

## Letters to the Editor

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Dear Sir,

We recognised the problem described in the Brief Report “Intrahepatic right-to-left shunting after the Fontan operation” by Giamberti and co-authors<sup>1</sup> with assent, however want to draw your attention to an alternate operative strategy. The authors understandably express their fear of possible hepatic necrosis subsequent to ligation of hepatic veins, because they were unsure about the adequacy of hepatic venous drainage to the inferior caval vein. Although reports on this complication are scarce, it is probably impossible to get certainty on hepatic venous distribution prior to the secondary intervention.

An additional consideration is that separate hepatic venous drainage to the atrium serve as a substitute for fenestration in the setting of total cavopulmonary connection. After all, the hepatic venous blood that would normally enter the pulmonary circulation, constitutes a right-to-left shunt when it enters the atrium and adds to the preload of the systemic circulation. A consideration of a totally different nature is that this construction – first described by Kawashima<sup>2</sup> – predisposes to pulmonary arteriovenous fistula, because of an unknown hepatic venous substance that prevents formation of these fistula. Nonetheless, from a haemodynamic standpoint, this “Kawashima operation” has the same effect on systemic preload as a fenestration has, thus to construct both is probably superfluous.

When we were prompted in 1995 to limit hepatic venous flow to the atrium, because of a cavo-atrial shunt via the liver (right-to-left), we **banded** the hepatic vein, instead of ligating it for fear of hepatic necrosis by venous obstruction<sup>3</sup>. Banding enabled us to calibrate the right-to-left shunt to a systemic oxygen saturation of ca. 90%, thus keeping systemic preload within a target range and at the same time precluding hepatic venous obstruction. Whether this fear of hepatic venous obstruction is justified, is unknown. We only want to draw attention to the possibility of banding the liver vein in stead of ligating it in the setting of intrahepatic right-to-left shunting after a cavopulmonary connection thus keeping the haemodynamic equivalent of a fenestration. Finally, when the banding is done with non-absorbable

material, the relative amount of right-to-left shunt will diminish with the growth of the patient.

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### References

1. Giamberti A, Anderson RH, de Leval MR. Intrahepatic right-to-left shunting after the Fontan operation. *Cardiol Young* 2002; 12: 308–310.
2. Kawashima Y, Kitamura S, Matsuda H, Shimazaki Y, Nakano S, Hirose H. Total cavopulmonary shunt operation in complex cardiac anomalies. A new operation. *J Thorac Cardiovasc Surg* 1984; 87: 74–81.
3. Waterbolk TW, Talsma MD, Loeff BG, Slooff MJH, Ebels T. Increasing cyanosis after total cavopulmonary connection treated by banding a separate liver vein. *Ann Thorac Surg* 1995; 59: 1226–1228.

### Reply

Dear Sir,

On behalf of my co-authors, I should like to thank Drs Ebels and Waterbolk for pointing out that, in 1995, they had described a case of intrahepatic right-to-left shunting after the Fontan procedure in a fairly similar situation to the one we emphasised in our recent brief report. The point we wanted to make is that, having confirmed the presence of large intrahepatic collaterals, one can safely ligate one hepatic vein. To band one hepatic vein solves only part of the problem. Furthermore, it is very difficult to apply any form of scientific criterions when deciding how to band a vein.

It is important not to confuse persistent right-to-left shunt following the Kawashima procedure with the shunt described by Drs Ebels and Waterbolk. In the Kawashima procedure, all the hepatic veins drain to the same low pressure atrial chamber. Incidentally, I believe that Dr Yves Lecompte from Paris was the first surgeon to suggest sequestering part of the hepatic venous return to the right atrium during the

Fontan procedure so as to unload the Fontan pathway. This was then applied by Dr Norwood and his colleagues, and abandoned because of the occurrence of increasing right-to-left shunt through these intrahepatic collateral vessels.

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## Reference

1. Giamberti A, Anderson RH, de Leval MR. Intrahepatic right-to-left shunting after the Fontan operation. *Cardiol Young* 2002; 12: 308–310.