

IMPACT OF FEMALE GENDER ON THE EARLY OUTCOME IN OFF-PUMP CORONARY ARTERY BYPASS SURGERY

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Abstract:

Background/Objective: Female gender is an independent risk factor for adverse outcome after conventional coronary bypass surgery (CABG). The objective of this retrospective study was to evaluate the influence of the gender on the early outcome in "off pump" coronary bypass surgery without extracorporeal circulation (OPCAB).

Patients and Method: Between January 2001 and December 2003, a total of 225 patients, 49 female and 176 male, underwent OPCAB surgery for multivessel disease at our institution. Operations were performed by the same surgeon. The relationship between OPCAB surgery and clinical outcome with major and minor adverse events was assessed with univariate analysis.

Results: The same operative technique was applied for both female and male patient groups. No conversion to conventional CABG with cardiopulmonary bypass was necessary. The overall in-hospital mortality was 1.3% (3 of 225 patients), all of them in the male patient group ($p = 0.08$). Female patients showed a lower rate of postoperative atrial fibrillation than male patients (6% vs. 15%; $p = 0.08$). The incidence for further postoperative complications such as rethoracotomy for bleeding, stroke, delirium, pneumonia and wound infection was identical and statistically not different in both groups.

Conclusions: In OPCAB surgery, female gender plays not a predictive role for postoperative adverse events and complications influencing morbidity and mortality. In selected female patients OPCAB surgery has a beneficial effect on early clinical outcome.

Key words: Female gender; OPCAB surgery; clinical outcome

INTRODUCTION

Coronary and cerebrovascular disorders rank first among all disease categories in hospital discharges for women. Female gender has been shown to be an independent risk factor for perioperative mortality after coronary bypass surgery, a risk which is 1.5 to 2-times higher than in male [1, 2, 3]. As reported in the current literature [4], female patients undergo cardiac catheterization 10 times less than male patients. In addition, the risk profile of female patients includes

higher age and functional class, advanced stage of the disease and higher prevalence of concomitant disorders such as diabetes and hypertension. All these facts can often lead to more urgent or emergent cardiac operations, which can be escorted by technical difficulties due to smaller size of coronary arteries [5-7, 8]. However, Bandrup-Wognsen et al. [9] and the investigators from the Bypass Angioplasty Revascularization Investigation (BARI) study have shown that women have a higher 5-year survival rate compared with men after adjustment of risk-related variables [10].

In the last decade, cardiac surgeons have increasingly diverted to less invasive surgical procedures to reduce perioperative mortality and morbidity. A step towards this target was to perform coronary surgery without using cardiopulmonary bypass to avoid the adverse side-effects of the extracorporeal circulation [11-13]. Therefore, OPCAB surgery has been introduced as an appropriate technique. To date, numerous studies indicate that OPCAB surgery leads to an overall benefit [14, 15], particularly in selected high-risk subgroups [16-18]. Regarding to perioperative morbidity and mortality however, it is not clearly assessed that female patients profit from OPCAB interventions.

The aim of this retrospective clinical study was to evaluate whether the female gender has an influence on the early outcome in OPCAB surgery.

PATIENTS AND METHOD

Between January 2001 and December 2003, 225 patients underwent elective OPCAB surgery for multivessel disease at our institution, performed by the same surgeon. Forty-nine female patients and 176 male patients were evaluated, representing 16% of all CABG procedures within the timeframe mentioned above. Emergency cases were excluded from our analysis. Preoperative patient characteristics are demonstrated in Table 1.

Postoperative complications were defined as minor (MIN) and major (MAJ) adverse events. MIN included atrial fibrillation, respiratory deficiency without prolonged ventilation (pneumothorax, pneumonia, pleural effusion), delirium or confusion (in accordance with the American Psychiatric Association guidelines [19]) and superficial wound infections (sternum and legs). MAJ included myocardial infarction with or without low-output syndrome, severe bleeding requiring retho-

Table 1. Preoperative patient characteristics.

