

# Le “tout artériel pas si indiscutable”

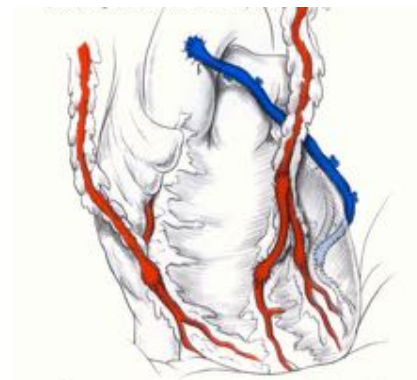
**L. Labrousse**

**Hopital Cardiologique de Haut Lévèque**

**CHU Bordeaux**



# Etat des lieux ?



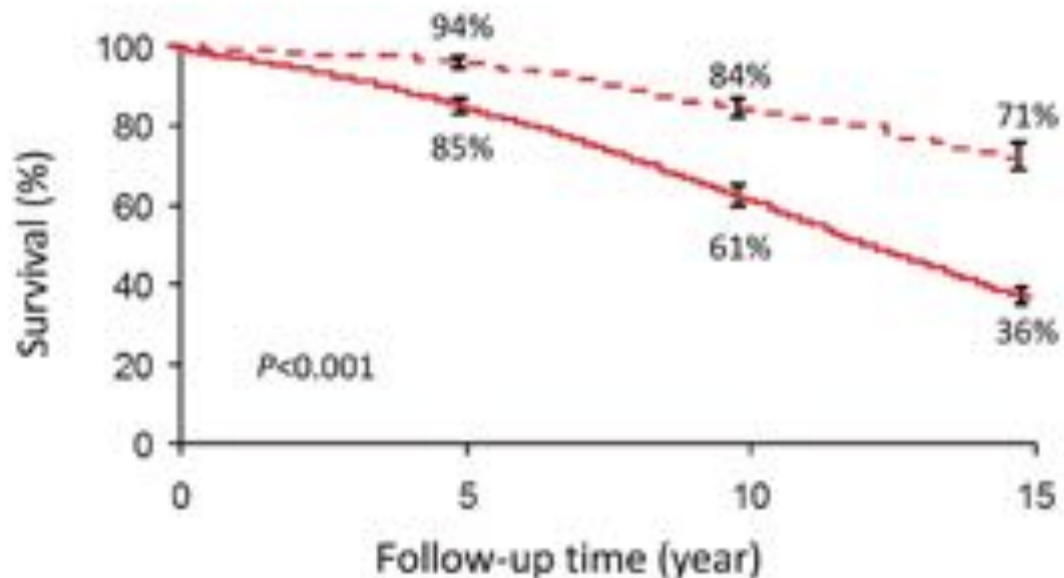
## **Multiple Arterial Grafts Improve Late Survival of Patients Undergoing Coronary Artery Bypass Graft Surgery** **Analysis of 8622 Patients With Multivessel Disease**

Chaim Locker, MD; Hartzell V. Schaff, MD; Joseph A. Dearani, MD; Lyle D. Joyce, MD, PhD;  
Soon J. Park, MD; Harold M. Burkhart, MD; Rakesh M. Suri, MD, DPhil; Kevin L. Greason, MD;  
John M. Stulak, MD; Zhuo Li, MS; Richard C. Daly, MD

**Mayo clinic – 8622 pts – 20 ans !!!**

# Etat des lieux ?

Late survival MultArt vs. LIMA/SV



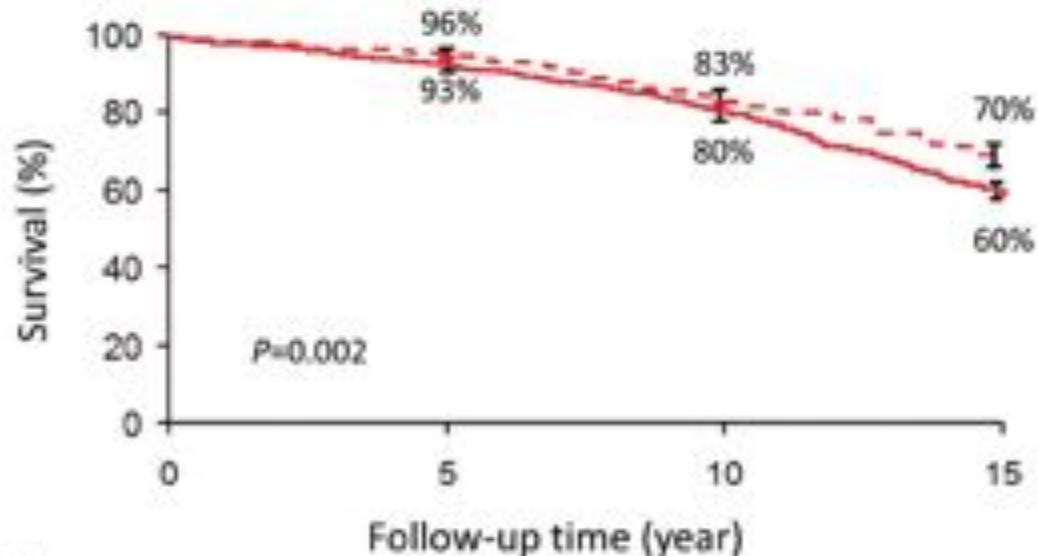
Patients at risk

|             |       |       |       |     |
|-------------|-------|-------|-------|-----|
| --- MultArt | 1,177 | 851   | 362   | 83  |
| — LIMA/SV   | 7,281 | 4,898 | 2,493 | 578 |

# Oui mais...

**Conclusions**—In patients undergoing isolated coronary artery bypass graft surgery with LIMA to left anterior descending artery, arterial grafting of the non-left anterior descending vessels conferred a survival advantage at 15 years compared with SV grafting. It is still unproven whether these results apply to higher-risk subgroups of patients. (*Circulation*. 2012;126:1023-1030.)

Late survival MultArt vs. LIMA/SV matched group



# Oui mais...

**Table 1** Patient characteristics<sup>†</sup>

| Variable                | Unmatched groups  |                   |         | Propensity score matched groups |                   |         |
|-------------------------|-------------------|-------------------|---------|---------------------------------|-------------------|---------|
|                         | LIMA/SV (n=7,435) | MultArt (n=1,187) | P value | LIMA/SV (n=1,153)               | MultArt (n=1,153) | P-value |
| Age, y                  | 68±9              | 58±9              | <0.001  | 59±10                           | 59±9              | 0.77    |
| Female sex, %           | 24.8 (23.8-35.7)  | 15.1 (13.0-17.1)  | <0.001  | 16.2 (14.1-18.4)                | 15.2 (13.1-17.3)  | 0.49    |
| BSA, m <sup>2</sup>     | 2.02±0.23         | 2.06±0.22         | <0.001  | 2.05±0.23                       | 2.05±0.22         | 0.46    |
| EF, %                   | 55±14             | 57±11             | <0.001  | 58±13                           | 58±11             | 0.77    |
| Hypertension, %         | 76.6 (75.7-77.6)  | 66.6 (64.0-69.3)  | <0.001  | 68.7 (66.0-71.4)                | 67.1 (64.4-69.8)  | 0.42    |
| Diabetes mellitus, %    | 33.5 (32.4-34.5)  | 18.1 (15.9-20.3)  | <0.001  | 19.2 (16.9-21.4)                | 18.5 (16.2-20.7)  | 0.67    |
| Chronic lung disease, % | 11.7 (10.9-12.4)  | 7.0 (5.5-8.4)     | <0.001  | 7.5 (5.9-9.0)                   | 7.0 (5.6-8.5)     | 0.68    |
| Renal failure, %        | 5.4 (4.9-5.9)     | 1.9 (1.2-2.3)     | <0.001  | 1.9 (1.1-2.7)                   | 2.0 (1.1-2.8)     | 0.88    |
| PVD, %                  | 21.5 (20.6-22.4)  | 13.2 (11.3-15.2)  | <0.001  | 14.8 (12.8-16.9)                | 13.5 (11.6-15.5)  | 0.37    |
| S/P MI, %               | 47.1 (45.9-48.1)  | 36.5 (33.7-39.1)  | <0.001  | 38.1 (35.3-45.9)                | 36.8 (34.0-39.6)  | 0.52    |
| S/P CVA, %              | 7.1 (6.5-7.7)     | 4.0 (2.9-5.2)     | <0.001  | 4.5 (3.3-5.7)                   | 4.1 (2.9-5.2)     | 0.60    |

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# Pourquoi pas deux mammaires systématiquement?

