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Case Report: Off-Pump Total Myocardial Revascularization for Dextrocardia and Situs Inversus

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ABSTRACT

A 42-year-old man with dextrocardia and situs inversus underwent successful off-pump total myocardial revascularization using the technique popularized by Tector [Tector 1994, Tector 1996]. The free left internal mammary artery (LIMA) was anastomosed to the in-situ right internal mammary artery (RIMA) at the level of the right-sided left atrial appendage, then anastomosed sequentially to the first diagonal branch (D1) of the left anterior descending artery (LAD), and to the LAD. The in-situ RIMA was sequentially anastomosed to the first and the second obtuse marginal branches (OM1 and OM2) of the circumflex coronary artery. A saphenous vein was then anastomosed to a diffusely diseased posterior descending branch (PDA) of the right coronary artery (RCA). The patient was asymptomatic and in excellent condition three months after surgery. In economically depressed regions of the world, such as the Gaza Strip, off-pump complete revascularization is an excellent alternative to cardiopulmonary bypass.

INTRODUCTION

While on a recent mission to the Gaza Strip (early October 2000) intended to demonstrate to local surgeons the techniques of off-pump coronary artery bypass (OPCAB), we were presented a patient with dextrocardia and situs inversus totalis in need of myocardial revascularization.

CASE REPORT

The patient was a 42-year-old male who had been diagnosed at age 10 with dextrocardia and situs inversus totalis. One month before our arrival he had sustained a non-Q wave myocardial infarction and subsequently developed class 3 angina despite adequate medical therapy. A chest x-ray showed a right-sided heart and gastric bubble and a left-sided liver. This confirmed the diagnosis of a classic mirror image dextrocardia with situs inversus (I), L-loop (L) [see Movie, ◎], and normally related great arteries (I). His EKG showed normal sinus rhythm, extreme right axis deviation (165+ degrees), and ST depression in leads 3VR, 4VR and 5VR. An echocardiogram showed mild left ventricular dilatation, fair left ventricular function (ejection fraction 50%), hypokinesis of the inferior and posterolateral walls with mild prolapse of the anterior mitral valve leaflet, and trivial tricuspid regurgitation. Cardiac catheterization showed high-grade stenoses of the left anterior descending artery (LAD), first diagonal branch (D1), first and second obtuse marginal branches (OM1 and OM2) of the circumflex coronary artery, and diffuse disease of the posterior descending branch (PDA) of the right coronary artery (RCA). There were no associated cardiac anomalies.

Surgery was performed through a standard median sternotomy [see Movie, ◎] using the CTS retractor (Genzyme Corp., Cambridge, MA). After orienting ourselves to the mirror image location of the coronary arteries and heart chambers (right cavities and RCA left-sided, left cavities and left coronary branches right-sided), we decided to perform all of the anastomoses from the left side of the operating table. Both IMAs were taken down, the left as a free skeletonized conduit and the right as an in-situ skeletonized conduit. An end-to-side anastomosis between the two vessels was first performed at the level of the right sided left atrial appendage using the technique proposed by Tector and following heparinization (activated clotting time kept around 400 seconds). We then anastomosed the free LIMA to the mid-portion of D1 in a parallel, side-to-side fashion. The distal end of the LIMA was then anastomosed to the mid-portion of the LAD. The operating table was then placed in a steep Trendelenburg position while three deep pericardial traction sutures were placed. This maneuver allowed excellent exposure of the entire posterior and lateral walls of the heart without causing any hemodynamic impairment. The in-situ RIMA was anastomosed in a parallel, side-to-side fashion to the mid-portion of OM1, then in an end-to-side fashion to the mid-portion of the OM2. A saphenous vein graft was then anastomosed to the PDA [see Figure 1, ◎]. The operating table was returned

