

Relief of Symptoms and Improvement of Health-Related Quality of Life Five Years after Coronary Artery Bypass Graft in Women and Men

JOHAN HERLITZ, M.D., INGELA WIKLUND, M.SC., PH.D.,* HELÉN SJÖLAND, M.D., PH.D., BJÖRN W. KARLSON, M.D., PH.D., THOMAS KARLSSON, M.SC., MARIA HAGLID, M.SC., MARIANNE HARTFORD, M.D., PH.D., KENNETH CAIDAHL, M.D., PH.D.

Division of Cardiology, Sahlgrenska University Hospital, Göteborg, and *Astra Hässle AB, Department for Behavioural Medicine, Mölndal, Sweden

Summary

Background: Severe coronary artery disease can be successfully treated with coronary artery bypass graft (CABG), with considerable improvement in the symptoms of angina pectoris. Approximately three of four patients are free of ischemic events for 5 years; however, increased survival is demonstrated only in selected subgroups with advanced coronary artery disease, and this effect has not been established in elderly patients.

Hypothesis: The study was undertaken to determine the relief of symptoms and improvement in other aspects of health-related quality of life (QoL) during 5 years after CABG in women and men.

Methods: Patients who underwent CABG in western Sweden were approached prior to and 5 years after surgery. Health-related QoL was estimated with Physical Activity Score (PAS), Nottingham Health Profile, and Psychological General Well-Being Index.

Results: Women (n = 381) had a 5-year mortality of 17% compared with 13% for men (n = 1,619; NS). After 5 years, 1,719 patients (survivors) were available for the survey; of these, 876 (51%) answered the inquiry both prior to and after 5 years. Both women and men improved markedly and highly

significantly, both with respect to symptoms and other aspects of health-related QoL. Women suffered more than men in terms of limitation of physical activity, dyspnea, chest pain, and others aspects of health-related QoL. There was a significant interaction between time and gender, with more improvement in men with regard to chest pain when walking uphill or quickly on level ground, when walking on level ground at the speed of other persons their own age, when under stress, and in windy and cold weather. For those parameters as well as for PAS, improvement was more marked in men than in women. In the other aspects of health-related QoL, there was no interaction between time and gender.

Conclusion: Five years after CABG, limitation of physical activity, symptoms of dyspnea, and chest pain were reduced, and various aspects of health-related QoL had improved in both women and men. In general, women suffered more than men both prior to and after CABG; however, in some aspects the improvement was more pronounced in men. Because of the limited response rate, the results may not be applicable to a nonselected population who had undergone CABG.

Key words: coronary artery bypass graft, gender, quality of life

Introduction

Severe coronary artery disease can be successfully treated with coronary artery bypass graft (CABG), with considerable improvement in the symptoms of angina pectoris.^{1–3} Approximately three of four patients are free of ischemic events for 5 years;⁴ however, increased survival is demonstrated only in selected subgroups with advanced coronary artery disease,^{5,6} and this effect has not been established in elderly patients.^{1,7} The outcome in terms of increased physical activity, symptom relief, and improved health-related quality of life (QoL) is of major importance in chronic symptomatic diseases, particularly if a prognostic gain cannot be expected. Health-related QoL outcomes show how patients perceive symptoms, well being, and physical and mental functioning.

This study was supported by grants from the Swedish Heart and Lung Foundation, Stockholm, and by the Gothenburg Medical Society, Göteborg.

Address for reprints:

Johan Herlitz, M.D.
Division of Cardiology
Sahlgrenska University Hospital
S-413 45 Göteborg, Sweden

Received: January 26, 2000

Accepted with revision: September 5, 2000

This study evaluates the effect of CABG on various symptomatic aspects such as physical activity, chest pain, dyspnea, and other aspects of health-related QoL for 5 years after the procedure, with special regard to gender. We have previously described experiences in terms of symptoms and various aspects of health-related QoL after CABG in this patient population in a short-term perspective.^{8,9}

Materials and Methods

All patients from all 15 hospitals in the western region of Sweden (1.6 million inhabitants), who underwent CABG between June 1988 and June 1991 at the two referral centers for CABG in that region, that is, Sahlgrenska University Hospital and the Scandinavian Heart Center in Göteborg, received a questionnaire regarding symptoms and other aspects of health-related QoL at the time of coronary angiography prior to and 5 years after surgery. The preoperative questionnaires were administered prior to coronary angiography to all patients on the waiting list who were scheduled for elective angiography. Patients undergoing emergency coronary evaluation received the questionnaires in the ward prior to angiography.