- Longueur du prélèvement 30min/greffon
- Risque septique et de désunion sternal





# Pourquoi pas deux mammaires systématiquement?

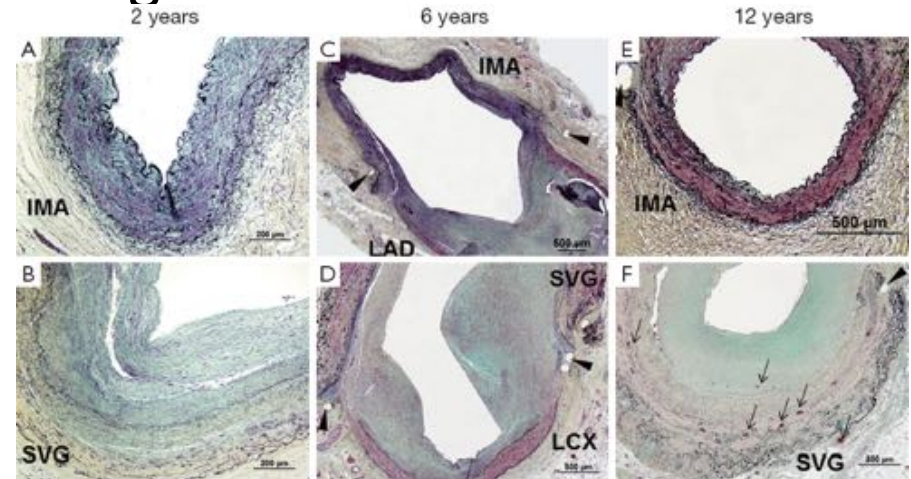
- Longueur du prélèvement 30min/greffon
- Risque septique et de désunion sternal
  - Mortalité (>10%)
  - Morbidité
    - Septique
    - douleur chronique ++++
    - suppuration chronique
  - Facteurs de risque
    - Obésité – Diabète – BPCO – ATCD d'irradiation

# Vive la sciences !

- Altérations cellules endothéliales
  - Perte cellulaire focale
    - Moindre production de NO...
- Fibrose-prolifération médiale et intimale
  - CML+++ -protéoglycane-collagène

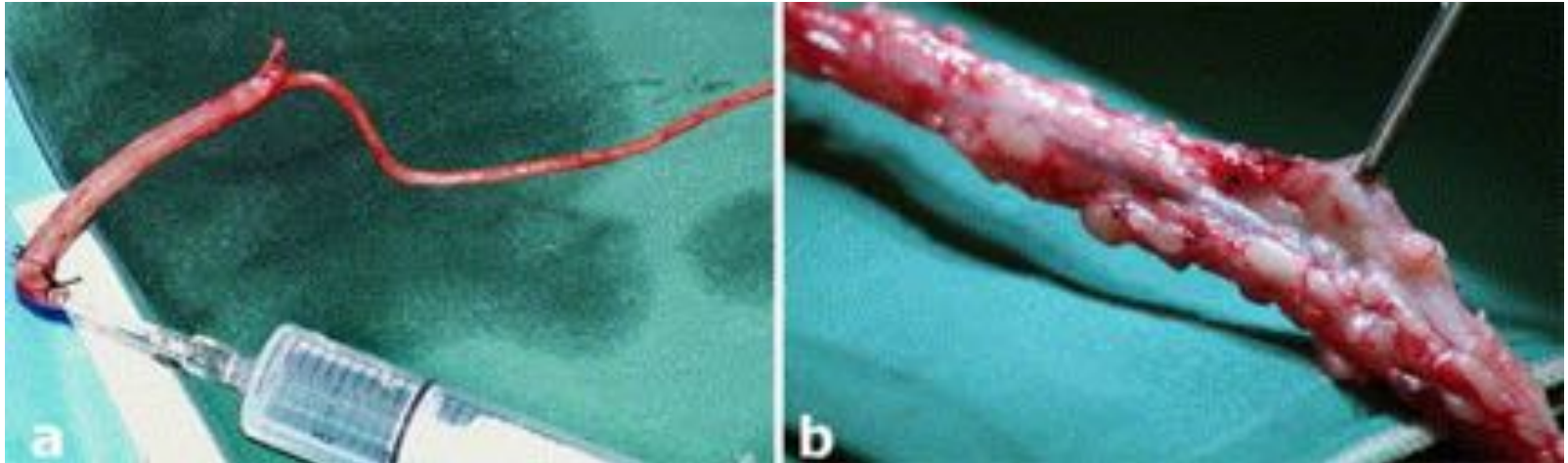


Athérosclérose accélérée



# Améliorer le prélèvement?

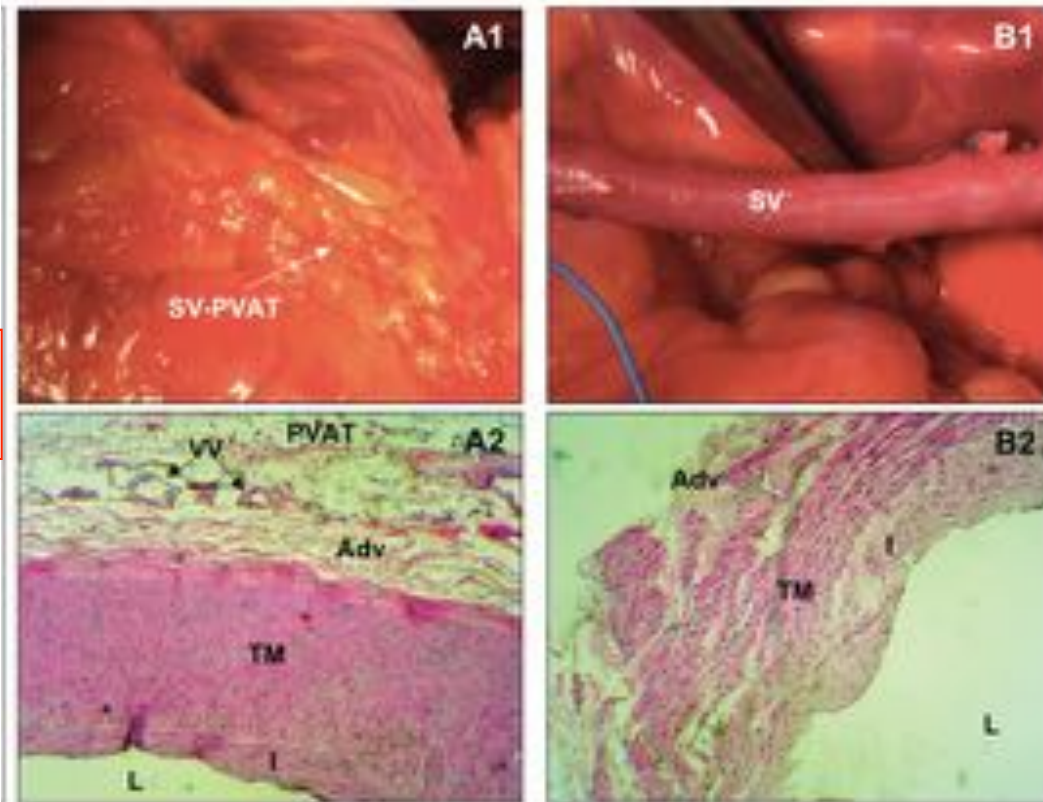
- “No-touch”



