Heart, Lung and Circulation (2016) xx, 1–14
1443-9506/04/$36.00
http://dx.doi.org/10.1016/j.hlc.2016.09.003

ORIGINAL ARTICLE

Comparison of Various Strategies for the Prognosis and Outcomes of Ischaemic Dilated Cardiomyopathy in Smokers: Complete Revascularisation and Smoking Cessation Produces a Superior Outcome

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Received 24 October 2015; received in revised form 15 August 2016; accepted 2 September 2016; online published-ahead-of-print xxx

Background Various therapies have been used to improve the symptoms and prognosis of patients with coronary artery disease. However, comparative studies showing more suitable choices for patients with ischaemic dilated cardiomyopathy (IDCM) and who smoke cigarettes are lacking.

Methods A total of 338 patients were divided into four groups according to whether they received complete revascularisation (CR), and/or underwent smoking cessation (SC). They were followed prospectively for 12 months. The major adverse cardiac and cerebrovascular events (MACCEs: all-cause mortality, non-fatal MI, non-fatal stroke, repeat revascularisation, and AHF) were the primary endpoint, and decompensation necessitating hospitalisation and the combined endpoint thereof were secondary endpoints.

Results During a mean follow-up of 12 months, the prevalence of MACCEs was significantly lower in patients receiving CR plus SC (CRSC) than in patients receiving CR only (CR), SC only (SC), and neither R nor SC (NoRSC) (CRSC 4.4% *vs*. CR 11.9, p<0.05; *vs*. SC 26.5%, p<0.001; *vs*. NoRSC 34.5%, p<0.001, respectively). At 12 months, CR plus SC induced the greatest clinical benefits of the secondary outcomes in the CRSC group (49.1% relative increase in LVEF; 89.8% decrease in NT-proBNP level; 30.9% decrease in LVEDD; 38.3% decrease in LVESD; 51.4% decrease in LVEDVi; 51.2% decrease in LVESVi; 96.4% decrease in hs-cTnT level; 93.5% decrease in CK-MB level; 91.1% decrease in hs-CRP level; 94.0% decrease in IL-6 level; 1.9-fold increase in eNOS level; 1.8-fold increase in NO level; 1.3-fold increase in NOS level, all p<0.001). Absence of revascularisation brought about fewer benefits, and those who continued smoking had worse outcomes.

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Please cite this article in press as: Jiahong W, et al. Comparison of Various Strategies for the Prognosis and Outcomes of Ischaemic Dilated Cardiomyopathy in Smokers: Complete Revascularisation and Smoking Cessation Produces a Superior Outcome. Heart, Lung and Circulation (2016), http://dx.doi.org/10.1016/j.hlc.2016.09.003

Conclusions The combination of CR and SC could be an optimal therapeutic regimen for smoking patients with IDCM because it improves myocardial blood perfusion and endothelial function.

Keywords Revascularisation • Smoking cessation • Ischaemic dilated cardiomyopathy • Prognosis • Outcomes

Introduction

Left ventricular (LV) remodelling (i.e., changes in the size, shape, structure and physiology of the left ventricle) is seen commonly in patients with severe heart failure (HF) due to ischaemic dilated cardiomyopathy (IDCM) and non-ischaemic dilated cardiomyopathy (DCM), which are the leading causes of congestive HF. Studies have shown that the prognosis, survival, outcome, and response to treatment of HF due to ischaemic aetiology is worse than HF due to non-ischaemic aetiology [1]. Recent advances in medical therapies, including angiotensin-converting enzyme inhibitors (ACEIs) and β-blockers, as well as cardiac resynchronisation therapy have been shown to improve the symptoms and prognosis in patients with IDCM, but mortality in these patients remains high [2]. Revascularisation using coronary artery bypass grafting (CABG) and percutaneous coronary intervention (PCI) has a well-established role in the management of coronary artery disease (CAD) and LV dysfunction, and can provide long-term benefits superior to those of medical therapy. However, the optimal strategy for patients with CAD and severe LV dysfunction (left ventricular ejection fraction (LVEF) ≤35%) is not clear [3]. Whether complete PCI should be undertaken in single-vessel disease with such severe LV dysfunction involving stenosis of the left anterior descending artery (LAD) is not known despite recent data providing evidence of the benefit and safety of completeness of myocardial revascularisation in patients with multi-vessel coronary artery disease [4].

In addition, poor lifestyle choices, such as cigarette smoking, are believed to have a pathogenic role in the induction and progression of IDCM, thereby eliciting dramatic effects on the pharmacologic or mechanical interventions to ameliorate IDCM progression [5,6]. Cigarette smoking is a well-known risk factor for CAD development. Smoking is associated with adverse clinical outcomes in patients undergoing revascularisation with PCI or CABG [7]. However, some studies have suggested a ''smoker's paradox'' whereby neutral or favourable outcomes in smokers who have developed CAD and HF have been observed [8,9]. Clinical trials evaluating the effects of single-vessel CR and smoking cessation (SC) in comparison with other incomplete strategies on smokers with IDCM are lacking.

We designed a study to compare the effects of complete treatments (CR; ACEIs; β-blockers; lowering of blood pressure as well as levels of lipids and sugars) and SC with incomplete treatments on clinical events in IDCM patients who smoked and who had only LAD disease.

Materials and Methods

An expanded Materials and Methods section containing details regarding patient selection, study design, primary outcomes, secondary outcomes, revascularisation, standard drug therapy, smoking cessation, follow-up, self-assessment, New York Heart Association (NYHA) classification, echocardiography, gated single-photon emission computed tomography (SPECT), coronary arteriography (CAG) and computed tomography (CT), biochemical analyses of serum, measurement of levels of reactive nitrogen species, and statistical analyses is available in the online-only Data Supplement.

Patient Selection

From January 2011 to December 2014, we conducted a prospective observational multicentre study of smokers with only LAD disease. All patients had severe (NYHA class III or IV) chronic heart failure (CHF) lasting for more than six months and had been smoking for more than five years, despite optimal medical treatment upon hospital admission.

Study Design

To compare the effects of different treatment methods in revascularisation and SC on smokers with IDCM, patients were divided into four groups in accordance with the treatment they wished to undergo: patients who were willing to accept PCI and standard drug therapy (antiplatelet agents; ACEI/angiotensin receptor blockers (ARBs); β-blockers; control of blood pressure as well as levels of lipids and glucose) and who could undergo complete revascularisation (CR) and SC were defined as the single-vessel CR + SC (CRSC) group. Patients who accepted CR and the standard drug therapy mentioned above but who could not stop smoking were defined as the CR group. Patients who underwent only standard drug therapy and SC but who refused PCI were defined as the SC only (SC) group. Reasons for rejection were not derived from factors arising from the healthcare professional, but instead from the patient, including the patient's subjective desires, inconsistency of family opinions, economic reasons, and religious faith. Patients who underwent only standard drug therapy but who abandoned PCI and SC were defined as the neither receiving revascularisation nor SC (NoRSC) group. Data for subjects who abandoned any type of standard drug therapy or elimination of bad lifestyle habits were not included in statistical analyses. Finally, 310 patients completed the study (**Figure S1**).

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