The art of mitral valve repair: Recreating nature or learning from it?

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Disclosures: Author has nothing to disclose with regard to commercial support.

Received for publication Aug 13, 2018; accepted for publication Aug 17, 2018; available ahead of print Sept 25, 2018.

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J Thorac Cardiovasc Surg 2019;157:941-2

0022-5223/\$36.00

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<https://doi.org/10.1016/j.jtcvs.2018.08.017>

Surgical repair is currently the undisputed gold standard for treatment of primary (ie, structural) mitral regurgitation. It is superior to replacement and interventional techniques and has the potential to restore normal life expectancy.^{1,2} However, repair techniques may be complex and often dependent on an artistic ability of the operating surgeon.^{3,4} This art is important because the impact on survival and symptoms is related to repair success and durability.^{5,6} In addition, it is not clear how many potentially repairable valves end up being replaced for their perceived high complexity.^{4,7} Discussions on repair techniques even sound artistic: We have to “recreate nature,” perform a “physiologic repair,” have to “preserve the mobility of both leaflets,” or “restore normal anatomy.” However, what is “natural,” “physiologic,” or “normal” in a complex diseased valve with large amounts of tissue, asymmetrically prolapsing segments, and annular dilatation? In addition, the majority of all valves after successful repair do not look “normal” or “physiologic” anymore. It appears that (although we can create durable repairs) we cannot recreate nature. Can we learn from it?

In this issue of the *Journal*, Chawla and colleagues⁷ address this point by describing their experimental experience with a polytetrafluoroethylene (PTFE) patch made with 4 extensions for neochords that is anchored at the base of the papillary muscle and neochords that are attached to the leaflets. They learned from nature by applying the principle that the length from the base of the papillary muscle to the chords’ leaflet insertion is the same for anterior and posterior mitral leaflets. Although the initial experience in swine is promising, application in patients has several challenges.

The design is similar to the loop technique,⁸ in which 4 premeasured PTFE (Gore-Tex; WL Gore & Associates, Flagstaff, Ariz) loops are tied to a pledget for anchoring at the papillary muscle. It differs in that the loop technique resuspends the anterior or posterior mitral leaflet, while the

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Central Message

Mitral repair can be complex. Applying principles from nature such as PTFE patches with neochords for length adjustment may simplify repair techniques. Thus far, however, mitral repair remains an art.

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PTFE patch always supports both leaflets at the same time (if needed, 2 patches for the whole valve attached to 2 papillary muscles). Although this principle recreates the original leaflet coaptation area, it is not clear what would happen to excessive tissue present in many prolapsing valves. The loop technique allows pulling down the posterior mitral leaflet or correcting the asymmetrical prolapse (eg, a prolapsing P2-segment is significantly larger in height than P1 or P3), providing a new zone of coaptation (a posterior curtain). The PTFE patch restores original coaptation zones, but the excessive tissue may end up moving inside the ventricle, posing a significant risk of systolic anterior motion.⁹ This problem specifically arises if an annuloplasty ring is added, and avoiding annuloplasty may be risky because durability classically depends on it.¹⁰ Finally, the need to anchor the PTFE patch to the base of the papillary muscles may be a challenge for the less-experienced mitral surgeon.

Nevertheless, the new patch deserves its chance in clinical practice. With that step, the art of mitral valve repair receives a new tool, and by applying it, we have learned a valuable lesson from nature. Chawla and colleagues⁷ should be thanked for it.

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