TABLE I Clinical characteristics at operation in all patients alive at 5 years after surgery in relation to whether patients answered the questionnaire both prior to and at 5 years after surgery (Responders) or not (Nonresponders)

Percent if not otherwise stated	Responders n = 876	Non-responders n = 843	p Value ^a
Female sex	16	21	0.005
Age (mean)	62.4	62.0	
NYHA class: (7) ^b			0.01
1	2	3	
2	12	14	
3	65	52	
4	21	32	
Previous MI	55	63	0.0006
Angina pectoris	98	97	
Congestive heart failure	11	14	0.05
Hypertension (2)	36	36	
Diabetes mellitus	10	11	
Renal dysfunction (3)	22	27	0.01
Cerebrovascular disease	8	7	
Claudication (1)	10	11	
Obesity	12	12	
Current smoker (2)	11	14	
Previous PTCA	4	8	0.0003
Triple-vessel disease (6)	66	63	
EF < 0.40 (77)	7	9	

^a Given if < 0.05.

^b Number of patients with missing information.

Abbreviations: NYHA = New York Heart Association, MI = myocardial infarction, PTCA = percutaneous transluminal coronary angioplasty, EF = ejection fraction.

Demographic data were collected through review of medical charts, interviews, and physical examination of the patients by a physician of the research team when the patient was hospitalized for CABG. Functional classification was made according to the New York Heart Association classification.

In all, 2,365 patients underwent CABG during the study period. Of these, 244 patients were excluded from this analysis because of concomitant valve surgery and 121 patients because of previous CABG.

Of the remaining 2,000 patients, 381 were women (19%) and 1,619 were men (81%). Of the women, 66 (17%) died during the subsequent 5 years; and of the 212 (13%) men, three patients were lost to follow-up. This study deals with all patients who were known to be alive 5 years after surgery (n = 1,719).

Of the remaining 1,719 patients, 876 (51%) answered the inquiry both prior to and 5 years after surgery (62% answered prior to surgery and 79% 5 years thereafter). Of these, 138 (16%) were women and 738 (84%) were men. A comparison of demographic and clinical characteristics in responders indicates that female gender and previous myocardial infarction were more prevalent among nonresponders (Table I).

Table II shows the distribution of responders and nonresponders among women and men. A significant interaction

TABLE II Clinical characteristics at operation in responders^b and nonresponders among women and men

Percent if not otherwise stated	Female responders		Male responders		p for interaction with sex ^a
	Yes n = 138	No n = 177	Yes n = 738	No n = 666	
Age (mean)	63.1	64.5	62.2	61.3	0.05
NYHA class					
1	<1	5	2	3	
2	7	7	13	15	
3	69	54	64	51	
4	23	34	21	31	
Previous MI	42	57	58	65	
Angina pectoris	>99	95	98	97	
Congestive HF	11	18	11	13	
Hypertension	50	48	33	33	
Diabetes mellitus	15	12	9	11	
Renal dysfunction	41	56	19	20	0.05
Cerebrovascular disease	6	8	8	7	
Claudication	12	16	9	10	
Obesity	20	15	11	11	
Current smoker	11	14	11	14	
Previous PTCA	8	7	3	8	0.02
Triple-vessel disease	57	65	68	62	0.02
EF < 0.40	3	10	8	8	0.05

^a Given if < 0.05.

^b Responders are defined as patients answering the questionnaire both prior to and at 5 years after surgery.

Abbreviation: HF = heart failure. Other abbreviations as in Table I.

with gender was found for age, previous percutaneous transluminal coronary angioplasty (PTCA), presumed triple-vessel disease, and ventricular dysfunction.

Among responders, women differed from men by having a lower educational background and by more often living alone.

Symptom Scores; Single Item Questions

Patients received a questionnaire at the time of coronary angiography (mean of 3.6 months prior to surgery) and then were approached by mail with the same inquiry 5 years after surgery. The questionnaire included questions about physical activity, reasons for limitation of physical activity, occurrence of various types of chest pain, frequency of chest pain, and occurrence of various types of dyspnea.

The questionnaires are modified from the World Health Organization Monograph¹⁰ and validated regarding dyspnea^{11, 12} as well as chest pain.^{12, 13} Modifications involved translation and addition of some questions.

