



Trends in Cardiac Surgery in Israel, 1985–2002

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Abstract

Background: Reports from Europe and North America indicate that significant changes have occurred in the practice of cardiac surgery in the last two decades.

Objectives: To examine the trends and case-mix in cardiac surgery in Israel and their relationship with changes in invasive cardiology.

Methods: We analysed data collected by the Ministry of Health from all cardiac centers in Israel from 1985 to 2002.

Results: Three periods were identified: the 1980s, when a relatively small number of operations were performed; 1990–1994, characterized by a dramatic rise in the number of operations; and 1994–present, characterized by a small decline and stabilization in the rate of operations. The percentage of valve procedures increased significantly from 15% of all cardiac surgeries in 1991 to 21% in 2002 ($P = 0.002$). In addition, the chance of a diagnostic coronary angiography being followed, in the same patient, by an interventional procedure such as percutaneous transluminal coronary angioplasty or by a coronary artery bypass graft increased dramatically from 42% in 1991 to 69% in 2002. At Rabin Medical Center, there was a constant decline in the percent of repeated CABGs out of the total CABGs performed, from 6.7% in 1996 to 1.3% in 2002.

Conclusions: Despite the rise in the rate of percutaneous coronary interventions since 1991, there has been no significant decline in the rate of CABGs performed. However, there is a significant shift to more complex operations. The number of repeated CABG operations has significantly decreased and, in view of the growing use of arterial grafts and further improvements in invasive cardiology techniques, we expect this decline to continue.

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The practice of cardiac surgery in Israel has undergone dramatic changes in the last two decades, especially with regard to the number of open-heart procedures performed. These changes were coupled by significant changes in invasive cardiology practices. The aim of this study was to review the recent trends in cardiac surgery in Israel and their relationship with invasive cardiology.

Methods

Data were collected directly by the Israel Ministry of Health from all cardiac centers in the country from 1985 to 2002 (received in April

2003). In addition, we analyzed the database of the Rabin Medical Center, Israel, and for purposes of comparison, the database of the Society of Thoracic Surgeons, USA [1] and of the Toronto General Hospital, Canada (received in April 2003).

Statistical analysis

Pearson correlation and the significance for it (P) were calculated between the variances. P values less than or equal to 0.05 were considered statistically significant.

Results

General

Three periods were identified by the number of open-heart operations performed [Figure 1]: the 1980s, when a relatively small number of operations were performed; 1990–1994, characterized by a dramatic rise in the number of operations (peak in 1994, Figure 1); and 1995–2002, characterized by a slight decline followed by stabilization.

The number of active cardiac surgery departments changed as well, with 6 departments in 1985 compared to 16 in 2002. The number of practicing departments rose in the late 1980s, prior to the increase in the number of operations. Interestingly, the average number of open-heart procedures per center in 1985 was equal to that in 2002, namely 459. From 1986 to 1990, because of the rapid rise in the number of departments, the average number of procedures per center was only 250.

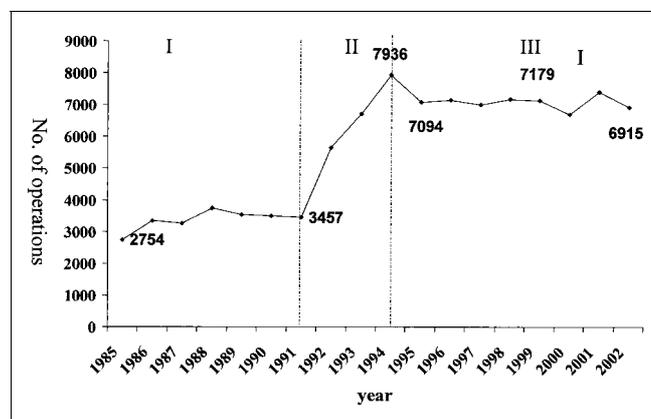


Figure 1. Number of open-heart operations performed in Israel, 1985–2002

CABG = coronary artery bypass graft

Open-heart operations: case mix

Figure 2 compares the trends over time in the performance of isolated coronary artery bypass grafts and of valve procedures (i.e., valve surgery alone or combined with CABG). There was a statistically significant rise in the proportion of valve procedures, from 15% of all open-heart procedures performed in 1991 to 21% in 2002 ($P = 0.002$). Data obtained from the Society of Thoracic Surgeons showed a very similar trend, with an increase from 12% to 16% ($P < 0.001$), and a corresponding decline in the proportion of isolated CABGs, from 78% of all coronary procedures performed in 1995 to 71% in 2001. According to the Society of Thoracic Surgeons, the rise in combined procedures (valve + CABG) in the United States was even more pronounced, from 5% in 1991 to 8% in 2001 ($P < 0.001$).

Relationship between cardiac surgery and interventional procedures

As shown in Figure 3, after 1991 there was a dramatic rise in the number of coronary angiographies performed, which stabilized (rate per million inhabitants) in 1997, with only minor changes thereafter. When the proportion of interventional procedures (percutaneous coronary interventions) was analyzed against the proportion of diagnostic procedures, a constant increase in the ratio was noted, from 18% in 1992 to 54% in 2002. In some cardiology units in Israel the ratio in 2002 was even higher, up to 83% in Rabin Medical Center.

The chance of a diagnostic coronary angiography procedure being followed in the same patient by interventional percutaneous coronary transluminal angiography or CABG increased dramatically. In 1991, the rate of performance for any intervention was 42%, compared with 69% in 2002. Since the rate of CABGs remained relatively stable, this increase was mainly due to the rise in percutaneous interventions.

