

CASE STUDY

Cardiac Surgery in A Multi-Ethnic Low Volume Service *The Caribbean Heart Care Experience*

Authors:

Jose Burgos-Irazabal M.D.
Risshi D. Rampersad BSc., M.B., B.S.
Walter J. Gomes M.D., PhD.
Kamal A. Rampersad BSc., M.B., B.S., DA, LLB
Gianni D. Angelini M.D., M.C.h, F.R.C.S.

Institution:

Caribbean Heart Care Medcorp,
St. Clair Medical Centre,
St. Clair, Port of Spain, Trinidad, W.I.

Correspondences:

Professor Walter Jose Gomes
Department of Cardiac Surgery
University of Sao Paulo
School of Medicine
Email: wjgomes.dcir@emp.br
Tel: 011-55-1155-718785
Fax: 011-55-1155-712719

Abstract

BACKGROUND:

The Caribbean is a multi-ethnic society including Caucasian, Afro-Caribbean, East Indians, Asians, Hispanics, Europeans and natives with a broad range of living standards. The Central Statistical Office of Trinidad and Tobago's (T&T) last census (2000) reported a total population of 1,262,400 inhabitants with an average 0.7% annual growth rate, being 40% East Indian descendants, 37% African, 20% Mixed, 0.6% Caucasian and 0.3% Chinese. The incidence and types of heart disease vary significantly amongst these races. We report the surgical experience (adult and paediatric) of a low volume multi-ethnic population service based in T&T.

OBJECTIVE:

Heart surgery in a multi-ethnic low volume service can be performed with excellent results comparable to international standards for adults and paediatrics.

METHODS:

The Adult Heart Surgery Program started in November 1993 when only two cases were performed and increased to 174 cases in 2004. The data on a total of 8778 cases (629 male, median age 67, age range 18 to 88 years old) is reported. The procedures include CABG, valve repair and replacement, and major aortic surgery including emergency dissection. The Paediatric Heart Surgery Program started in September 1998 and a total of 279 operations have been performed (age range, 2 weeks to 21 years old).

RESULTS:

Adult

Overall mortality was 3.8%. The majority of procedures were CABG (82.3%). The mean number of grafts per patient was 2.6 with an overall mortality of 2.8% (0% in 2004). Off pump surgery, which was introduced in 1997, accounts for 43% of the total procedures (71.2% in 2004). Aortic valve surgery was carried out in 49 patients and mitral valve replacement/repair in 96, with or without CABG.

Paediatric

The majority of the procedures were VSD 111, ASD 57, TOF 23, and 88 others (including A-V canal, BT shunt and coarctation) with an overall mortality of 1.5%.

CONCLUSIONS:

Heart surgery in a multi-ethnic low volume service can be performed with excellent results comparable to international standards for adults and paediatrics.

Introduction

The English-speaking Caribbean is a multi-ethnic society with different cultures, religions and lifestyles. This multi-racial society includes Caucasian, Afro-Caribbean, East Indians, Asians, Hispanics, Europeans and original natives with a broad range of living standards. The Central Statistical Office of Trinidad and Tobago's last census (2000) reported a total population of 1,262,400 inhabitants with an average 0.7% annual growth rate, being 40% East Indian descendants, 37% African, 20% Mixed, 0.6% Caucasian and 0.3% Chinese. The incidence and types of heart disease vary significantly amongst these races. Historically, people requiring cardiac surgery had to travel to Florida or to the United Kingdom. In 1993, an adult heart surgical program was started in Trinidad and Tobago with the aim of providing a service to the whole Caribbean. The volume of surgery was predominantly low since the surgery was private in nature. We were therefore faced with the challenge of sustaining such a program as well as achieving international standards.

The general consensus from the literature is that a certain minimum volume of surgery needs to be performed by individual surgeons or institutions in order to obtain good quality results. In a study on 120 cardiac surgery programs in California, it was shown that the unadjusted mortality for CABG surgery was 3.91% (923 of 23,629) in hospitals performing fewer than 200 procedures per year, and 2.09% (496 of 23,704) in hospitals performing more than or equal to 500 procedures per year. Risk adjusted data on CABG showed a vast disparity between hospital volumes of less than 200 procedures and more than 200 procedures per year. However, in this study, there were many low volume hospitals with excellent results.

