Comorbid illness affects health-related quality of life after coronary artery bypass graft surgery

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KEY WORDS

Cardiac surgery, SF-36, comorbid illness, quality of life, self report

ABSTRACT

Objective
The purpose of this study was primarily to examine patients' health related quality of life (HRQoL) and secondarily to examine the effect of comorbid illness on HRQoL five years after coronary artery bypass graft surgery (CABGS).

Design
A prospective study using the Short-Form 36 health survey (SF-36) was performed.

Setting
The study was performed at a central London hospital, United Kingdom.

Subjects
From a previous study with 162 patients enrolled, one hundred and twenty-eight (79%) agreed to participate in a follow-up study five years after cardiac surgery by either a face-to-face or postal method.

Intervention
Participants were asked to complete questionnaires about their HRQoL, current illnesses and medication five years after CABGS.

Main outcome measures
Physical and mental HRQoL was recorded using a self report and the effect that comorbid illness has on HRQoL five years post CABGS was determined.

Results
Fifty five percent of the sample reported concomitant illness at the time of follow-up and lower scores were observed in the physical domains of the SF-36 reflecting poorer HRQoL. The domains of physical functioning, physical role limitations, social functioning and bodily pain and the summary physical score were significantly lower in those with comorbid illness ($p<0.001$). Significantly higher rates of hospitalisation following CABGS were also noted. However no significant differences were observed in mental HRQoL ($p=0.593$) compared to those with no comorbid illness.

Conclusion
The presence of comorbid illness impacts significantly on physical HRQoL five years after CABGS but no such effect is noted in mental wellbeing. From a nursing perspective, the importance of comorbid illness should be taken into account when planning physical activities after CABGS, when educating patients about the benefits of CABGS and when setting realistic expectations after surgery.

INTRODUCTION

Coronary artery disease (CAD) is a major cause of mortality and morbidity in the adult population in Australia (Australian Institute of Health and Welfare 2005). The main symptoms associated with CAD are angina and dyspnoea leading to decreased physical functioning and physical activity. CAD can also lead to myocardial infarction (MI) damaging the myocardium and potentially causing heart failure. The risk factors for CAD are well known and include hypertension, diabetes, raised cholesterol levels, obesity and smoking. In the USA, a report identified that 90% of CAD patients have prior exposure to at least one of these major risk factors (Greenland et al 2003). Although medications and lifestyle modifications can reduce the risk of CAD, many individuals still require coronary artery bypass graft surgery (CABGS).

CABGS is performed to re-vascularise the myocardium, reduce associated symptoms and prevent further MIs. In 2004, 427,000 CABGS were performed in the USA (American Heart Association 2007), while in the UK in 2003, a total of 29,000 CABGS were performed (Allender et al 2007). The focus of CABGS research has shifted from investigating mortality and morbidity to examining health related quality of life (HRQoL) focusing on the patient's subjective perception of their physical and mental health. One commonly used questionnaire to examine HRQoL is the Short-Form 36 health survey (SF-36) (Ware et al 1994) which examines physical and mental health.

HRQoL and CABGS

Although there are many HRQoL questionnaires available, the SF-36 has been used extensively in the cardiac population (Lindsay et al 2000; Rumsfeld et al 1999). The primary reason for CABGS is to relieve angina and breathless symptoms. Research has demonstrated the benefits of CABGS with Lindsay et al (2000) reporting improvements in all SF-36 scores from the pre-operative level when taken one year after CABGS ($p<0.001$). However the authors also noted lower scores one year post CABGS (reflecting poorer HRQoL) in certain patients (diabetics, smokers, those having surgery at a younger age, higher socio-economic deprivation and drinking excess alcohol).

Specifically examining angina and breathless symptoms, Sjoland et al (1996) showed those with the poorest exercise capacity pre-operatively benefited the most from surgery with patients able to exercise without dyspnoea symptoms post CABGS. HRQoL has been examined five years post CABGS by Caine et al (1999) who reported chest pain symptoms in 40% of patients with 50% complaining of dyspnoea. Herlitz et al (2000) noted improvements in physical activity and a reduction of chest pain and dyspnoea symptoms, but also a significant association between breathless symptoms and physical activities such as walking and dressing ($p<0.0001$). However neither of these follow-up studies specifically examined the issue of comorbid illness and its effect on physical and mental HRQoL.

