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Health-Related Quality of Life in Thoracic Aortic Disease

Part II. After Surgery on the Proximal (Root, Ascending, Arch) Aorta

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Abstract

Background: **Health-related quality of life (HRQOL) has been reported to be near-to-normal after operations on the proximal aorta. However, a thorough evaluation of variables related to postoperative HRQOL is lacking. We report HRQOL after surgery on the proximal aorta acknowledging current symptoms and conditions. If modifiable factors affect HRQOL, surgical treatment could be tailored to optimize outcomes.** ***Methods:*** **The short form 36 item (SF-36) questionnaire was used to measure HRQOL in eight domains and a physical component summary (PCS) and mental component summary (MCS) score. Median differences (Δ) between the component summary scores and a sex- and age-matched reference group from the general population were the primary outcome measures, along with comparisons of patient subgroups according to pathology (aneurysm versus dissection), aortic valve procedure, and circulatory arrest.** ***Results:*** **In 207 patients operated on the proximal aorta, after a mean of three years, there were no significant differences in median PCS (Δ = −0.3 [95% confidence limits −2.6, 2.0]) and MCS (Δ = 1.7 [−0.4, 2.9]) scores compared to the reference group, but median scores for the physical functioning, general health, and mental health domains were significantly lower. There were no statistically significant differences in PCS, MCS, or domain scores for patients with aneurysm versus dissection, for patients undergoing aortic valve procedures or not, or for patients managed with circulatory arrest or not. In multivariable analysis, exertional dyspnea was independently related to both ΔPCS (−6.5 [−13, −0.44]) and ΔMCS (−7.5 [−13, −1.6]), whereas age, exertional calf pain, and myocardial infarction were related only to ΔPCS.** ***Conclusions:*** **Overall HRQOL after surgery on the proximal aorta is encouraging, which remains important when benchmarking against novel therapeutic procedures. At follow-up, HRQOL appears related to current symptoms and conditions, but not to operative procedures. To better understand their impact on HRQOL, prospective studies comparing pre- and postoperative scores are needed.**

Key Words

Ascending aorta · Surgery · Quality of life

Introduction

The health-related quality of life (HRQOL) after operations on proximal aorta (including the aortic root, the ascending aorta, and the aortic arch) has been studied previously [1–6]. Findings have suggested acceptable or indeed near-normal HRQOL postoperatively, especially when deep hypothermic circulatory arrest (DHCA) is avoided, or when antegrade cerebral perfusion (ACP) is used for cerebral protection in arch surgery entailing DHCA [4]. How-

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Table 1. Demographic and Clinical Characteristics of All Patients Operated on for Proximal Thoracic Aortic Disease ($n = 207$)

Variable	*n* (%)
Male sex	145 (70)
Age, median (IQR)	57 (12)
Comorbid or health-related conditions	
Obesity	6 (2.9)
BMI, median (IQR)	26 (4.3)
Hypertension	171 (83)
Heart failure	16 (7.7)
Ischemic heart disease	30 (14)
Myocardial infarction	18
Angina pectoris	12
Coronary artery intervention	23 (11)
Coronary artery bypass graft	11
Percutaneous procedure	12
Peripheral vascular intervention	42 (20)
Venous thromboembolic disease	15 (7.2)
Chronic obstructive pulmonary disease	10 (4.8)
Smoking	65 (31)
Diabetes	5 (2.4)
Cerebrovascular insult	22 (11)
Coumadin treatment	25 (12)
Marfan syndrome	12 (5.8)
Current symptoms or complaints	
Exertional dyspnea	59 (28)
Exertional chest discomfort	13 (6.3)
Exertional calf discomfort	18 (8.7)
Joint pain	36 (17)
Echocardiographic findings	
Bicuspid aortic valve	41 (20)
Aortic regurgitation	106 (51)
Aortic stenosis	23 (11)

IQR indicates interquartile range; BMI, body mass index.

ever, despite their retrospective postoperative design, few studies have evaluated HRQOL in patients operated on the proximal aorta and included variables other than perioperative strategies that may potentially influence HRQOL [2]. We investigated HRQOL after surgical repair of the proximal aorta using the short-form 36-item (SF-36) questionnaire, compared outcomes to an age- and sex-matched reference group from the general population, and used multivariable analyses to identify predictors of HRQOL in patients after operation for proximal thoracic aortic disease (TAD). Evidently, perioperative strategies providing superior HRQOL outcomes should be promoted. Factors demonstrably affecting HRQOL can

Table 2. Characteristics of Thoracic Aortic Disease in 207 Patients Operated on for Proximal Thoracic Aortic Disease

Variable	*n* (%)
Aneurysm	105 (51)
Aortic root	4
Ascending aorta ± hemiarch	100
Total aortic arch	11
Dissection or intramural hematoma	102 (49)
Aortic root	28
Ascending aorta hemiarch	95
Total aortic arch	7

help guide treatment decisions. Equally important, if factors not related to the operation itself determine long-term HRQOL, they need to be identified and included in overall patient management.