Pas d'inflation forcée – Préservation tissu environnant  
Préservation per-opératoire “optimale”

# Améliorer le prélèvement ?

## Peri-vascular leptin levels and activity



Intact adventitial collagen layers

Endothelial integrity

Increase in the total area of vasa vasorum

Elevated endothelial nitric oxide synthase expression and activity

From Kopjar et al. *Braz J Cardiovasc Surg.* 2016.31(6):461-464

From Cepehrpour et al. *Interact Cardiovasc Thorac Surg.* 2011 Dec;13(6):626-30

# Améliorer le prélèvement?

- “No-touch”



# Améliorer le prélèvement?

- “No-touch” : résultats

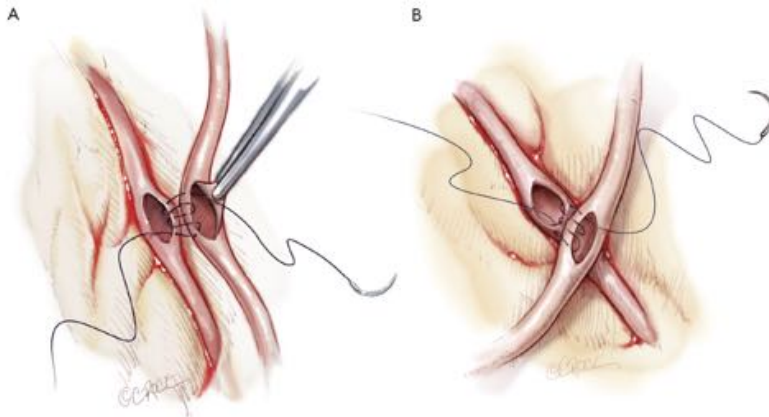
|                | Conventional  |              | "No touch"    |              | difference* |           |
|----------------|---------------|--------------|---------------|--------------|-------------|-----------|
|                | 18 months     | 8.5 years    | 18 months     | 8.5 years    | 18 months   | 8.5 years |
| No of patients | 46            | 37           | 45            | 37           | 91          | 74        |
| Graft type:    |               |              |               |              |             |           |
| Single         | 95/107 (89%)  | 67/87 (77%)  | 103/109 (94%) | 77/87 (89%)  | .15         | .07       |
| Sequential     | 18/20 (90%)   | 10/14 (71%)  | 15/15 (100%)  | 14/14 (100%) | .50         | .10       |
| Total          | 113/127 (89%) | 77/101 (76%) | 118/124 (95%) | 91/101 (90%) | .10         | .01       |

\*Fisher exact test.

- Peu de généralisation de cette technique...

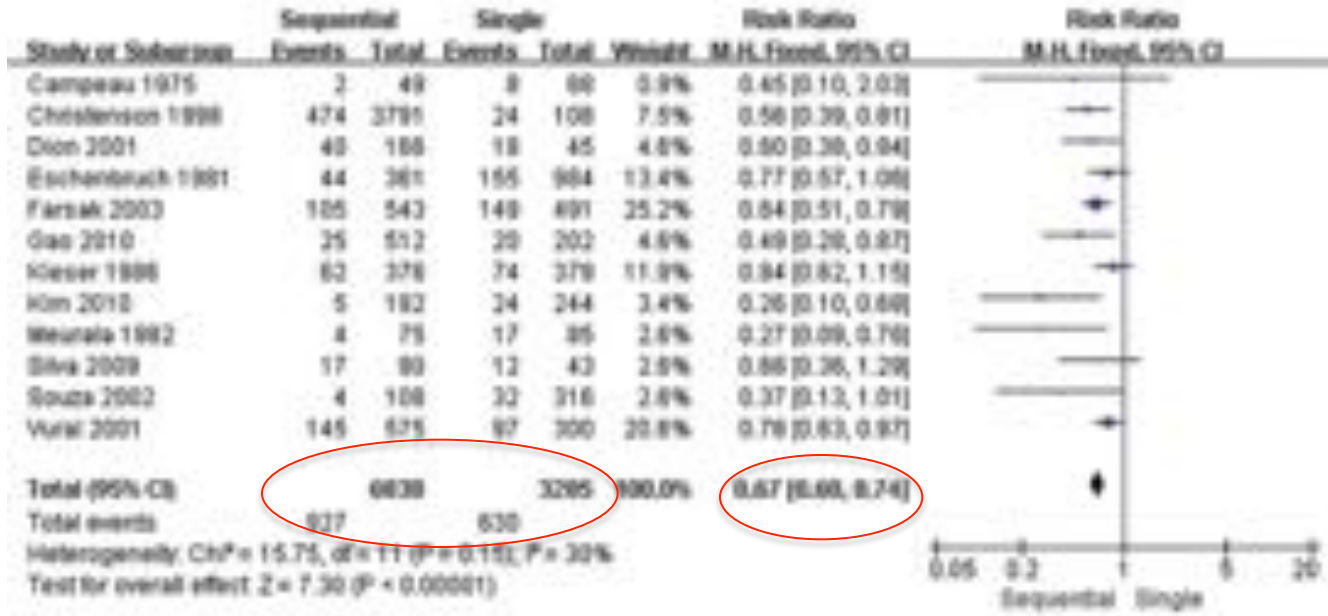
# Améliorer les anastomoses?

- Séquentielle vs individuelle
  - Buts :
    - Augmenter le débit
    - Diminuer la résistance
    - Diminuer la thrombose du greffon



