Original Article

A decade of cardiothoracic surgery at a tertiary care hospital in Karachi, Pakistan

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Abstract

Objective: The medical records at Aga Khan University were reviewed to analyze the trends, mortality and patients characteristics of cardiothoracic surgeries in the last decade.

Method: The medical records of all adult cardiac, thoracic and combined cardiothoracic operations performed during January 1995 to December 2004 at the Aga Khan University Hospital were reviewed. Data were retrieved and analyzed for trends, patient characteristics, and procedure mortality.

Results: From January 1995 - December 2004, 4553 cases were eligible for the study, of which 73% were males and 9.4% were children. Male to female ratio changed from 1.3:1 to 3:1 from childhood to adulthood. Number of patients requiring cardiothoracic intervention increased continuously throughout the period, cardiac operations outnumbering thoracic or combined procedures. Ten-year average annual mortality remained 4.8% with slight variation per annum. Age distribution of cardiac surgery patients remained the same, however, constantly increasing number of over-70-year olds was observed. Mortality for isolated CABG, isolated valve and CABG with valve remained 1.9%, 4.3% and 18.3% respectively.

Conclusion: Trends of cardiothoracic procedures appear similar to those in the developed countries, so are the mortality figures (JPMA 57:532:2007).

Introduction

With the increase in chronic non-communicable and man-made disorders, incidence of cardiac and thoracic diseases has increased throughout the world with concomitant rise in interventions required to treat these diseases.[1,2] This increase is also due to the greater acceptability of the treatment modalities as quantum leaps in the progress of technology have made interventions easier and safer.[3-8] This control over the situation is gained because hospitals providing such services in the industrialized world have developed a mechanism to share their experience, and disseminate the knowledge to the scientific community and medical industry across the globe.[9,10] This mechanism has allowed continuous monitoring of effects of different procedures, techniques and implants on the outcomes, thus providing a useful feedback for making appropriate adjustments and refinements in all aspects of cardiothoracic surgery.

In this background of ever increasing success rate, it is not surprising that cardiac and thoracic surgeries are now a commonplace in medical practice. Number of Coronary Artery Bypass Grafting (CABG) alone exceeds 800,000 per year globally.[11] Thoracic as well as the congenital cardiac operations are also being performed with increasing frequency and improved results.

Sharp increase in the chronic non-communicable diseases such as coronary heart diseases (CHD) in developing countries has also compelled the healthcare sector to provide advanced surgical services in this part of the world, but the concomitant development of data collection and sharing mechanism is largely lacking, especially in Southeast Asian region.[1] Consequently there is paucity of scientifically collected data to show the need, benefits and effects of interventions for CHD. A major deterrent to maintain a data collection and processing system (database) is its considerable cost, however, its benefits outweigh the cost.[12]

At the Aga Khan University, a private tertiary care hospital, with state of the art facilities for cardiothoracic support, we had the opportunity to retrieve the data of last 10 years. The objective of this medical record review was to look at the trends of cardiac, thoracic and combined surgeries, patient characteristics and their outcomes over the last decade.

Methodology

A medical record review of all patients admitted to AKUH for cardiothoracic surgery during last 10 years was conducted. For administrative purposes some variables are recorded in our hospital's database routinely, hence we could obtain secondary data for the analysis. From the AKUH information system department database we retrieved data with selection criteria of 'all the surgeries, done by classified cardiothoracic surgeons from January 1995 to December 2004'. All operating room (OR) re-visits, e.g. for re-opening due to complications were excluded.

