Experience with implantable cardioverter defibrillator therapy in elderly patients

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Aim Concern exists about the benefit of implantable defibrillator therapy in elderly patients. We assessed the utility of implantable defibrillator therapy and its effect on mortality in patients 70 years and older and compared results in this group to those in younger patients.

Methods and results Thirty-two out of 200 consecutive patients (16%) were 70 years or older at the time of implantation of a defibrillator. When comparing elderly to younger patients no significant differences were noted with respect to presenting arrhythmia, left ventricular ejection fraction or presence of an old myocardial infarction. Elderly patients had a higher prevalence of ischaemic heart disease, while in the younger group more patients had idiopathic ventricular tachycardia. Cumulative survival curves (Kaplan–Meier method) for all-cause mortality, sudden cardiac death and non-sudden cardiac death were constructed for elderly and younger patients. No significant differences for cumulative survival from all-cause mortality (75 vs 74%), sudden cardiac death (0 vs 4%) and non-sudden cardiac death (97 vs 93%) were found. The incidence of appropriate shocks during follow-up was comparable (65 vs 72%).

Conclusion Implantable defibrillator therapy was effective in preventing sudden cardiac death in the elderly. Total mortality was similar to younger patients at a follow-up of 19 ± 14 and 25 ± 19 months, respectively. Age itself should be no contraindication to implantable cardioverter defibrillator therapy.

(Eur Heart J 1997; 18: 1339–1342)

Key Words: Implantable cardioverter defibrillator, mortality, elderly.

Introduction

Implantable cardioverter defibrillator therapy is highly effective in preventing sudden cardiac death in patients with malignant ventricular arrhythmias[11]. The impact of such therapy on total mortality, however, is still a matter of debate, although in the recently reported Multicenter Automatic Defibrillator Implantation Trial (MADIT) there was a benefit on total survival in a subset of patients with ischaemic heart disease and non-sustained ventricular tachycardia[2–4]. Mortality after long-term follow-up is mostly due to non-sudden cardiac and non-cardiac deaths[5]. These observations have led to concern about the mortality benefit of implantable cardioverter defibrillator treatment in certain patient groups, such as the elderly. We therefore retrospectively reviewed our experience with this treatment in 200 consecutive patients, and compared data of patients 70 years or older to patients younger than 70 years of age.

Patients and Methods

We reviewed the available data on 200 patients who had received an implantable cardioverter defibrillator in our centre since 1991. Patients who survived an episode of ventricular fibrillation and patients with haemodynamically poorly tolerated ventricular tachycardia were candidates for implantation after correctable causes were excluded. Exclusion criteria were non-treatable cancer, dementia and medically refractory end-stage NYHA class IV heart failure in patients with a contraindication to heart transplantation. All patients who were 70 years or older at the time of cardioverter defibrillator implantation were grouped as elderly patients and compared to the younger patient group, with respect to the clinical arrhythmia, underlying heart disease, left ventricular ejection fraction and length of follow-up. All patients received regular follow-up at our centre and no patients were lost to follow-up. Table 1 summarizes the clinical characteristics of the patients. Actuarial survival curves using the Kaplan–Meier method were constructed to compare total mortality, sudden cardiac death, non-sudden cardiac death and non-cardiac death between elderly and younger patients. The same procedure was
Table 1 Patient characteristics

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Elderly patients</th>
<th>Younger patients</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(range 70-81)</td>
<td>73 ± 3</td>
<td>56 ± 13</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Males</td>
<td>88%</td>
<td>87%</td>
<td>ns</td>
</tr>
<tr>
<td>Left ventricular ejection fraction</td>
<td>39 ± 16%</td>
<td>41 ± 19%</td>
<td>ns</td>
</tr>
<tr>
<td>Ventricular fibrillation</td>
<td>41%</td>
<td>35%</td>
<td>ns</td>
</tr>
<tr>
<td>Syncopal ventricular tachycardia</td>
<td>59%</td>
<td>65%</td>
<td>ns</td>
</tr>
<tr>
<td>Ischaemic heart disease</td>
<td>88%</td>
<td>68%</td>
<td>0.03</td>
</tr>
<tr>
<td>Non-ischaemic dilated cardiomyopathy</td>
<td>12%</td>
<td>13%</td>
<td>ns</td>
</tr>
<tr>
<td>Idiopathic ventricular tachycardia/ventricular fibrillation</td>
<td>0%</td>
<td>12%</td>
<td>0.04</td>
</tr>
<tr>
<td>Hypertrophic cardiomyopathy</td>
<td>0%</td>
<td>4%</td>
<td>ns</td>
</tr>
<tr>
<td>Long QT syndrome</td>
<td>0%</td>
<td>3%</td>
<td>ns</td>
</tr>
<tr>
<td>Old myocardial infarction</td>
<td>72%</td>
<td>53%</td>
<td>ns</td>
</tr>
<tr>
<td>Follow-up</td>
<td>19 ± 14 months</td>
<td>25 ± 19 months</td>
<td>ns</td>
</tr>
</tbody>
</table>

Statistical methods

All data are expressed as means ± standard deviation. Differences between continuous variables were analysed using the Student t-test and differences between proportions with Fisher's exact test. The differences between the Kaplan–Meier actuarial survival curves were analysed with the log-rank method. P values <0.05 were considered significant.

Results

Thirty-two out of 200 patients (16%) were 70 years or older at the time of implantation. The mean age was 73 ± 3 years (range 70 to 81) compared to 56 ± 13 years in the other 168 patients (P<0.0001). Out of the 32 elderly patients, 41% had been resuscitated from ventricular fibrillation and 59% suffered from syncopal ventricular tachycardia. Eighty-eight percent of the elderly patients had ischaemic heart disease and 12% suffered from non-ischaemic dilated cardiomyopathy. The left ventricular ejection fraction of the elderly patients was 39 ± 16%.