Patients and Methods

The study cohort selection and formation, data collection, definitions, and statistical methods are described in detail in Part I of this study [7]. In brief, subjects enlisted for follow-up of TAD at a dedicated aortic outpatient clinic and alive at the time of study were eligible. Out of 654 subjects, 417 (64%) returned the SF-36 HRQOL questionnaire (nonresponders were accounted for in detail in Part I of this study [7]). Of these, 232 (56%) had undergone intervention. Twenty-two (9.5%) were treated for descending or thoraco-abdominal TAD (three by percutaneous intervention only) and were excluded from further analysis, yielding a study group of 207 patients after excluding another three individuals with incomplete data. Additional clinical data were accrued from an additional health survey and medical records. The summarizing physical component summary (PCS) and mental component summary (MCS) scores, and specifically their difference (Δ) from the age- and sex-matched reference group, remained primary outcome measures (cf Olsson and Franco-Cereceda [7]). Patients' demographic and clinical characteristics are presented in Table 1, perioperative variables in Table 2, and the distribution of TAD in Table 3. All participants gave written informed consent and the regional research ethics committee approved the study.

Definitions

Apart from definitions of TAD and comorbid conditions, as specified in Part I [7], this part of the study employed the following additional definitions: procedure on the aortic valve was categorized as mechanical valve replacement, biological valve replacement, or valve-sparing procedure (including variants of aortic valve repair, subcommissural annuloplasty, aortic valve resuspension, and valve-sparing root replacement), respectively. DHCA was applied as a dichotomous variable, and

Table 3. Operative Procedures in 207 Patients Operated on for Proximal Thoracic Aortic Disease

Variable	*n* (%)
Supracoronary graft, no aortic valve procedure	106 (51)
Aortic valve-sparing procedure	59
Aortic valve replacement (including composite grafts)	72 (35)
Biological valve	13
Mechanical valve	59
On-clamp distal anastomosis	84 (41)
Open distal anastomosis	123 (59)
DHCA only	30
DHCA + RCP	71
DHCA + ACP	22
DHCA duration, minutes (range)	35 (1-102)

ACP indicates antegrade cerebral perfusion; DHCA, deep hypothermic circulatory arrest; RCP, retrograde cerebral perfusion.

Table 4. Differences (Δ) in Median (Interquartile Range) Transformed (0-100 scale) SF-36 Domain and Component Summary Scores in Patients with Operated Proximal Thoracic Aortic Disease Compared to an Age- and Sex-Matched Reference Group from the Normal Population

SF-36 domain	Op TAD median transformed score (IQR)	Reference group median transformed score (IQR)	Δ Median (TAD-Reference) [95% CL]
PF	80 (40)	90 (30)	−10 [−15, −5.0]
RP	100 (75)	100 (75)	0 [−8.0, 8.0]
BP	84 (49)	74 (59)	10 [4.4, 16]
GH	67 (35)	72 (35)	−7 [−11, −2.6]
VT	65 (40)	70 (40)	−5 [−10, 0.04]
SF	100 (25)	100 (25)	0 [−4.5, 4.5]
RE	100 (33)	100 (33)	0 [−7.2, 7.2]
MH	80 (28)	88 (30)	−8 [−12, −3.9]
PCS	48.4 (20)	48.7 (19)	−0.3 [−2.6, 2.0]
MCS	52.2 (15)	50.5 (14)	1.7 [−0.4, 2.9]

Op TAD indicates operated thoracic aortic disease; IQR, interquartile range; CL, confidence limit; PF, physical functioning; RP, role physical; BP, bodily pain; GH, general health; VT, vitality; SF, social functioning; RE, role emotional; MH, mental health; PCS, physical component summary; MCS, mental component summary.

when used, it was further specified by duration (in minutes) and use of cerebral perfusion, in turn further subdivided by ACP or retrograde cerebral perfusion as employed during the DHCA interval. The use of respective intraoperative procedures is displayed in Table 3. According to their respective definitions, these variables were analyzed in addition to those listed in Part I [7] (cf *Definitions* paragraph) in multivariable modeling.