Variables	Females, n = 49	Males, n = 176	p -Value
Age [yrs]	64.7 ± 11.2	63.5 ± 10.7	ns
BMI [kg/m ₂]	28.5 ± 5.1	28.2 ± 5.8	ns
Arterial Hypertension	37 (76%)	123 (70%)	ns
Dyslipidemia	40 (82%)	140 (80%)	ns
NIDDM/IDDM	8 (16%)	36 (21%)	ns
Smoking history	14 (29%)	42 (24%)	ns
COPD	3 (6%)	8 (5%)	ns
Diseased CV	2.5 ± 0.7	2.6 ± 0.7	ns
Previous myocardial infarction	2 (4%)	18 (10%)	ns
Ejection fraction (%)	55 ± 15	54 ± 17	ns
Euroscore	5.4 ± 3.9	3.7 ± 3.1	0.001

BMI: Body mass index; NIDDM/IDDM: (Not-)Insulin dependent diabetes mellitus; COPD: Chronic obstructive pulmonary disease; CV: Coronary vessel

racotomy, renal dysfunction, prolonged ventilation, mediastinitis, stroke (new temporary or permanent, focal or global neurological deficiency) and in-hospital mortality. Perioperative myocardial infarction was diagnosed by new electrocardiographic events (loss of R-wave progression, new left bundle branch block, new ST-, or T-wave changes), associated with an increase of cardiac enzymes indicating myocardial ischemia. Renal dysfunction was defined as increased serum creatinine (> 200 µmol/L) requiring medical treatment with at least diuretics, or dialysis. Prolonged ventilation was defined as intubation longer than 24 hours. Criteria for conversion to cardiopulmonary bypass were malignant arrhythmias related to ischemia and persistent hemodynamic instability with continuous irreversibly mean arterial pressure lower than 50 mmHg.

Intraoperative management: Anesthesia was induced with Thiopental 5 mg/kg, Pancuronium 0.1 – 0.15 mg/kg and Fentanyl 1.5 – 5 µg/kg. For maintenance, inhalative anesthesia with Isoflurane 1 Vol% and ventilation with air and 50 Vol% oxygen was used. During assembly of distal anastomoses, oxygen was elevated to 80 Vol%. Anticoagulation was achieved by administration of 300 U/kg of heparin. During the procedure, an activated clotting time (ACT) of 400 sec was maintained. For hemodynamic stability, volume substitution with infusions and/or low dose inotropic support was carried out. The use of pre-warmed intravenous fluids and a heated mattress with a warm air blanket helped maintain normothermia.

Surgical technique: All procedures were performed via midline sternotomy. Saphenous vein harvesting was performed simultaneously and pedicled internal thoracic artery was used. For stabilization of the heart and visualization of coronary arteries, an Octopus™-3-stabilizer (Medtronic Inc, Minneapolis, Minnesota, USA) was used. After sternotomy, a deep pericardial stitch

was placed close to the vena cava inferior and a sponge was introduced to help elevating and rotating the heart in any given position. In all patients, intra-coronary shunts were placed. Anastomoses were sewn with 7-0 or 8-0 monofilament running sutures.

Statistical analysis: Data collection and statistical analysis were performed with Access for Windows and SPSS (SPSS Inc., Chicago, Illinois, USA) for Windows. Continuous variables are expressed as mean ± standard deviation throughout the article and categorical data as number and/or proportion using t-test, chi-square, or Fisher Exact test. Statistical significance was assumed at p < 0.05.

RESULTS

The operative procedure did not differ between female and male patients. In none of the patients, a conversion to conventional CABG was necessary. The mean number of grafts applied was 2.6 in female and 2.4 in male patients. The use of the internal thoracic artery was similar in both groups, with 97% in male and 98% in female patients (p = 0.3). Detailed intraoperative data are shown in Table 2. There were three in-hospital deaths (1.3%) in the male patient group. One patient with main-stem stenosis developed an acute low output syndrome based on a postoperative myocardial infarction with electromechanical dissociation at the third postoperative day, making a mechanical resuscitation inevitable. He died of ischemic brain failure at the eighth postoperative day. Another patient developed low output syndrome based on a perioperative myocardial infarction, requiring circulatory support with an intra-aortic balloon pump. He died at the first postoperative day. The third patient was found dead in his bed at the eighth postoperative day shortly before discharge. Unfortunately, an autopsy was denied by the family.

Male patients showed a not significantly elevated rate of postoperative atrial fibrillation compared to fe-

Table 2. Intraoperative data.

Variables	Females, n = 49	Males, n = 176	p -Value
OP-time [min]	141.7 ± 34	150.2 ± 46	ns
No of grafts	2.6 ± 1.0	2.4 ± 0.5	ns
LAD	98%	97%	ns
RCA	59%	48%	ns
DB/IB	4%	10%	ns
OB	45%	52%	ns
Completeness of RV	94%	95%	ns

LAD: Left anterior descending; RCA: Right coronary artery; DB: Diagonal branch; Intermediate branch; OB: obtuse branch; RV: Revascularization

Table 3. Postoperative complications and adverse events.