Age was noted as the completed years at the time of surgery. Any patient who had not crossed his/her 14th birthday on the day of surgery was considered as a child. Surgical procedures were coded using ICD 9.0 (International Classification of Diseases 9.0 Clinical Modification). Any procedure having a code from 35.00 to 39.99 was considered as 'cardiac procedure', whereas all procedures given codes from 30.00 to 34.99 were considered as 'thoracic procedure'. All procedure codes outside this range were for adjuvant procedures hence did not affect the original classification of a case. However, if a patient underwent procedures from both the cardiac and thoracic code ranges, it was considered as 'cardiothoracic procedure'. Multiple procedures done in one OR visit were represented once. Isolated CABG operation was defined as CABG with no simultaneous procedure involving valves, aneurysms, septa, pericardium or any procedure for congenital malformation. Isolated valve cases were also defined in the same way. Any death before discharge of the patient was counted towards mortality due to the surgery. As cardiac procedures were the most common type of procedures, it was analyzed in greater detail.

Data was retrieved from AKUH electronic database and imported into SPSS® version 12.0 (SPSS Inc., Illinois, USA). All reopen procedures were deleted from the dataset. Appropriate variables were created using ICD (9.0 CM) procedure codes. Frequencies and cross tabs were run to get statistics. Charts were made by exporting tables to MS Excel® (Microsoft Corp. Redmond, WA, USA).

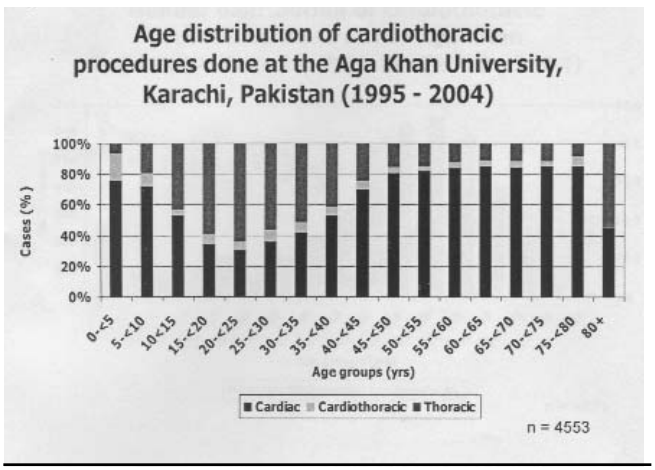
Results

From January 1995 to December 2004, we found 4553 cases of cardiothoracic surgery fulfilling inclusion/exclusion criteria. Out of these 3321 (72.9%) were males. Adults were 4217 (90.6%). Among adults, male to female ratio was 3:1 whereas among children it was 1.3:1. Majority of the procedures were cardiac (75%), cardiothoracic procedures were 5% and rest were thoracic (20%). Trend over time showed ever increasing number of cardiac operations, whereas number of other procedures displayed relatively little change (Table 1). Cardiac procedures were more commonly done on very young, middle and old age people whereas thoracic procedures were mostly done on people between 15 to 30 years of age (Figure 1). As the age increased, the percentage of females undergoing cardiac or thoracic surgery decreased from nearly 46% to 20% stabilizing there after (Figure 2).

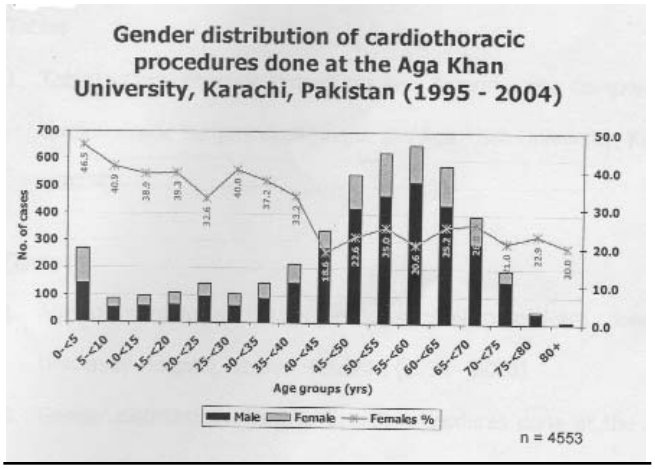
Overall ten year in-hospital mortality of the cardiac surgery unit remained 4.8%, 8 (0.2%) patients either left against medical advice or were transferred to another facility for various reasons and the rest (95.0%) were discharged home. Combined mortality trend over the decade showed that there was a little variation, ranging from 2% to 10%. Category wise ten year mortality of cardiac, thoracic and combined procedures was 3.4%, 5.4% and

Table1. Cardiothoracic procedures and proportionate composition of work load at cardiothoracic surgery department, the Aga Khan University, Karachi, Pakistan (1995 - 2004).

