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Imaging and Case Report

Preclose Cinching "C-Stitch" to Aid Hemostasis After Impella Insertion

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Access site bleeding is a known complication of Impella (Abiomed) implantation and may be associated with adverse outcomes.[1,2] We describe the preclose cinching stitch or "C-stitch" technique to aid hemostasis in patients requiring prolonged hemodynamic support.

Case report

An 83-year-old man with a history of hypertension, hyperlipidemia, and atrial fibrillation presented with anginal chest pain and electrocardiogram changes consistent with anterior wall acute myocardial infarction (AMI). Sublingual nitroglycerin, aspirin, and ticagrelor were given before catheterization. Ultrasound-guided femoral access was obtained, and a left ventriculogram demonstrated severe anteroapical hypokinesis (Figure 1A). Coronary angiography revealed 70% left main stenosis and 100% thrombotic occlusion of the midleft anterior descending artery (LAD) (Figure 1B, C). Subsequent right heart catheterization was not consistent with cardiogenic shock. However, given the need for left main and LAD intervention in the setting of AMI, an Impella CP device was placed for hemodynamic support. After multidisciplinary discussion, postprocedural Impella support was planned given the concern for delayed cardiogenic shock.

Access, preclose cinching stitch, and percutaneous coronary intervention procedures

Using the 5F catheter access established for the diagnostic portion of the procedure (Figure 1D), the sheath was removed over a standard J wire, and a single Perclose ProGlide (Abbott) was deployed. The sutures were set aside using Kelly clamps. A Supracore wire (Abbott) was used to introduce the 14F Impella peel-away sheath after sequential dilation. Next, the Impella CP was implanted across the aortic valve in a standard fashion (Figure 1E) and initiated on automatic mode. Successful intravascular ultrasound–guided percutaneous coronary intervention of the mid-LAD and distal left main coronary arteries was performed with a goal door-to-balloon time of 57 minutes. During the left main portion of the intervention, the patient had several periods of loss of pulsatility, requiring a low-dose norepinephrine drip in addition to the Impella CP to maintain adequate mean arterial pressure. Intravascular ultrasound demonstrated a postprocedural mid-LAD minimal stent area of 8 mm^2 (Figure 1F). Postinterventional angiography demonstrated well-expanded, well-apposed stents with thrombolysis in myocardial infarction 3 flow (Figure 1E).

Placement of the repositioning sheath and tightening of the cinching stitch

With 2 operators, the peel-away sheath was removed from the body. Using the Impella catheter as a rail, the tapered 9F to 13F repositioning sheath was advanced into the arteriotomy at a 45° angle. Next, with the ProGlide knot pusher on the rail suture, the slipknot was advanced under the skin down against the repositioning sheath. The short stitch (white end) was gently pulled to lock the knot around the repositioning sheath (Figure 1G-I and Supplemental Video S1). The suture tails were not cut but secured inside a stopcock to allow easy breaking of the cinching stitch during Impella extraction.

Removal of the cinching stitch and Impella CP extraction

After approximately 48 hours, the patient was deemed stable for Impella removal. The groin was sterilely prepared, and the stopcock was removed to access the ProGlide sutures. Radial access was obtained with a 6F slender sheath (Terumo), and a long PV multicurve catheter was placed to the external iliac artery for angiography.

Next, with gentle traction on the nonlocking stitch (black end), slowly progressive tension in the same direction was applied to the locking stitch (white end) to remove the ProGlide stitch (Figure 1J, K). After

