strengthens the original submission, and I am grateful for their efforts.

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The return of the coronary stapler: Will a new technique overcome an old obstacle?

To the Editor:

I read with greatest interest the recent article by Dr Suyker and colleagues.¹ The authors used a circular coronary stapler to perform an end-to-side left internal thoracic artery (LITA)-to-left anterior descending artery (LAD) anastomosis in 10 pigs. The procedure was performed on the beating heart through a partial median sternotomy. Patency of the anastomoses was confirmed by means of postmortem angiography, and histomorphologic evaluation performed at 5 weeks after the operation showed a normal healing response.

A few comments seem to be appropriate and of interest to the readership of the Journal. The clinical use of circular coronary stapling has a short yet fascinating history.² Vladimir P. Demikhov (1916-1998) used the coronary stapling device in the early 1950s to make LITA-to-LAD end-to-end anastomoses in dogs and cadavers.³ On the basis of Demikhov's experiments, Vasilii I. Kolesov (1904-1992) first clinically applied the coronary vascular stapler (VCA-4) on March 22, 1967, when he constructed an end-to-end anastomosis between the LITA and LAD in a 52-year-old man with class IV angina.⁴ Three years later, the patient remained free of angina. Kolesov subsequently used modified staplers with prolonged bushing (Figure 1, A) and vacuum suction to hold the LITA wall while the stapling was performed (US patent 4,350,160 of September 21, 1982).² The coronary angiography performed almost 4 years after the operation with this vacuum-facilitated stapler demonstrated patent end-to-end anastomosis (Figure 1, B). Thus it has already been demonstrated that coronary stapling can be successfully applied clinically. There were 3 main ob-

Figure 1. A, Vascular circular stapler with prolonged bushing (VCA-PB) applied by V. I. Kolesov and E. V. Kolesov in coronary surgery: 1, coronary artery; 2, internal thoracic artery; 3, incision in the coronary artery; 4, bushing; and 5, prolonged bushing. From Kolesov VI. *The Surgery of Coronary Arteries of the Heart*. Leningrad: Meditsina Publishing; 1977. p. 163. B, Angiogram done in the late 1960s demonstrating patent end-to-end anastomosis (arrow) applied by vacuum-facilitated stapler 3 years and 7 months after the operation. Courtesy of Dr Evgenii V. Kolesov.

stacles that precluded the use of coronary staplers in the early era of coronary surgery.

First, it was easier and faster to perform the anastomosis by hand either with or without cardiopulmonary bypass. The modern demands of achieving minimally invasive coronary surgery through ever-shrinking incisions reversed this. Both Kolesov's and Suyker's staplers could be adjusted to video-assisted robotic coronary surgery.

Second, it was not possible to make an end-to-side anastomosis with those early staplers. The ingenious stapler described by Dr Suyker and colleagues resolved this problem.

The third and most significant obstacle was the inability of the early staplers to bite through the heavily atherosclerotic vascular wall. They chewed on it. The Kolesov stapler overcame this obstacle in the late 1960s. It produced a perfect anastomosis in heavily atherosclerotic coronary arteries. Will the new stapler described by Dr Suyker and colleagues overcome this obstacle too?

It never ceases to amaze me how often old ideas, which seemed utterly impractical

for many years, return to life. It seems that what has been accomplished in surgery never dies but rather remains dormant for a number of years, waiting to be rediscovered. The time of robotic and minimally invasive coronary surgery has come, and the coronary staplers are evolving under the pressure of modern technology to find their new applications. Are these stapling devices here to stay this time?

Last but not least, I would like to congratulate Dr Suyker and colleagues on their fine experimental study. I am anxiously awaiting the results of their clinical experience and hope that their stapler will be more successful than its predecessors. If it can successfully bite through the atherosclerotic vascular wall, it will have an enormous effect on minimally invasive coronary surgery.

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Reply to the Editor:

We appreciate Dr Konstantinov's encouraging words and fascinating account of the early pioneering work on coronary staplers by Drs Demikhov and Kolesov. We believe that the S² connector design is about to overcome the 3 main obstacles that, according to Dr Konstantinov, to date have precluded the use of coronary staplers as invented in the 1950s and 1960s.

First, S² coronary stapling is an easier and faster bypass grafting method than suturing manually. In subsequent open-chest, beating-heart porcine studies the stapled anastomosis was constructed in 1.8 ± 0.6 (SD) minutes of coronary ischemia time after preloading the graft (1.9 ± 0.5 minutes) versus 11.8 ± 2.7 minutes of ischemia time for the sutured anastomosis ($P < .001$, unpublished observation). Experiments with the device endoscopically on the beating heart look promising for both anterior and posterior coronary arteries (unpublished observation, Paul Gründeman, MD).

Second, the S² stapler can deal with both side-to-side and end-to-side anastomoses because the latter is converted from an initially side-to-side configuration by clipping the very end of the graft. The device uses the latest micromanufacturing technology. As a result, it combines effective stapling and ease of use with minimal connector mass and minimal exposure of foreign body material to blood.

Third, the S² device is designed to stay close to basic surgical principles, which is especially important when handling atherosclerotic vessels. The staples meet the vessel walls in a standardized way, similar to how a surgeon would position his needle, and the applicator allows exerting a precise and direct force on the staples to effect

penetration. Transmitting any undue forces to the tissue is minimized to avoid trauma. Tests with human explanted hearts have shown that the system is capable of effectively dealing with severely atherosclerotic coronary arteries (unpublished observation). Clinical evaluation, however, is needed to substantiate these results and determine patency rates in human subjects.

The coronary stapler is indeed a concept that has remained dormant for almost half a century, waiting for both the proper technology and design to enable its effective implementation. Without modern manufacturing technology, the present development would have been prohibitively difficult. Whether this time coronary stapling devices are here to stay remains to be determined. Our current additional porcine data at 3 months in 20 animals (unpublished) warrant initiation of clinical evaluation.

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Value of intraoperative pleural lavage in staging non-small cell lung cancer

To the Editor:

We are pleased that our article¹ warranted an editorial and grateful to Dr D'Amico for his thoughtful comments. Unfortunately, there is a typographic error in the second paragraph stating that "only 5 of the 292 patients had pathologic stage I or II disease." Of course the denominator should be 13. Dr D'Amico mentions that our follow-up was incomplete, but in fact we accounted for all the patients in our study.

We accept the fact that the pleural lavage cytology results were positive in only 4.5% of our cases. However, this does not render the technique of no value. Other investigators have found a higher incidence of positive pleural lavage (up to 38% in one

study).² We believe that the value of a prognostic indicator should be based more on the discriminating ability of survival than on the frequency alone. In our study, positive lavage status was a more powerful predictor than TNM stage.

Central to our study was a desire to contribute to the discussion on the prognostic impact of positive pleural lavage cytology in patients who did not have a malignant pleural effusion. All patients with any macroscopic effusion were excluded from the study. The Japan Lung Cancer Society in its first English version³ states that "a positive cytologic examination of intrathoracic washings cannot be classified as T4" without further comment on the appropriate classification for this finding. The International Union Against Cancer in its TNM Supplement (a commentary on uniform use)⁴ states, when considering peritoneal lavage cytology, that "newer data suggest that the worsening of prognosis as indicated by positive lavage cytology may have been overestimated" and recommends that the addition of "cy +ve" to the T4 category and R1 classification be applied in these circumstances.

We hope that our data will inform the debate for future revisions of the TNM staging system.

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