

# Endarterectomy of the left anterior descending artery with internal mammary artery patch

## Endartériectomie de l'inter-ventriculaire antérieure gauche avec patch de l'artère mammaire interne

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### SUMMARY

Coronary endarterectomy combined with an internal mammary artery patch may be the only option to achieve complete revascularization when conventional anastomosis is precluded.

We report the case of 82-year-old patient, admitted for acute coronary syndrome. Coronary angiography revealed severe three-vessel disease involving the left anterior descending artery, the circumflex artery, and the right coronary artery. Extensive calcification was observed intra-operatively. A thrombo-endarterectomy of the was performed. Revascularization was completed using the internal mammary artery as a patch.

The immediate postoperative course was uneventful.

### KEYWORDS

Coronary endarterectomy; arterial patch; coronary artery bypass grafting; diffuse coronary calcification.

### RÉSUMÉ

L'endartériectomie coronaire associée à un patch d'artère mammaire interne peut constituer la seule option de la revascularisation complète lorsque l'anastomose conventionnelle est impossible.

Nous rapportons le cas d'un patient âgé de 82 ans, admis pour un syndrome coronarien aigu. L'angiographie coronaire a révélé une atteinte tritronculaire. Une calcification étendue et continue a été observée en per-opératoire. Une thrombo-endartériectomie a été réalisée. La revascularisation a été complétée par un patch d'artère mammaire interne gauche. Les suites opératoires immédiates ont été simples.

### MOTS-CLÉS

Endartériectomie coronaire ; patch artériel ; pontage coronaire ; calcifications coronaires diffuses.

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## INTRODUCTION

Surgical management of elderly patients with diffuse coronary calcifications and multi-vessel disease represents a major technical challenge for cardiac surgeons (1). Coronary endarterectomy (CE), although associated with increased operative risk and myocardial infarction, may be the only option to achieve complete revascularization when the distal coronary bed is diffusely calcified or chronically occluded (2)(3).

The left anterior descending artery (LAD) is most commonly affected by diffuse calcification, and its open thrombo-endarterectomy remains technically challenging with high risk of postoperative myocardial dysfunction (5). Revascularization strategies for diffusely diseased LAD include conventional LIMA-to-LAD anastomosis when suitable distal targets exist, or reconstruction techniques using LIMA onlay-patch or venous patch when the artery is ungraftable by conventional means (6)(7).

## CASE PRESENTATION

We report the case of a 82-year-old male patient with type 2 diabetes mellitus, blood hypertension, and dyslipidemia, admitted for acute coronary syndrome. The patient demonstrated good physiological status despite advanced age. Coronary angiography revealed severe three-vessel disease involving the left anterior descending artery (LAD), the circumflex artery (Cx), and the right coronary artery (RCA), without visible calcifications on angiographic imaging.

Considering the patient's good physiological status, surgical revascularization with triple coronary artery bypass grafting under cardiopulmonary bypass was performed. Intraoperatively, extensive and continuous calcification of the LAD was observed along its entire course, precluding conventional anastomosis. An extended thrombo-endarterectomy of the LAD was performed through an approximately 4 cm arteriotomy (figure 1). Revascularization was completed using the left internal mammary artery (LIMA) as a patch over the LAD arteriotomy (Figures 2 and 3).



Figure 1. A Intra-operative photography showing extensive and continuous calcification of the LAD was observed along its entire course, precluding conventional anastomosis.



Figure 2. Intra-operative photography showing atherosclerotic plaque removed from the coronary artery.

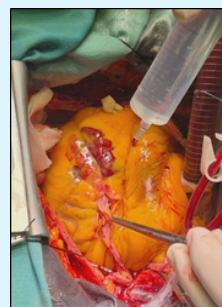


Figure 3. Intra-operative photograph showing extended thrombo-endarterectomy of the left anterior descending artery through 4 cm arteriotomy, and revascularization using the left internal mammary artery as a patch over the arteriotomy.

The marginal branch and the RCA were grafted using reversed saphenous vein segments. Postoperative management included standard cardiopulmonary bypass protocol, meticulous hemostasis, and routine intensive care monitoring.