Year	Type of operations		
	Cardiac (%)	Thoracic (%)	Cardiothoracic (%)
1995	57 (41.6)	61 (44.5)	19 (13.9)
1996	131 (65.5)	55 (27.5)	14 (7.0)
1997	165 (59.4)	92 (33.1)	21 (7.6)
1998	238 (76.8)	48 (15.5)	24 (7.7)
1999	290 (81.0)	51 (14.2)	17 (4.7)
2000	392 (77.5)	93 (18.4)	21 (4.2)
2001	375 (78.8)	86 (18.1)	15 (3.2)
2002	528 (80.1)	1 09 (16.5)	22 (3.3)
2003	546 (76.0)	142 (19.8)	30 (4.2)
2004	695 (76.3)	170 (18.7)	46 (5.0)



Figures 1. Age distribution of cardiothoracic surgical procedures done at the Aga Khan University Hospital, Karachi, Pakistan (1994 - 2004).



Figures 2. Gender distribution of cardiothoracic procedures done at the Aga Khan University, Karachi, Pakistan (1995 - 2004).

23.1% respectively whereas mean (SD) of these mortalities were 4.4 (1.3), 6.1(2.0) and 22.2 (22.2) respectively. There was also no significant difference of average mortality of these categories between first half of the decade and the second (p-values: 0.63, 0.73 & 0.98).

Age distribution of patients undergoing cardiac surgical procedures did not show any change although we received larger number of patients from each group in successive years. Patients undergoing cardiac surgery in their 70s increased constantly and in 2004 we also operated upon 3 patients who were in their 8th decade of life.

Isolated CABG was the most commonly done operation among the cardiac procedures (2674; 79%) followed by isolated valve operations (255; 7%). Other major cardiac procedures (213; 6%) included surgery of aneurysms, septal repairs, pericardiectomy, correction of Tetralogy of Fallot, and systemic to pulmonary shunts. CABG with valve or other procedures were relatively less frequently done (67; 2%). Remaining were miscellaneous procedures like redo CABG, redo valves, redo CABG with valve and cardiac myxomas (208; 6%).

Ten year mortality of isolated CABG and isolated valve was 1.9% and 4.3% respectively. CABG when combined with valve or any other procedure carried higher mortality (18.3% and 14.3%). Other major and miscellaneous cardiac procedures (as described above) had 8.5 and 10.6% mortality.

Isolated CABG mortality is now considered as the indicator of quality of care of any cardiac surgery unit. Our experience showed that initially mortality increased as the patient load increased until 2001 but thereafter it constantly decreased to reach a lowest level of 1.1% in 2004.

We also looked at the isolated valve mortality. At our unit total of 255 isolated valve procedures were done from 1995 to 2004. Out of these less than one fourth (59) were carried out in first half. Total deaths were 11 making over all mortality of 4.3%. Mean (SD) of mortality per year was 4.5% (4.1). There was no association between year of surgery and mortality ($p<0.18$). Average mortality rate during the first half was also compared with the second half using t-test. No significant difference was found again ($p<0.96$). Mortality nevertheless ranged from 0 - 12%.

Discussion

Despite being fortunate to have the facilities of a well established information technology department which keeps electronic records of all the procedures being done at the hospital, only a very small number of variables were being recorded. It is because this data was not collected for medical outcome research purposes, but rather for administrative purposes. Therefore, we had secondary data with its inherent problems, including missing information and unclear definitions. Data were also not entered twice to enable detection of key punching errors. However, during our analysis we found only couple of key punching errors which was rather unusual for any secondary data. Further, as for the coding of surgical procedures ICD codes were used, ambiguity in definitions was also avoided. So we had relatively much valid data to analyze.