# Améliorer les anastomoses?

- Séquentielle vs individuelle : méta-analyse\*
  - Résultats globaux

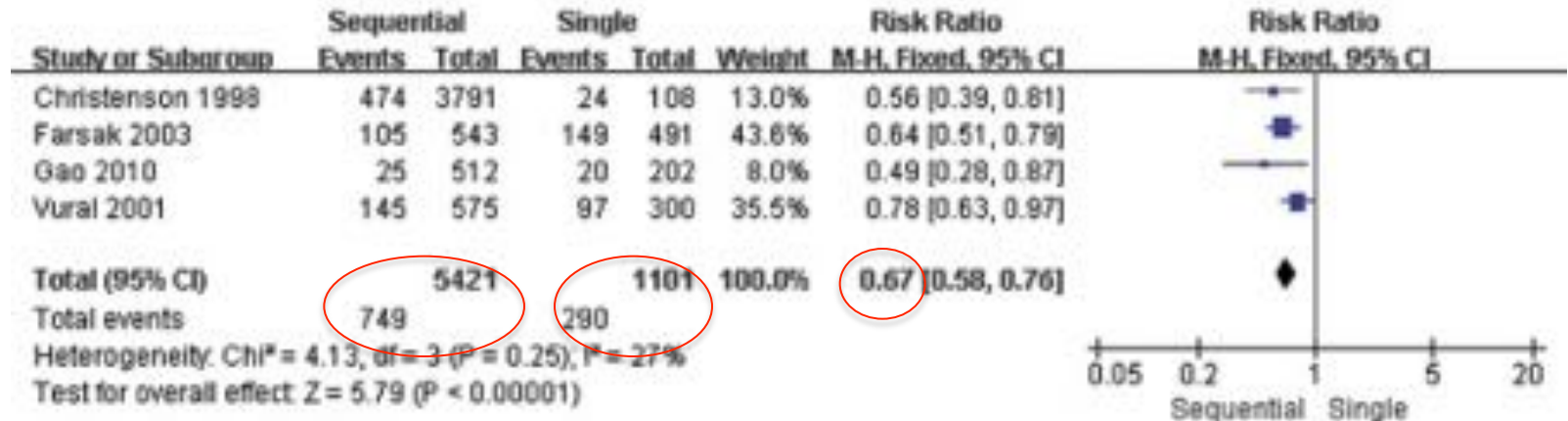


\* : From Li et al. Ann Thorac Surg 2011;92:1292-8



# Améliorer les anastomoses?

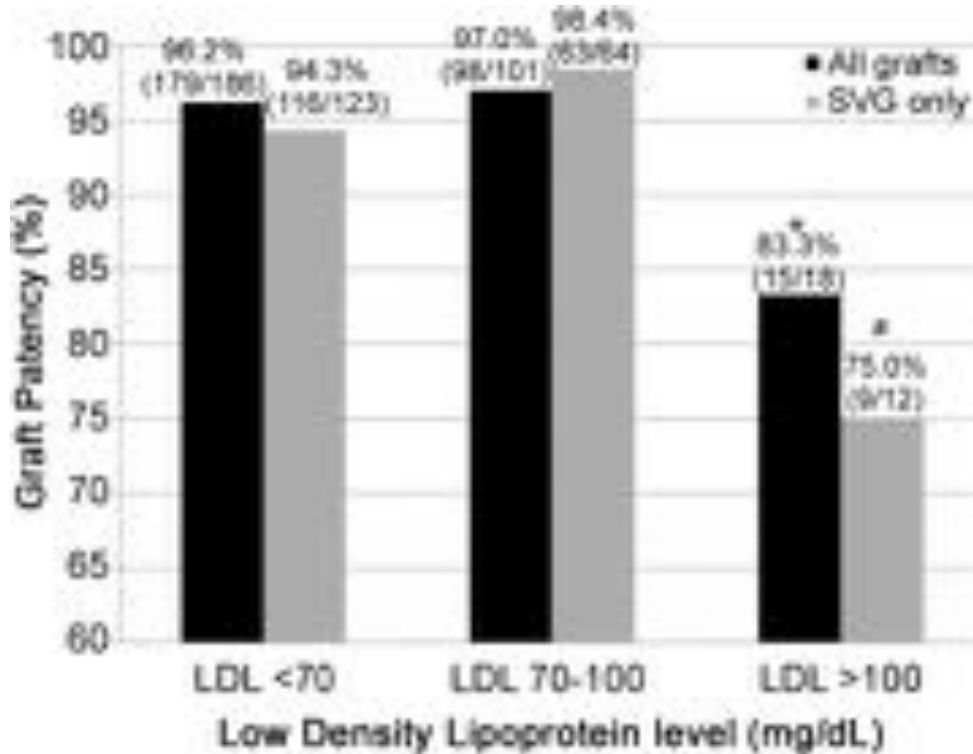
- Séquentielle vs individuelle : méta-analyse\*
  - Résultats études “population matchées”



\* : From Li et al. Ann Thorac Surg 2011;92:1292-8

# Améliorer le post-opératoire?

- CASCADE Trial : perméabilité / greffon



STATINE +++  
Double anti  
agrégation +/-

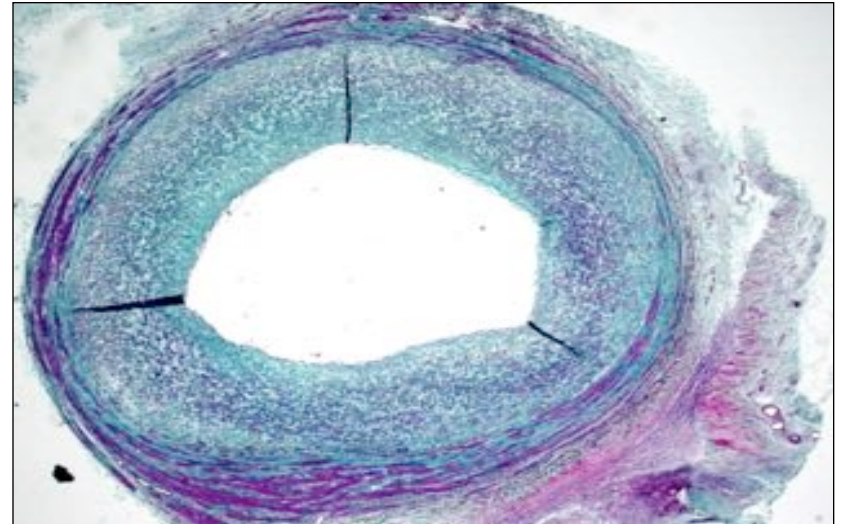
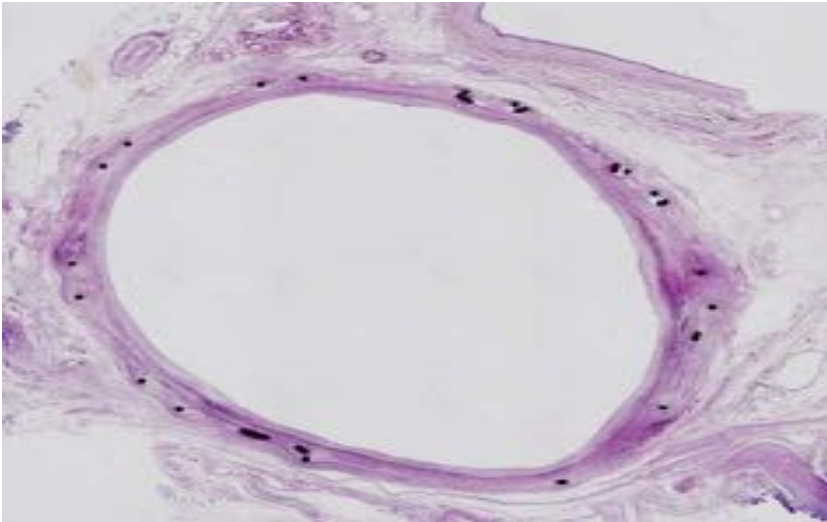
# Améliorer le greffon – le futur ?