We present here a retrospective analysis on prospectively collected data, which summarizes the whole Caribbean Heart Care experience with regards to the adult as well as the paediatric programs of a low volume multi-ethnic population service based in Trinidad and Tobago.

Method

Prospectively collected data was retrospectively analysed. Clinical data was collected from 1,157 patients who underwent cardiac surgical procedures at two hospitals under the same

program in Trinidad and Tobago between November 1993 and December 2004. The paediatric program was started in 1998.

Results

Of the total 1,157 cases, 878 were adult (629 males, median age 67, age range 18 to 88 years) and 279 were paediatric (age range 2 weeks to 21 years).

Figure 1 shows the volume of surgery performed on the adult and paediatric population.

ADULT

Of the adults, 65% were East Indian, 12% were Afro-Caribbean and 23% were Mixed. Of these, 39.4% were diabetics and 46.5% hypertensive.

The adult procedures included CABG, valve repair and replacement, and major aortic surgery including emergency aortic dissection.

The number of procedures remained around 70 to 80 per year until 2003 when the Government of Trinidad and Tobago started to finance 120 cases per year. The majority of the procedures were coronary artery bypass surgery (82.2%) with a 2.6 ± 0.8 mean number of grafts per patient. Aortic valve surgery was carried out in 49 patients (6.8%) and mitral valve replacement/repair in 96 (10.9%) with or without CABG. Of the mitral valve surgery, about 50% were repaired.

Other procedures (4.1%) included the removal of myxoma, major aortic surgery, root and arch, and also acute dissection of the ascending aorta.

In the early part of the program, a few cases were performed off pump but from 1997, the number increased progressively and in 2001, the number of procedures performed off pump exceeded those done on pump (Figure 2). In 2004, 71.2% of all coronary procedures were performed using the off pump technique. Overall adult mortality to date is 3.8% and CABG mortality, 2.8% (0% in 2004).

PAEDIATRIC

The paediatric program was started in September 1998 and by December 2004, 279 operations had been performed. The predominant procedures were correction of straightforward congenital heart defects, but a significant number of other complex procedures were also performed (Table). The overall paediatric mortality was 1.1%.

Discussion

This study is a retrospective analysis of prospectively collected data on the experience of a single low volume centre in a multi-ethnic society in the English-speaking Caribbean. The data shows excellent results with a low mortality in line with that of international centres. Reports in the literature have often criticised low volume cardiac institutions and surgeons as being unable to produce good results. Evidence does exist that there is higher mortality for certain conditions

in low volume hospitals⁵. However, other studies show that as the surgical risk increases, the patient is more likely to have surgery at a low volume hospital⁶.

We can only speculate about the reason for our results:

- i) The service is predominantly consultant-led in terms of surgeons, anaesthetists and intensivists with a high level of supervision. The service is run entirely by local doctors trained in the United Kingdom, with the exception of the lead surgeons who on a rotating basis, are still visiting mostly from the United Kingdom, Italy and South America. A junior doctor was trained in the United Kingdom but he did not return to Trinidad to take over the surgical responsibility.
- ii) The visiting surgeons – although they do not perform individually a large number of procedures in Trinidad – all head units in their own countries where they perform 200 or more procedures per year.

Few studies have looked at the association between race and the results after CABG, while controlling patient and hospital effects as well as the prevalence of cardiovascular disease in some ethnic groups due to risk factors contributed by cultural practices and values^{8,9}. As our institution's number of procedures is increasing, this may give us the opportunity in the future to answer this question in our multi-cultural, multi-racial environ.

Conclusion

The experience of our low volume multi-ethnic centre demonstrates that it is possible to achieve results comparable to international standards. We believe this is predominantly due to the high level of senior professionals involved in the program, which results in a high level of patient care.