Table 5. Mean (with 95% Confidence Limits) Transformed (0-100 Scale) SF-36 Domain and Summary Scores in the Study Group (Patients Operated on for Proximal Thoracic Aortic Disease) and Reference Group (Age- and Sex-Matched Individuals from Normal Population): Differences (Δ) in Mean Scores (with 95% Confidence Limits)

SF-36 domain	Op TAD median transformed score (IQR)	Reference group median transformed score (IQR)	Δ Median (TAD-Reference) [95% CL]
PF	73 [70-76]	78 [74-81]	−4.9 [−9.9, 0.44]
RP	66 [60-71]	68 [63-74]	−2.0 [−10, 4.9]
BP	75 [71-78]	69 [65-73]	5.8 [0.26, 11]
GH	63 [60-66]	67 [64-71]	−4.1 [−8.4, 0.30]
VT	61 [58-65]	65 [61-68]	−3.1 [−8.2, 1.9]
SF	82 [79-86]	87 [84-90]	−4.7 [−9.2, −0.18]
RE	77 [72-82]	76 [71-81]	0.61 [−5.7, 6.9]
MH	76 [74-79]	79 [76-82]	−3.0 [−7.0, 1.1]
PCS	44 [42-45]	45 [43-47]	−1.0 [−3.2, 1.4]
MCS	48 [47-50]	50 [48-51]	−1.3 [−3.5, 0.96]

Op TAD indicates operated thoracic aortic disease; IQR, interquartile range; CL, confidence limit; PF, physical functioning; RP, role physical; BP, bodily pain; GH, general health; VT, vitality; SF, social functioning; RE, role emotional; MH, mental health; PCS, physical component summary; MCS, mental component summary.

Results

The cross-sectional follow-up was performed at a mean of 3.3 (±5.2) years postoperatively. The primary outcome measures, ΔPCS and ΔMCS, showed no statistically significant difference from the reference group (Table 4). For the SF-36 domain scores, four [role physical (RP), vitality (VT), social functioning (SF), role emotional (RE)] were not significantly different from the reference group, three [physical functioning (PF), general health (GH), mental health (MH)] were lower, and one [bodily pain (BP)] was significantly higher than those in the reference group (Table 4). The overall pattern of SF-36 scores was quite similar to that of the reference group. When mean, rather than median, SF-36 values were compared, only SF remained significantly lower (and BP still significantly higher) than in the reference group (Table 5). Cronbach's α-coefficient of internal consistency varied 0.80-0.93 and was generally on par with that of the reference group (Table 6). The statistical power to detect a 10% difference from the reference group median varied 0.86-1.0 (Table 6).

Grouping patients according to aortic pathology, dissection versus aneurysm, SF-36 domain scores were

Table 6. Cronbach's α-Coefficient for Internal Consistency for Each SF-36 Domain, Compared to Normal Swedish Population ($n = 8930$)

SF-36 domain	Cronbach's alpha (Normal Population)	Power
PF	0.93 (0.91)	0.99
RP	0.90 (0.88)	0.93
BP	0.90 (0.93)	0.86
GH	0.80 (0.84)	1.00
VT	0.88 (0.85)	0.95
SF	0.86 (0.85)	1.00
RE	0.86 (0.79)	0.97
MH	0.86 (0.87)	1.00
PCS	n/a	1.00
MCS	n/a	1.00

Statistical power for each SF-36 domain and summary score was used to detect a 10% difference from reference group median score. PF indicates physical functioning; RP, role physical; BP, bodily pain; GH, general health; VT, vitality; SF, social functioning; RE, role emotional; MH, mental health; PCS, physical component summary; MCS, mental component summary; n/a, not applicable.