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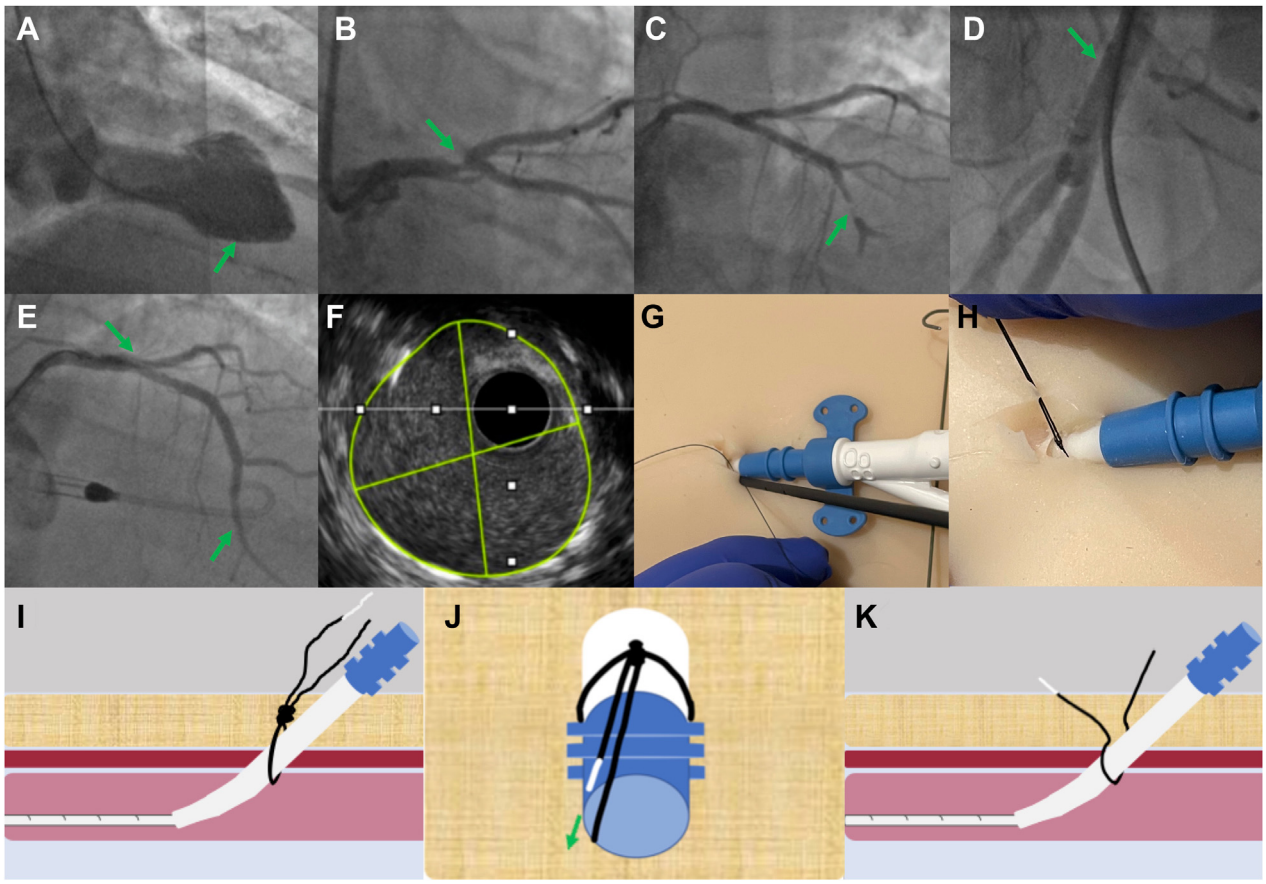

Figure 1. Percutaneous coronary intervention, with Impella placement using cinching stitch. (**A**) Ventriculogram demonstrating reduced ejection fraction (green arrow); (**B**) angiography of the left main disease (green arrow); (**C**) angiography of the midleft anterior descending artery occlusion (green arrow); (**D**) femoral cannulation (green arrow); (**E**) Impella placement (bottom green arrow), postinterventional angiography (top green arrow); (**F**) the intravascular ultrasound minimal stent area, the midleft anterior descending artery; (**G, H**) dry model representation of cinching stitch; (**I**) cinching stitch schematic; and (**J, K**) cinching stitch removal.

placing a 0.035-inch wire through the side port of the repositioning sheath, the Impella was explanted using the standard postclosure technique.[3] Angiography performed through a radially placed catheter in the right external iliac artery revealed a patent femoral artery without bleeding, dissection, or thrombus. Distal extremity pulses were noted to be triphasic on Doppler ultrasound.

Discussion

Postprocedural exchange of the 14F peel-away sheath for the tapered repositioning sheath may lead to access-related bleeding because of several possible mechanisms. For example, the repositioning sheath may back out of the artery because of patient movement or turning. In addition, failure to angle-match the catheter insertion angle with a gauze dressing underneath the distal portion of the repositioning sheath may lead to aggressive flattening of the device against the thigh, with subsequent tenting of the arteriotomy resulting in bleeding around the sheath.

Preclosure is commonly used when the Impella is expected to be removed quickly with adequate arterial access. However, in patients anticipated to require support for more than 48 hours, there can be concern for femoral access site–related infections or thrombus formation and showering of distal emboli (requiring thrombus aspiration/embolectomy). Therefore, we chose to use the cinching stitch to further secure the repositioning sheath with the option to remove the suture (using the Perclose ProGlide bailout mechanism) just before device extraction. Furthermore, we used a single preclosure stitch given the urgent nature of coronary revascularization during AMI. In less emergent situations, such as oozing in the coronary care unit, 2 preclosure stitches left in after Impella removal may further aid hemostasis. Lastly, care should be taken to pull the correct suture tail when removing the cinching stitch to avoid vessel injury.

Declaration of competing interest

Dr Sethi reports honoraria from Janssen and Chiesi Inc. Dr Parikh has received institutional grants/research support from Abbott Vascular, Shockwave Medical, TriReme Medical, Surmodics, Silk Road Medical, and the National Institutes of Health; has received consulting fees from Terumo and Abiomed; and has served on the Advisory Boards of Abbott, Medtronic, Boston Scientific, Cardiovascular Systems Inc, Janssen, and Philips. Dr Uriel has received grant support from Abbott and Medtronic. Dr Kirtane has received institutional funding to Columbia University and/or the Cardiovascular Research Foundation from Medtronic, Boston Scientific, Abbott Vascular, Abiomed, Cardiovascular Systems Inc, CathWorks, Siemens, Philips, and ReCor Medical. Dr Finn has received speaker fees from Janssen. No other potential conflict of interest relevant to this article was reported.

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Ethics statement and patient consent

The research reported has adhered to the relevant ethical guidelines. The authors obtained written consent from the patient.

Supplementary material

To access the supplementary material accompanying this article, visit the online version of the *Journal of the Society for Cardiovascular Angiography & Interventions* at https://doi.org/10.1016/j.jscai.2022.100447.

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