Clinical Research

Feasibility and safety of combined interventional procedures in elderly patients with complex cardiovascular diseases: experience of a single medical center

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Objectives: To report the clinical experience of combined interventional procedures in the treatment of elderly patients with coexisting two or more cardiovascular diseases in our medical center, and to assess the feasibility, safety and therapeutic efficacy of this management strategy. Methods: Patients were selected to the study if: 1) age >65 years; 2) with coexistence of two or more cardiovascular diseases which are indications for interventional therapy; 3) patients' general condition and organ functions allow the performance of combined multiple procedures; 4) the predicted procedure time is within 150 min; 5) the predicted contrast medium dosage is within 300 ml. The criteria we analyzed included procedural type, procedural time, fluoroscopy time, dosage of contrast medium, success rates of the procedures, complications and in-hospital mortality. All patients were followed up for 30.4 ± 9.3 months, to determine the all-cause mortality, recurrence rates and adverse cardiac events. Results: From January 2000 to December 2004, combined interventional procedures were performed on 136 patients, with 2 procedures on 134 patients and 3 procedures on 2 patients. The mean procedure time was 115.4 ± 11.6 min, the mean fluoroscopy time was 35.7 ± 9.3 min, and the mean dosage of contrast medium used was 183.6 ± 19.4 ml. Procedural success rate was 100%, no procedure related death or major complications occurred. Conclusion: Performed by a competent team, combined interventional procedures in elderly patients with multiple cardiovascular diseases were feasible and relatively safe.

Key Words: cardiovascular disease; angioplasty; the elderly

Because of the rapid growth of the elderly population and the increase of people’s life expectancy, physicians are facing a growing number of elderly patients who suffer more than one kind of cardiovascular disease, whether congenital or acquired.1,2 We named the clustering of multiple heart diseases in one patient as complex cardiovascular diseases (CCD). Prevalence of CCD in the general population is still not clear. Development of these various diseases may span many years, and the relationship among them may be closely related or just incidentally coexisting. However, the detrimental effects of these coexisting diseases in the patients are additive. Medical treatment or selective surgery play important roles in the management of these diseases, although interventional therapies have been more and more widely used in recent years. If one patient has two or more typical indications for interventional treatment, the management strategy usually is to perform the procedures one at a time. This strategy has the advantage of avoiding long performance time and additive complications, but it is inconvenient to the patient to have repeated hospitalizations. In 2001, Wang and colleagues proposed the concept of ‘combined interventional procedure (CIP)’ for elderly patients with multiple cardiovascular diseases. They suggested that for these patients the interventional procedures can be performed in a same setting provided that they are done by a competent team and the interventional laboratory is properly equipped.3 Here, we report the experience of CIP for four years in our institute, analyzing the feasibility, safety and therapeutic efficacy of CIP in elderly patients with CCD.

Patients and Methods

Patients

Patients were enrolled into this study if all the following criteria were met 1) age>65 years; 2) with coexistence of 2 or more cardiovascular diseases; 3) with indications for 2 or more interventional procedures; 4) the patient agreed to participate in the study and gave written consent; and 5) the procedures planned to be performed were in consistent or coexisted relationship (defined as below).

Definition of terms

1) complex cardiovascular disease: two or more different cardiovascular diseases, whether congenital or acquired, coexisting in the same patient. The development of these diseases may span many years, and the relationship among these diseases might be closely associated, or only incidentally coexisting, but their detrimental effects on patients are additive. 2) Combined interventional procedure: for patients with multiple cardiovascular diseases, if, according to the current guidelines, they are indicated for 2 or more different kinds of interventional therapies, then the interventional procedures can be performed simultaneously, provided that the interventional...
laboratory is properly equipped, the operators are experienced, and the relationship types of the procedures are consistent or coexisted. 3) Types of relationship of the procedures: the relationship among the different procedures can be divided into 3 types. Consistent relationships: the different procedures are consistent regarding factors such as the time and course of the procedures, concomitant medication, and the management of procedure-related complications. Non-conflicting relationships: for the different procedures, although the above mentioned factors are not consistent, they are also not in conflict. Conflicting relationships: there exist conflicts in one or more of these factors among different procedures.

Modification of the intervention techniques
the diagnostic and therapeutic intervention techniques are all commonly used techniques. The diagnostic procedures included: 1) selective coronary angiography; 2) cardiac electrophysiological study; and 3) selective peripheral arteriography. The therapeutic interventions included: 1) percutaneous coronary stenting; 2) carotid artery stenting; 3) renal artery stenting; 4) peripheral artery stenting; 5) alcohol septal ablation; 6) radiofrequency ablation for tachycardia arrhythmias; and, 7) cardiac pacemaker implantation. All these interventions were carried out according to standard techniques. However, we have modified these techniques to minimize the number of catheters, to simplify the operation, to reduce procedure time and to control the dosage of contrast medium.

Clinical and technical considerations in selecting patients
CIP was considered only when all the following requirements were met: 1) there were clear indications for each interventional procedure; 2) the relationship type of the planned procedures were consistent or non-conflicting; 3) patient’s general condition and functional status allowed the performance of the CIP; 4) the predicted procedure time was within 150 min; 5) the predicted contrast medium dosage is within 300 ml; 6) the interventional laboratory was properly equipped and the operators were competent in performing the involved procedures. 7) a written consent was signed for each procedure by the patient, and an individualized protocol of the procedure was discussed in advance between the patients or their families and the treating physicians.