Repeated CABG

At Rabin Medical Center, we noted a constant decline in the percent of repeated CABG procedures out of the total number of CABG

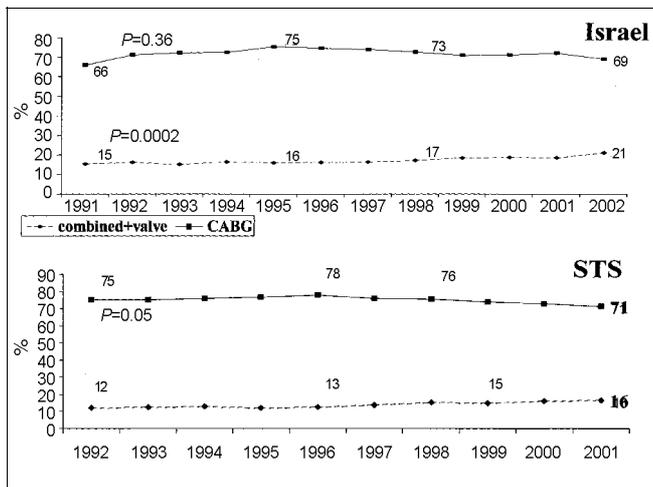


Figure 2. Percentage of CABG (alone) and valvular operations performed in Israel and the United States (according to the Society of Thoracic Surgeons)

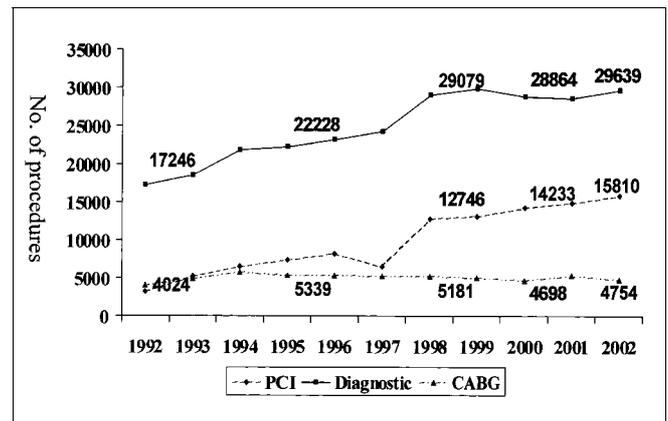


Figure 3. Comparison of trends in diagnostic procedures against percutaneous coronary interventions and CABG

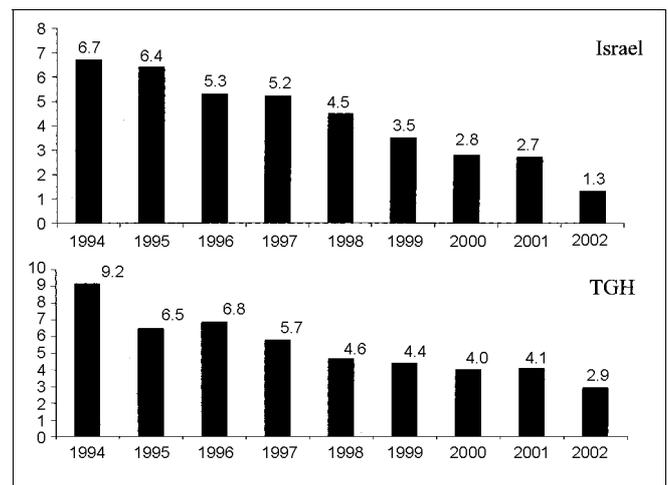


Figure 4. Percent of repeated-CABG procedures (out of total CABGs) performed at Rabin Medical Center and Toronto General Hospital

procedures performed. A very similar trend was noted at the Toronto General Hospital [Figure 4].

Discussion

During the 1980s the number of cardiac operations performed was relatively small. The list of candidates was long, and patients sometimes had to wait up to 2 years. The dramatic rise in the number of operations from 1990 to 1994 in Israel can be attributed to three main factors: the opening of many more cardiac surgery departments; the governmental plan to shorten the waiting list by promoting second-shift operations; and the massive wave of immigration from the Soviet Union, which included many elderly and ill people. The rate of operations peaked in 1994, probably as a consequence of overshoot. After 1994 there was a small decline, followed by stabilization in the number of procedures until 2002. Although the increase in the number of departments was accompanied by a rise in the number of operations performed throughout the last period, the number of operations was not divided evenly among the departments. The majority (70%) was performed in the five largest departments, with others doing as few as 250 procedures per year.

The case-mix in open-heart operations also showed a significant change, with an increase in the number of combined procedures (valve surgery + CABG). This finding might be explained by improvements in operative techniques, leading to the referral of more high risk patients, especially elderly ones with co-morbid disease. A mutual effect was noted between the changes in cardiac surgery practices and invasive cardiology practices. Owing to advances in the field of invasive cardiology, more patients are referred for procedures. The dramatic rise in diagnostic coronary catheterizations affected the number of all types of interventional procedures performed: The chances of a patient undergoing diagnostic coronary angiography and subsequent percutaneous transluminal coronary angiography or CABG rose from 42% in 1991 to 69% in 2002. Since the guidelines for intervention in coronary disease did not change significantly during those years, this increase may suggest an increase in the pool of patients who are candidates for intervention. We suspect that this increase in the pool of patients is probably a result of improved technology and procedural devices and improved periprocedural outcomes, even in older and sicker patients. More and more sicker and older patients who in the 1980s were not candidates even for angiography are now referred for percutaneous coronary interventions and/or CABG. The net result is that despite the fact that percutaneous coronary interventions in-

creased dramatically, the rate of CABGs remained relatively stable.

The decline in repeated CABGs is probably a consequence of the routine use of the internal mammary artery graft to bypass the left anterior descending artery, and the increasing success of percutaneous coronary intervention procedures to treat diseased vein grafts. This trend will probably continue with the growing use of arterial conduits for CABG and the introduction of new stent technologies.

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