



Flat Spring to Ensure an Elastic and Compliant Branch Connection Between Two Stents

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INTRODUCTION

Connecting large stents together is currently performed in two ways. The first is by overlapping, inserting a larger stent into a smaller one to obtain fixation through the radial force of the inner stent and friction between them. The second consists of laterally inserting a balloon expandable stent through a reinforced window to get fixation by plastic deformation of the stent inside a non-deformable aperture. These two approaches lead to stent protrusion through the window, or at least a vulnerable overlap zone. These connections are stiff and may predispose to late disconnection. This paper describes an innovative technology that ensures an elastic and adaptable perpendicular connection between two stents.

TECHNOLOGY

The technology proposed here is for reconstruction of the ilio-caval confluence. The mother ilio-caval stent is a laser cut nitinol conical stent that includes a window constructed as a specific braided elliptical nitinol wire, acting as a flat spring (Figs. 1A and 2A). The branch is a braided nitinol wire stent with a special proximal design that opens in a “floral” configuration, followed by a groove and a flare (Fig. 1B). The caval part of the mother stent is first deployed; the window is cannulated to allow insertion of the branch delivery system (Fig. 2A). The branch is delivered in three steps: the proximal “flower” inside the mother stent, the flare outside, and then the remaining branch to lock the flat spring against the groove. After complete delivery of the branch stent, the window establishes an equilibrated connection using the elastic forces applied by both the branch stent and the flat spring (Figs. 2B and 1B).

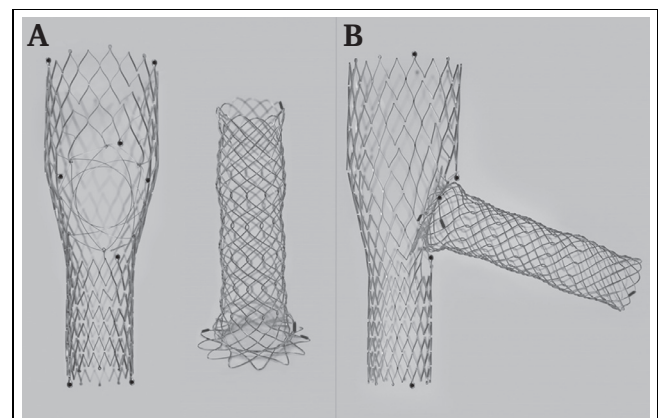


Figure 1. (A) The laser cut nitinol ilio-caval stent with the window including the flat spring and the dedicated iliac branch. (B) The iliac branch is connected to the mother stent.

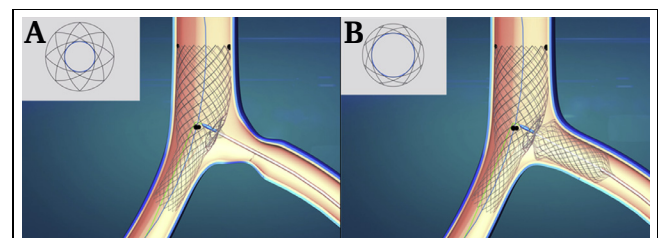


Figure 2. Connection between the ilio-caval stent and the iliac branch. (A) The flat spring is in a relaxed state. (B) Once the groove is open in the window, the flat spring is now compressing the groove.

CONCLUSION

Prototypes have been constructed for testing to obtain a CE mark and further trialling. The next step of this technology is the application in covered stents for branched devices in the aortic arch.

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<https://doi.org/10.1016/j.ejvs.2020.08.045>