HRQoL and chronic conditions

HRQoL has also been investigated in people with chronic illness (Brown et al 1999; Pearson et al 1999; Stewart et al 1989). Chronic disease markedly reduces HRQoL in those with chronic conditions especially in physical functioning, physical role, social functioning, mental health, general health perceptions and bodily pain. The SF-36 has also been cited as useful in predicting unplanned hospital admission in people with chronic illness (Pearson et al 1999) with both Brazier et al (1992) and Jenkinson et al (1997) reporting lower scores in individuals with longstanding illness compared to those with no illness ($p<0.001$).

Chronic illness is common in people with CAD with a significant proportion diagnosed with hypertension, hypercholestraemia and diabetes, which may be being treated sub-optimally or the person may not adhere to their medication (Vasan et al 2005). CABGS only re-vascularises the identified occluded arteries and patients need to continue medication such as aspirin and lipid-lowering drugs after CABGS. Therefore it can be said that CAD after CABGS can be seen as a chronic condition which requires monitoring and treatment. One survey of 9,298 adults in the UK identified the functional limitation in long standing illness and its effect on HRQoL (Netuveli et al 2005). The authors reported that long standing illness resulted in poorer functional HRQoL which

was four times greater in older people. A Canadian study of 22,432 people reported reduced physical activity in people with chronic conditions which can lead to further problems such as mobility limitations and pain (Sawatzky et al 2007). These studies highlight the negative effects of chronic disease on physical functioning and on HRQoL. From a nursing perspective, one of the important roles for nurses is educating and advising patients post CABGS (in particular in relation to undertaking regular physical activity). The presence of chronic disease needs to be taken into consideration when recommending physical activities although there is little in the literature about this.

Although the negative effect of chronic disease on physical HRQoL has been reported, similar declines in psychological wellbeing are not observed. Singer et al (1999) showed that with advanced age where there is a decline in physical functioning in people with chronic disease, no psychological decline is evident. The researchers concluded there is a process of psychological adjustment to physical health problems associated with ageing. This result has been demonstrated by other authors (Pit et al 1996). A study by Goldberg et al (2001) found that perceived health status was related closely to self reported diseases in people who perceived themselves to be in poor health and who had comorbid illness which confirmed their health status. Therefore it would seem worthwhile to examine self reported illness and CABGS. Specifically relating to long term physical and mental HRQoL in CABGS patients, no research examining the impact of comorbid illness after CABGS was identified.

The purpose of this study was primarily to examine HRQoL five years post CABGS and a secondary aim to examine the effect of comorbid illness on HRQoL.

METHODS

Participants

All participants were admitted to a hospital in London, UK for their elective bypass surgery and were subjects in a randomised control trial of the efficacy of a neuroprotective drug. The inclusion criteria were patients undergoing elective CABGS aged between 18 and 75 years. Those who had a history of neurological or psychiatric conditions, previous drug or alcohol abuse, and those undergoing emergency CABGS were excluded from the study. The hospital's Ethics Review Committee gave approval for the follow-up study.

Participants were asked to include the impact of all illnesses and diseases on their HRQoL five years post CABGS. Those who had other illnesses treated successfully after CABGS but were well at the time of assessment were categorised as 'no reported comorbid illness'. The presence of reported comorbid illness was defined as suffering symptoms, taking prescribed medication, or being given a medical diagnosis by a doctor at the time of assessment. Medical records were not accessed at the five year follow-up and patients' reports on their health not corroborated with any medical data. Participants' were asked about the start or return of angina after CABGS and interim data: MI incidence, the need for cardiac procedures (such as angiography) and hospitalisation. Interim data refers to events that took place between CABGS and the time of the follow-up visit (this referred to any time from their operation to the follow-up appointment).

