

Surgical Revascularization of the Myocardium by Minimally Invasive Access

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Abstract

The median sternotomy is the standard Gold access for surgical myocardial revascularization, but it is not without complications, especially in patients with multiple comorbidities. Minimally invasive access offers the advantage of avoiding sternotomy, achieving a faster postoperative recovery, with less time of hospital stay and a higher level of satisfaction in quality of life.

We present the case of a 49-year-old male patient, diabetic, hypertensive, smoking, with multiarterial coronary artery disease, very symptomatic, who was surgically revascularized by left mini thoracotomy.

Keywords: myocardial revascularization; mini thoracotomy; graft; bridge

Introduction

Myocardial revascularization by conventional sternotomy has been performed since ancient times until Dr. McGinn in 2005 promotes minimally invasive myocardial revascularization (MVR-MNI) by left anterior thoracotomy, either with arterial grafts such as left internal mammary artery (AMII), right (AMID) or radial artery (RA), and the saphenous vein (SVF)¹. The long-term results of myocardial revascularization are similar to conventional surgery in that arterial grafts such as the right and left internal breast grafts can be harvested through the left thoracotomy incision and the corresponding bypasses can be performed either with extracorporeal circulation support (ECC) or without extracorporeal circulation (S-CEC)². The advantage of this access is that it avoids the median sternotomy, infections of the operative site, allows better pain management and shorter stay in the postoperative care unit with high promptness as has been demonstrated in different studies of large centers³. In addition, as has been demonstrated, double breast graft can be used in "Y" configuration or in situ with a greater patency of the bypass⁴.

In Peru, at the Edgardo Rebagliati Martins Hospital, Quispe et al, published in 2017, a report of 30 cases of myocardial revascularization surgery by left mini thoracotomy. In 96.7% of cases it was without ECC support, 70% of cases were used only anastomosis from AMII to AD, 16.6% of cases were hybrid revascularization (AMII to DA and Stent to CD or Mg), there was

only one case of conversion to medium sternotomy due to difficulties in surgical exposure. There were no cases of in-hospital mortality or excessive postoperative bleeding requiring re-examination. The average length of hospital stay was 8.9 days¹⁰.

For these fundamentals exposed, it was decided to perform the first myocardial revascularization by mini left anterior thoracotomy with graft of AMII, RA and VSF with support of ECC in the Instituto Nacional Cardiovascular (INCOR).

Description of the case

A 49-year-old patient with a history of hypertension, non-insulin type 2 diabetes mellitus and chronic hypertension was admitted with a one-year illness with angina functional class III and positive stress test. Cardiac catheterization was performed and severe multiarterial coronary disease was evidenced with left coronary trunk (TCI) (90%), anterior descending (AD) (80%), 1° diagonal (Dg) (70%), circumflex (CX) (80%), 1° marginal (Mg) (70%), right coronary artery without lesions and left dominance (**Figura 1**). Echocardiography showed 62% left ventricular function, no ventricle dilation, and no valvular heart disease. The chest tomography with and without contrast ruled out abnormality in heart, large vessels and lung pair.

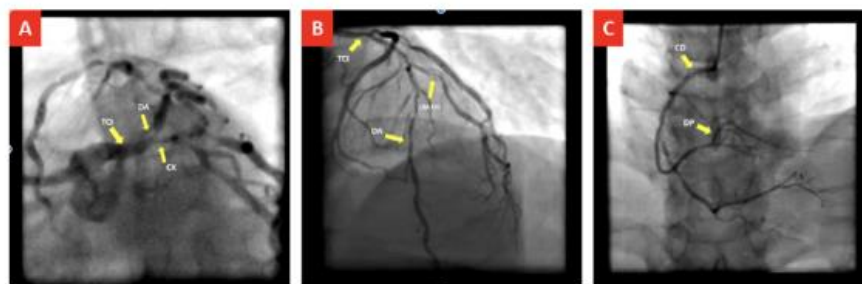


FIGURA 1: Cateterismo Cardíaco Prequirúrgico. (A) Proyección oblicua caudal izquierda donde se evidencia lesión severa de TCI distal y origen de DA con CX (señaladas con puntero amarillo), (B) Proyección oblicua craneal derecha donde se observa lesión severa de TCI, DA tercio medio y lesión severa de segmento proximal de 1era diagonal (puntero amarillo). (C) Coronariografía derecha: proyección oblicua izquierda; dominancia derecha. VP y DP sin lesiones

Surgical technique

In the operating room, selective intubation of the left bronchus (with double lumen tube) was performed, positioning in decúbito supine with elevation of 30 ° of the hemitorleft rax. Next, left anterior thoracotomy at the level of the 5 left clavicular intercostal space (**Figure 2a**) to enter the pleural cavity with selective collapse of the left lung orn to be able to perform the harvest of the left internal mammary artery video-assisted, obtaining approximately 9cm in length. (**Figure 3a and 3b**), parallel to s and obtains graft of radial artery of right forearm (**Figure 2b**) and a segment of the saphenous vein of right thigh (**Figure 2c**). We proceed to expose right femoral vas to proceed

to canular peripherally with cannula of high arterial flow Nro. 21 and venous No. 25. Followed by aortic clamping and cardiac arrest with retschneider B solution. Se proceeds to perform aorto-coronary anastomosis with saphenous vein greater than the first Dg, then RA from the saphenous vein in "y" inverted to the first Mg, finally AMII to DA. We proceed to unclamp the aorta, and progressive exit of CPB without any intercurrance. Hemostasis revision, transient epic radical pacemaker thread implantation and left dren pleuroperic dren Nro. 32. Finally faces the ribs with closure by planes to the skin. The duration of extracorporeal circulation was 180 minutes and aortic clamping 120 minutes, total bleeding was 150ml.