Sequence of the interventions
There were two major classes of procedural combinations in this study: 1) diagnostic plus interventional procedure for coronary artery disease plus other interventional procedures; 2) diagnostic plus electrophysiological interventions plus other interventional procedures. In deciding the sequence of the interventions, we took into consideration the following factors: the need for systemic anticoagulation (in this case, a pacemaker was implanted before the administration of anticoagulation drugs); effects of the procedure on patient’s other co-existing disease (e.g. repeated inducing of tachycardia might cause angina or myocardial infarction); importance or severity of the diseases (e.g. coronary intervention is generally performed prior to periphery artery intervention).

Documentation of clinical data
All clinical and interventional data were recorded prospectively, they included: 1) patient’s baseline characteristics, including age, sex, underlying cardiovascular diseases and risk factors; 2) data related to the interventions, including type of the procedure, performance time, fluoroscopy time, dosage of contrast medium, success rate, procedure related death and other major complications; 3) follow-up data, including short and long-term all-cause mortality, recurrence of the disease and major adverse cardiovascular events (MACE).

Follow-up
Patients were regularly followed up for the occurrence and date of adverse events. Follow-up data were collected in the out-patient department or by telephone or letter contacts with patients or their families.

Results
Clinical characteristics of the patients
From January 2001 through December 2004, a total of 136 patients ( 104 males and 32 females; average age: 67.3 ± 6.5 years) underwent combined interventional procedures. Most of the CIPs were coronary interventions combined with one or more of the following procedures: renal artery stenting (67 patients); catheter ablation for tachycardia arrhythmias (28 patients); pacemaker implantation for bradyarrhythmias (21 patients); lower extremity artery stenting (11 patients); chemical ablation for hypertrophic cardiomyopathy (7 patients); catheter ablation for atrial fibrillation (2 patients); and carotid artery stenting (2 patients). No patients had any history of previous cardiac intervention.

Technical outcomes
In 134 patients, 2 procedures were performed. In the remaining 2 patients, 3 procedures were performed; coronary intervention plus septal chemical ablation plus dual-chamber pacemaker implantation in one, and coronary intervention plus catheter ablation for atrial tachycardia plus dual-chamber pacemaker implantation in the other. The mean total procedure time was 115.4 ± 11.6 (76-168) min, the mean fluoroscopy time was 35.7 ± 9.3 min, and the mean dosage of contrast medium was 183.6 ± 19.4 ml. No procedure related death or major complications occurred.

Follow-up results
Patients were followed for a mean time of 30.4 ± 9.3 (6-57) months. During the follow-up, cardiovascular events occurred in 2 patients, with no occurrence of cardiovascular death, repeated revascularization or recurrence of tachycardia arrhythmia.

Discussion
Complex cardiovascular diseases and combined interventional procedures
Because of the rapid growth of the elderly population, the increase in people’s predicted lifespan, and the more widely
use of both invasive and noninvasive diagnostic techniques in cardiovascular diseases, the incidence and diagnosis of composite cardiovascular disease are growing rapidly. For these patients, current management strategy is to perform the intervention procedures in different sessions. This stepwise strategy has the disadvantage of prolonging and increasing the patients’ mental, physical stress, and the cost of hospitalization.

With the improvement of interventional equipment and techniques, and the accumulation of experience of interventional cardiologists, some patients with CCD could be diagnosed and treated by a combined mini-invasive interventional procedure performed in a single session. In particular, the patients of advanced age, with high risk of surgical complication, who more often have contraindications of surgical treatment, could benefit from this strategic approach. Currently there is a tendency worldwide for cardiovascular facilities and professionals to divide into more and more branches of subspecialty, so patients with CCD frequently have to be treated by different physicians in different sessions and at different facilities; hence the lack of studies on concurrent interventions for CCD patients.

Wang and colleagues first proposed the concept of combined interventional procedures for elderly patients with CCD in 2000. Then they subsequently reported their experiences in 2003, at the same time with Hofmann and associates.

Feasibility and safety of concurrent interventional procedures

In our study of carefully selected patients, no major procedure-related complications occurred, in spite of the relatively advanced age of our patients. The procedural time, fluoroscopy time and the amount of contrast medium used were all in acceptable ranges. Our study suggests that, at least for a certain proportion of patients with CCD, interventional procedures can be performed safely in a single session. However, the performance of combined procedures are technically demanding, and the technique of individual procedures often were modified to minimize the procedural time, fluoroscopy time and amount of the contrast medium.

We assumed that there are several advantages of CIP for patients with CCD: 1) to reduce the patients’ periprocedural discomfort; 2) to reduce hospital stay or to avoid a second hospital admission; and 3) to reduce the overall cost of treatment.

Study limitations

There are several limitations in our study. First, this study was carried out in a single center with a relatively small sample, so it is not clear whether the results could be extrapolated to those centers with different level of experience. Second, the kinds of procedures involved in this study are limited mostly to coronary interventions and arrhythmia-related interventions or other vascular interventions, so experience with other interventions is still lacking. Third, this is not a randomized study, so the advantages of combined interventional procedures, in comparison to the staged approach, should be confirmed by multi-center, randomized clinical trials with larger population sample.

Reference