

Robotic Training in Cardiothoracic Surgery

To the Editor:

In 1961, President Kennedy challenged the nation to undertake one of the most audacious goals in the history of humankind. Less than a decade later, a human stepped on the surface of the moon. Indeed, the series of methodical steps that resulted in "one giant leap for mankind" represents a blueprint for achieving the most audacious feats in science.

In many aspects, cardiac and thoracic surgeons that consider adopting surgical robotics into their practices face challenges that are analogous to those of President Kennedy. This task has been formidable. Of nearly 400 surgeons who have trained in robotics, fewer than 30 have developed sustainable programs. It is becoming increasingly clear that the high failure rate of robotics has been the result of suboptimal training. Clearly, cardiothoracic surgeons need to assume a position of leadership in determining the direction and methods for training.

In retrospect, it seems self-evident that the path of industry-sponsored training of surgeons in this highly complicated nascent field was not going to be successful. The training curriculum from industry emphasizes maneuvering the robot and port placement, leaving training for the actual surgical procedure to the discretion of the surgeon. Clearly this approach plays a key role in the slow pace of the adoption of robotic technology and the public's increasingly poor perception of this field.

As early adopters of this technology, we have performed more than 2,000 robotic procedures and have published compelling data regarding the potential advantages, the efficacy, and cost of robotics in this publication and other peer-reviewed journals. We believe that we are in a unique position to comment on the state of training in robotic surgery. At our institution, we have instituted a program of mentorship by senior experienced surgeons who teach specific procedures on human cadavers in a simulated operating room. This program consists of three specific programs for resident surgeons, young surgeons, and experienced surgeons. It begins with the teaching of procedures using the robot to the surgeon and their operating room team. After mastering the surgical procedure, the surgeons are instructed in port placement and other complex technological aspects of robotics. In addition, our training emphasizes the managerial responsibilities that accompany the sometimes dramatic effects that this type of program can have on an organization.

We believe that cardiothoracic surgeons should begin a dialogue within the structure of our organizations with the singular purpose of designing a curriculum for training surgeons at different stages in their careers. In partnership with industry, such a curriculum can be implemented in institutions across the United States. Undoubtedly, such leadership by cardiothoracic surgeons will enable a series of small steps that can culminate in the final goal of incorporating robotics in a safe and efficacious manner and be in keeping with the highest standards of our field.

Robert Poston, MD
Farid Gharagozloo, MD
Zain Khalpey, MD, PhD
Samuel Kim, MD

Division of Cardiothoracic Surgery
University of Arizona Medical Center
1501 N Campbell Ave, Ste 4302
PO Box 245071
Tucson, AZ 85724-5071
e-mail: fgharagozloo@surgeary.arizona.edu

TachoSil to Prevent Postoperative Pericardial Adhesions

To the Editor:

We read with great interest the article by Cannata and colleagues [1]. As rightly outlined in this remarkable review of the literature, multiple approaches to prevent or to decrease postcardiotomy pericardial adhesions have been proposed, ranging from simple pericardial closure to the placement of bioresorbable membrane or nonresorbable barriers to more imaginative solutions such as vodka and pericardial instillation of melatonin. None of the proposed solutions gained widespread clinical acceptance; therefore, reduction in pericardial adhesion formation is still a greatly researched issue in cardiac surgery, and the investigation for the ideal solution continues.

Apart from its hemostatic and aerostatic properties of TachoSil, Kuschel and colleagues [2] have recently verified an additional benefit for using it in a human fibrinogen-thrombin patch in cardiac surgery. As assessed using a macroscopic grading scale, they demonstrated in a rabbit study comparing TachoSil with Gore-Tex that the fibrinogen-thrombin patch significantly reduced macroscopic pericardial adhesions after 6 months of implantation. Moreover, the limited retrosternal adhesions present in the TachoSil group were much less tenacious; to some extent this is due to the rapid mesothelial recovery induced by TachoSil. Another possible explanation is the reduction of intrapericardial blood loss because of its hemostatic properties. This bioabsorbable patch barrier has shown promising results when used in several regions of the human body [3]. Prevention of postoperative pleural adhesions was evaluated in another experimental animal model by Getman and colleagues [4]. After microscopical evaluation, they concluded that TachoSil completely prevented the development of pleural adhesions up to 6 weeks.