Validations have been made in previous population studies evaluating clinical signs¹⁰ and left ventricular wall motion abnormalities¹² in cardiac dyspnea, as well as prognosis in patients with chest pain (uncomplicated angina pectoris, complicated angina pectoris, myocardial infarction).¹³

Health-Related Quality of Life Questionnaires

The patients completed three self-administered questionnaires for the assessment of health-related QoL: the Physical Activity Score (PAS), the Nottingham Health Profile (NHP), and the Psychological General Well-Being (PGWB) index. These questionnaires have been carefully validated and tested for reliability.^{14–17}

The PAS represents one dimension of an angina-specific questionnaire,¹⁴ the Angina Pectoris Quality of Life questionnaire, which contains six questions for the self-estimation of physical abilities and limitations. Each response is graded from 1 to 6 and the mean value for all six questions is calculated. The higher the value, the greater the degree of disability.

The NHP is divided into two parts. Part I, which is used in this study, consists of 38 statements that convey limitations in activity or aspects of distress in six dimensions: physical mobility, pain, sleep, energy, social isolation, and emotional reactions. Patients are required to indicate by a yes/no answer which of the problems they are experiencing at the time they complete the questionnaire. A score ranging from 0 to 100 as well as a total score applying a weighting technique can be calculated for each dimension.¹⁸ The higher the score, the worse the QoL. Reference values from a healthy population are available.¹⁹

The PGWB index contains 22 questions, dealing with six dimensions of well-being: anxiety, depressed mood, vitality, general health, self-control, and well being.¹⁶ The response format is graded from 1 to 6 (total score range 22–132), with the highest value corresponding to superior well being. Reference values derived in an unselected population are available.²⁰

Selection of Questionnaires

The symptomatic response to myocardial ischemia in angina pectoris is chest discomfort, induced by physical or mental stress, thereby limiting physical performance. However, angina pectoris also has other detrimental impacts, such as increased anxiety and limitations of leisure activity, working capacity, and social and sexual function.^{21–23}

The PAS represents one dimension of a disease-specific questionnaire for the estimation of physical capacity in angina pectoris.¹⁴ The NHP and the PGWB index are categorized as generic questionnaires. The NHP is most useful in patients with chronic diseases and/or pronounced symptoms²⁴ and has previously been used to evaluate the effect of CABG.^{25, 26} The PGWB index is suitable for addressing the impact of symptoms on well being and is applicable in healthy as well as patient populations. The purpose of this choice of questionnaires was to capture the whole range of outcomes, from symptomatic limitations of physical abilities due to angina pectoris to overall well being and health-related QoL. These questionnaires were chosen rather than other estimates, observed to have a lesser ability to reflect subjective results after CABG, such as New York Heart Association (NYHA) classification²⁷ and return to work.²⁸

Statistical Methods

The Mann-Whitney U test and Fisher's exact test for proportions were used to test for differences in Table I. In Table II, logistic regression was used to test for interaction. The repeated measurement analysis of variance model was used in all other analyses.

All p-values are two-tailed and considered significant if <0.05 in Tables I and II and if <0.01 otherwise.

Results

Physical Activity, Chest Pain, and Dyspnea

Physical activity: Physical activity increased significantly over time but was more limited in women than in men. There was no interaction between time and gender. Limitation of physical activity because of tiredness and dyspnea increased and limitation of physical activity because of chest pain decreased over time. Limitation of physical activity due to dyspnea was more common in women. There was no interaction between time and gender with regard to cause of limitation of physical activity.

Dyspnea (Table III): Symptoms of dyspnea in all situations listed in Table III decreased over time. In all situations, women suffered from dyspnea more often than men; however, there was no interaction between time and gender.

Frequency of attacks of chest pain: The number of attacks with chest pain decreased significantly over time and chest pain was more prevalent in women than in men. There was no interaction between time and gender.

TABLE III Symptoms of dyspnea prior to and at 5 years after surgery

	Preop		5 Years postop		p ^a	p ^b	p ^c
	F %	M %	F %	M %			
No dyspnea	4	16	20	43	<0.0001	<0.0001	0.06
When walking uphill or quickly on level ground	94	82	75	53	<0.0001	<0.0001	0.04
When walking on level ground at the speed of other persons of the same age	84	63	58	31	<0.0001	<0.0001	0.33
Have to stop to catch breath when walking on the level at their own speed	51	30	24	11	<0.0001	<0.0001	0.10
When dressing or washing	34	19	16	8	<0.0001	<0.0001	0.07
At rest, when sitting, or at night	14	10	2	3	<0.0001	0.39	0.20
Have to sit down and rest when returning from a walk	83	59	55	30	<0.0001	<0.0001	0.84
Wake up at night due to dyspnea	23	14	10	6	<0.0001	0.008	0.14

^a p-Value for difference between preop and 5 years postop.