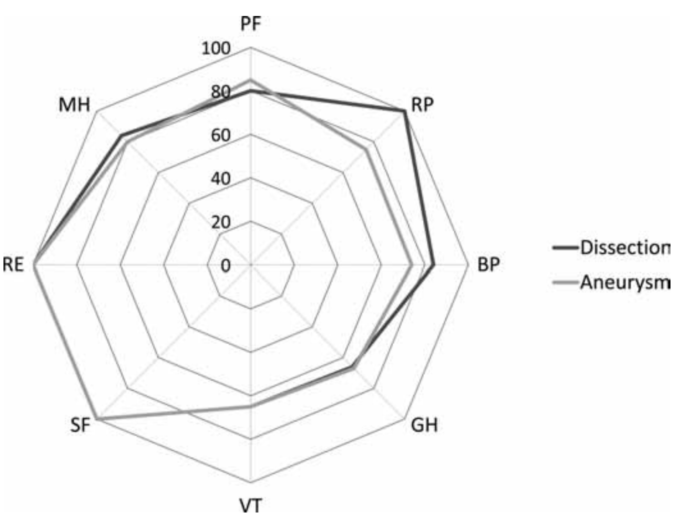

Figure 1. Polar plot of median transformed SF-36 domain scores for aneurysm versus dissection.

essentially identical (Fig. 1). Patients undergoing simultaneous valve procedures displayed a pattern of higher SF-36 domain scores than patients undergoing isolated aortic procedures (Fig. 2), but differences in individual SF-36 domains were not statistically significant (Table 7). When further analyzed by type of valve procedure— biological valve replacement versus mechanical valve replacement versus valve-sparing procedure—there was a tendency toward lower SF-36 domain scores with biological valve replacement (Fig.

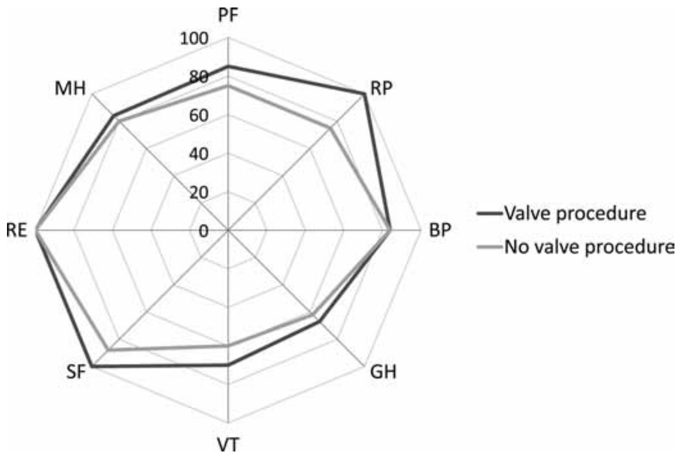

Figure 2. Polar plot of median transformed SF-36 domain scores for patients operated with or without concomitant aortic valve procedure.

3), but again, differences were not statistically significant, and the number of patients receiving a biological aortic valve was small ($n = 13$). With an approach similar to the use of DHCA, the overall pattern of SF-36 domain scores was in favor of not utilizing DHCA (Fig. 4), but no individual domain scores were significantly different. Subgrouping DHCA patients to DHCA alone versus DHCA with retrograde cerebral perfusion versus DHCA with antegrade cerebral perfusion, SF-36 domain score differences were small and insignificant, but overall somewhat worse with DHCA alone versus DHCA with any type of cerebral perfusion (Fig. 5).

In multivariable (median) regression analysis, symptoms of exertional dyspnea or calf pain along with a history of myocardial infarction and increased age were related to worse ΔPCS, whereas only exertional dyspnea was related to worse ΔMCS (Table 8). Modeling with linear regression on the mean did not return significantly different findings. Bootstrap bagging of predictors identified several conditions related to ΔMCS and ΔPCS, respectively (Table 9). Notably, age, sex, aortic pathology, use of DHCA, and duration of DHCA were not related to any of the primary outcome measures (Tables 4 and 8).

Discussion

HRQOL as measured by the SF-36 questionnaire was equal to that of a normal, age- and sex-matched, reference group in the physical (PCS) and mental (MCS) component summary scores (Table 4). In the PF,

Table 7. Median (Interquartile Range) Transformed (0-100 Scale) SF-36 Domain and Component Summary Scores in Patients with Thoracic Aortic Disease Grouped by Diagnosis (Dissection versus Aneurysm), Use of Circulatory Arrest (DHCA versus No DHCA), and Concomitant Aortic Valve Procedure versus No Aortic Valve Procedure

