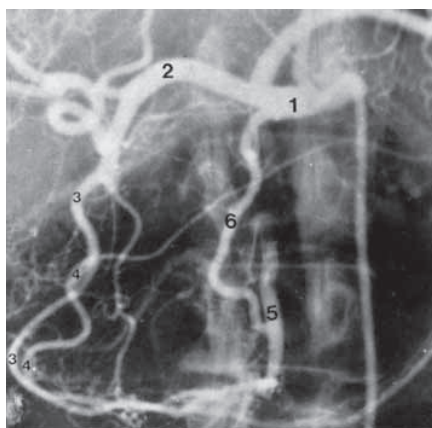
tion is occlusion of arteries on transplant (6). Increase of number of pancreatic diseases imposed us with need for more detailed and better knowledge of the organ in a sense of improvement of method to examine pancreas. Supraselective arteriography of pancreatic arteries enables insight into distribution of blood vessels of pancreas as directing surgical approach to this organ. Anatomy of pancreatic blood vessels has important place in this area.

MATERIAL AND METHODS

We used arteriogram of 39 patients of Radiology Clinic of University of Sarajevo Clinics Centre, obtained following selective arteriography of celiac trunk and superior mesenteric artery together with 10 splenoportograms

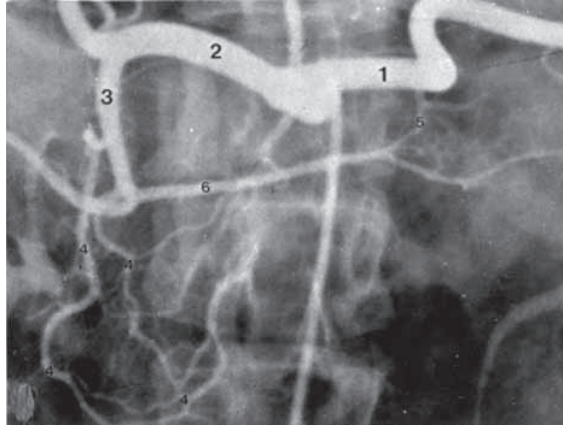
RESULTS

In analyzed arteriogram celiac trunk and superior mesenteric artery had their common start compared to abdominal aorta. Celiac trunk parted from abdominal aorta on lower edge of 12th thoracic vertebra and superior mesenteric artery 1,5 cm below the trunk. In all



1. celiac trunk
2. common hepatic artery
3. ventral pancreaticoduodenal arcades
4. dorsal pancreaticoduodenal arcade
5. superior mesenteric artery
6. Tandler's anastomosis

FIGURE 2. Biselective arteriography of celiac trunk and superior mesenteric artery. Pancreatic duodenal arcades and Tandler's anastomosis are shown.



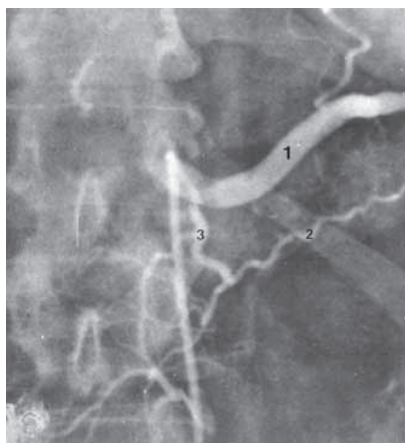
1. splenic artery
2. common hepatic artery
3. gastroduodenal artery
4. ventral and dorsal pancreaticoduodenal arcades
5. greater pancreatic artery
6. inferior pancreatic artery

FIGURE 3. Selective arteriography of celiac trunk. Greater pancreatic artery, inferior pancreatic artery and pancreaticoduodenal arcades are shown.

cases celiac trunk was divided into left gastric artery, common hepatica artery and splenic artery. Arteriography of superior mesenteric artery also visualized major branches that part from this artery (Figure 1). In biselective simultaneous arteriography of superior mesenteric artery and celiac trunk In arterial phase, in all cases we saw ventral et dorsal pancreaticoduodenal arcades (Figure 2 and 3).