Population is aging world over and so is in our region. Demographic and epidemiologic transitions are behind this phenomenon.[1] In Europe life expectancy was raised from 71 years to 83 years in the last four decades and life expectancy at age 65 ranged from 16 to 19 years.[13] In US it increased to around 2 years since 1989, the smaller increment may be due to already high life expectancy of 75.5 years.[14] A much sharper 5-6 year increase has been observed in Southeast Asia in the last 7 to 8 years.[15] On the one hand, it is a sign of protection from diseases and hazards in early years of life but paradoxically, it also serves as an indicator of higher prevalence of degenerative diseases in later age.[16] Increasing incidence of condition like coronary artery disease with increasing age has been reported in the absence of any other risk factor.[17,18] This provides sufficient evidence to support our observation that more and more people are requiring intervention for cardiovascular illnesses. Furthermore, diabetes mellitus, an established risk factor for coronary heart disease (CHD) is on the rise worldwide, while obesity, smoking, dyslipidemias and hypertension are highly prevalent indicating that CHD will rise further.[19-21] Moreover, despite addition of other cardiothoracic surgery centers in the city AKUH received increasing number of patients. This gives further support to our premise that number of people requiring cardiovascular interventions is rising.

We found that as the age increased, males made the larger proportion of the cardiothoracic surgery patients. In the early years of life, the male to female ratio was almost equal. This is because gender does not significantly influence the occurrence of congenital malformation, therefore both sexes were represented equally. However, we know that as age increases, certain factors act differently on each gender for example females are protected by their hormones against cardiovascular diseases.[9] However, this change in proportion might not be only due to physiological reasons. Factors like health care behaviour may also be acting, at least in our part of the world, e.g. preference is given to the bread earner of the family in case of health care need. This preference often persists even after the bread-earner has grown old and has retired.[22]

Isolated CABG mortality world wide is decreasing. The European Association of Cardio-thoracic Surgery

database report of 2005 shows the same trend and so does the Spring report of Society of Thoracic Surgeons, USA.[10] Furthermore, isolated CABG is now considered to be the indicator for quality of care of any unit as the procedure is now standardized and statistical models have been developed to calculate the preoperative mortality of each patient undergoing isolated CABG.

Valve surgery is although being done more frequently, but not only is the mortality still high, around 4 - 6%, but also no clear decreasing trend is seen.[10] Our experience, too, was not much different from the other centers across the globe. It ranged from 0% to 12% over the decade in our center with a decline in later years.

Despite having good quality data, we felt restricted due to the paucity of variables available to us. This is because there is no mechanism for collecting and computerizing cardiothoracic surgery patient data routinely. Variables to look at the preoperative mortality of patients were insufficient to adjust mortality rate. The high mortality of cardiac surgery can be due to selection of high risk cases for surgery and may not always indicate poor quality of care. The evaluation of such patients with risk stratification systems like EuroSCORE, Parsonet score etc have helped in calculating risk adjusted mortality which is gradually becoming a prime indicator of performance.

Since we are presenting data of a single center only, it is not representative of the population. Therefore, there is a dire need to develop and maintain data collection and processing systems for cardiothoracic surgeries at all the centers providing such services. This can help formulate national policies for the future.[23]

Conclusion

Cardiac and thoracic operations are being done more frequently in which cardiac procedures dominate. Less than 10-year-olds and adults over 40 undergo cardiac surgery more frequently. Thoracic surgery is more commonly done in age group of 10 - 40 years. Percentage of females among cardiothoracic surgery patients decreases as the age increases which may not only due to physiological reasons. The cardiac surgery trends show increasing number of elderly being offered surgery. Most common procedure is isolated CABG with a crude mortality not different from western centers. Other isolated and combined procedures carry higher mortality risk.

Trends of cardiothoracic surgery seem comparable with the west but extensive and more representative data must be obtained from centers across the country to identify national trends in cardiothoracic surgery ultimately leading to development of firmly based action plan.

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