

# Is there an Age Limit for Cardiac Surgery?

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## Abstract

**Introduction:** This study was undertaken to analyze the risk of peri-operative mortality and morbidity after Cardiac Surgery with Cardio-pulmonary Bypass (CPB) in Patients above 85 years of age.

**Patients and Methods:** Between 1/2001 and 05/2005 thirty-nine patients  $\geq 85$  years of age at the time of surgery were examined. Median age was 87 years (85–92), 13 were males and 26 were females. 11 (28%) were urgent cases, and 4 (10%) considered as emergencies. 12 (32.5%) received CABG, 14 (35%) aortic valve replacement and in 10 (25%) a combination of the both was performed. The remaining had a combination of CABG with other operations.

**Results:** Peri-operative mortality was 7.7% (3 pts). All were in the emergency group. One of them went into the OR under cardio-pulmonary resuscitation and died in the OR. The other two were urgent cases who died later in the ICU due to cardiac failure. Temporary neurological dysfunction (TND) was found in 10.3% (4 pts) of the survivors. Mean mechanical ventilation time was 1.5 days, mean ICU stay was 3 days and mean hospital stay 9 days.

**Conclusion:** Cardiac surgery with CPB in Octogenarians can be performed with an acceptable mortality in elective patients, but is associated with a dismal outcome under emergency conditions.

**Keywords:** coronary bypass surgery, cardiac valve surgery, octogenarians

## Introduction

Increasing life expectancy and better health status of the population, especially in the industrialized world have raised a number of ethical and medical questions regarding indications for Cardiac surgery in elderly patients. These questions can best be answered objectively by examining the results of surgical procedures in the age cohort under discussion.

Patients in the ninth decade of life are usually at a higher surgical risk due to significant co-morbidity from age-related factors.

This retrospective single centre review was undertaken to analyze the risk of mortality or morbidity in all patients over 85 years of age. All patients who underwent Cardiac surgery with Cardio-pulmonary Bypass (CPB) were included.

## Materials and Methods

This retrospective study was approved by the institutional review board.

From January 2001 to May 2005, 39 Patients equal to or above the age of 85 years of age at the time of surgery underwent On-pump Cardiac Operations at Hannover Medical School. Information was reviewed retrospectively using data gathered contemporaneously in our departmental database and supplemented from patient records.

There were 13 men and 26 women whose age ranged from 85 to 92 (mean 87). Of the entire cohort 11 (28%) were considered as urgent cases, 4 (10%) were emergencies and the rest were elective cases. Preoperative patient characteristics are shown in Table 1.

Hypertension was the most common preoperative finding, followed by a history of smoking. 12 (32.5%) received isolated CABG, 14 (35%) isolated aortic valve replacement and in 10 (25%) a

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**Table 1.** Patient characteristics.

| Patient                   | (n = 39)    |
|---------------------------|-------------|
| Age (year)                | 87 (85–92)  |
| Male                      | 13          |
| Diabetes                  | 11          |
| Creatinine (mmol)         | 99 (39–150) |
| Prior MI                  | 11          |
| LV Function               |             |
| Bad                       | 20          |
| Average                   | 5           |
| Good                      | 6           |
| Cardiogenic Shock         | 3           |
| Cardiac Rhythm            |             |
| Sinus                     | 22          |
| Chr. Atrial Fibrillation  | 5           |
| MI: Myocardial infarction |             |

combination of the both was performed. The remaining had a combination of CABG with other operations.

Definition of adverse outcome and neurological complications:

In this study, adverse outcome was defined as intra-operative or in hospital death or the occurrence of permanent neurological injury. A stroke was considered permanent when patients were discharged with residual neurological symptoms. Temporary neurological dysfunction (TND) was analyzed separately in all patients surviving the operation, excluding those who suffered strokes or who never regained consciousness after surgery. TND was defined as postoperative confusion, agitation, delirium, prolonged obtundation or Parkinson-like symptoms, with no focal deficit in computer tomography or magnetic resonance imaging if these studies were available.

## Statistical Methods

Results were expressed as mean  $\pm$  standard deviation. Due to the limited number of patients only descriptive statistics has been used.