Variables	Females, n = 49	Males, n = 176	p-Value
30-day mortality	0	3 (1.7%)	ns
Myocardial infarction	0	2 (1%)	ns
Low output	0	2 (1%)	ns
Stroke	0	1 (0.6%)	ns
Major Bleeding (RTx)	1 (2%)	1 (0.6%)	ns
Pneumonia	0	4 (2%)	ns
Atrial fibrillation	3 (6%)	28 (15%)	ns
Confusion/Delirium	0	3 (1.7%)	ns
Superficial wound infection	0	1 (0.6%)	ns

RTx: Re-Thoracotomy

male patients (15% vs 6% [p = 0.08]). Further postoperative complications, such as postoperative myocardial infarction, rethoracotomy for bleeding, stroke, delirium, pneumonia and wound infection were also comparable between both groups (Table 3). All patients except two in-hospital deaths could be weaned from ventilation within the first twelve hours after surgery, and discharged from the intensive care unit within the first twenty-four hours.

DISCUSSION

Coronary artery bypass grafting is one of the most frequently performed surgical procedures in western countries. In several previous studies, the female gender has been identified as a risk factor for perioperative mortality and morbidity [1, 5, 6]. The current literature shows that in conventional CABG procedures, the outcome in female patients is worse than in male [1, 3]. However, the real reason for worse outcome in women remains still unclear. Most investigators agree that, women come to surgery in a more advanced stage of the disease than men. In addition, at the time of presentation, women are generally older and have a higher prevalence of diabetes, hypertension, and congestive heart failure [8, 21].

In the recent literature comparing both operative techniques only in female patients, OPCAB patients

showed a better outcome than the conventional CABG group. Petro et al. reported a mortality of 2.3% in OPCAB patients compared to 4.1% in the on-pump group [22]. However, this difference was not significant. In a study of Brown et al., the unadjusted mortality rate was 3.1% and 3.9% respectively [23]. Although this difference was small, Brown had translated this into the number of patients, and reported a difference of 111 fewer deaths in the female OPCAB group compared with the conventional CABG group (555 deaths versus 444 deaths). On the other hand, in a multicenter, propensity score matched study performed by Mack et al. [20] with nearly 22.000 female patients and in a single center study of Bucerius et al. [24] with 2182 female patients, significantly lower perioperative mortality in the female OPCAB group was observed. Considering these results, it is evident that OPCAB surgery would lead to a clinical benefit for female patients in comparison with conventional CABG. Therefore, it would be of interest to investigate how OPCAB would influence the early outcome in female vs. male patients with identical preoperative clinical characteristics. In our retrospective clinical study with 176 male and 49 female OPCAB patients, we have observed no statistically significant differences between both subgroups related to perioperative minor or major adverse events. Our results are in accordance with Athanasiou et al. who examined 413 OPCAB patients

(232 male and 181 female) under the same aspects [2]. He concluded that the female gender is not an independent predictor for minor or major adverse outcome. Since in our study the entire patient group was operated by the same surgeon, our results are homogenous, excluding any difference between technical skills of varying surgeons.

In our study, the postoperative course showed no differences between both subgroups in ventilation time, ICU stay and hospital length of stay. This observation is in contrast to the results of Capdeville et al., presenting significantly longer periods for all of these parameters in women, even if the evidence of perioperative complication was similar in both subgroups [25]. In our point of view, the postoperative course can considerably be influenced by logistic and administrative parameters in different institutions.

Atrial fibrillation is the most common complication after CABG with an incidence between 20% and 40% in the first postoperative week [25]. Zangrillo et al. [26] and Athanasiou et al. [2] revealed a high incidence of postoperative atrial fibrillation in OPCAB surgery reaching 20%. Considering the results of a meta-analysis, Athanasiou et al. [27] suggested that OPCAB surgery may reduce the incidence of postoperative atrial fibrillation in a population with a mean age of less than 70 years. He concluded that, where only studies of high quality were considered, non-significance may have been achieved as a result of small number of patients in the selected group. In accordance to the results of Zangrillo et al. [26], we observed a lower incidence rate of atrial fibrillation in female patients.

In conclusion, OPCAB surgery has proven as a safe and effective technique for women with multivessel disease leading to similar clinical results compared to the male patient population. Female gender demonstrates a trend towards a better outcome after OPCAB surgery than conventional CABG. We suggest that, in selected female patients, OPCAB surgery would show a clear benefit for the early clinical outcome.

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