**DEBATE:** For BTK Occlusive Lesions, Subintimal Wire Passage Works And Is Best

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Since its first introduction in 1974, Balloon Angioplasty has been widely used for peripheral vascular disease and in particular, has made a substantial impact on the treatment of critical limb ischaemia. The endovascular approach is the first line treatment for critical limb ischaemia (CLI) has shown encouraging limb salvage rates. Initially, the treatment was applicable for TASC (Trans Atlantic Inter Society Consensus) A and B lesions, but nowadays it is also widely used in TASC C and D lesions. The latter predominantly constitute arterial occlusive disease which could be at any or all of these levels; Iliac artery, superficial femoral artery (SFA), popliteal artery and tibial arteries.

With the improvement in materials, particularly the hydrophilic guide wires and low profile balloons, the vast majority of the patients with critical limb ischaemia are suitable for the endovascular approach and providing excellent limb salvage rates.

The aim of the treatment in Chronic Critical Limb Ischaemia, is to treat the disease at as many levels as possible, so as to take advantage of the best possible haemodynamics. Thus as an example, an Iliac stenosis, a full length Superficial Femoral Artery (SFA) occlusion and tibial lesions can be treated, all at the same sitting to get the best haemodynamic result. This has the added advantage of the inflow providing benefit to the outflow vessels, and in so doing, both will have the chance of better long term patency, because both territories will have the benefit of fast flow.

For long occlusive lesions, particularly flush occlusions of the SFA, long tibial occlusions, and popliteal occlusions that extend into the trifurcation, Subintimal Angioplasty has made a substantial impact on the treatment of these sorts of lesions.

With the help of a short curved tipped catheter (Bolia Mini-Cath, TERUMO, Japan), most flush SFA occlusions can be entered through an antegrade approach. However, the antegrade approach involves determining the correct position for a puncture which would normally be in a high position, in order to allow sufficient room to manipulate the wire/catheter into the flush occlusion. Some of these cases may require the help of Duplex ultrasound to determine the precise position of the puncture site. The catheter is normally positioned at the origin of the occlusion, the tip pointing in the opposite direction to the origin of the profunda artery. Using a curved tipped hydrophilic guide wire an entry into the SFA is normally achieved and soon after the wire has entered the occlusion, with further advancing of the wire, a loop is formed which is then advanced to a few centimetres until the position of the wire is secure within the occluded SFA. Having achieved this position, the short catheter is removed and the balloon catheter introduced. The loop is then extended through the length of the occlusion, followed by advancement of the balloon catheter to provide support. Re-entry is usually achieved by using a twisting action as the loop is being pushed towards the patent vessel. Having achieved re-entry, the entire length of the occlusion is dilated using short inflations of the balloon (up to 5 seconds) but high inflation pressure of up to 12 atmospheres.
Whilst Critical Limb Ischaemia is often due to stenotic and occlusive disease at multiple levels, by simply treating the inflow disease (Iliac and Femoro-Popliteal segments) is usually not sufficient. Moreover, it makes sense to treat disease at as many levels as possible to achieve the best haemodynamics. Subintimal Angioplasty in Critical Limb Ischaemia is most effective for Infrapopliteal occlusive disease. It has the best application for Popliteal occlusions that extend into the trifurcation. The Popliteal occlusion can be recanalised into whichever, and as many vessels as are available to enter into. The decision to recanalise into a particular vessel is determined by the quality of the run-off vessel or vessels. Thus, the end result may be one, or up to three run-off vessel recanalisation. The more vessels achieved, the better the haemodynamics (Increased total perfusion to the foot, faster flow and more run-off vessels means better patency of any Angioplasty to Inflow vessels).

Subintimal Angioplasty is very effective for long Tibial occlusions so long as there is a good target vessel (an essential requirement for Subintimal Angioplasty). If the target vessels are showing diffuse disease and small vessels, then Intraluminal Angioplasty is more applicable.

For tibial occlusive disease, a 1.5mm ‘J’ hydrophilic guide wire (0.035 inch diameter and 180cm long) is normally used to form a loop within the tibial occlusion (it is difficult to form a loop in the hydrophilic guide wire when the tip is either straight or curved instead of the ‘J’). The loop is then advanced gently, taking care not to make the loop too long (keeping it less than 5cm. in length). A backup balloon catheter of 3mm x 2cm on a 5 French shaft provides support for the system. The majority of the occlusions are crossed in this fashion and re-entry achieved in a similar manner to the SFA.

For popliteal occlusions that extend into the trifurcation, a ‘J’ wire is used to advance through the occlusion. The wire has a tendency to go in a straight line which would normally end up in the peroneal artery. Having recanalised this one vessel, a further vessel (either anterior tibial or posterior tibial or both) can be entered using a curved tipped hydrophilic wire, followed by the ‘J’ tipped wire to do the crossing of the rest of the occlusion. In this fashion, the entire trifurcation may be reconstituted.

Thus, the majority of the occlusive lesions can be tackled using one or two hydrophilic guide wires and a balloon catheter. It is rare for any other device to be required to help with the crossing of the lesion or to achieve re-entry.

Subintimal Angioplasty has a limited application when a reconstitution of the foot Arcade is required. A short occlusion with a good target vessel may result in good reconstitution, but one has to bear in mind that we are dealing with very small vessels, and Subintimal Angioplasty, by its principle of a dissection approach, may damage the digital branches arising from the Arcade, so caution is suggested for this approach. On the other hand, arcade recanalisation is perfectly suited to an Intraluminal approach, with the use of a 3.5F catheter/0.014 or 0.018 systems.

Two large Meta analysis/Systematic reviews published recently (Bown MJ and Met R) confirm that Subintimal Angioplasty is able to achieve durable results in terms of Limb Salvage for patients with Chronic Critical Limb Ischaemia. Eighty to 90% Limb Salvage rates have been achieved at 1 year, though patency rates were about 50%.
The majority of patients with occlusive disease can be treated by simple and inexpensive means, using the minimum of materials. The success rates are high and the complication rates are low. Similar results have been shown using Intraluminal Angioplasty, particularly in Diabetic patients with CLI, who have diffusely diseased small vessels, affecting the run-off and foot vessels. The Intraluminal approach in such cases requires smaller systems, using 3.5F balloon catheters and 0.014/0.018 in. guide wires. Excellent results have been published from a few centres in Europe.

References:


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