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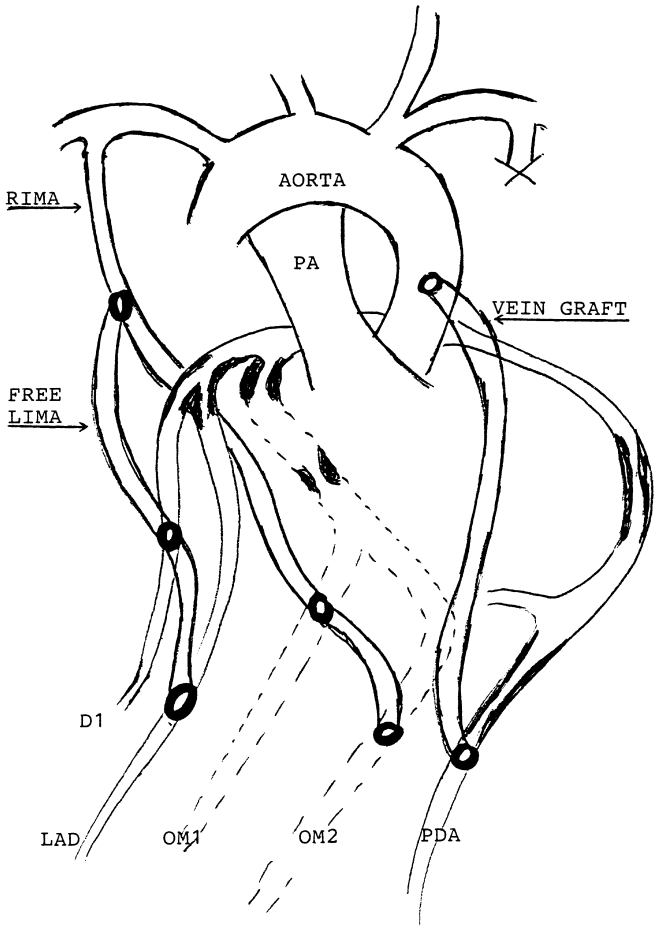

Figure 1. End result of quintuple OPCAB for dextrocardia and situs inversus.

to the horizontal position and the proximal anastomosis of the vein to the aorta completed. Heparin was partially reversed with protamine and the chest cavity drained with two chest tubes. The sternotomy was closed in standard fashion with the surgeon now standing on the right side of the operating table. The patient's post-operative course was uneventful. He was discharged on the sixth post-operative day on Cardizem (Biovail, Mississauga, Ontario, Canada) 60 mg tid, Atenolol (Astra Zeneca Pharmaceuticals, Wilmington, DE) 25mg once a day, and coated aspirin once a day. Three months later he remained asymptomatic and in excellent condition.

DISCUSSION

Dextrocardia with situs inversus is a rare anomaly occurring in about one of 10,000 people. Associated cardiac anomalies are rare, and the incidence of atherosclerotic heart disease is the same as in the general population [Hynes 1973, Aris 1981, Al-Khadra 1988]. It was first reported by the anatomist Hieronymus Fabricius in 1606 [cited in Cleveland 1926]. Though initially diagnosed only at autopsy, it began to be recognized in live patients during the early 1800s because of improvement in percussion and auscultation techniques. It became even easier to diagnose with the advent of x-ray and EKG technology. Cardiac catheterization and angiography made accurate intracardiac diagnosis of associated anomalies and coexisting coronary arteriosclerosis possible.

A number of case reports have described patients with dextrocardia and situs inversus undergoing coronary revascularization with cardiopulmonary bypass [Grey 1981, Irwin 1982, Moreno-Cabral 1984, Abensur 1988, Ebuoka 1990, Yamaguchi 1990, Mesa 1995, Nomoto 1997, Seddio 1999, Wong 1999]. Some cases involved concomitant procedures such as aortic arch resection [Sasaki 1997], resection of post-infarct left ventricular aneurysm [Richardson 1974], and mitral valve replacement [Ueno 1992]. One patient with this condition had coronary angioplasty [Sanchez Gonsalez 1995].