References

1. 2000 Census, Central Statistical Office of Trinidad and Tobago, Port of Spain.
2. Thomas CN, Brann SH, Douglas AR, Thomas JM, Daniel SC, Posthoff C, Rampersad KA, Angelini GD. *Coronary artery bypass graft outcome: the Trinidad and Tobago experience*. West Indian Medical Journal, 2000 Dec; 49(4): 290-3
3. Carey JS, Robertson JM, Misbach GA, Fisher AL. *Relationship of hospital volume to outcome in cardiac programs in California*. American Journal of Surgery Jan; 69(1): 63-8
4. Noronha JC, Martins M, Travassos C, Campos MR, Maia P, Panezzuti R. *Use of hospital mortality rates following coronary artery bypass graft surgery to monitor hospital care*. CAD Saude Publica 2004, 20 Suppl 2: S322-30. Epub 2004 Dec. 15
5. Dudley RA, Johansen KL, Brand R, Rennie DJ, Milstein A. Selective referral to high-volume hospitals: estimating potentially avoidable deaths. JAMA. 2000 Mar 1; 283(9): 1191-3

6. Nallamothu BK, Saint S, Hofer TP, Vijan S, Eagle KA, Bernstein SJ. *Impact of patient risk on the hospital volume-outcome relationship in coronary artery bypass grafting.* Arch Inter Med. 2005 Feb 14; 165(3); 333-37
7. Hannan EL, Siu AL, Kumar D, Kilburn H Jr., Chassin M. *The decline in coronary artery bypass graft surgery mortality in New York State. The role of surgeon volume.* JAMA. 1995 Jan 18; 273(3): 209-13
8. Verderber A, Castelfranco AM, Nishioka A, Johnson KG. *Cardiovascular risk factors and cardiac surgery outcomes in a multiethnic sample of men and women.* American Journal of Critical Care. 1999 May; 8(3): 209-13
9. Konety SH, Vaughn Sarrazin MS, Rosenthal GE. *Patient and hospital differences underlying racial variation in outcomes after coronary artery bypass graft surgery.* Circulation 2005 Mar 15; 111(10): 1210-6

Figure 1: Number of cases per year

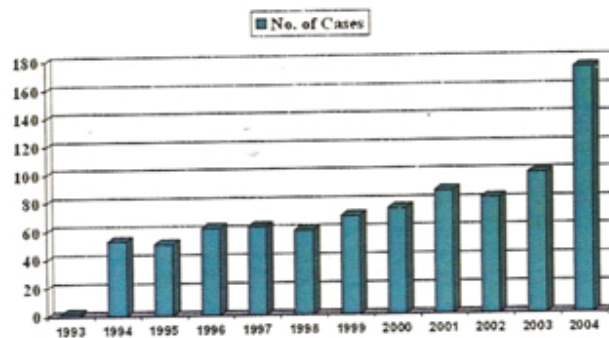
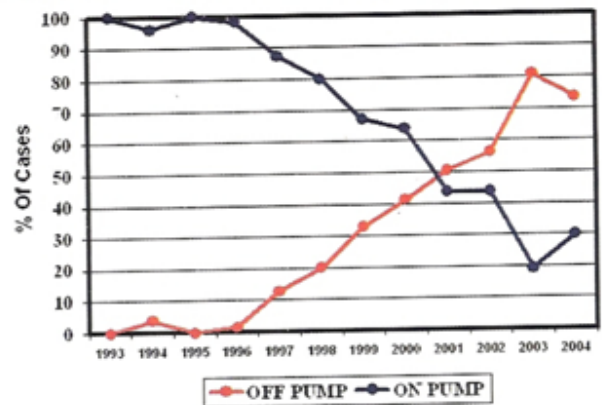


Figure 2: On-pump versus Off-pump



Table

NUMBER OF PEDIATRIC CASES DONE

YEAR	ASD	VSD	TOF	OTHER	TOTAL
1998	5	2	1	2	10
1999	5	3	1	2	11
2000	16	23	5	11	55
2001	9	27	11	14	61
2002	5	22	1	22	50
2003	8	20	2	21	51
2004	9	14	2	16	41
TOTAL	57	111	23	88	279

Other procedures
 AV Canal
 BT Shunt
 AVSD
 Repair of Coactation