The immediate postoperative course was uneventful. No perioperative myocardial infarction, low cardiac output syndrome, or surgical complications occurred. The patient was discharged on day 4 postoperatively. Clinical follow-up at day 15 confirmed good general condition,

satisfactory wound healing, absence of recurrent angina, and no evidence of graft-related complications.

## DISCUSSION

Recent studies suggest that pre-operative imaging, including coronary computed tomography angiography, can better characterize coronary plaque morphology and vessel wall characteristics than conventional angiography, guiding complex revascularization in diffuse disease (10). However, the discrepancies between angiographic appearance and intraoperative findings show the importance of surgical expertise in managing ungraftable coronary arteries (11).

Pre-operative evaluation using coronary CT angiography plays a crucial role in managing patients with diffuse coronary disease, particularly when conventional angiography reveals poor-quality targets. Detailed assessment of coronary anatomy, plaque morphology, vessel wall characteristics, and distal vessel patency can guide surgical planning and identify patients who may require endarterectomy (1).

Coronary endarterectomy combined with LIMA patch reconstruction represents an interesting technique for the management of extensively calcified LAD, that is ungraftable by conventional CABG methods.

Our case illustrates several critical aspects of surgical decision-making in elderly patients with diffuse coronary disease, and reflects our institutional preference for LIMA onlay-patch reconstruction when the LAD is ungraftable by conventional means.

Recent systematic reviews and meta-analyses confirmed that coronary endarterectomy combined with coronary artery bypass grafting (CABG) increases short-term complications, but demonstrates comparable long-term survival to isolated CABG, supporting its use as a salvage technique in carefully selected patients (2)(4).

The open thrombo-endarterectomy technique through a 4 cm arteriotomy allowed complete removal of calcified plaque along the entire LAD course. The LIMA onlay-patch technique provides superior patency compared with venous patches, as demonstrated by angiographic follow-up studies showing 100% patency of reconstructed LAD patches at midterm evaluation (7). The length of the reconstructed patch correlates with excellent flow

dynamics and minimal turbulence (7). In our practice, we ensure the LIMA patch length matches the arteriotomy exactly to prevent kinking or stenosis at the ends.

Recent meta-analyses confirm that while CE increases short-term mortality and perioperative myocardial infarction, long-term survival remains comparable between CE-CABG and isolated CABG groups (2). In octogenarians with triple-vessel disease, complete revascularization strategies including CE doesn't negatively impact early survival when meticulous technique is applied (12). Our patient's uneventful recovery and early discharge align with contemporary outcomes reported in high-volume centers (4).

Notably, coronary angiography in our case did not demonstrate visible calcifications, but extensive continuous calcification was observed intraoperatively. This discrepancy highlights a well-documented limitation of conventional angiography, which visualizes luminal narrowing rather than vessel wall characteristics (11). Coronary CT angiography with calcium scoring provides superior detection of calcified plaque, as calcification occurs late in atherosclerosis and may be underestimated on angiography alone (11) (13).

The choice of LIMA as patch material rather than saphenous vein is supported by superior long-term outcomes. It demonstrates 98% of patency at 5 years compared to 60-70% for vein grafts, with improved 10-year survival rates (8)(9). Mid-term angiographic evaluation of LIMA-LAD anastomoses following endarterectomy confirms 60% of patency at mean 32.8 months (3).

The LIMA graft demonstrates superior long-term patency rates compared to saphenous vein grafts, and results in improved late survival, particularly in elderly patients (8)(9). Single-center experiences and retrospective cohorts limit of CE outcomes. Randomized controlled trials comparing CE-CABG versus isolated CABG in diffuse disease are lacking. Future studies should focus on the risk stratification tools, the imaging-guided surgical planning, and the long-term angiographic follow-up of LIMA patch reconstruction (2)(4).

## CONCLUSION

Coronary endarterectomy combined with an internal mammary artery patch is an effective salvage technique for managing extensively calcified LAD ungraftable by conventional methods.

In elderly patients with good physiological status, this approach allows complete revascularization with satisfactory early outcomes, provided meticulous surgical technique is applied. The discrepancy between angiographic findings and intraoperative calcification underscores the importance of surgical expertise and suggests potential benefits of preoperative coronary CT angiography for complex revascularization planning.

In our experience, early discharge is achievable in elderly patients when the endarterectomy is performed with technical precision and the LIMA patch is adequately sized.

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