- “Supporter” le greffon :
  - emesh (Kibsbay©-USA)
  - Vascular Graft Solution (VGS© –USA)



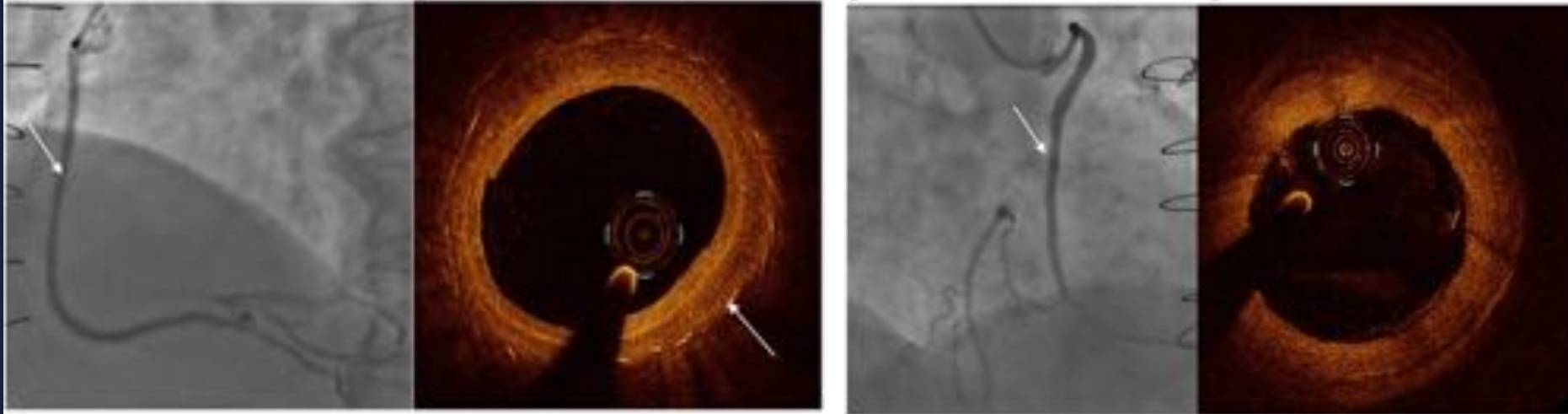
# Améliorer le greffon – le futur?

- “Supporter” le greffon :
  - But : réduire la réaction athérogénique



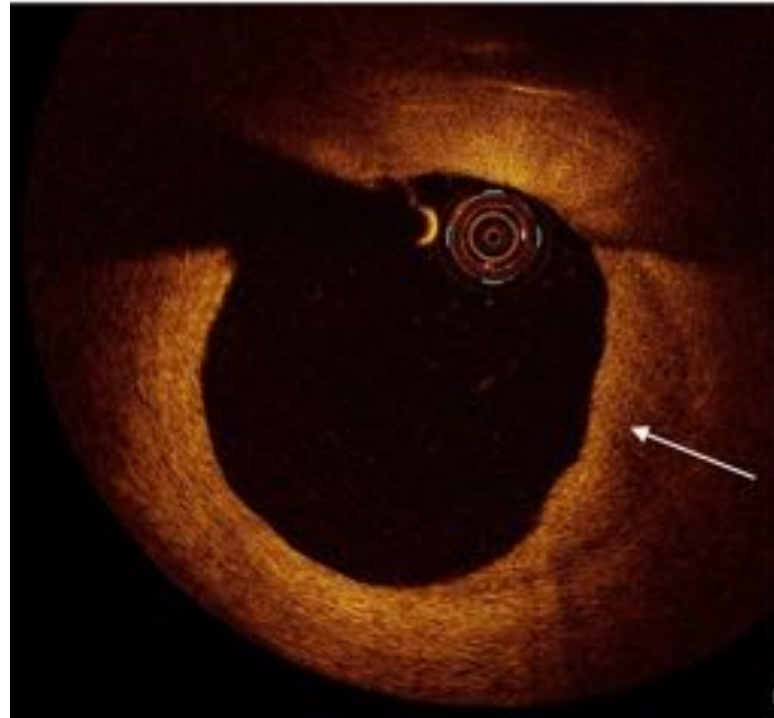
# Améliorer le greffon – le futur ?

- “Supporter” le greffon : Etude en OCT (1an)
  - 23 “stentés” vs 20 “non stentés”



# Améliorer le greffon – le futur?

- “Supporter” le greffon : Etude en OCT (1an)
  - Thrombus :
    - Stenté n = 0/20
    - Non stenté : n=3/23



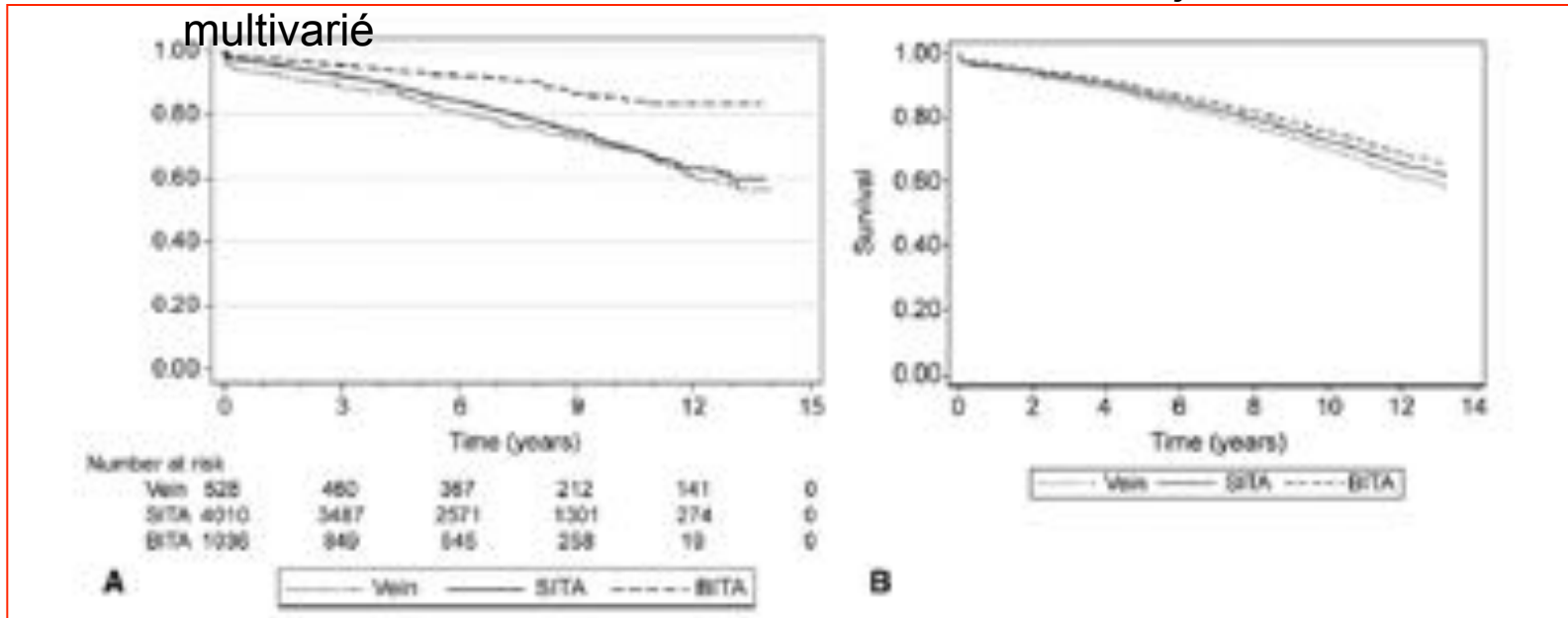
# Et l'age ?

