Commentary: Imagination is more important than knowledge

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Dr Machaidze and colleagues¹ should be commended on this work regarding cutting-edge optical visualization technology, because such innovation has played a critical role in the advancement of cardiac surgery. Although off-pump artificial chordae tendineae (ACT) implantation under transesophageal echocardiographic guidance is being performed with increasing frequency,^{2,3} this strategy denies the surgeon precise visualization of the mitral valve leaflets, illuminating the clinical need for the endoscopic visualization device presented by the authors. Historically, development of new technologies in cardiac surgery has been in response to a specific clinical demand, but this optical technology may have implications reaching far beyond ACT implantation.

In his classic anthropological book “Guns, Germs, and Steel: The Fates of Human Societies,”⁴ Pulitzer Prize winner Jared Diamond asserts that “many or most inventions were developed by people driven by curiosity or by a love of tinkering, in the absence of any initial demand for the product they had in mind. Once a device had been invented, the inventor then had to find an application for it. Only after it had been in use for a considerable time did consumers come to feel that they ‘needed’ it.” Certainly, this perspective is consistent with many of humankind’s most impactful technologies, including the internet and global positioning satellites, which were both repurposed from their original motivation for development.

Machaidze and colleagues¹ performed ex vivo mechanical testing of the delivery device and novel “T-bar” anchors, demonstrating that their delivered ACT could withstand approximately 3.8 Newtons of force before tearing the valve leaflet, which significantly exceeds the physiologic forces (<0.5 Newtons) measured in both ACT and native chordae. Additionally, they demonstrated ACT delivery into the desired segment of both anterior and posterior leaflets in 13 of 14 in vivo attempts, indicating

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Central Message

The true value of the optical technology in this ACT delivery system is its potential application for additional endoscopic and catheter-based procedures.

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that this visualization device may be a useful adjunctive technology. However, the true value of this technology is the direct visualization of catheter-tissue contact, which could be applied more broadly to other endoscopic and catheter-based procedures. The authors mention the placement of clips to mimic the Alfieri stitch, but this technology may have additional applications for paravalvular leaks, atrial septal defects, and extra-cardiac vascular procedures.

Ultimately, the authors successfully demonstrate proof of concept for this ACT delivery device, but the question of whether this device is superior to currently available technology is premature. Before that determination, the device would need to be adopted by other surgeons and equivalent long-term outcomes would need to be verified. However, the true value of this technology is likely to be found in applying this direct visualization technology for additional endoscopic and catheter-based applications. As stated by Albert Einstein, “Imagination is more important than knowledge. For knowledge is limited, whereas imagination embraces the entire world, stimulating progress, giving birth to evolution. It is, strictly speaking, a real factor in scientific research.”⁵

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