^b p-Value for difference between men and women.

^c p-Value for interaction between time and gender.

Abbreviations: F = female, M = male.

TABLE IV Chest pain at various occasions prior to and at 5 years after surgery

	Preop		5 Years postop		p ^a	p ^b	p ^c
	F %	M %	F %	M %			
When walking uphill or quickly on level ground	97	93	60	37	<0.0001	<0.0001	<0.0001
When walking on level ground at the speed of other persons of the same age	87	75	47	20	<0.0001	<0.0001	0.009
When walking on the level at own speed	52	31	14	6	<0.0001	<0.0001	0.02
When dressing or washing	37	23	10	4	<0.0001	<0.0001	0.07
At rest, when sitting	24	13	6	3	<0.0001	0.002	0.05
At night	38	29	13	7	<0.0001	0.005	0.46
When under stress	87	85	56	37	<0.0001	0.001	0.003
After dinner	39	35	13	10	<0.0001	0.23	0.99
When out in windy or cold weather	92	82	65	38	<0.0001	<0.0001	0.001

^a p-Value for difference between preop and 5 years postop.

^b p-Value for difference between men and women.

^c p-Value for interaction between time and gender.

Abbreviations as in Table III.

Chest pain on various occasions (Table IV): Chest pain on various occasions decreased significantly over time. Except for after dinner, chest pain was more common in women. There was a significant interaction between gender and time for chest pain when walking uphill or quickly on level ground, when walking on level ground at the speed of other persons of the same age, when under stress, and in windy and cold weather. Under these conditions, men improved more than women.

Physical Activity Score (Fig. 1): The PAS improved over time. Men scored lower (better) than women. There was a significant interaction between time and gender, that is, men improved more than women.

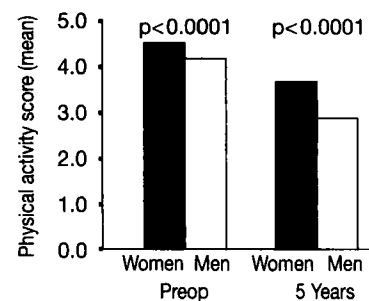


FIG. 1 Physical activity score prior to and at 5 years after coronary artery bypass graft ($p < 0.0001$ for change over time; $p = 0.0002$ for interaction between time and gender).

TABLE V Nottingham Health Profile subcomponents score prior to and at 5 years after surgery

	Preop	5 Years postop	p ^a	p ^b	p ^c
Emotions			<0.0001	0.20	0.05
Women	20.1 ± 20.0	08.5 ± 16.0			
Men	16.2 ± 21.2	8.5 ± 17.2			
Sleep			<0.0001	<0.0001	0.07
Women	34.2 ± 27.7	26.6 ± 27.7			
Men	20.0 ± 23.0	16.4 ± 21.2			
Energy			<0.0001	<0.0001	0.50
Women	47.2 ± 39.6	27.5 ± 36.7			
Men	34.1 ± 34.5	16.7 ± 28.8			
Pain			<0.0001	<0.0001	0.51
Women	26.8 ± 23.7	16.1 ± 22.7			
Men	17.0 ± 20.6	7.6 ± 16.0			
Mobility			<0.0001	<0.0001	0.06
Women	25.2 ± 22.1	17.9 ± 20.5			
Men	13.1 ± 15.1	9.0 ± 16.4			
Social			0.04	0.33	0.89
Women	7.9 ± 14.8	6.1 ± 13.4			
Men	6.6 ± 16.6	5.0 ± 14.5			

Data are expressed as mean ± standard deviation.

^a p-Value for difference between preop and 5 years postop.

^b p-Value for difference between men and women.

^c p-Value for interaction between time and gender.

Nottingham Health Profile (total score): There was a significant improvement over time. Women scored higher (worse) than men. There was no interaction between time and gender.

Dimensions (Table V): There was a significant improvement over time for all dimensions with the exception of social dimension. Women scored higher (worse) for all dimensions except emotions and social dimension. There was no interaction between time and gender for any dimension. However, there was a trend indicating a more marked improvement in women with regard to emotions (p = 0.05) and sleep (p = 0.07) and in men with regard to mobility (p = 0.06).

