A Modified Technique to Safely Close the Arterial Puncture Site After TAVI

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ABSTRACT: Background. We describe a vascular closure technique, convenient in practice, that permits effective femoral artery closure after CoreValve (Medtronic) implantation during transcatheter aortic valve implantation (TAVI). Vascular complications of transfemoral access implantation have been associated with significantly increased patient morbidity and mortality, as well as with increased hospitalization, among patients undergoing TAVI.

Technique. The crossover technique is performed while using the sheath dilator in order to tightly grasp the crossover wire; a peripheral artery balloon is inserted in the iliac artery and inflated above the puncture site. The 18 Fr sheath is removed while hemostasis is achieved in that way. Minor vascular complications were observed in 10% (3 out of 30) of the patients treated with this vascular closure technique. No major vascular complications were observed.

Conclusions. The described vascular closure maneuver is operator friendly, without demanding special skills and can be added to the therapeutic quiver for minimizing vascular complications after TAVI.

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and advanced in the sheath (Figure 2B). This stabilizes the Terumo wire, as it is tightly grasped between the sheath and dilator walls. Thereafter, it can be used as a stable route for the over-the-wire delivery of the Monorail peripheral balloon (Boston Scientific).

This double-lumen peripheral artery balloon (8 to 9 mm in diameter depending on common femoral or external iliac size) is inserted through the contralateral catheter into the 18 Fr sheath with an over-the-wire technique up to the iliac artery and kept deflated (Figure 2C). Thereafter, the wire is withdrawn and the balloon’s main lumen is connected to the manifold, allowing either arterial pressure monitoring at its peripheral edge or contrast injections. Afterward, the sheath is further withdrawn to a level just above the puncture site (Figure 2D). Subsequently, the Prostar-XL knots are pushed down to the femoral arterial wall. Then, the balloon is inflated, while hemostasis distally is ensured by pressure precipitation (Figure 2E).

The 18 Fr sheath is then safely removed, while the balloon is kept inflated for approximately 3 minutes and slightly stretched to the vessel wall.

Afterward, the balloon is deflated and slightly withdrawn, while contrast injections are performed through its central lumen to ensure the arterial sealing (Figure 2F). This maneuver not only serves the evaluation of potential leakage, but in case of inadequate hemostasis the balloon can be re-advanced at the bleeding site and inflated again. If no significant residual bleeding is observed, mechanical pressure is applied by the operator at the level of the puncture site. Finally, it is removed through the contralateral femoral artery.

**Experience and 30-day outcomes.** At our center, out of 115 patients treated with TAVI in the past 3 years, the last 30 aortic device implantations were conducted following the aforementioned technique during arterial closure. Minor vascular complication, as defined by the Valve Academic Research Consortium (VARC), was observed in 3 patients (10%) at the puncture site and treated successfully with balloon inflation. No major vascular complications were observed.

**Discussion**

We describe a simple vascular closure technique after TAVI with CoreValve prosthesis, which according to our experience can lead to a minimization of vascular complications. The precautionary balloon inflation above the puncture site promotes hemostasis and enables the appropriate vascular sealing, as suture stretching is performed under minor arterial pressure. During the procedure, pressure recording at the balloon edge represents a reliable and accurate method for ensuring vessel occlusion. Additionally, due to total vessel occlusion, the mechanical pressure applied at the site, if deemed necessary, is more effective for sealing, as there is no opposed hydrostatic tension.

Crossover technique from the contralateral femoral artery facilitates the delivery of endovascular devices for vascular...
complication management. Instead of delivering separate long sheaths and special back-up catheters, the required support for balloon delivery is acquired by inserting the 18 Fr sheath dilator in the contralateral site, wedging the wire. In this way, the operator is able to cross over the balloon into the large sheath without worrying about catheter support.

Despite the preventive use of a peripheral vessel balloon in all patients, we believe that applying that technique for vessel closure could potentially be cost effective. The minimization of vascular complications such as rupture, perforation or hematoma renders the likelihood of using further rescue devices rather distant. Moreover, by wedging the wire with the sheath dilator in the contralateral site, we avoid the use of further longer sheaths and extra back-up catheters.

In conclusion, we believe that the described vascular closure maneuver is operator friendly, without demanding special skills, and can fairly be added to the therapeutic quiver for minimizing vascular complications after TAVI. Our technique is in the same direction as similar effective vascular closure techniques proposed by other operators.\textsuperscript{8,9} However, further studies are needed in order to test and compare the short- and long-term complications and outcomes of the proposed techniques with more common practice methods.

**References**