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High-fidelity minimally invasive mitral valve repair simulator

## High-fidelity minimally invasive mitral valve repair simulator

Mitral valve repair is one of the most complicated and difficult procedures in cardiac surgery due to the complexity of the mitral valve and diversity of its pathology. Performing mitral valve repair through minimally invasive techniques (whether endoscopically, through direct vision, or with robotic-assistance) is even more difficult.

Minimally invasive mitral valve repair (MIMVR) has been shown to be effective and beneficial for patients, but the application of this technique has been concentrated in high-volume centers and in the hands of a limited number of surgeons. Dexterity in open surgery is insufficient for starting a MIMVR, as a new dexterity must be developed. The most critical technical steps are working with long-shafted instruments endoscopically and placing sutures on the mitral valve annulus. Therefore, the learning curve of MIMVR is steep and unfortunately still developed in patients.



Dr. Peyman Sardari Nia, a cardiothoracic surgeon from Maastricht, has developed and designed a minimally invasive mitral valve repair simulator with the help of the engineering department (IDEE – Instrument Development Engineering & Evaluation) at the Maastricht University Medical Center+ (Maastricht UMC+), the Netherlands. This simulator will enable residents, fellows, and surgeons to develop skills in MIMVR, and practice those skills endlessly. These simulators were successfully tested for the first time during the EACTS course, Minimally Invasive Techniques in Adult Cardiac Surgery, held in Maastricht during June 2014.

## **Characteristics of the simulator**

- **1.** The simulator can be used for the following surgical approaches:
  - MIMVR endoscopically
  - MIMVR through direct vision
  - MIMVR with robotic-assistance using the available ports
- Conventional mitral valve repair by opening the thorax
- **2.** The mitral valve component is disposable and developed from special material that mimics the tissue characteristics of the mitral valve so that a true suturing experience can be created
- **3.** The simulator gives feedback about the exact depth and length of each suture.
- 4. The simulator provides a picture of each suture.
- **5.** The depth and length of each suture attempt can be pre-setted and the simulator will provide feedback about the suture attempt with regard to pre-setted values.
- **6.** The disposable papillary muscles for suturing the neochordae are available.
- **7.** The disposable mitral valve can theoretically be replaced by a 3D-printed mitral valve of an individual patient for pre-operative practice and pre-planning of complex mitral valve repair.



## CE marking and production

CE marking has been granted and the simulator will be ready for surgeons and centers to order in October 2014. The simulator is currently available at EM-TRAC in Maastricht (European Medical TRAining Center). For further information please visit the EM-TRAC website (www.em-trac.org).