Psychological General Well Being index (total score) (Fig. 2): There was a significant improvement over time. Women scored lower (worse) than men. There was no interaction between time and gender.

Dimensions of well being: There was a significant improvement for all dimensions over time. Women scored significantly lower (worse) than men for all dimensions except for self-control. There was no significant interaction between time and gender for any of the dimensions.

Relation to other study groups: Compared with a normal population, patients showed a lower health-related QoL prior to CABG but a similar health-related QoL 5 years after CABG when measured with PGWB total score.²⁰ When compared with another patient population, it was found that patients with heartburn had a better health-related QoL than patients waiting for CABG.²⁰

When evaluating various subcomponents of the NHP, patients appeared to have a worse health-related QoL prior to CABG than a normal population, whereas 5 years after CABG

health-related QoL was similar to a normal population.¹⁵ However, health-related QoL according to NHP subcomponents was better among patients both prior to and after CABG than among patients suffering from arthrosis and arthritis.^{15, 29}

Health-related quality of life prior to coronary artery bypass grafting in relation to survival: With regard to NHP total score and PAS, patients who died during the subsequent 5 years had significantly worse health-related QoL prior to CABG than patients who survived. A similar trend was observed with regard to PGWB total score.

Patients who died more frequently had triple-vessel disease prior to surgery. Among these, 59% died a cardiac death, 20%

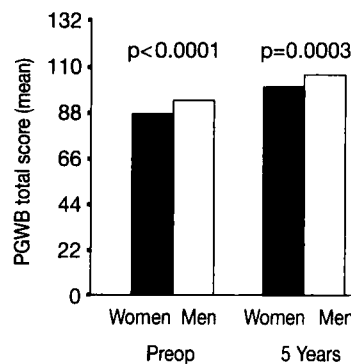


FIG. 2 Psychological General Well Being (PGWB) index total score prior to and 5 years after coronary artery bypass graft (p < 0.0001 for change over time; p = 0.38 for interaction between time and gender).

died in association with stroke, and 3% in association with pulmonary embolism.

Discussion

This study evaluates the long-term reduction in the limitation of physical activity, dyspnea, and chest pain, and improvement in various aspects of health-related QoL after CABG, with a particular emphasis on differences between women and men. Although having reported on this issue during a 2-year follow-up,^{8,9} we thought it important to describe gender differences in an even longer perspective, since development of coronary atherosclerosis as well as progression of other diseases might differ between women and men.

The two most important observations were that (1) women had a lower level of physical activity and suffered from more serious symptoms of dyspnea and chest pain, as well as from inferior well being according to various estimates of health-related QoL, both prior to and 5 years after CABG; (2) men improved more than women in terms of symptom relief and physical activity but not in other estimates of health-related QoL.

The information that women with ischemic heart disease have a lower health-related QoL than men is not new. Previous studies made by ourselves³⁰ and others³¹ have reported similar observations. The underlying mechanisms have not been clearly addressed. The women suffered from more risk indicators than men, including a higher prevalence of hypertension, diabetes mellitus, renal dysfunction, and obesity. This can only explain a portion of our findings, because in a multivariate analysis taking such differences into account, female sex appeared as an independent risk indicator for an adverse health-related QoL 2 years after surgery.³² It has also been reported that healthy women suffer from an inferior QoL compared with healthy men.³³ One potential reason for women to report poorer QoL than men may be a greater degree of subjective stress for the same degree of objective abnormality (e.g., ischemic, left ventricular dysfunction), thus representing a response bias.

The observation that women improved less than men in terms of physical activity is not new; similar observations were made in a 2-year follow-up of these patients.³⁴ This is also in accordance with previous experience that the greatest benefit from CABG is observed within the initial months of surgery.^{35,36} There are several possible explanations for a less symptomatic improvement in women than in men: first, a less successful rehabilitation and less tendency for women to return to work might be contributing factors;^{34,37} second, a premature graft occlusion has been reported to occur more frequently among women;³⁸ third, other factors that are not affected by the surgical procedure might contribute to symptoms in women, thereby partly explaining less symptom improvement in women. Even after controlling for body size, women have smaller coronary arteries than men, which may not only explain higher perioperative mortality among women but also contribute to more easily perceived ischemic

symptoms.³⁹ Furthermore, it has been demonstrated that among patients undergoing CABG, the plaque structure of women differs from that of men in that women exhibit more cellular fibrous tissue often found at an early stage of plaque development.⁴⁰ These data may indicate a more rapid progression of coronary artery disease in women. A higher prevalence of hypertension and diabetes might also suggest such a possibility.^{41,42}

