



When do we need hepatic artery reconstruction after celiac artery resection?

Lessons of 20 modified Appleby procedure, HPB and upper GI experience

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Background

DP – CAR (by 2016)

All over the world

27 series >2 cases of DP-CAR **334** pts

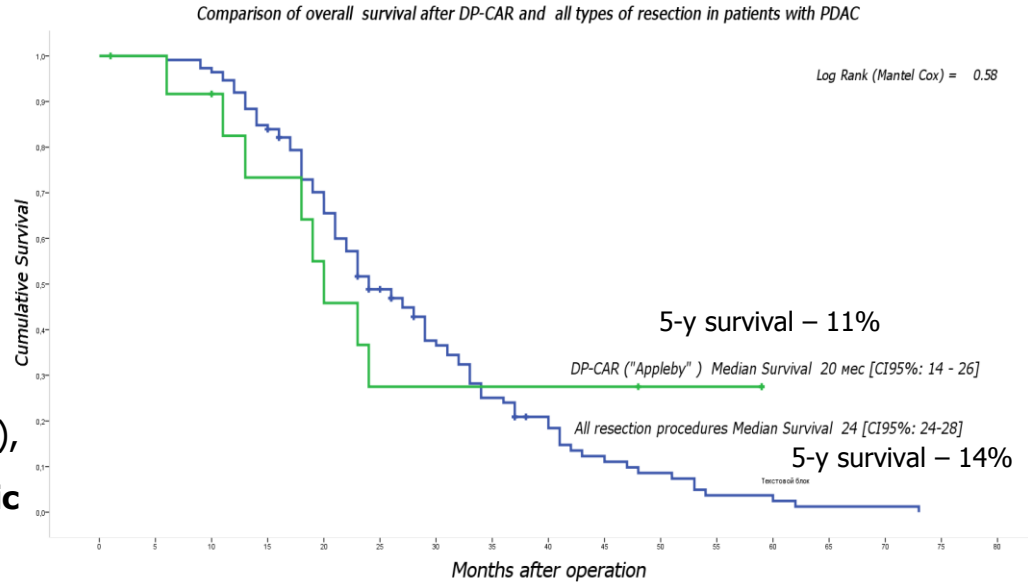
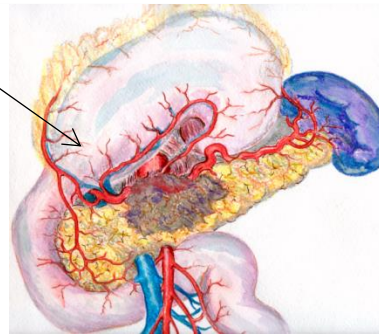
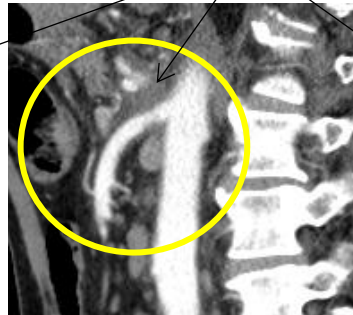
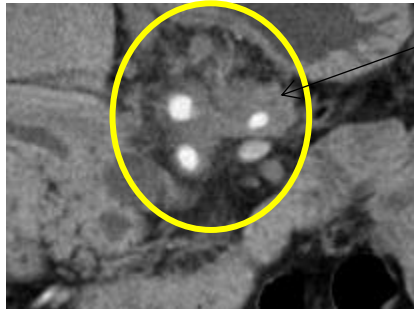
Morbidity 43% Mortality 4%

Our data : 294 radical procedures for pancreatic malignancies (2009-2015)

