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*The Editorial board actively encourages Letters to the Editor.  
We are pleased to present here the first correspondence.*

## Chronic total occlusions (CTO): the paradox of “premature balloon support”

**Pravin K Goel \***, MD, DM, FACC

*Sanjay Gandhi Postgraduate Institute of Medical Sciences, Lucknow, India*

It is well understood that there are several technicalities involved in doing a CTO<sup>1</sup>, but I do not think there would be any disagreement with the fact that the most crucial step to final success of a CTO is the initial successful wire crossing – short of which there is no way to success. Also, within wire crossing, the ideal situation is to somehow cross the lesion without any dissection or false passage entry, because although there may be ways to get out of this eventually, the best chance of final success lies in not entering a false tract at all from the very first go<sup>2-4</sup>. You would also agree that the real trick during wire crossing is the constant utilisation of the tactile feedback of the resistance given by the lesion being transmitted from the wire tip to the operator’s fingers. I am of the strong opinion that any technique or step that would hamper the transmission of this tactile feel would not only impair extraction of full wire capability in crossing the lesion, but also increase the chances of entering a false passage, how so ever soft the wire tip may be.

Adding balloon support to the wire is one of the standard teachings in CTO crossing<sup>1</sup>, but I write in opposition to this because what I believe it truly does is to increase pushability at the cost of right tactile feel transmission to the finger tips. In my opinion, it is better to use a stiffer tip wire if a softer wire fails to penetrate the proximal fibrous cap, but without balloon support, when exploring a CTO, keeping all your tactile senses alive, than to try playing safe – and truly falsely safe – by still continuing with the softer wire, but having had its pushability increased using balloon support and having lost most of the tactile feedback from the lesion in the bargain.

The other drawback using balloon support is that the manoeuvrability and freedom of movement of the wire also gets restricted, at least to some extent, when compared with the bare wire, and this further reduces one’s capability of exploring the CTO and getting a right passage down.

The only place where I feel balloon support helps is when one has already penetrated the proximal cap and has also crossed the major part of the length of the lesion using the wire characteristics, and its right manipulation independently, almost to the point of exiting the distal fibrous cap. But there is difficulty moving the distal wire tip further as it is gripped within the CTO, and this effect is observed more often if the CTO is long. The long CTO channel grips the wire and does not let the push be transmitted to the wire tip, and at times also limits wire torquability at distal tip. This additionally gives the wire a tendency to be pushed in the same direction that it has exited the CTO, and as a result, it is not uncommon for the wire tip to now catch an intimal flap, i.e., after having crossed completely through the lesion successfully, which is then most disheartening. Balloon support at this stage gives the extra pushability and also freedom of movement for the wire to allow it to track down the length of the vessel. This is because at this stage the grip inside the balloon lumen is less than the grip inside a long CTO with the wire gripped inside the long CTO channels.

I have come to this surmise based on my experience of nearly 135 CTO cases (>1 month old occlusions) out of a total of 961 cases done over a period of three years from January 2004 to December 2006 with a success rate of 113/135 (83.5%) using this technique, and observing several operators during the same period falling into the trap of premature balloon support and ending up in a false passage entry with even softer wires and a final failure to cross the occlusions

This only being a technical tip/observation, it will be difficult to study it through a randomised trial as no two CTO lesions would be the same, nor would any two operators/ techniques be the same. What a CTO needs is an amalgamation of several tricks and skills.

\* Corresponding author: Sanjay Gandhi Postgraduate Institute of Medical Sciences, Lucknow 226014, India

E-mail: [pkgoel@sushrut.sggpi.ac.in](mailto:pkgoel@sushrut.sggpi.ac.in)



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## Reply from the authors

Dear Dr Goel,

Thank you for the important point you raised which helps us to clarify how the balloon support should be used during procedures of CTO recanalisation. We absolutely agree that the most frequent mistake is to advance the balloon, OTW or Monorail, against the occlusion, right at the tip of the guidewire. This obviously increases the ability of the guidewire, even a floppy guidewire, to penetrate in the segment of occlusion but completely impairs its steerability and commits the wire to follow a straight path ahead. While this can be occasionally acceptable in straight peripheral arteries, coronaries are always curved and tortuous and the likelihood of forcing the wire to penetrate into a false lumen and create a dissection is extremely high. At this point if you just continue sliding the balloon along the false track or, worse, inflate the balloon, you create those nasty perforations requiring pericardiocentesis or surgical correction which gave to the recanalisation of CTO a bad name in terms of safety.

The role of the balloon, always OTW, is very different. It allows to exchange the soft wire, which must be used to negotiate the segment proximal to the occlusion, for a stiffer wire with an optimal small distal curve to penetrate the proximal occlusion cap. We advise trying to probe the occlusion with a soft wire, and I personally often use polymer coated soft wires such as the PILOT 50 or analogues, but the balloon must be kept far enough from the tip to avoid excessive straightening. We disagree that having the wire inside an OTW catheter reduces the tactile feeling of engaging and crossing the occlusion. On the contrary, this feed-back is increased when the guidewire does not bend inside a large guiding catheter and is supported till the last cm of length. Especially with the use of OTW end-hole catheter without balloon which have low profile, but

often slightly larger inner lumens, the feed-back and steerability is excellent. We agree that it is sometimes required to advance the balloon across the occluded segment to avoid friction of the guidewire within the occlusion and allow their progression. Still this should be used as a last resource, and the operator should always try to advance the balloon only when the wire has fully crossed the occlusion and its intraluminal position has been confirmed by an appropriate injection filling the collaterals (contralateral if needed). Of course only a few dedicated wires can maintain inside the occlusion sufficient steerability and freedom of movement.

Let us compliment you upon your successful results in a recent consecutive series. Of course, every operator will develop with experience his own "style", which is never the same as others, and I am sure I will be able to understand better your approach in review sessions showing live and taped cases presented. After the guidelines were printed, Professor Claus Reifart organised a cath lab session hosted by the laboratory of Professor Joachim Schofer in Hamburg with eight complex previously failed occlusions. Besides the great clinical success with seven out of the eight patients recanalised, this was a great opportunity for the Club members to better understand strengths and weaknesses of their approach and compare it with the technique of other Club members and those of Dr Osamu Katoh and Dr Hideo Tamai, actively involved in these cases. A similar international cooperation with dedicated live cases at the session the CTO EuroClub organised at EuroPCR, or the CRF Course in New York last January are of the utmost importance. The specificity of a European club will be to deal with issues like training, organisation, and reimbursement, which are different in various countries and must be improved to increase the frequency of use and success rate of PCI for CTO in Europe.

Carlo Di Mario\* MD, PhD, FACC, FESC  
On behalf of the EuroCTO Club

\* Corresponding author: Royal Brompton Hospital, Department of Cardiology, Sydney Street, SW3 6NP, London, United Kingdom  
E-mail: c.dimario@rbht.nhs.uk