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End-to-side venous anastomoses… a patency test

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Summary A hitherto unpublished means of testing the patency across an end-to-side venous anastomosis is described. It relies on the elasticity of the venous walls to produce ballooning when the appropriate segments of the veins are occluded and blood is flowing unimpeded across the end-to-side anastomosis. It is foolproof, easy to perform and has no ambiguity in its interpretation.

Technique

An end-to-side venous anastomosis is performed as per conventional microvascular technique(s). All distal and proximal clamps are removed. Blood is allowed to flow across the anastomosis.

The arterial component of the anastomosis is tested by a combination of expansile pulsation, wriggling, and the Acland empty–refill/uplift test.[1]

Flow across the end-to-side venous anastomosis is clinically determined by a series of steps as follows.

Venous flow from the free flap towards the anastomosis is assessed by a classic Acland empty–refill/uplift test.[1] In this, a segment of the free flap vein is emptied in a direction from the anastomosis towards the flap. Keeping the end of the vein near the anastomosis occluded, the free flap end of the vein is released. Filling of the venous segment is visible and establishes the fact that there is good venous egress from the flap.

To establish the presence of flow across the anastomosis the following steps are performed.

Step 1. The portion of the recipient vein in between the anastomosis and the peripheral circulation is completely occluded just adjacent to the anastomosis by means of a microvascular clamp (Fig. 1).

Step 2. The recipient vein is now emptied in a central (towards the heart) direction by a milking action over a short segment of approximately 2–3 cm (away from the anastomosis junction and the previous clamped end). The microvascular forceps performing the milking action are now used as a clamp to occlude the lumen of the vein (Fig. 2).

Step 3. Patency across the anastomosis is confirmed by a gradual and increasing ballooning of the recipient vessel as it fills with venous blood from the free flap across the anastomosis (Fig. 3). The occluding clamp is now removed to finish the test.

Discussion

The empty–refill test as described by Acland[1] has stood the test of time. It is reliable and easy, both to perform as well as to duplicate and repeat.

It is fairly straightforward to demonstrate blood

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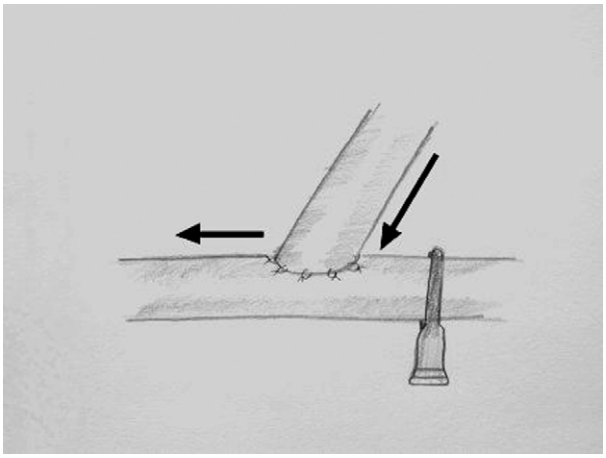

Fig. 1 Occlusion of the recipient vein between anastomosis and the peripheral circulation by a microvascular clamp.

flow across an end-to-side arterial anastomosis by performing the Acland empty–refill test on the arterial segment distal to the anastomosis and leading to the flap.

No test has yet been published to determine/-demonstrate flow across an end-to-side venous anastomosis. There are problems with using a standard milking test across a non-linear anastomosis. It is difficult to evaluate the flow across a T-junction with an empty–refill test. There is also a possibility of causing damage or disruption to the anastomosis. Currently, most surgeons rely on visual filling up of the vein across the anastomosis as a clinical test.[2,3] Whereas this may be possible in certain cases, there are times when a clinical demonstration of blood flow may be both very helpful and mandatory. This may be in the case of a low flow flap or when there are problems with the arterial anastomosis (where the veins may appear

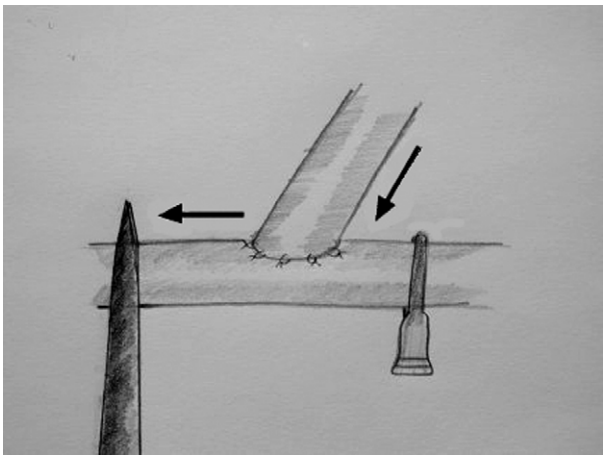

Fig. 2 Occlusion of the recipient vein between the anastomosis and the direction of venous blood flow.

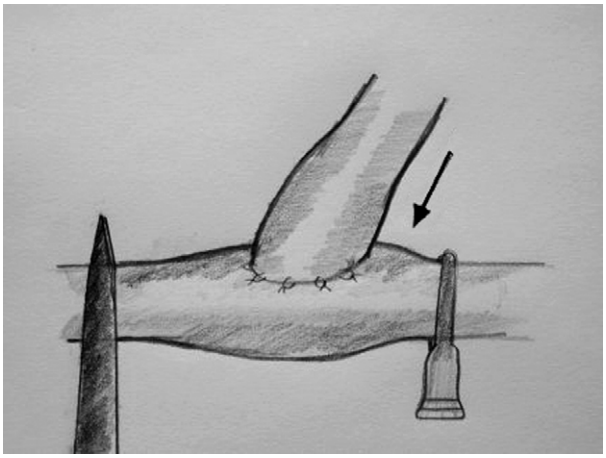

Fig. 3 Ballooning of venous segment between the two clamps demonstrating and confirming blood flow across the anastomosis.

to have collapsed). There may also be occasions when the end-to-side venous anastomosis is under mild stretch. Here too, the clinical filling of the venous segments on either side of the anastomosis may not be clearly evident. Finally, for the microsurgical trainee this is a good means of clinically evaluating the results of the end-to-side venous anastomosis.

Conclusion

Reliable clinical tests have been described to assess the blood flow across end-to-end arterial and venous and end-to-side arterial anastomoses. The clinical determination of blood flow across an end-to-side venous anastomosis has long continued to be an imprecise test of a visual rush of blood across the anastomosis when the clamps are first released. Once the veins have filled up there is some degree of difficulty in confirming trans-anastomotic flow.

The ballooning patency test described above is a reliable mean of testing for blood flow across an end-to-side venous anastomosis.

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