Instruments

The SF-36 consists of 36 questions, is easy to administer and has sound psychometric qualities (Ware et al 1988). The questionnaire examines HRQoL relative to physical health (physical functioning, physical role limitations, bodily pain, energy and general health perceptions) and emotional health (mental health, social functioning and emotional role limitations). The role limitations allow both physical and mental health problems to be evaluated. The physical and mental summary score measures (PCS and MCS respectively) are generated with the aim of reducing the number of statistical comparisons without the loss of information whilst reflecting both physical and mental health. The SF-36 has been adapted for use in the UK population (Jenkinson et al 1997). The scores are rated from zero to 100. One hundred represents optimal health with no

physical or emotional health limitations and zero represents poor physical and mental health. In the study, the patients used the adapted UK standard SF-36 version 2 (Jenkinson et al 1999). Missing scores were estimated if more than half of the items within a scale were completed as instructed in the user's manual (Ware et al 1988).

Angina and breathless symptoms were clinically assessed using the Canadian Cardiovascular Society score (Campeau 1976) and the New York Heart Association Classification (the Criteria Committee for the New York Heart Association 1974) respectively.

Procedure

The follow-up study was carried out five years after surgery and all 162 patients were invited by letter to return to the hospital to examine HRQoL five years after CABGS. The information sheet outlined anonymity and confidentiality of patient information and the use of data. Patients who attended the hospital face-to-face visit completed questionnaires in a quiet room. Postal surveys were sent out with a covering letter, including details of how to contact the researcher in case of difficulties to people unable or unwilling to attend the hospital. Participants were asked to telephone if they had any queries or experienced difficulty in completing the questionnaires and to return the completed questionnaires in the enclosed stamped addressed envelope. Those patients are identified as 'postal' patients. Those who declined the invitation were not contacted again. Data collected included demographic data, symptoms, previous medical history, medication and questions about hospitalisation since the time of CABGS. The methodology has previously been published (Lee 2008a). Data were stored on a password protected computer and only researchers had access to the data.

Statistical analysis

The SPSS 12.0® statistical package was used for data entry and analysis within the managed PC system. Continuous data were analysed using independent t-tests; chi-squared analysis was used for categorical data; and where there were less than five in a group, Fisher's exact test was used.

FINDINGS

One hundred and sixty-two patients were recruited at the time of surgery originally. From this cohort, information was obtained five years later on 156 patients, a trace rate of 96.3% with no trace on six patients. One hundred and twenty-eight (that is, 79% of the original sample) participated in the five year follow-up study with the reminder not participating: eighteen failing to attend appointments, four patients declining to participate in the five year follow-up and six patients who had died from the time of surgery to the time of follow-up.

Table 1: Study participation of patients five years after coronary artery bypass graft surgery

Classification	n=162	Percent (%)
Followed-up	128	79.0%
Failed to turn up for appointment	18	11.1%
Declined	4	2.5%
Died	6	3.7%
No Trace	6	3.7%
Total	162	100.0%

One hundred and twenty-eight patients (79%) agreed to participate in the follow-up study. Some of those unable to attend a hospital visit agreed to participate using a posted questionnaire. One hundred and nine patients were interviewed (face-to-face) and nineteen completed postal questionnaires. Of the 126 assessed patients, 55% (n=70) reported comorbid illnesses at the time of their follow-up compared to 45% (n=56) with no reported comorbid illness at the time of follow-up. Examining pre-operative characteristics, no differences were observed in pre-operative MI incidence (p=0.373), angina scores (p=0.509) or breathless symptoms (p=0.655). Similar numbers of grafts were undertaken peri-operatively in both groups with 74.3% of patients with reported comorbid illness undergoing three bypass grafts compared to 69.6% of those with no reported comorbid illness.

With post-operative characteristics, comparing those with no reported comorbid illness and those with reported comorbid illness, no statistical differences were observed in interim data (ie from the time of

CABGS to time of follow-up) including MIs (p=0.067) or angiography post CABGS (p=0.183). However significant symptoms were noted in the reported comorbid patients five years post-operatively in angina (p<0.001) and breathlessness symptoms (p<0.05) and increased rates of interim hospitalisation (p<0.001).