Women complained more often of dyspnea than men both prior to and after surgery, and improvement in dyspnea tended to be less marked in women. Most likely, an important contributing factor, as suggested by previous studies, was a higher prevalence of diastolic dysfunction in women than in men.⁴³⁻⁴⁵ There is no reason to believe that coronary revascularization will markedly affect diastolic dysfunction. Thus, if such a mechanism explains a substantial part of dyspnea in women, then a marked improvement in dyspnea is not to be expected by CABG. However, ischemia contributes to diastolic abnormalities, and this should improve following successful revascularization procedures.

Overall, symptoms of dyspnea were surprisingly common 5 years after surgery. It has been found that 45.5% of 70-year-old persons in Göteborg have an increased exertional dyspnea, with no overall difference found between men and women.⁴⁶

Dyspnea as defined in the current study has been found among 40.5% of 67-year-old men in the general population of Göteborg.¹¹ Thus, the prevalence of dyspnea among our patients 5 years post surgery was somewhat higher than that in the general population.

Limitations

1. The symptomatic results of CABG in the patients who did not respond to the questionnaires is unknown. Those patients appeared to suffer from more severe coronary artery disease than the responders. Therefore, our results may not be applicable in a totally nonselected population undergoing CABG.

2. The patients were approached with the first questionnaire at the time of coronary angiography when not only angina pectoris but also the personal distress of mental preparation for cardiac surgery may have affected QoL scores; however, favorable expectations of the surgical procedure might also have influenced the results.

3. No objective data on long-term myocardial function and myocardial ischemia were available; however, it is important to stress that the major objective of CABG is to relieve symptoms.

4. There was a lack of information regarding lipid management during follow-up.

5. Since over 100 tests on QoL were performed in this study, the increased probability of false significances should be considered. A Bonferroni correction (which is too conservative to be quite appropriate in this case) would require an uncorrected *p* value of <0.0005 for significance at the 0.05 level.

6. There was no information with regard to rehabilitation of the patients studied, although many of the dependent variables hypothetically may have been influenced by exercise-based rehabilitation. Although similar responses to exercise-based rehabilitation have been reported in men and women suffering from coronary artery disease, previous studies have shown gender-related differences in the referral pattern.

Conclusion

Our results suggest that both women and men improve markedly 5 years after coronary surgery in terms of physical activity, symptoms of dyspnea and chest pain, and various estimates of health-related QoL; however, in some aspects men improve more markedly than women and explanations for this observation are lacking at present. Since it appears that women systematically score differently than men on QoL instruments regardless of their state of health, it needs to be emphasized that women gain at least as much as men in most aspects of health-related QoL following bypass surgery. Due to the limited response rate, the results may not be applicable to a nonselected population who had undergone CABG.