20 DP-CARs (neck + body + tail + spleen)

with morbidity 11 (55%), mortality 2 (10%),

without arterial reconstructions and ischemic complications



Background

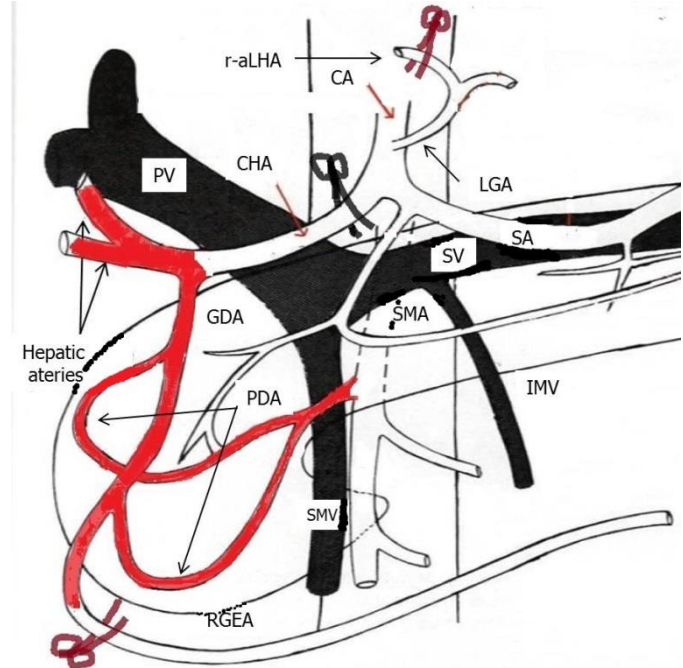
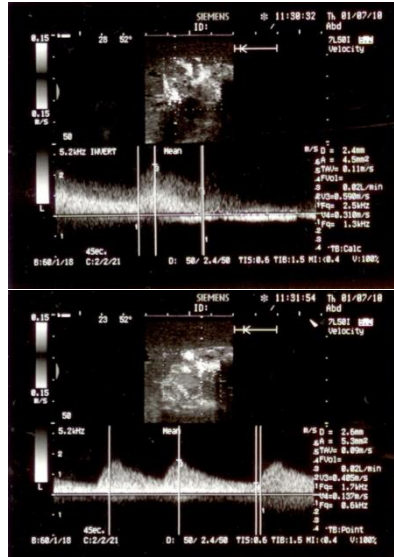
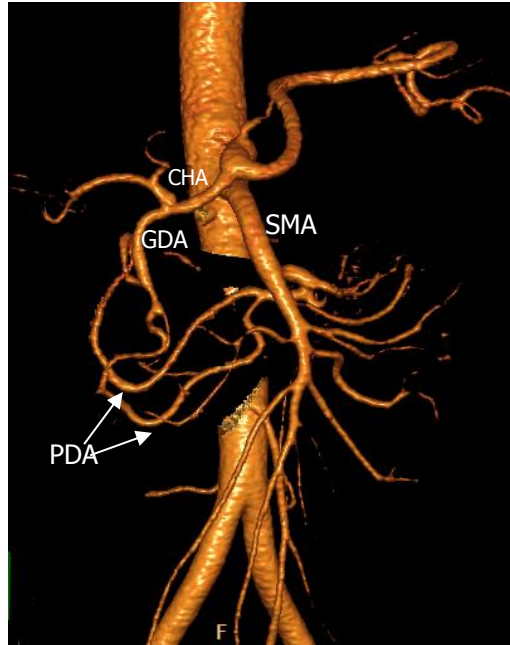
Distal pancreatectomy with celiac artery resection (DP-CAR) is a valid procedure for borderline -resectable pancreatic cancer. It is believed that considerable reduction of the liver arterial supply after DP-CAR may cause severe liver and/or gallbladder ischemia. The necessity of arterial reconstruction and reliability of existing preoperative test are still debated

Aim. Studying of 1. vascular sequelae of the DP-CAR; 2. liver collateral arterial supply after temporary occlusion of the common(CHA), right gastroepiploic(RGEA) and accessory/replaced left hepatic arteries (a/r LHA).

Patients and methods: arterial anatomy, diameters of CHA, proper hepatic (PHA), gastroduodenal (GDA) and pancreatoduodenal arteries (PDA) were registered before surgery in 110 consecutive patients with pancreatic body/tail cancer (n35), gastric cancer with pancreatic involvement (n30) and liver tumors (n45) by CT. For DP-CARs (n20) these data were obtained after surgery as well. Diameters of peripancreatic arteries and mean systolic blood velocity in hepatic arteries before and after CHA clamping were measured intraoperatively by Doppler ultrasound.