The International Classification of Diseases was used to classify the presence of other illnesses, disorders and diseases as reported by the patient at the time of assessment. Fifty six patients had no comorbid illnesses at the time of assessment (45%). The majority of those with reported comorbid illness reported endocrine or metabolic disorders (31.7%) such as diabetes mellitus and hypothyroidism. A further eleven patients (8.7%) had musculoskeletal disease (the primary diagnosis being osteoarthritis). Statistically, no difference was detected in the numbers in each group ($\chi 2=1.56$, df=1, p=0.212).

Comparing the SF-36 results demonstrated significant differences at the time of follow-up. Mean scores of all eight domains were higher (reflecting a better HRQoL) in those with no reported comorbid illness compared to those with comorbid illness as outlined in table 2.

Table 2: SF-36 of those with no reported comorbid illness (n=56) and those with reported comorbid illness at the time of follow-up (n=70)

SF-36 domains	No reported comorbid illness	Reported comorbid illness	t (independent)	p value (2 tailed)
Physical functioning	48.65 (10.65)	38.77 (15.97)	4.23	<0.001
Physical role	51.01 (8.26)	45.15 (14.23)	2.86	0.005
Emotional role	52.19 (8.23)	49.08 (11.64)	1.76	0.082
Mental health	54.69 (9.49)	52.95 (10.65)	0.96	0.341
Social functioning	47.73 (7.51)	41.05 (13.54)	3.49	<.001
Vitality/Energy	52.69 (8.84)	48.92 (12.38)	1.99	0.048
Bodily pain	49.69 (10.52)	44.10 (11.00)	2.89	0.005
General health perceptions	51.14 (9.95)	45.43 (14.28)	2.62	0.010
PCS	48.35 (9.44)	39.90 (13.04)	4.17	<0.001
MCS	53.54 (7.83)	52.68 (9.66)	0.547	0.593

Patients with a comorbid illness had lower scores in four domains: physical functioning, physical role, social functioning and bodily pain. The PCS for those with concomitant illness was significantly lower than those without illness (p<0.001). There was no significant difference in MCS scores (p=0.0593).

DISCUSSION

Fifty five percent of the sample reported concomitant illness (mainly endocrine and metabolic disorders) at the time of follow-up and lower scores were observed in physical domains of the SF-36 (physical functioning, physical role, social functioning and bodily pain) reflecting significantly poorer HRQoL (p<.001). The PCS was significantly lower in those with comorbid illness (PCS mean 39.9) compared to those with no illness (PCS mean 48.4). Significantly higher rates of interim hospitalisation (i.e. from the time of their operation to the five year follow-up visit) were also noted. However, no significant differences were observed in their mental HRQoL (p=.593) compared to those with no comorbid illness.

The findings support the view that comorbid illness has a negative effect on physical HRQoL in people who have undergone CABGS in this study and supports previous studies with MI patients and other illnesses (Brown et al 1999; Brazier et al 1992; Stewart et al 1989) and also in unplanned hospital admission (Pearson et al 1999). Although improvements in SF-36 scores have been reported previously, this was

only one year after surgery and those with diabetes did not demonstrate the same benefits (Lindsay et al 2000).

The lower PCS scores indicate the effect of comorbid illness on physical HRQoL with functional problems. Similar results were reported by Ware (1985) and Jenkinson et al (1997). This is evident in the five-year follow-up with distinct differences in physical scores reflecting these physical limitations due to the presence of comorbid illness (Brazier et al 1992; Stewart et al 1989). There was little doubt that the presence of physical illness had a significant effect on patient functionality and HRQoL in this study. As highlighted by Netuveli et al (2005), there can be a fourfold increase in functional limitation in those with chronic conditions and given these findings, it would seem pertinent to recognise the negative effect of chronic illness on HRQoL.