References

- European Coronary Surgery Study Group: Long-term results of prospective randomised study of coronary artery bypass surgery in stable angina pectoris. *Lancet* 1982;ii:1173-1180
- CASS Principal Investigators and their associates: Coronary artery surgery study (CASS): A randomized trial of coronary artery bypass surgery. *Circulation* 1983;68:951-960
- Hultgren HN, Peduzzi P, Detre K, Takaro T, and the study participants: The 5-year effect of bypass surgery on relief of angina and exercise performance. *Circulation* 1985;72(suppl V):V-79-V-83
- Kirklin JW, Naftel DC, Blackstone EH, Pohost GM: Summary of a consensus concerning death and ischemic events after coronary artery bypass grafting. *Circulation* 1989;79(suppl I):I-81-I-91
- Varnauskas E, and the European Coronary Surgery Study Group: Twelve-year follow-up of survival in the randomized European Coronary Surgery Study. *N Engl J Med* 1988;319:332-337
- Califf RM, Harrell Jr FE, Lee KL, Scott Rankin J, Hlatky MA, Mark DB, Jones RH, Muhlbaier LH, Newlander Oldham H, Pryor DB: The evolution of medical and surgical therapy for coronary artery disease: A 15-year perspective. *J Am Med Assoc* 1989;261:2077-2086
- Yusuf S, Zucker D, Peduzzi P, Fisher LD, Takaro T, Kennedy JW, Davis K, Kilip T, Passamani E, Norris R, Morris C, Mathur V, Varnauskas E, Chalmers TC: Effect of coronary artery bypass graft surgery on survival: Overview of 10-year results from randomised trials by the Coronary Artery Bypass Graft Surgery Trialists Collaboration. *Lancet* 1994;344:563-570
- Sjöland H, Caidahl K, Karlson BW, Karlsson T, Herlitz J: Limitation of physical activity, dyspnea and chest pain before and two years after coronary artery bypass grafting in relation to sex. *Int J Cardiol* 1997;61:2:123-133
- Sjöland H, Wiklund I, Caidahl K, Hartford M, Karlsson T, Herlitz J: Improvement in quality of life differs between women and men after coronary artery bypass surgery. *J Intern Med* 1999;245:445-454
- Rose GA, Blackburn H, Gillum RF, Prineas RJ: Cardiovascular survey methods. World Health Organization Monograph Series No. 56. Geneva, 2nd ed., 1982;162-166
- Eriksson H, Caidahl K, Svärdsudd K, Larsson B, Ohlson L-O, Welin L, Wilhelmsen L: Cardiac and pulmonary causes of dyspnoea-validation of a scoring test for clinical-epidemiological use: The study of men born in 1913. *Eur Heart J* 1987;8:1007-1014
- Caidahl K, Svärdsudd K, Eriksson H, Wilhelmsen L: Relation of dyspnea to left ventricular wall motion disturbances in a population of 67-year-old men. *Am J Cardiol* 1987;59:1277-1282
- Hagman M, Wilhelmsen L, Pennert K, Wedel H: Factors of importance for prognosis in men with angina pectoris derived from a random population sample. The Multifactor Primary Prevention Trial. Gothenburg, Sweden. *Am J Cardiol* 1988;61:530-535
- Wilson A, Wiklund I, Lahti T, Wahl M: A summary index for the assessment of quality of life in angina pectoris. *J Clin Epidemiol* 1991;44:981-988
- Wiklund I, Romanus B, Hunt S: Self-assessed disability in patients with arthrosis of the hip joint. Reliability of the Swedish version of the Nottingham Health Profile. *Int Disabil Study* 1988;10:159-163
- Hunt S, Wiklund I: Cross-cultural variation in the weighting of health statements: A comparison of English and Swedish valuations. *Health Policy* 1987;8:227-235
- Dupuy H: The Psychological General Well-Being (PGWB) Index. In *Assessment of Quality of Life in Clinical Trials of Cardiovascular Therapies* (Eds. Wenger NK, Mattson ME, Furberg CD, Elinson J), p. 170-183. New York: Le Jacq Publishers, Inc., 1984
- Hunt SM, McKenna SP, Williams J: Reliability of a population survey tool for measuring perceived health problems: A study of patients with osteoarthritis. *J Epidemiol Commun Health* 1981;35:297-300
- Hunt SM, McEwen J, McKenna SP: Perceived health: Age and sex comparisons in a community. *J Epidemiol Commun Health* 1984;38:156-160
- Dimenäs E, Carlsson G, Glise H, Israelsson B, Wiklund I: Relevance of norm values as part of the documentation of quality of life instruments for use in upper gastrointestinal disease. *Scand J Gastroenterol* 1996;31(suppl 221):8-13
- Mayou R: The patient with angina: Symptoms and disability. *Postgrad Med J* 1973;49:250-254
- Dongier M: Psychosomatic aspects in myocardial infarction in comparison with angina pectoris. *Psychother Psychosom* 1974;23:123-131
- Smith TW, Follicle MJ, Korr KS: Anger, neuroticism, Type A behaviour and the experience of angina. *Br J Med Psychol* 1984;57:249-252
- Hunt S: Subjective health indicators and health promotion. *Health Prom* 1986;3:1-12
- Caine N, Harrison SCW, Sharples LD, Wallwork J: Prospective study of quality of life before and after coronary artery bypass grafting. *Br Med J* 1991;302:511-516
- Pocock SJ, Henderson RA, Seed P, Treasure T, Hampton JR: Quality of life, employment status, and anginal symptoms after angioplasty of bypass surgery: Three-year follow-up in the Randomized Intervention Treatment of Angina (RITA) Trial. *Circulation* 1996;94:135-142
- Goldman L, Hashimoto B, Cook F, Loscalzo A: Comparative reproducibility and validity of systems for assessing cardiovascular functional class: Advantages of a new specific activity scale. *Circulation* 1981;64:1227-1234
- Walter PJ: Return to work after coronary artery bypass surgery. *Eur Heart J* 1988;9(suppl L):58-66
- Wiklund I: Quality of life in arthritis patients using nonsteroidal anti-inflammatory drugs. *Can J Gastroenterol* 1999;13:129-133
- Wiklund I, Herlitz J, Johansson S, Bengtson A, Karlson BW, Persson NG: Subjective symptoms and well-being differ in women and men after myocardial infarction. *Eur Heart J* 1993;14:1315-1319
- Czajkowski SM, Terrin M, Lindquist R, Hoogwerf B, Dupuis G, Schumaker SA, Gray R, Herd JA, Treat-Jacobson D, Zyzanski S, Knatterud GL, for the POST CABG Biobehavioral Study Investi-