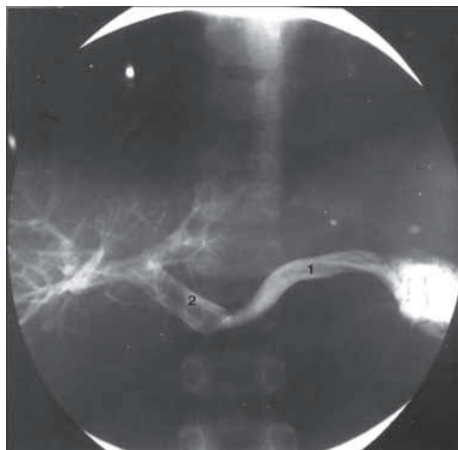
We established existence of direct anastomosis between celiac trunk and superior mesenteric artery in one patient by analyzing arteriogram. Namely, by demonstration of blood vessels we observed that single arterial trunk which linked celiac trunk with superior mesenteric artery, in literature it is described as Tandler's anastomosis (Figure 2). We did not observe that branches parted this blood vessels that would participate in vascularization of surrounding organs, and in the same scan pancreaticoduodenal arcades and retroduodenal artery, branch of gastroduodenal artery were well shown. Selective arteriography of celiac trunk shown splenic artery was well shown, but its branches which

went to pancreas were not always visualized (Figure 3). In this case one variation of inferior pancreatic artery which parted from gastroduodenal artery. Dorsal pancreatic artery was not visualized in all cases and in 10 cases where we could see it was relatively easy identified due to its characteristic appearance in form of "reverse" letter T (Figure 4). We identified this artery in all three cases where we performed subselective arteriography of splenic artery, and in these cases inferior pancreatic artery was also visualized. Inferior pancreatic artery mostly parted from dorsal pancreatic artery while in one case we noted that this artery parted from gastroduodenal artery. In one case we noted that inferior pancreatic artery had curvy flow (Figure 4). Pancreatic veins were not visualized on our findings. We were interested in position of splenic vein and we widened our investigation by analyzing 10 splenoportograms. In all cases we shown splenic vein (Figure 5), which was positioned horizontally from hilum of spleen toward right side and together with superior mesenteric vein participated in forming of portal vein. Intrapaneatic veins were not visualized



1. splenic artery
2. inferior pancreatic artery
3. dorsal pancreatic artery

FIGURE 4. Subselective arteriography of splenic artery. Dorsal pancreatic artery and inferior pancreatic artery are shown.



1. splenic vein
2. portal vein.

FIGURE 5. Demonstration of splenic vein by method of splenoportography

but we noted that splenic vein has mild curvy flow unlike splenic artery which has ring-form appearance.

DISCUSSION

Two major arteries were mostly identified while analyzing all arteriography finding made on two major arterial trunks of abdomen. We needed to demonstrate complete arterial vascular ring of pancreas where it would be possible to show all arteries during the arterial phase of filling in for good visualization of pancreatic artery with method of supraseductive angiography. Understanding exact anatomy of blood vessels in pancreas has a big practical value. In accordance to the data from literature (4, 6, 7, 8) and our results we may say that the pancreas has rich vascularization. Numerous anastomoses between single parts of pancreas direct

to ability of establishing collateral circulation in a case of lower inflow to one or more single arteries. Angiography of pancreatic blood vessels provided us with an insight of distribution of pancreatic arteries "in vivo". This method besides it, has given good results in its early phase of formation, demonstrated itself as exceptionally useful in surgery of pancreas, especially last years when transplantation of this organ current (3, 9, 10, 11, 12). Understanding common arterial variation of celiac trunk and its branches as well as superior mesenteric artery and its branches is of a great importance in evaluation of opportunities and danger linked to particular type of surgical technique. Application of supraseductive arteriography of blood vessels of pancreas enables us today to become familiar with regional situation on every single patient and to predict stability of collateral blood flow in a case of ligation of a single artery.

CONCLUSION

1. There are anastomoses on all levels of pancreas.
2. The existence of individual differences, development of arterial-arterial anastomosis asks for obligatory preoperative supraseductive angiography which enables insight into distribution of blood vessels *in vivo*.

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