

The techniques to improve graft patency in CABG of patients with small vessel disease especially in women : A tribute to Alexis Carrel (the father of small vessel surgery)

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Abstract

A technique to improve patency of grafts in CABG is explained. It is based on laws of physics, flow dynamics and long term experience.

Keywords: CABG, Small vessels, Women

Despite the great improvements in medical and surgical treatments, the mortality of coronary artery disease has not decreased in women.(Fig.1) According to STS database between 1994 and 1996, 28.2 percent of isolated CABGs were performed on women.

Gender differences in mortality after CABG remain controversial. However, the weight of the evidence indicates that short – term mortality is higher in women

than in men.

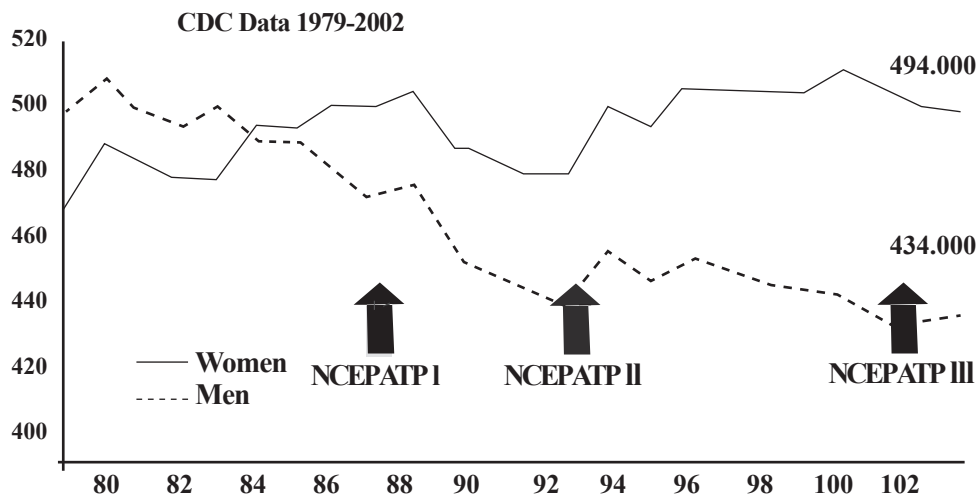
The most recent 2002 data from STS database reported an operative mortality of 3.54% in women compared with 2.15% in men(1).

The baseline characteristics of patients undergoing isolated CABG show a significantly higher incidence in women than in men of older age, emergency operations, acute coronary syndrome, angina class III or IV, stroke, heart failure, diabetes, peripheral vascular disease and systemic hypertension.

From a surgeon's point of view, the tissue of coronary arteries and the saphenous vein graft in women are generally thin and friable(2). This demands greater care in the handling of these structures at surgery and very fine suture technique.



CVD Mortality in US Women Is Not Declining



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of these factors may lead to long operative time and may result in a smaller number of bypass grafts limited to the larger vessels. The development and eventual susceptibility of a new intimal plaque to rupture after establishment of high coronary blood flow needs special attention in view of observations showing that a smaller number of grafts remain patent, for a long time, in women than in men(3). Humphries, et al have shown that after adjustment for baseline differences like age, comorbid conditions and surgical factors, women were still at increased risk of early mortality compared with men. However after adjustment for body surface area (BSA), a surrogate for vessel size, the gender difference was no longer statistically significant(4). So, it is reasonable to think that using techniques to improve patency in small vessel disease will improve outcome of CABG in female patients.

In this regard some point should be stressed: Patency of small vessels is affected by turbulent flow. In vessels with diameter of less than 4 mm flow is naturally turbulent. Turbulence increases at areas of bifurcation:

- Angles of 30-45 have less turbulence
- Angles of 75-90 have severe turbulence

Based on the pioneer works of Alexis Carrel, we propose a multisuture technique for coronary artery anastomosis and we believe there is no justification for purse – string suture.