We believe that our patient was the first to undergo OPCAB for this isolated condition. Because of his young age it seemed appropriate to provide him with total arterial revascularization, though diffuse disease of the PDA prevented us from extending this technique to his right heart.

CONCLUSION

With the exception of a mirror image coronary anatomy, this patient with dextrocardia and situs inversus totalis presented no unusual challenge to a completely off-pump coronary revascularization using arterial conduits. In economically depressed regions of the world, such as the Gaza Strip, off-pump complete revascularization is an excellent alternative to cardiopulmonary bypass.

Acknowledgments

Our mission to Gaza would not have been possible without the unselfish involvement of Joan Barbati, RN, CCRN, Layna Harper, RN, CCRN, Nestor Megano, CPP, Teresa Miller, RN, and MariNoel Weatherly, RN. Their willingness to volunteer their time and expertise, and the gratitude we encountered on the part of the patients we operated upon and the local cardiac surgical team, far outweighed the gravity of the political situation and the violent confrontations our visiting team found itself in the midst of during our mission.

REFERENCES

1. Abensur H, Ramires JA, Dallan LA, et al. Right mammary-coronary anastomosis in a patient with situs inversus. Chest 94(4):886-7, 1988.
2. Al-Khadra AS. Images in cardiovascular medicine. Mirror image dextrocardia and situs inversus. Circulation 91(5):1602-3, 1995.
3. Aris A, Casellas A, Oriol A. Dextrocardia i aterscleros coronaria. San Pau, (2):192-94, 1981.
4. Cleveland M. Situs inversus viscerum: anatomic study. Arch Surg 13:343, 1926.
5. Ebuoka M. Coronary artery bypass in dextrocardia with situs inversus totalis ... a case report. Nippon Kyobu Geka Gakkai Zasshi 38(9):1538-42, 1990.
6. Grey DP, Cooley DA. Dextrocardia with situs inversus totalis: car-

diovascular surgery in three patients with concomitant coronary artery disease. Cardiovasc Dis Bull Tex Heart Inst 8:527-30, 1981.
7. Hynes KM, Gau GT, Titus JL. Coronary heart disease in situs inversus totalis. Am J Cardiol 31(5):666-9, 1973.
8. Irvin RG, Ballenger JF. Coronary artery bypass in a patient with situs inversus. Chest 31:380-81, 1982.
9. Mesa JM. Situs inversus and myocardial revascularization. Case report. J Cardiovasc Surg (Torino) 35(6):571-2, 1995.
10. Moreno-Cabral RJ, Daily PO. Coronary bypass in dextrocardia. Chest 85(5):714, 1984.
11. Nomoto T, Ueda Y, Ogino H, et al. Emergent coronary artery bypass grafting in a patient with mirror-image dextrocardia. Kyobu Geka 50(9):785-8, 1997.
12. Richardson RL, Yousufuddin M, Eubanks DR. Ventricular aneurysm, arrhythmia and open heart operation in a patient with dextrocardia. Am Surg 40:667-70, 1974.
13. Sanchez Gonsalez A, Fournier Andray JA, Perez Fernandez-Cortacero JA, et al. Coronary angioplasty in a case of dextrocardia with situs inversus after myocardial infarct. Rev Esp Cardiol 48(8):560-2, 1995.
14. Sasaki A, Umami T, Oka Y, et al. Simultaneous coronary artery bypass grafting and total arch graft replacement with dextrocardia and situs inversus. Kyobu Geka 50(12):1022-5, 1997.
15. Seddio F, Colagrande L, Pellegrino A, et al. Myocardial revascularization in dextro-cardia with situs inversus. G Ital Cardiol 29(10):1222-6, 1999.
16. Tector AJ, Kress DC, Downey FX, et al. Complete revascularization with internal thoracic artery grafts. Semin Thorac Cardiovasc Surg, Jan. 1996.
17. Tector AJ, Kress DC, Schmahl TM, et al. T-graft: a new method of coronary arterial revascularization. J Cardiovasc Surg (Torino) 35(6Suppl):19-23, 1994.
18. Ueno Y, Toba T, Ezaki H, et al. Mitral valve replacement with concomitant coronary bypass for papillary muscle rupture after acute myocardial infarction in situs inversus. Kyobu Geka 45(11):1031-4, 1992.
19. Wong PS, Chong CL. Multiple coronary artery bypass grafting in dextrocardia: case report. Med J Malaysia 54(4):514-6, 1999.
20. Yamaguchi T, Kikkuchi S, Doi H, et al. Coronary artery bypass in dextrocardia with situs inversus totalis. Nippon Kyobu Geka Gakkai Zasshi 38(9):1538-42, 1990.

