

In our opinion, the solution we offer, which we believe has not been described before, seems to be much simpler since it avoids one arterial anastomosis and grafting is not necessary. The dissection of the splenic artery above the pancreatic edge, 2 or 3 cm from the celiac trunk, is much simpler than the aorta dissections described above. Spleen vascularization is not compromised and even in these patients, who usually present with hypersplenism and splenomegaly, it can promote a faster postoperative recovery from their thrombocytopenia.

References

1. Launois B, Lebeau G, Meunier B, Campion JP, Bardaxoglou E, Bourdonnec P, Malier F, Messner M (1989) Reconstructions artérielles et veineuses inhabituelles en transplantation hépatique. *Chirurgie* 115: 347–352
2. Starzl TE, Putnam W (1969) Experience in hepatic transplantation. Saunders, Philadelphia, pp 112–144, 203–206, 303–305
3. Todo S, Makowka L, Tzakis AG, Marsh JW, Karrer FM Jr, Armany M, Miller C, Tallent MB, Esquivel CO, Gordon RD, Iwatsuki S, Starzl TE (1987) Hepatic artery in liver transplantation. *Transplant Proc* 19: 2406–2411
4. Tzakis A, Todo S, Starzl TE (1989) Orthotopic liver transplantation with preservation of the inferior vena cava. *Ann Surg* 210: 649–652

Note added in proof: Since we sent the paper to the journal, we performed this kind of anastomosis in two more patients with success.

“Arterialization”, “revascularization”, “reararterialization” – what’s in a name?

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Sir: The terminology currently used in transplant-related medical literature to refer to artery-to-artery vascular union is quite broad in range and includes both terms that correctly convey the intended meaning and those, such as “arterialization”, that are used incorrectly. It is the aim of this review to expose the confusion in meaning associated with the term “arterialization” and with variants of it, such as “reararterialization” and “dearterialization”.

“Arterialization” is defined as the change of venous into arterial blood, the supplying of oxygenated instead of venous blood [1, 2]. The most common example of this

maneuver is the creation of an arteriovenous fistula in the upper limb of patients with end-stage renal disease for hemodialysis. The most striking postoperative feature in these “arterialized” veins is their “arterial-like” nature. Clinically and histologically, their features resemble those of an artery. “Arterialization” has also been alluded to and elaborated upon in an experimental model of heterotopic partial liver transplantation. In that model, the donor liver was arterialized by constructing a vascular anastomosis between the donor portal vein, recipient inferior vena cava and recipient aorta. A small arteriovenous fistula between the recipient aorta and inferior vena cava provided the arterial blood in this special case of arterialization [9].

These two examples demonstrate the correct meaning and usage of the term “arterialization”. The term can also be found correctly used in articles devoted to the problems that arise following portacaval shunting [12, 16].

“Arterialization”, as it is currently used in transplantation literature, implies and describes the provision of hepatic arterial blood to a transplanted liver through the creation of a surgical vascular anastomosis between donor and recipient arterial sources. Hence, these transplanted livers are generally referred to as “arterialized”. However, what the authors actually mean differs considerably from the correct meaning of “arterialization”. Examples of such incorrect usage of the term abound in the literature related to clinical and experimental liver transplantation [5, 8, 15, 17, 18, 20, 21]. In these examples, “arterialization” is used in the title and/or body of the reports. The inappropriate use of the terms “dearterialization” and “reararterialization” are also encountered in both transplantation and nontransplantation literature. “Dearterialization” has been used by some authors to describe an intraoperative situation where the hepatic arterial blood flow to a transplanted liver was found to be interrupted [22]. At the same time, other authors have referred to the purposeful interruption of the arterial blood supply to the liver harboring malignant primary or secondary tumor deposits as “dearterialization” [11, 14]. Diametrically opposed, “reararterialization” has incorrectly been used to indicate the re-establishment of hepatic arterial inflow to liver transplants through a vascular union [7].

It is clear from the definition of “arterialization” that the terms “dearterialization” and “reararterialization” were used incorrectly in the examples cited above. By definition, “dearterialization” would imply the termination of arterialization, whereas “reararterialization” would indicate that arterialization was once again instituted following a period of dearterialization.

The concurrent, often interchangeable, and incorrect use of “arterialization” along-side terms such as “revascularization” [3, 10, 13, 19], “restoration of arterial circulation”, “arterial reconstruction” [3, 4, 13], “reconstitution of arterial blood flow” [3, 6], and “arterial anastomosis”, connoting the correct meaning of a graft artery to host artery anastomosis, is clearly erroneous, misconstrued, and misleading. These authors feel that when the provision of arterial blood flow to a transplanted liver through donor and recipient arterial union is intended to be described,

the terms "revascularization", "reconstruction", and "reconstitution" are those that must be used to convey the correct meaning. The accurate use of such appropriate and descriptive terms serves an important purpose in contributing to (1) scientific exactness, (2) ease of location and retrieval of scientific reports (through computer or manual aids) pertaining to arterial vascular reconstruction and arterialization and, (3) inclusion of such terms in "key words" or index terms in the categorization of articles.