ABCs of this technique are as follow:

- Angle of graft lays no more than 35 – 45°
- Beveled graft does not have enough tissue to keep toe angles open (fig.2)
- Cobra head or spatula shape for implanted graft should be used.

Methods (fig3):

The first suture is started at the middle of spatula and the suture is crossed and the vein or IMA approximated but not tied.

The second suture is inserted close to the first suture with taking tissue from spatula (approximated at 20° angle)

The third suture is inserted at 45°.

This process at toe level is repeated on the other side of spatula.

The two ends of initial suture are continued by over and over thechnique till the middle of anastomosis is reached.

At heel level (second suture) the process is done in the same manner till the middle of anastomosis is reached.

Then the sutures are tied at each side.

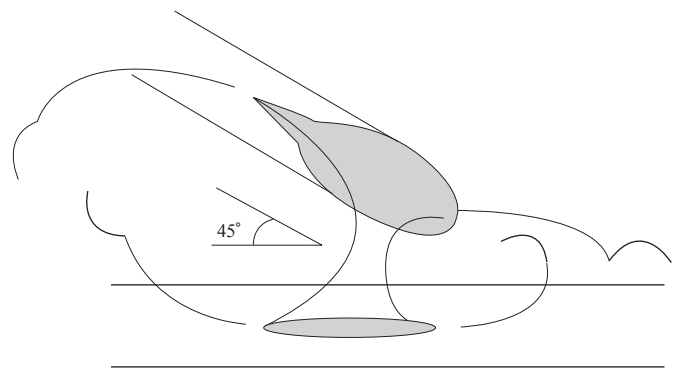
Moderate tension is used on sutures by first assistant to prevent the leakage.

Note that the length of vein or IMA opening should be 2-3 mm longer than arteriotomy.

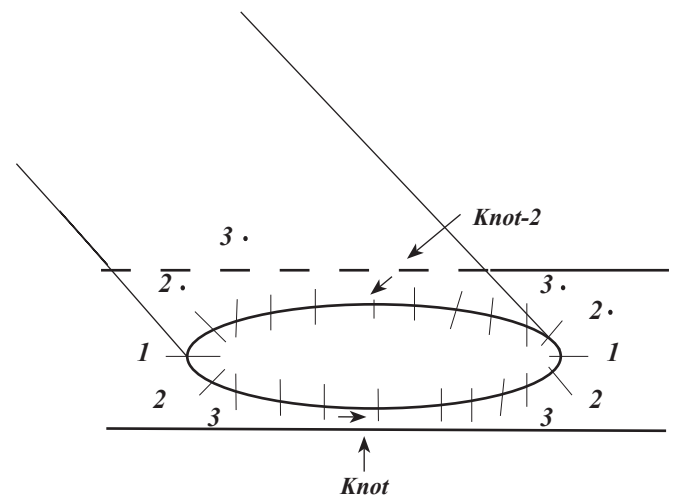
Proximal anastomosis (to aorta) should be at lesser curvature for left grafts and at greater curvature of aorta for right grafts. No anastomosis should be at anterior wall which has the greatest turbulence.

Conclusion:

The purse technique with one suture should be abandoned in CABG especially in women with small coronaries and the 2-suture method should be used



(Fig.2)



(Fig.3)

References

1. Edwards FH, Ferraris VA, Shahian DM, Peterson E, Furnary AP, Haan CK, Bridges CR. Gender-specific practice guidelines for coronary artery bypass surgery: perioperative management. *Ann Thorac Surg* 2005;79:2189-94.
2. Mickleborough LL, Carson S, Ivanov J. Gender differences in quality of distal vessels: effect on results of coronary artery bypass grafting. *J Thorac Cardiovasc Surg* 2003;126:950-8.
3. Bolooki H. The controversy in clinical results among men and women after CABG. *J Am Coll Cardiol* 2007;49:1559-60
4. Humphries KH, Gao M, Pu A, Lichtenstein S, Thompson CR. Significant improvement in short-term mortality in women undergoing coronary artery bypass surgery (1991 to 2004). *J Am Coll Cardiol* 2007;49:1552-8