- Etude de cohorte
  - 5601 pts
    - 1038 : BIMA
    - 4029 : SIMA + VS
    - 534 : VS
  - Cox model analysis : analyse de survie

# Et l'age ?

Courbe Kaplan-Meier

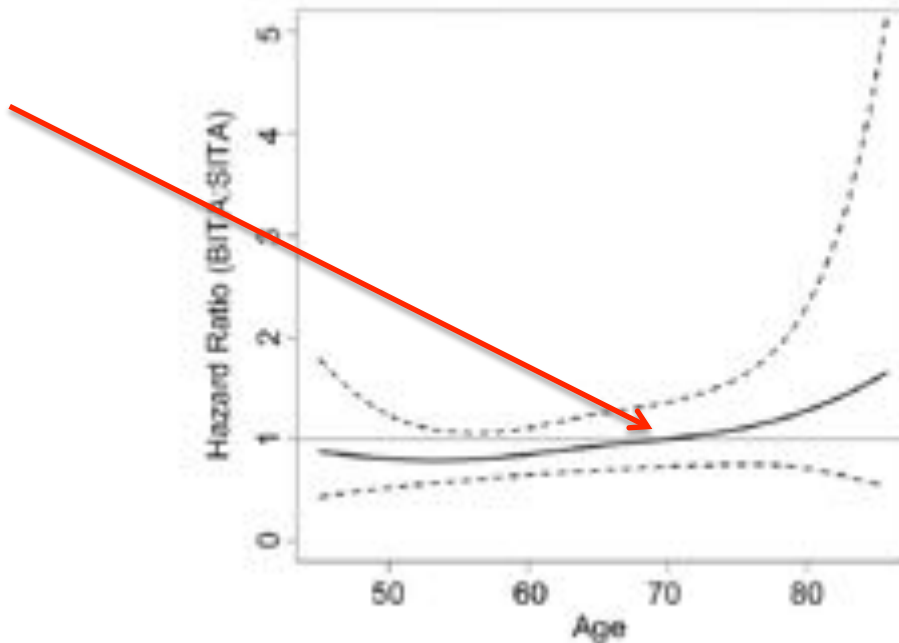
Cox modèle avec  
ajustement





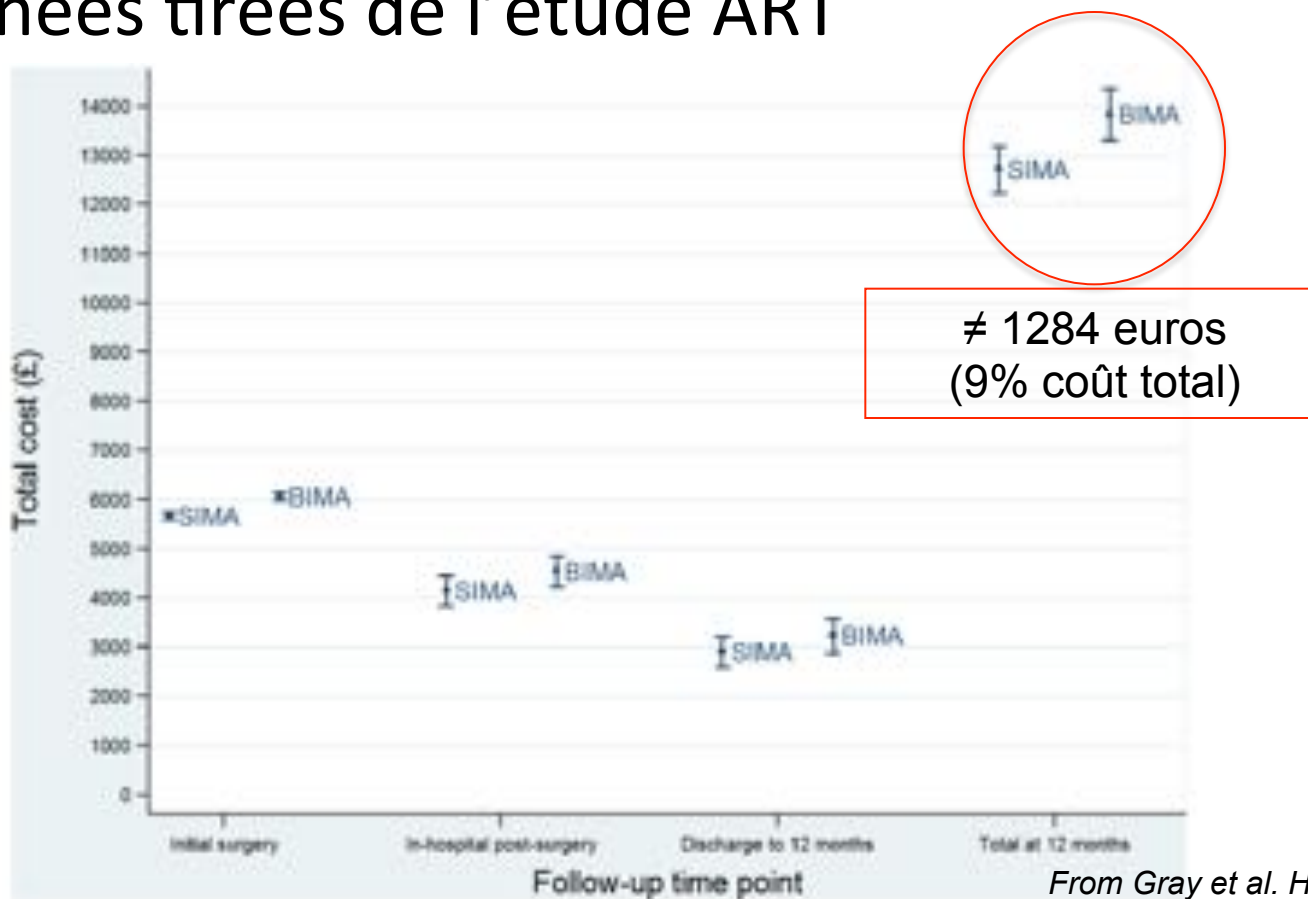
# Et l'âge ?

- **Conclusion :** Relation du hazard ratio bi vs uni mammaire en fonction de l'âge



# Et le prix ?

- Données tirées de l'étude ART



# Enfin la solution!?

THE NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

## Randomized Trial of Bilateral versus Single Internal-Thoracic-Artery Grafts

David P. Taggart, M.D., Ph.D., Douglas G. Altman, D.Sc., Alastair M. Gray, Ph.D.,  
Belinda Lees, Ph.D., Stephen Gerry, M.Sc., Umberto Benedetto, M.D.,  
and Marcus Flather, M.B., B.S., for the ART Investigators\*