FIGURA 2: (A) Marcaje prequirúrgico de acceso para mini toracotomía anterior izquierda a nivel del 5to espacio intercostal izquierdo de 5 cm de longitud, (B) Posicionamiento del paciente para obtención de injerto arterial radial derecho, (C) Líneas punteadas indican trayecto de vena safena mayor derecha; acceso inguinal derecho para canulación periférica (flecha negra).

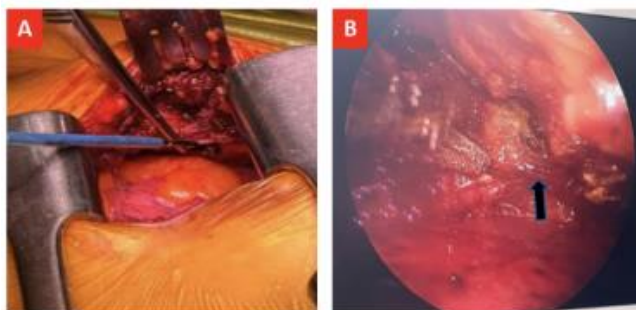


Figure 3a and 3b

Spotoperative follow-up

Iam admitted to the postoperative care unit extubated with dobutamine and nitroglycerin in low doses and drains with minimal bleeding. After 24 hours of a day, the pleuropericardico drain was removed and then transferred to

intermediate care. The next day he underwent general care where coronary angiography was performed to check the patency of the coronary bridges (**Figure 3c**). He is discharged on the 3rd day of stay in general care with optimal medical medication.

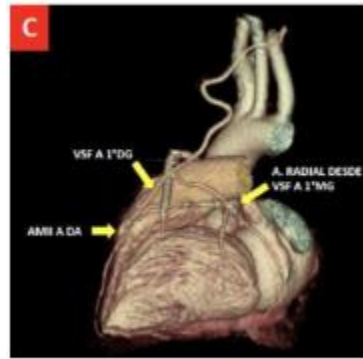


Figure 3c

Discussion

The RVM - MNI has been developed since 2005 with the Dr. Joseph McGinn and Dr. Marc Ruel through a small left anterior thoracotomy with anastomosis of the bypass with direct vision with the appropriate equipment with or without support of ECC⁵. In 2009 the Dr. McGinn publishes its large series of 450 patients undergoing mini-invasive myocardial revascularization obtaining excellent results and shorter hospital stay with a hospital mortality of 1.3%¹.

In this type of surgery, physical materials are required to visualize especially the mammary arteries, but this is not entirely true since the Dr. Nambiar performs harvesting of left and right AMI without thoracoscope support, obtaining a volume of 150 patients with patent grafts verified by angiogram before discharge⁶. As it was observed that the mini-invasive approach does not produce greater postoperative complications than conventional revascularization especially in diabetic patients and with lower stay in the ICU (40 ± 12 hours) and 3.1 days in hospitalization⁴.

Taichi et al. mention that the indications, for this access, are the same as the conventional except for emergencies, deformidades de la caja torácica como pectus excavatum, severe lung disease, an intramyocardial DA artery, calcified or diffuse disease and peripheral arterial disease if ECC⁷ is intended. It is also suitable in patients with body mass index <30 , with multiple comorbidities⁸.

Peter A. Andrews et al. They demonstrated that minimally invasive myocardial revascularization surgery requires a learning curve on the part of the surgeon to optimize results, achieving a progressive increase in the total number of bypasses performed, decrease in operative time and conversion to sternotomy¹⁰.

In the present case, left anterior minithoracotomy offers advantages over sternotomy in terms of compliance, reduction of deep surgical site infection. The use of arterial and venous grafts with multiple bypasses was supported by ECC since the experience without it is scarce even in our center¹⁰. Immediate extubation and a 24-hour ICU stay with <3 -day general care stay were results comparable to those published in other centers^{1,9}. In addition, the patency of the grafts was confirmed with angiotomography prior to discharge. This surgical experience drives us to increase the number of cases of MVR - MNI in our institution.

Conclusion

Minimally invasive revascularization is feasible in our institution. It offers the advantages of avoiding the middle sternotomy and its complications, the most disastrous being mediastinitis. Additionally, it allows immediate extubation after surgery, less bleeding volume, fewer hours in intensive care unit and days of hospital stay.

References

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