## Results

The peri-operative data are shown in Table 2. Peri-operative mortality was 7.7% (3 pts). All were in the emergency group. One of them went into the

**Table 2.** Peri-operative data.

|                                   |             |
|-----------------------------------|-------------|
| Exitus in Tabula                  | 1/39        |
| Aortic clamping time (min)        | 47 (31–102) |
| Cardiopulmonary bypass time (min) | 84 (49–257) |
| Ventilation:                      |             |
| Under 12 hours                    | 18          |
| 12–24 hours                       | 15          |
| More than 24 hours                | 5           |
| ICU Stay:                         |             |
| Under 24 hours                    | 18          |
| 24–72 hours                       | 10          |
| More than 72 hours                | 10          |

OR under cardio-pulmonary resuscitation and died in the OR. The other two were urgent cases who died later in the ICU due to cardiac failure.

Temporary neurological dysfunction (TND) was found in 10.3% (4 pts) of the survivors.

Mean mechanical ventilation time was 1.5 days, mean ICU stay was 3 days and mean hospital was stay 9 days.

## Discussion

With an increasing life expectancy and better health status of the population, resulting in increased proportion of octogenarians, the number of patients referred for Cardiac surgery has also grown. Whether or not it is a good idea to undertake Cardiac surgery in these extremely old patients has to be evaluated carefully, not only because of limited resources but also because it is not clear that outcomes from such procedures always justify their being attempted also from the patient's view.

This study shows that Cardiac surgery with CPB in Octogenarians can be performed with an acceptable mortality in elective patients, but is associated with a dismal outcome under emergency conditions. Moreover, hospital morbidity and mortality are considerably higher in elderly patients, and the duration of hospitalization is usually prolonged.

In 10860 patients who underwent coronary bypass operations, Puskas and coworkers were able to show that age is a strong predictor (OR, 1.07/year) of post-operative stroke. These facts have led to a debate as to whether patients in the

ninth decade of life should be accepted for Cardiac surgery.

In most of the cases of symptomatic coronary artery disease, despite maximum medical therapy or symptomatic cardiac valvular disease, surgery is usually the only option not only for prognostic reasons but also for symptomatic therapy. Increasing number of Octogenarian Cardiac patients live at home, sometimes alone and surgery offers the only way that they will be able to live at their homes with minimal specialized medical or nursing care. The other option would be for them to live in specialized nursing homes which would be of greater financial load to the society.

In this study, we confirm that emergency operation is an important risk factor for adverse outcome with all our mortality coming from emergency or urgent cases. However, even elective Cardiac surgery has serious risks, which are magnified in the elderly. It has been shown that the risks both of neurological complications and of adverse outcome (death or permanent neurological sequelae) increase with advancing age (Peterson, 1995; Puskas, 2000) Furthermore, the proportion of patients with serious neurological complications (permanent rather than transient strokes) also rises steeply in the elderly.

Our results show that octogenarians undergoing cardiac surgery had an overall in-hospital mortality of 7.7%, which is not strikingly higher than results in younger patients. In elective patients, the risk of adverse events outcome is actually surprisingly low.

The present study shows that the chance of adverse outcome increases in urgent or emergency cases. Compared to the younger patients, these patients needed longer ICU and hospital stay (1.1 versus 3 days ICU stay and 7 versus 9 days hospital stay).

During the interval under study, no patients were refused operation at our centre only because of advanced age, but we cannot assess the possible impact of selection of better risk patients by referring physicians. Although these high risk patients were referred to our clinic by cardiologists, the final decision concerning surgery was made by the surgeon.

Nevertheless, our results in elective cases justify Cardiac surgery with CPB in Octogenarians and emergency cardiac surgery must be recognised to carry a very high risk.

A high incidence of TND in this study was also noted, and reflects the vulnerability of the brain in geriatric patients. Prolonged obtundation may however also be related to slower metabolism of anaesthetic drugs in the elderly.

## Conclusion

From our experience, there is no justification for refusing a patient a Cardiac operation just because of age. Elective coronary or valve procedures are associated with acceptable risks of adverse events and should be undertaken for appropriate indications without unnecessary hesitation. However, emergency operations dramatically increase the likelihood of adverse outcome and as such in these patients, the decision to operate should be weighed very carefully.

Furthermore, this operation is associated with a significant incidence of TND and a prolonged ICU stay, which may cause secondary complications.

## Disclosure

The authors report no conflicts of interest.

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