When comparing the elderly patient group to the other implantable cardioverter defibrillator patients there was a higher prevalence of ischaemic heart disease in the elderly patients (88% vs 68%, P=0.03), while idiopathic ventricular tachycardia/fibrillation was noted more often in the younger patient group (12% vs 0%, P=0.04). No significant differences with respect to the clinical arrhythmia, left ventricular ejection fraction or presence of an old myocardial infarction were seen. The follow-up in the elderly patients was 19 ± 14 months compared to 25 ± 19 months in the other patients (P=ns). All but two patients received a non-thoracotomy implantable cardioverter defibrillator with a transvenous lead system; 92% of the implanted devices were capable of storing RR intervals or electrocardiograms.

Four deaths occurred in the elderly patients. One patient died of a large anterior wall myocardial infarction 2 weeks after implantation. Coronary angiography before implantation had shown diffuse coronary artery disease without critical stenoses. One patient suffered a fatal cerebral infarction 2 months after implantation, another died of acute pancreatitis after 7 months and a third died of haematological malignancy after 33 months.

In the younger patient group, 22 patients died during follow-up. Four patients died suddenly. In one of these patients bradycardia evolving into asystole was documented by the device and two others died suddenly with documentation of intractable ventricular tachycardia/fibrillation by the implantable cardioverter defibrillator in one patient. Another patient died in cardiac shock after many hours of incessant ventricular tachycardia, but we classified this case as sudden due to the arrhythmic nature of death. Eight patients in this group died from progressive heart failure (non-sudden cardiac death) and ten patients died from non-cardiac causes (four patients suffered cerebrovascular infarction or bleeding, four died of cancer, one died of gastrointestinal bleeding and one died in sepsis). Six patients in this younger patient group died within one month of implantation, although in only one patient was death clearly related to the operative procedure. In this patient, coronary artery bypass grafting and defibrillator implantation with epicardial patches was performed in a single procedure and the patient died 5 days later of postoperative complications. One of these six patients died of progressive heart failure within 1 month, one died suddenly (the above patient with incessant ventricular tachycardia), two died due to a cerebral infarction and one died of sepsis after pneumonia.

Figure 1 shows that there was no difference in cumulative survival from all-cause mortality between the two groups. Total survival was 75% after 48 months for the elderly patients compared to 74% after 68 months for the younger patients. Figure 1 also shows that the
cumulative incidence of sudden cardiac death was low in the younger patients (4%) and that no sudden deaths occurred in the elderly patients ($P=\text{ns}$). Although not depicted in the figure, we also noted no significant difference in cumulative survival from non-sudden cardiac death in the two groups (97% in the elderly patients and 93% in the others). The same was true for cumulative survival from non-cardiac death: 77% in the elderly patients vs 83% in the younger patient group.

When we compared the cumulative occurrence of appropriate shocks in the two groups (Fig. 2) no significant differences were noted. Sixty-five percent of the elderly patients and 72% of the younger patients received at least one appropriate shock during follow-up.

Twelve percent of the elderly patients and 10% of the other patients suffered an inappropriate shock during follow-up ($P=\text{ns}$).

**Discussion**

Implantation of a cardioverter defibrillator is a very effective means of preventing sudden cardiac death from malignant ventricular arrhythmias\(^1\). Total mortality in the implanted population is therefore primarily determined by non-sudden cardiac or non-cardiac death. Implantation of this device may thus have the greatest impact on total survival in patients with minimal heart...
disease and without serious non-cardiac diseases. Controversy exists about the effect on total mortality in other patient groups\[2-6\]. There is a fear of changing sudden cardiac death into non-sudden cardiac death in patients with malignant ventricular arrhythmias and a severely depressed left ventricular function. Similarly, there is speculation about whether implantable defibrillator therapy has the same effect on total survival and survival from sudden cardiac and non-sudden cardiac death in both elderly and younger patients. Grimm et al. also showed no excess in arrhythmic and total mortality in 48 implanted patients of 70 years or older in comparison with 193 younger patients\[7\]. The fact that our elderly patients all experienced similar benefit from implantable defibrillator treatment was reflected by the comparable occurrence of appropriate shocks.

It must be borne in mind, however, that the uniform benefit in the elderly population was achieved by carefully evaluating all potential candidates with respect to the presence of serious non-cardiac diseases with a poor short-term prognosis. Implantation in demented patients and in patients with a life expectancy of less than 1 year because of non-cardiac diseases (e.g. non-treatable malignancies) was not considered appropriate by us. Although this policy is maintained for both younger and elderly patients, the prevalence of pathologies with a poor short-term prognosis, such as cancer, is higher among an elderly population. A broad-based view of the health of elderly patients is therefore necessary to prevent inappropriate implantation. Patients with medically refractory NYHA class IV heart failure and a contraindication to cardiac transplantation were excluded from implantation. This means that elderly patients with malignant ventricular arrhythmias and medically refractory class IV heart failure did not undergo implantation as their age precluded cardiac transplantation. In the young patient group, however, 17 patients with end-stage heart failure and malignant ventricular arrhythmias received an implantable defibrillator as a bridge to cardiac transplantation and 16 patients were successfully transplanted. Thus, inclusion of these high-risk patients in the young patient group did not negatively influence the survival rate in this population as almost all survived to cardiac transplantation.

We conclude that the implantation of a defibrillator is effective in the prevention of sudden cardiac death in an elderly population and that mortality in our group of elderly patients did not exceed that in the younger patient group. Old age by itself should be no contraindication to implantation of a defibrillator.

References