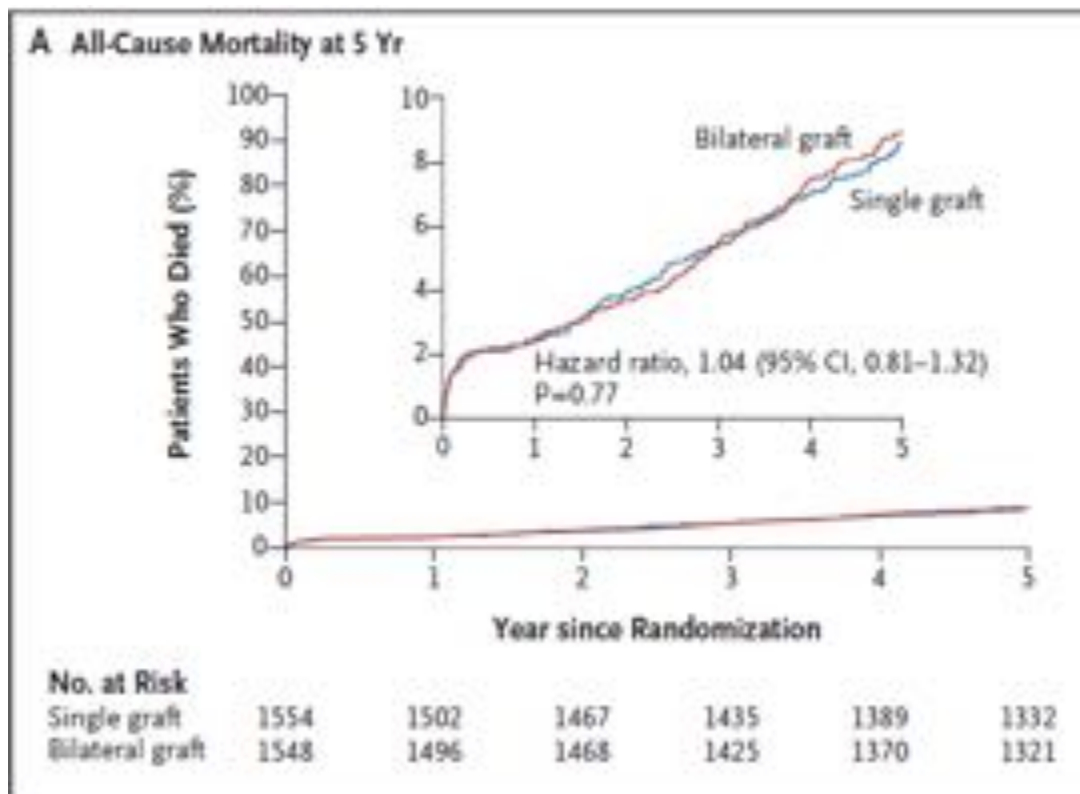
Randomization 3102 pts : 1554 vs 1548

# Enfin la solution!?

Table 1. Demographic and Clinical Characteristics at Baseline.<sup>a</sup>

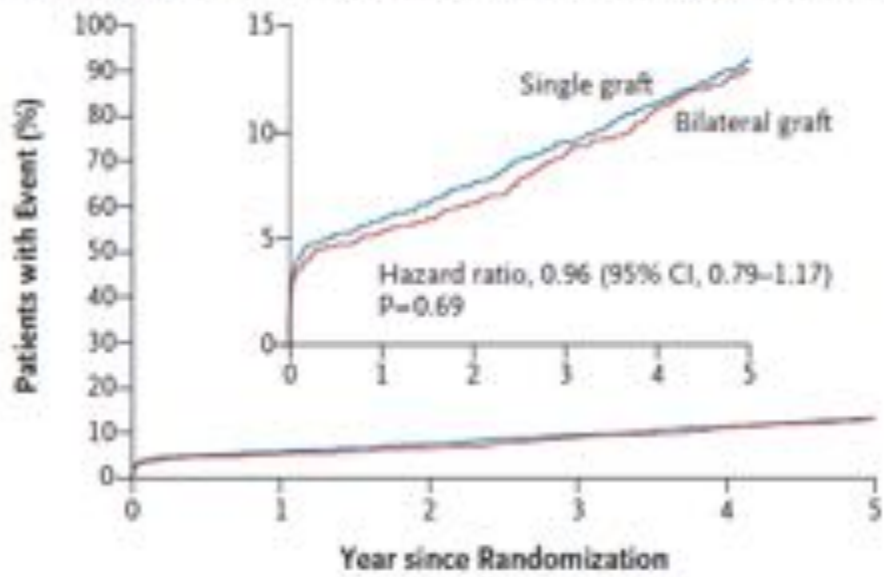
| Characteristic                 | Single-Graft Group<br>(N = 1554) | Bilateral-Graft Group<br>(N = 1548) |
|--------------------------------|----------------------------------|-------------------------------------|
| Age at randomization — yr      | 63.5 ± 9.1                       | 63.7 ± 8.7                          |
| Male sex — no. (%)             | 1338 (86.1)                      | 1318 (85.1)                         |
| Smoking status — no. (%)       |                                  |                                     |
| Current smoking                | 214 (13.8)                       | 237 (15.3)                          |
| Former smoking                 | 898 (57.8)                       | 834 (53.9)                          |
| Never smoked                   | 442 (28.4)                       | 477 (30.8)                          |
| Diabetes — no. (%)             |                                  |                                     |
| No history                     | 1191 (76.6)                      | 1177 (76.0)                         |
| Insulin-dependent diabetes     | 79 (5.1)                         | 95 (6.1)                            |
| Non-insulin-dependent diabetes | 284 (18.3)                       | 276 (17.8)                          |

# Enfin la solution?



# Enfin la solution!?

**B Composite of Death from Any Cause, Myocardial Infarction, or Stroke at 5 Yr**



| No. at Risk     |      |      |      |      |      |      |
|-----------------|------|------|------|------|------|------|
| Single graft    | 1554 | 1448 | 1410 | 1371 | 1322 | 1261 |
| Bilateral graft | 1548 | 1452 | 1422 | 1373 | 1317 | 1266 |

# Une autre solution ... Revascularisation hybride :

## **Clinical outcomes after hybrid coronary revascularization versus coronary artery bypass surgery: a meta-analysis of 1,190 patients**

Ralf E. Harskamp, MD,<sup>a,b</sup> Akshay Bagai, MD, MHS,<sup>c</sup> Michael E. Halkos, MD, MSc,<sup>d</sup> Sunil V. Rao, MD, MHS,<sup>a</sup>  
William B. Bachinsky, MD,<sup>e</sup> Manesh R. Patel, MD,<sup>a</sup> Robbert J. de Winter, MD, PhD,<sup>b</sup> Eric D. Peterson, MD, MPH,<sup>a</sup>  
John H. Alexander, MD, MHS,<sup>a</sup> and Renato D. Lopes, MD, PhD, MHS<sup>a</sup> *Durham, NC; Amsterdam, The Netherlands;  
Ontario, Canada; Atlanta, GA; and Harrisburg, PA*