- gators: Comparison of preoperative characteristics of men and women undergoing coronary artery bypass grafting (the Post Coronary Artery Bypass Graft [CABG] Biobehavioral Study). *Am J Cardiol* 1997;79(8):1017-1024
32. Sjöland H, Hartford M, Caidahl K, Karlson BW, Wiklund I, Karlsson T, Herlitz J: Improvement in various estimates of quality of life after coronary artery bypass grafting in patients with and without a history of hypertension. *J Hypertens* 1997;15(9):1033-1039
 33. Hunt SM, McEwen J, McKenna SP: Perceived health: Age and sex norms in a community. *J Epidemiol Comm Health* 1984;38:150-160
 34. Sjöland H, Herlitz J, Karlson BW, Karlsson T, Caidahl K: Influence of patient sex and clinical history on working capacity and myocardial ischemia after coronary artery bypass surgery. *Cor Art Dis* 1995;6:561-571
 35. Sjöland H, Caidahl K, Wiklund I, Haglid M, Hartford M, Karlson BW, Karlsson T, Herlitz J: Impact of coronary artery bypass grafting on various aspects of quality of life. *Eur J Cardiothorac Surg* 1997;12:612-619
 36. Klersy C, Collarini L, Morellini MC, Cellino F: Heart surgery and quality of life: A prospective study on ischemic patients. *Eur J Cardiothorac Surg* 1997;12:602-609
 37. Brezinka V, Kittel F: Psychosocial factors of coronary heart disease in women: A review. *Soc Sci Med* 1996;42:1351-1365
 38. Becker RC, Corrao JM, Alpert JS: Coronary artery bypass surgery in women. *Clin Cardiol* 1988;11(7):443-448
 39. O'Connor NJ, Morton JR, Birkmeyer JD, Olmstead EM, O'Connor GT: Effect of coronary artery diameter in patients undergoing coronary bypass surgery. Northern New England Cardiovascular Disease Study Group. *Circulation* 1996;93:652-655
 40. Mautner SL, Lin F, Mautner GC, Roberts WC: Comparison in women versus men of composition of atherosclerotic plaques in native coronary arteries and in saphenous veins used as aortocoronary conduits. *J Am Coll Cardiol* 1993;21:1312-1318
 41. Hwang MH, Meadows WR, Palac RT, Piao ZE, Pifarre R, Loeb HS, Gunnar RM: Progression of native coronary artery disease at 10 years: Insights from a randomized study of medical versus surgical therapy for angina. *J Am Coll Cardiol* 1990;16:1066-1070
 42. Vigorito C, Betocchi S, Giudice P, Miceli D: Severity in coronary artery disease in patients with diabetes mellitus: Angiographic study of 34 diabetic and 120 non-diabetic patients. *Am Heart J* 1980;100:782-787
 43. Eriksson SV, Björkander I, Held C, Hjemdahl P, Forslund L, Rehnqvist N: Age and gender differences in left ventricular function among patients with stable angina and a matched control group. A report from the Angina Prognosis Study in Stockholm. *Cardiology* 1996;87(4):287-293
 44. Lindenfeld J, Krause-Steinrauf H, Salerno J: Where are all the women with heart failure? *J Am Coll Cardiol* 1997;30:1417-1419
 45. Mendes LA, Davidoff R, Cupples A, Ryan TJ, Jacobs AK: Congestive heart failure in patients with coronary artery disease: The gender paradox. *Am Heart J* 1997;134:207-212
 46. Landahl S, Steen B, Svanborg A: Dyspnea in 70-year-old people. *Acta Med Scand* 1980;207:225-230