Based on the study by Kuschel and colleagues [2], TachoSil should be added to the list of resorbable pericardial substitutes used in the prevention of postoperative adhesions in order to make sternal reentry safer by significantly reducing the risk of injuring the heart, the grafts, or the great vessels. TachoSil was effective in the prevention of pericardial [2] and pleural adhesions [4] in small animal studies. Additional studies in humans are warranted to validate the efficacy of the TachoSil as an antiadhesion agent in the pericardial space.

Jamil Hajj-Chahine, MD
Christophe Jayle, MD, PhD
Jacques Tomasi, MD
Pierre Corbi, MD, PhD

Department of Cardiothoracic Surgery
University Hospital of Poitiers
2 Rue de la Milétrie
86021 Poitiers cedex, France
e-mail: jamilhajjchahine@yahoo.fr

References

1. Cannata A, Petrella D, Russo CF, et al. Postsurgical intra-pericardial adhesions: mechanisms of formation and prevention. *Ann Thorac Surg* 2013;95:1818–26.
2. Kuschel TJ, Gruszka A, Hermanns-Sachweh B, et al. Prevention of postoperative pericardial adhesions with TachoSil. *Ann Thorac Surg* 2013;95:183–8.
3. Rickenbacher A, Breitenstein S, Lesurtel M, Frilling A. Efficacy of TachoSil a fibrin-based haemostat in different fields of

- surgery—a systematic review. *Expert Opin Biol Ther* 2009;9:897–907.
4. Getman V, Devyatko E, Wolner E, Aharinejad S, Mueller MR. Fleece bound sealing prevents pleural adhesions. *Interact Cardiovasc Thorac Surg* 2006;5:243–6.

Reply

To the Editor:

We thank Hajj-Chahine and colleagues [1] for their interest in our recent review about the mechanisms of formation of postoperative intrapericardial adhesions and their prevention [2]. Their letter gives us the opportunity to discuss an interesting article from Kuschel and colleagues [3]. We could not quote this article because it had been published electronically when our paper was already under review. After an experimental study on rabbits, Kuschel and colleagues [3] suggested that TachoSil was effective in the prevention of pericardial adhesions. In our opinion, such a conclusion deserves some comments. First, TachoSil was compared with a physical barrier, like Gore-Tex, not with a sealant, like polyethylene glycol, or with hyaluronic acid membrane. It is well known that Gore-Tex, albeit quite effective as a barrier to protect the heart, does not prevent intrapericardial adhesions [2]. Indeed, it induces a strong fibrotic reaction on epicardial surfaces. A similar finding was observed also in the study from Kuschel and colleagues [3]. Therefore, it is unsurprising that TachoSil showed superior efficacy in comparison with Gore-Tex for prevention of adhesions. Nevertheless, significantly fewer and less dense adhesions were observed in the retrosternal region after the application of TachoSil than in control subjects with an uncovered pericardial defect. Moreover, TachoSil is composed of equine collagen and human fibrinogen and thrombin, and the risk of anaphylactic reaction and transmission of infectious diseases cannot be understated. This is a potential disadvantage compared with other more biologically inert means to prevent adhesions, such as polyethylene glycol and hyaluronic acid. Finally, TachoSil persists at 6 weeks and disappears at 12 weeks [4], whereas hyaluronic acid and polyethylene glycol are completely resorbed within 1 and 4 weeks from application, respectively. It is unknown whether reoperations performed within a few months from the first procedure could be complicated because of the longer persistence of TachoSil. In conclusion, the encouraging results about the efficacy of TachoSil should be confirmed by comparison with other products with well-proven efficacy in the prevention of intrapericardial adhesions, such as polyethylene glycol and hyaluronic acid.