REVIEW AND COMMENTARY

1. Editorial Board Member DB515 writes:

It is most interesting that the authors have apparently been able to develop OPCAB surgery in the Gaza Strip with success and are also able to meet the anatomical challenges posed by dextrocardia for OPCAB without significant problems. I would like to see a more detailed description of the hemodynamic management during positioning of the heart and whether this caused any special problems. Also, a brief description of the approach to CABG in general in their Gaza center would be of interest.

Authors' Response by Imad F. Tabry, MD:

The hemodynamic management throughout the surgery was no different and not more challenging than for a routine OPCAB: With a Swan-Ganz catheter in place, stability during exposure of the circumflex and RCA territories was maintained with judicious use of fluids and neosynephrine drip.

As for the Gaza Strip heart program, it is amazing that, until recently, the Gaza Strip has lacked a working cardiac catheterization laboratory and a heart surgery program despite a population of 1.2 million with the highest growth rate in the world. This lack must be attributed to poor socioeconomic conditions and obvious negative political circumstances. This situation has resulted in an unusually high mortality rate in patients with congenital heart defects or acquired heart diseases. These facts were very disturbing to Steve Sosebee, founder of the PCRF (Palestinian Children's Relief Fund), an American, non-political humanitarian relief group originally dedicated to helping Arab children in need of life-saving medical care not available in their homeland. With the help of the Ministry of Health he has intensified the PCRF's efforts and expanded its activities in Gaza and the West Bank, sending in pediatric cardiac teams (from Italy, Belgium, Britain, and the United States) and more recently adult cardiac teams, training Arab medical professionals locally and in hospitals in Europe and the Middle East, and donating medical equipment and supplies. His efforts were instrumental in laying the foundations for the first cardiac catheterization laboratory being built in Gaza through the generosity of the Belgian government, which will be operational in 2002. However, despite the infrastructure for cardiac surgery provided by the international community, there remains a lack of local technical abilities.

While sponsored visiting teams from neighboring Egypt and the U.S.A. (Tulsa, OK) did initiate a successful, though intermittent, adult cardiac surgery program, the recent uprising and subsequent siege of Gaza have prevented many specialists and outside experts from visiting and working there. Nevertheless, our team was able to introduce OPCAB in Gaza and, through the generosity of U.S. manufacturers, has provided the appropriate supplies and equipment for its performance. With the help of the Sisters of Mercy we were also able to sponsor the Shifa Hospital cardiac anesthesiologist (Dr. Akeilan) for a five-week training period at Holy Cross Hospital during which he observed and participated in a number of cardiac procedures performed in a modern U.S. facility. Because of stringent licensure requirements in the U.S., a similar sponsorship of Palestinian cardiac surgeons is not feasible. This limitation, along with the fact that in this economically depressed area OPCAB is an excellent alternative to cardiopulmonary bypass, has increased our resolve to teach the technique of OPCAB surgery in Gaza on our future missions. Our next mission is scheduled for October 2001. Doctors and nurses willing to volunteer in Palestine are invited to contact me at itabry@att.net or the PCRF at ThePCRF@aol.com.