	Dissection	Aneurysm	DHCA	No DHCA	Valve procedure	No valve procedure
PF	80 (35)	85 (35)	80 (40)	85 (25)	85 (25)	75 (40)
RP	100 (75)	75 (75)	75 (100)	100 (75)	100 (75)	75 (100)
BP	84 (49)	74 (49)	84 (49)	79 (58)	84 (49)	84 (49)
GH	66 (30)	67 (35)	62 (32)	67 (32)	67 (32)	62 (37)
VT	65 (40)	65 (40)	60 (40)	70 (35)	70 (35)	60 (45)
SF	100 (38)	100 (25)	100 (38)	100 (25)	100 (25)	88 (38)
RE	100 (33)	100 (33)	100 (67)	100 (33)	100 (33)	100 (67)
MH	84 (28)	80 (28)	84 (28)	80 (32)	84 (28)	80 (28)
PCS	52.7 (20)	52.0 (14)	52.1 (17)	52.2 (14)	52.7 (14)	51.6 (15)
MCS	48.6 (19)	47.6 (22)	46.5 (22)	49.8 (20)	50.5 (18)	46.7 (22)

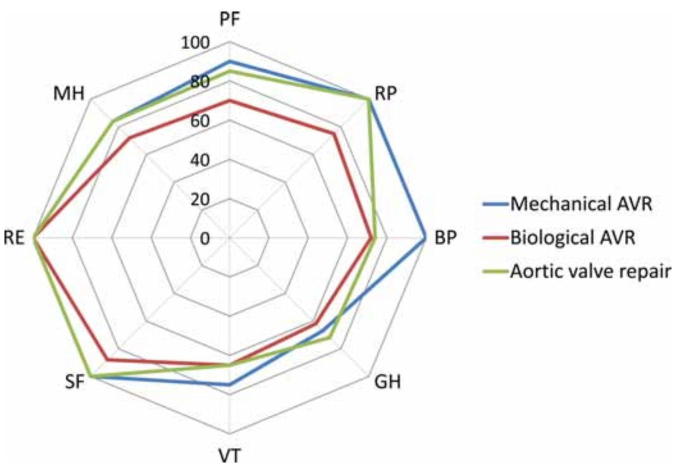

Figure 3. Polar plot of median transformed SF-36 domain scores for patients with concomitant aortic valve procedures: mechanical valve replacement versus biological valve replacement versus valve-sparing procedure.

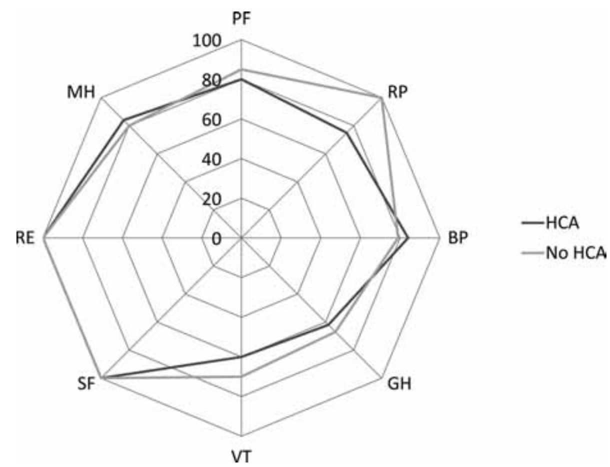

Figure 4. Polar plot of median transformed SF-36 domain scores for patients operated with or without hypothermic circulatory arrest.

GH, and MH domains, scores were significantly lower (approximately 10%) in the study group, which could reflect differences of clinical relevance. On crude comparison, SF-36 summary and domain scores were higher in operated than in nonoperated patients [7] throughout, except for VT, indicating at least that operations on the proximal aorta, applying current indications and techniques, does not, on the group level, entail worse HRQOL. Interestingly, in multivariable analysis, exertional dyspnea surfaced as the only variable independently related to both ΔPCS and ΔMCS and, indeed, the only one related to MCS (Table 8). Moreover, with bootstrap bagging analysis of predictors, no modifiable, ie, procedure-related variables, were identified as predictors of ΔPCS and ΔMCS (Table 5). Instead, current symptoms, regardless of association to operation, seem to dictate HRQOL at an interval several years postoperatively—quite similar to the nonoperated TAD population in Part I of this study [7]. Resembling the findings of the present study, Zierer et al. [2] used multivariable analysis to identify advanced heart failure functional class and chronic obstructive pulmonary disorder—conditions associated with, for example, exertional dyspnea and fatigue—as independent predictors of worse functional status at late follow-up after thoracic aortic surgery.