Relating specifically to CAD symptoms, the patients with comorbid illness also had substantially more symptoms (angina and breathlessness) and a higher rate of pre- and post-operative MIs. Deterioration in functioning as seen with increased symptoms as decline in graft patency occurred (Caine et al 1999). A strong association was reported by Caine and colleagues between the presence of symptoms and restrictions in activities both socially and at home ($p<0.01$). These results were also seen with breathless symptoms leading to a decrease in physical activities (Herlitz et al 2000). These results five years after CABGS are in keeping with Sjoland et al's (1996) findings and emphasise the clinical significance of breathlessness and its effect in quality of life.

The incidence of hospitalisation over the five year period was also examined. Interim hospitalisation was taken as an indicator of ill-health from CHD or other conditions. Other five year follow-up studies in the literature have offered no data on hospitalisation post CABGS (Herlitz et al 2000; Caine et al 1999). A comparison between pre-operative medications and medications five years later was not performed as many pre-operative medications are for the relief of angina symptoms and comparing medications was seen as having little benefit.

The MCS scores were not significantly different among those patients with comorbid illnesses compared to those with no comorbid illness five years after CABGS. This finding suggests that the patients made psychological adjustments to comorbid illnesses, which has been seen in other studies (Singer et al 1999; Pit et al 1996). Another explanation is that no change in mental health occurs in the presence of illness. Such a process could explain the lack of change in mental health, despite decline in physical functioning in older subjects with chronic disease. Although these physical problems resulted in physical limitations, a corresponding decrease in emotional and mental limitations did not occur. The adjustment appears quite strong; hence, as the data indicated, mental health remained stable.

This study found that the majority of patients perceive themselves to have good HRQoL five years post CABGS, however the presence of comorbid illness has a negative effect on physical HRQoL. From a clinical perspective, clinical objective findings can be examined by health care professionals with the patient's personal subjective experience to gain an understanding of their HRQoL. In doing so, the possibility of improving patient care is enhanced. This study has demonstrated clearly the value of this approach for patients undergoing CABGS and acknowledging the presence of comorbid illness and its effect on physical HRQoL. Potentially this information can be used when advising patients on physical activity after CABGS. As alluded to by Sawatzky et al (2007), people with chronic illness tend to participate in less physical activity which in turn can exacerbate their physical HRQoL and increase problems such as immobility and pain. The challenge would be to balance chronic illness symptoms and maximise the benefits of CABGS. The presence of comorbid illness and its effects on physical health needs to be considered when planning cardiac rehabilitation programs and also when giving advice to patients about undertaking physical activities. Often patients are told to undertake daily walks but if there are problems with osteoarthritis for example, patients may be unable to perform their exercise so alternative physical

activities could be recommended such as swimming which is non weight bearing. Nurses cannot look at CABGS in isolation but attempt to encompass other health issues when planning patient care.

Limitations

The study had some limitations. Firstly, the study depended on patients' self reports and data was not corroborated with their medical history or their general practitioners. However to overcome this limitation, the researchers examined the spouses' perceptions also on the patients' HRQoL and this has been reported elsewhere (Lee 2008b). Differences between the groups in their results using two administration methods could be anticipated; however this was not seen (Lee 2008a).

CONCLUSION

CAD is a progressive condition and while CABGS seeks to relieve symptoms, it is not curative. The importance of monitoring and managing other comorbid conditions is essential post CABGS to maximise physical HRQoL. This study revealed problems in physical health five years post CABGS and demonstrated that some patients have physical health problems. The presence of comorbid illness affects HRQoL and needs to be considered when assessing patients and planning physical activities post CABGS.

RECOMMENDATION

Coronary artery disease is a progressive condition and many people presenting for surgery have other comorbidities. These other health problems should be considered when educating patients prior to discharge. The importance of monitoring and managing other comorbid conditions is essential post CABGS to maximise physical HRQoL (especially when giving advice regarding exercise in cardiac rehabilitation programs). The benefits of CABGS need to be balanced with other health problems and realistic expectations set in terms of recovery and physical activity levels.

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