Aldo Cannata, MD
Luigi Martinelli, MD

Department of Cardiac Surgery
Niguarda Ca' Granda Hospital
P.zza Ospedale Maggiore, 3
20162 Milan, Italy
e-mail: aldo.cannata@ospedaleniguarda.it

References

1. Hajj-Chahine J, Jayle C, Tomasi J, Corbi P. TachoSil to prevent postoperative pericardial adhesions (letter). *Ann Thorac Surg* 2014;97:378–9.
2. Cannata A, Petrella D, Russo CF, et al. Postsurgical intrapericardial adhesions: mechanisms of formation and prevention. *Ann Thorac Surg* 2013;95:1818–26.

3. Kuschel TJ, Gruszka A, Hermanns-Sachweh B, et al. Prevention of postoperative pericardial adhesions with TachoSil. *Ann Thorac Surg* 2013;95:183–8.
4. Getman V, Devyatko E, Wolner E, Aharinejad S, Mueller MR. Fleece bound sealing prevents pleural adhesions. *Interact Cardiovasc Thorac Surg* 2006;5:243–6.

Correction of Anterior Leaflet Prolapse

To the Editor:

While reviewing an article for repair of anterior leaflet prolapse, I came across the article by Fundaró and colleagues [1]. In this article, the authors claim the technique as a personal technique used by them in 47 patients. This technique of chordal shortening at cusp level was originally published by us in 1992 [2]. In fact, the figure 1 of Fundaró's article describes exactly the same technique we have used. We also published long-term results in 226 patients in 2004 [3]. It is quite surprising that the authors have not searched the English-language literature before claiming the technique as a personal one. The technique was first described by Frater [4] in experimental animals and later by us in our clinical experience.

Arkalgud Sampathkumar, MCh

Pushpanjali Crosslay Hospital
W3 sector 1, Vaishali, Ghaziabad, NCR, UP 201012, India
e-mail: asampath_kumar@hotmail.com

References

1. Fundaró P, Moneta A, Villa E, et al. Chordal plication and free edge remodeling for mitral anterior leaflet prolapse repair: 8-year follow-up. *Ann Thorac Surg* 2001;72:1515–9.
2. Kumar AS, Bhan A, Kumar RV, Shrivastava S, Sood AK, Gopinath N. Cusp level chordal shortening for rheumatic mitral regurgitation. *Texas Heart Inst J* 1992;19:47–50.
3. Murala JSK, Kumar AS. Long-term results of cusp level chordal shortening for anterior mitral leaflet prolapse. *Texas Heart Inst J* 2004;31:246–50.
4. Frater RWM. Mitral valvuloplasty. In: Roberts AJ, Conti CR, eds. *Current Surgery of the Heart*. Philadelphia, PA: Lippincott; 1987:62–77.

Activated T Cells, but Not Lung Tumor Cells, Express Fas Ligand

To the Editor:

We read with great interest the recent article by Lin and colleagues [1] in which they conclude that lung cancer cells express Fas ligand (FasL) and induce death of tumor-infiltrating lymphocytes (TILs). However, reports not discussed in this study show that lung cancer cells from resected tissue, malignant pleural effusions, and cell lines do not express FasL [2, 3]. TILs rather than tumor cells express FasL [2].

Regarding the study of Lin and colleagues [1], some technical concerns should be addressed. It is unclear whether NOK-1 antibody, which is not suitable for Western blot, was used for analyzing the expression of FasL in cell lysates. Primary tumor cultures might contain FasL-expressing stroma cells, which would be responsible for bystander TILs death and reduce cytotoxic activity of TILs against tumor cells. Lin and colleagues, using a procedure previously reported by us for apoptosis detection [3], report that A549 cells induce FasL-mediated