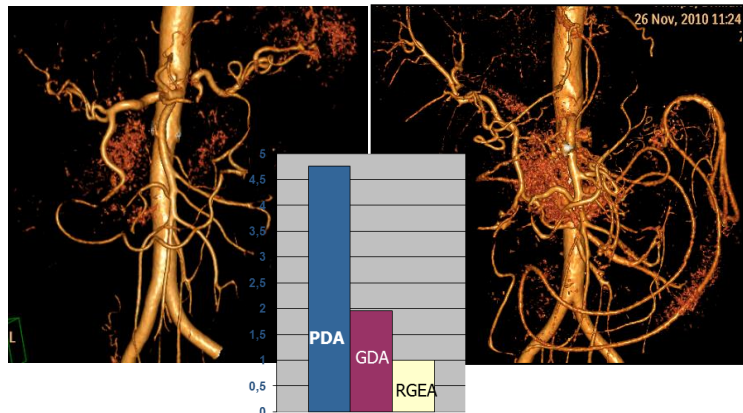
Patients and methods

1. Comparison of CT and CTA data before and after DP-CAR for **detection of the main collaterals**, supplying the liver and stomach
2. Comparison of CT-measured main and collateral arterial diameters before and after DP-CAR to determine **the degree of variations of the blood flow intensity along the collaterals**
3. I/o detection of pulse and mean systolic velocity at proper, left and middle hepatic arteries after temporary clamping of CHA, r-aLHA and RGEA in 110 patients with HPB and gastric surgery



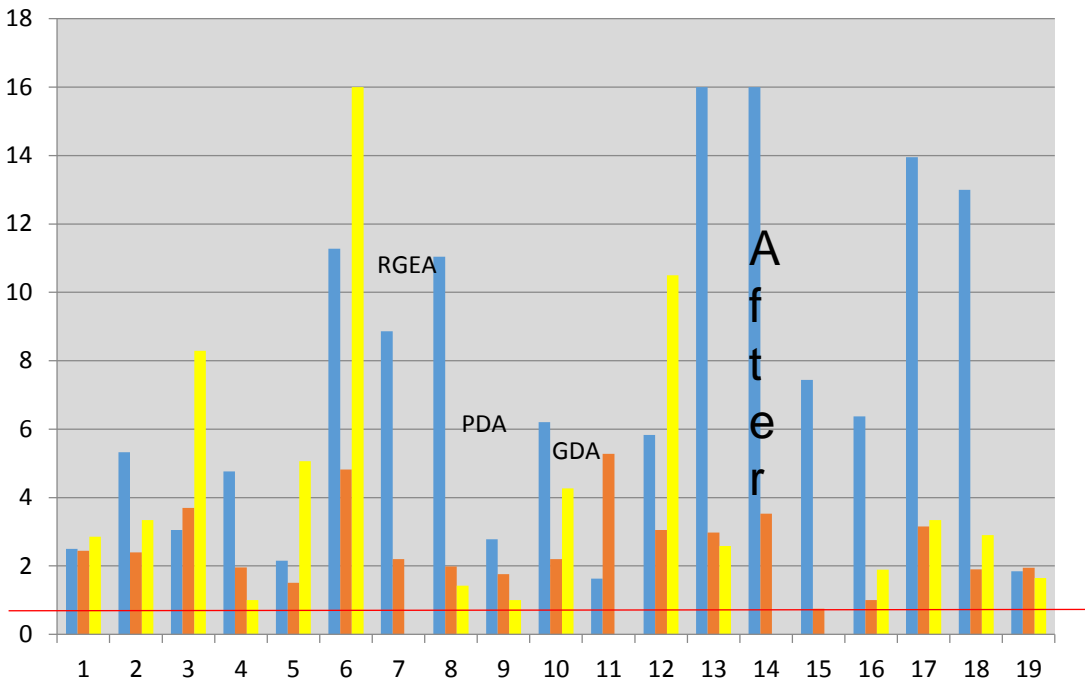
Results

Changing of blood flow intensity through PDA, GDA and RGEA after DP-CAR



$$Q_1/Q_2 \sim r_1^4/r_2^4 \sim (r_1/r_2)^4$$

Estimation of the blood flow intensity alteration through GDA, PDA and RGEA after DP-CAR