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References

1. Churchill's illustrated medical dictionary (1989) Churchill Livingstone, New York, p 152
2. Dorland's illustrated medical dictionary (1981) 26th edn. Saunders, Philadelphia, p 118
3. Gordon RD, Shaw BW, Iwatsuki S, Todo S, Starzl TE (1985) A simplified technique for revascularization of homografts of the liver with a variant right hepatic artery from the superior mesenteric artery. *Surg Gynecol Obstet* 160: 475-476
4. Hesselink EJ, Slooff MJH, Schuur KH, Bijleveld CH, Gips C (1987) Consequences of hepatic artery pathology after orthotopic liver transplantation. *Transplant Proc* 19: 2476-2477
5. Hickman R, Innes CR (1990) The relevance of the order of revascularization in liver grafting. *Hepatology* 11: 471-476
6. Houssin D, Vigouroux C, Filipponi F, Rossat-Mignod JC, Dousset B, Hamaguchi M, Bokobza B, Icard P, Mathey C, Prasad-Jude N, Lecam B, Grateau F, Crougenau S, Michel A, Chapius Y (1988) One liver for two: an experimental study in primates. *Transplant Int* 1: 201-204
7. Howden B, Jablonski P, Grossman H, Marshall VC (1989) The importance of the hepatic artery in rat liver transplantation. *Transplantation* 47: 428-431
8. Kalayoglu M, Belzer FO (1987) A new technique for arterialization of the hepatic graft. *Surg Gynecol Obstet* 164: 565-567
9. Lee S, D'Silva M, Glassford E, Dennis R, Moossa AR (1989) Arterialization of liver transplants in rats: I. Application of the tissue perfusion monitor in hemodynamic studies. *Microsurgery* 10: 15-20
10. Libertino JA, Lagneau P (1983) A new method of revascularisation of the right renal artery by the gastroduodenal artery. *Surg Gynecol Obstet* 156: 221-223
11. Mack P, Ahren B, Jeppsson B, Bengmark S (1989) Insulin response to glucose challenge after transient hepatic dearterialization for rat liver malignancy. *J Surg Res* 47: 124-128
12. Maillard JN, Benhamou JP, Rueff B (1970) Arterialization of the liver with portacaval shunt in the treatment of portal hypertension due to intrahepatic block. *Surgery* 67: 883-890
13. Merion RM, Burtch GD, Ham JM, Turcotte JG, Campbell DA (1989) The hepatic artery in liver transplantation. *Transplantation* 48: 438-443
14. Persson BG, Jeppsson B, Ekberg H, Tranberg KG, Lundstedt C, Bengmark S (1990) Repeated dearterialization of hepatic tumors with an implantable occluder. *Cancer* 66: 1139-1146
15. Quinones-Baldrich WJ, Mensic L, Ramming K, Hiatt J, Busuttill RW (1986) Branch patch for arterialization of hepatic grafts. *Surg Gynecol Obstet* 162: 489-490
16. Schwartz SI, Morton JH, McGovern GR (1961) Experimental arterialization of the liver. *Surgery* 49: 161-167
17. Shaw BW, Iwatsuki S, Starzl TE (1984) Alternative methods of arterialization of the hepatic graft. *Surg Gynecol Obstet* 159: 491-493
18. Stewart MT, Millikan WJ Jr, Henderson JM, Galloway JR, Dodson TF (1989) Proximal abdominal graft for arterialization during hepatic transplantation. *Surg Gynecol Obstet* 169: 261-262
19. Tanaka K, Tokunaga Y, Zaima M, Sakai Y, Yamamoto Y, Ueda J, Takada Y, Yamaguti M, Katayama T, Kitakado Y, Yamaoka Y, Ozawa K (1988) Graft transection and warm perfusion in situ in canine partial orthotopic liver transplantation. *Transplant Int* 1: 213-218
20. Todo S, Makowka L, Tzakis AG, Marsh JW, Karrer FM, Armany M, Miller C, Tallent MB, Esquivel CO, Gordon RD, Iwatsuki S, Starzl TE (1987) Hepatic artery in liver transplantation. *Transplant Proc* 19: 2406-2411
21. Tzakis A, Todo S, Starzl TE (1989) The anterior route for arterial graft conduits in liver transplantation. *Transplant Int* 2: 121
22. Yanaga K, Tzakis AG, Starzl TE (1990) Partial dearterialization of the liver allograft. *Transplant Int* 3: 185-188