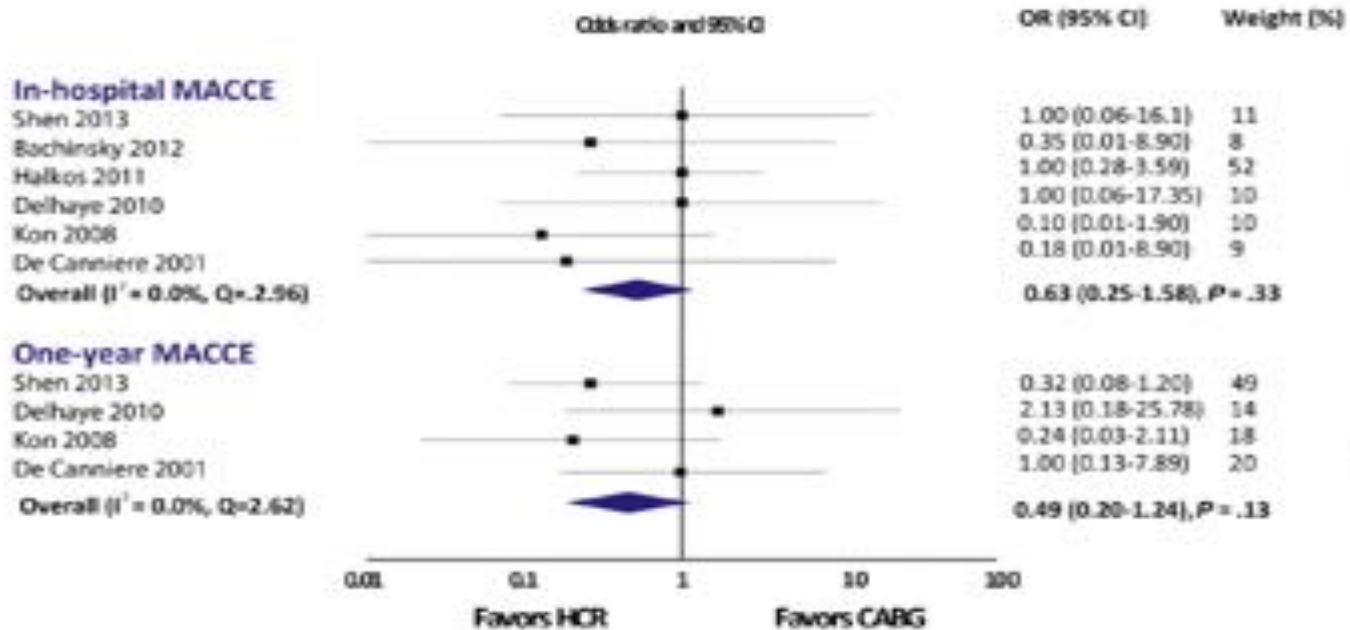
6 case-control ou propensity adjusted

366 hybride vs 824 CABG

Usage de DES : 89%

# Une autre solution ...

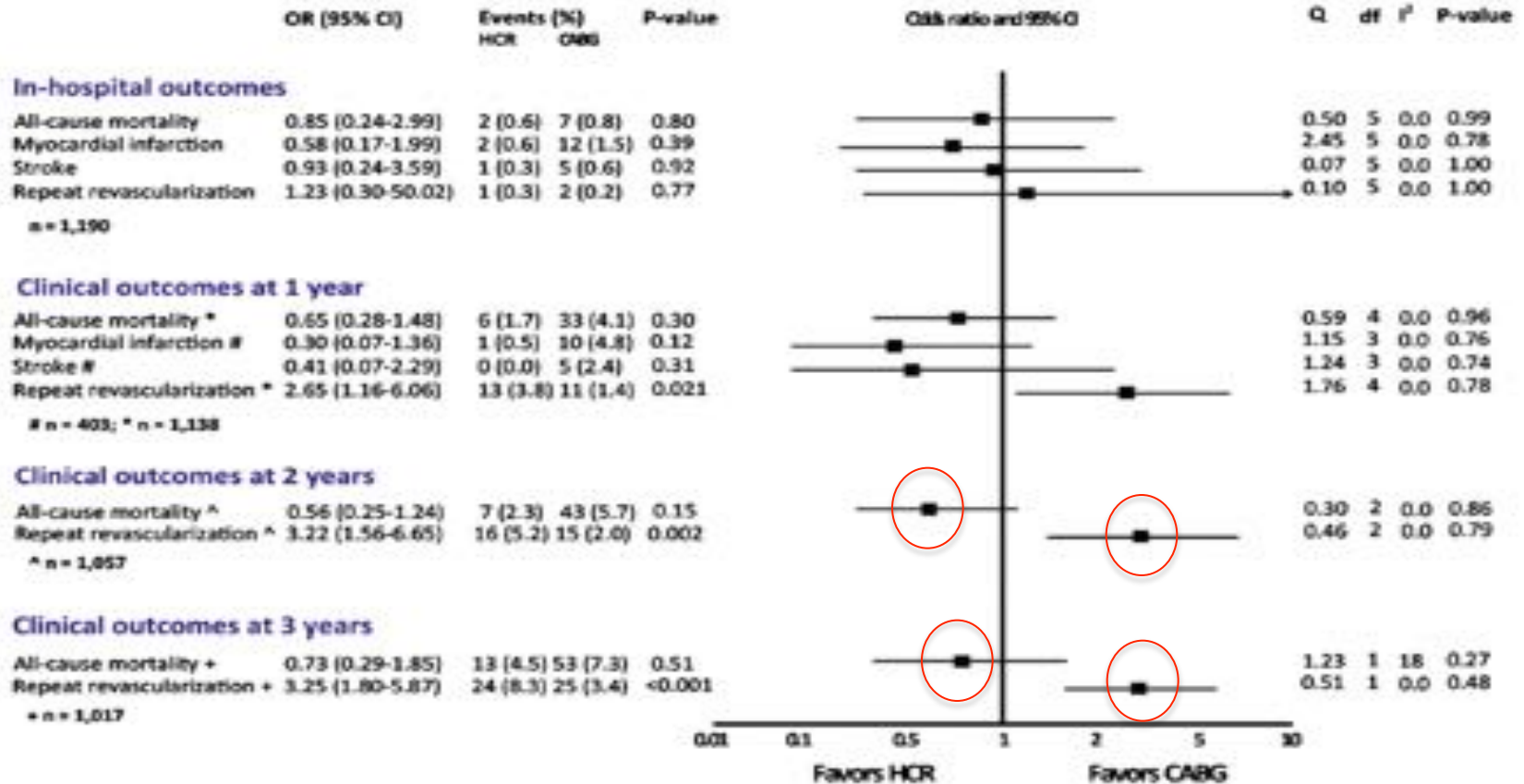
## Revascularisation hybride :





# Une autre solution ...

## Revascularisation hybride :



# Conclusion

- Le “tout artériel” reste le gold standard

# Conclusion

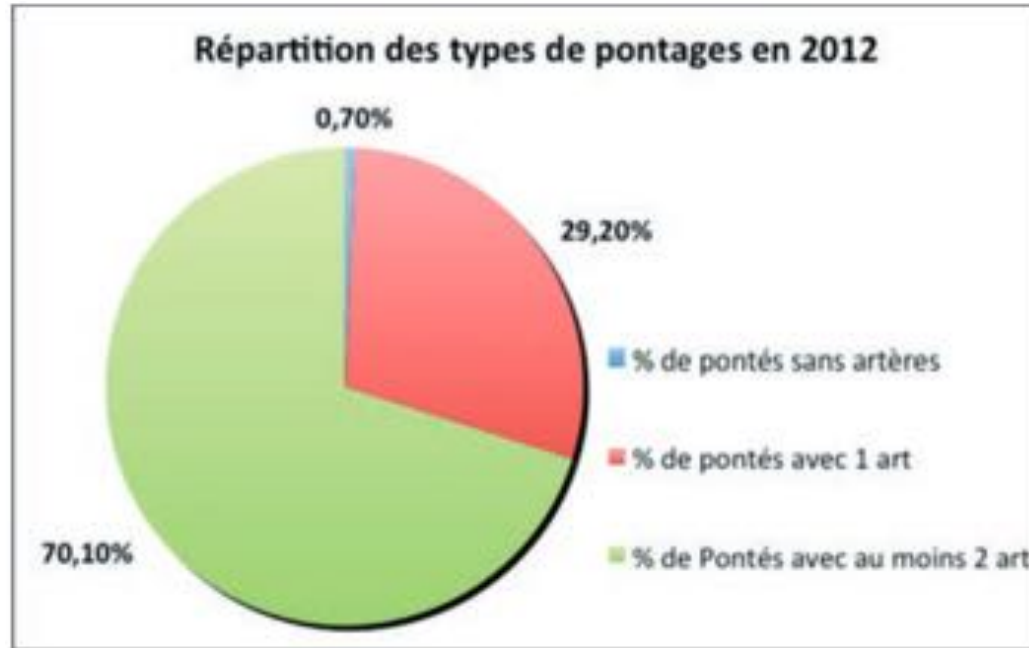
- Le “tout artériel” reste le gold standard
- Au delà de 70 ans, le greffon veineux ou la stratégie hybride garde une place chez les patients à risque de double prélèvement mammaire

# Conclusion

- Le “tout artériel” reste le gold standard
- Au delà de 70 ans, le greffon veineux ou la stratégie hybride garde une place chez les patients à risque de double prélèvement mammaire
- La qualité du prélèvement veineux et du geste chirurgical sont des facteurs importants de durabilité

# Et en France?

- Base de donnée nationale : EPICARD



US – STS database : 2015 < 25%

# Conclusion