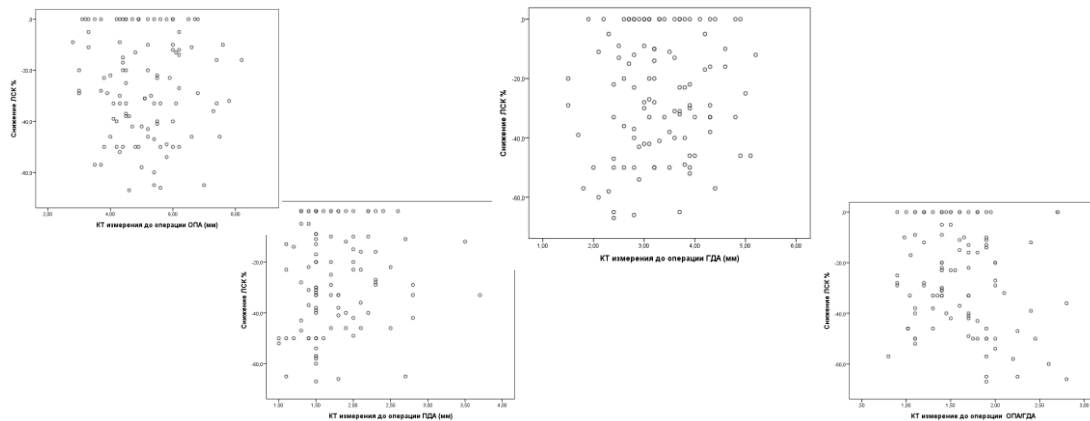
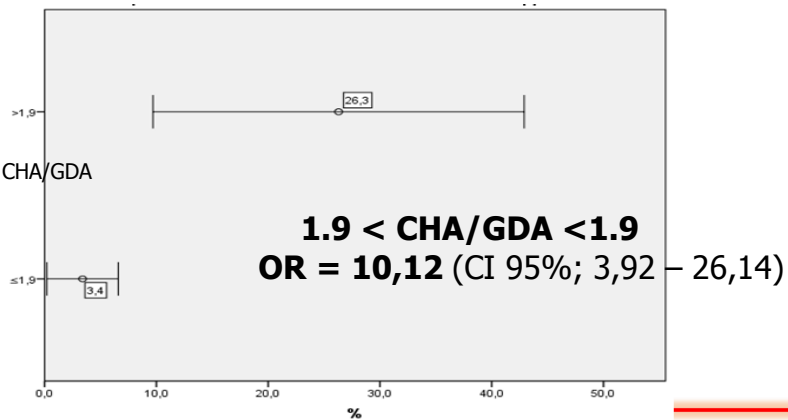


Increase of blood flow intensity for PDA in 1,7 -16, for GDA in 0,8 - 5,5 and for RGEA in 1 – 16 times quantitatively shows that the **main and sole** collateral to the liver after CA resection is the route from the SMA: Pancreaticoduodenal artery – PD arcades – gastroduodenal artery

Results

110 patients were studied during HPB and upper GI surgery 75 (68%) – Michels type I , 35 (32%) – other types

1. **PS** after temporary occlusion CHA, r-aLHA and RGEA was preserved in 91% , disappeared in 8 (7,5%) of cases
2. Type of arterial anatomy did not influence on Degree of MSV reduction ($p = 0.787$, t – criterion Student) and probability of PS disappearance ($p = 0.399$,Fisher's exact test)
3. Degree of MSV decrease is impossible to anticipate before surgery knowing arteries diameters and their ratios
4. Odds of PS disappearance on GD ligament differs 10 times between the cases when CHA/GDA radii ratio was more or less than **1,9**



Conclusion

- CHA reconstruction after CA resection is unnecessary if Doppler US detects arterial blood flow in liver parenchyma for all types of arterial anatomy
- The **main and sole** collateral for liver (and stomach) **after DP-CAR** is a route from the SMA through the PDA and GDA
- CHA occlusion before DP-CAR is unnecessary, because collateral vessels capacity.
- Knowing of the CHA and GDA diameters allows to allocate the group of risk for ischemic complications after CA resection
- I/O Duplex US of the GDL and liver parenchyma is a reliable method for assessment of the arterial liver blood supply

Points of concern

DP-CAR can be risky in cases of

- right hepatic artery originating from celiac artery
 - more than 3 times MSV decrease in the arteries of GD ligament
 - prominent reduction of parenchymal arterial blood flow
 - diseases lowering the liver tolerance to ischemia
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