While a formal area under the curve analysis of the SF-36 polar plot is not correct [8], the resulting "footprint" may be interpreted both regarding size and shape to illustrate differences. Apparently (Fig. 4), patients managed without DHCA present an overall

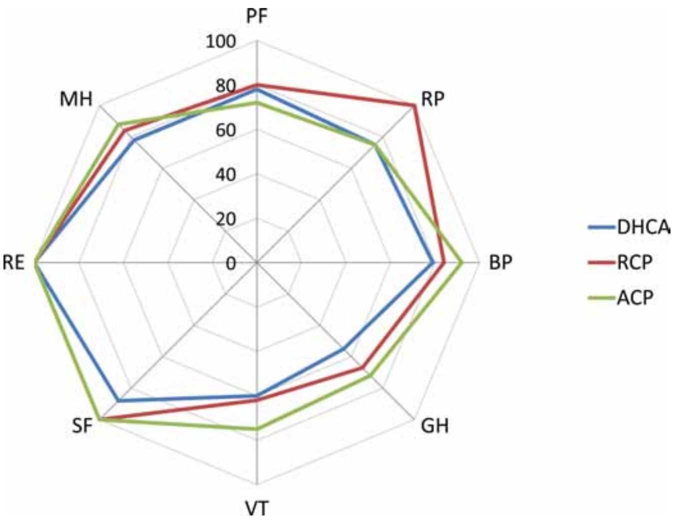

Figure 5. Polar plot of median transformed SF-36 domain scores for patients managed with deep hypothermic circulatory arrest (DHCA) alone versus DHCA with retrograde cerebral perfusion (RCP) versus DHCA with antegrade cerebral perfusion (ACP).

Table 8. Variables Independently Related to the Difference (Δ) in Medians between the Study Group and the Reference Group for the Physical Component Score (ΔPCS) and Mental Component Score (ΔMCS) in Multivariable Median Regression, Adjusted for Sex and Age

Variable	Coefficient	95% CL	*p*-value
A) ΔPCS			
Exertional calf pain	−10	−19, −1.4	0.023
Age	−0.18	−0.30, −0.01	0.003
Myocardial infarction	−9.9	−19, −0.86	0.032
Exertional dyspnea	−6.5	−13, −0.44	0.035
B) ΔMCS			
Exertional dyspnea	−7.5	−13, −1.6	0.013

CL indicates confidence limits. Values are standardized (β) coefficients with bootstrapped ($n = 1000$ repetitions) standard errors for confidence limits.

Table 9. Variables (in Italics) with > 600 Occurrences (> 60%) in Bootstrap Analysis ($n = 1000$ Bootstrapped Samples with Replacement) of ΔPCS and ΔMCS, respectively

Variable	Occurrences/ 1000 bootstraps
A) ΔPCS	
Chronic renal failure	966
Exertional calf pain	931
Joint pain	863
Exertional dyspnea	853
Myocardial infarction	702
Marfan syndrome	661
Cerebrovascular insult	644
Male sex	146
Age (years)	
Dissection (versus aneurysm)	131
Circulatory arrest (versus no circulatory arrest)	167
Duration of circulatory arrest (minutes)	177
B) ΔMCS	
Exertional dyspnea	883
Male sex	151
Age (years)	177
Dissection (versus aneurysm)	185
Circulatory arrest (versus no circulatory arrest)	355
Duration of circulatory arrest (minutes)	177

Age, sex, type of thoracic aortic disease (dissection versus aneurysm), use of circulatory arrest (versus no circulatory arrest), and duration of circulatory arrest (1 min increment) are included for reference.

larger (ie, better HRQOL) footprint than those for whom DHCA was used. Similarly, the group undergoing a simultaneous procedure on the aortic valve presents a larger footprint than those who did not (Fig. 2). Differences between aneurysm and dissection (Fig. 1) were indeed small. The pattern of higher RE, BP, PF, and MH scores and lower VT and GH scores remained similar regardless of subgrouping. Further, the differences between groups seemed most obvious in the RP domain. Lower RP score denotes "problems with work or other daily activities as a result of physical health" and correlates with, for example, sleep disturbance, leg and joint pain, and general fatigue [9].

Interestingly, in this study population, no significant differences between dissection (in the proximal aorta, almost invariably acute operations) and aneurysm (the majority elective operations) was found (Fig. 1). As previously described for both TAD [2] and abdominal aortic aneurysm [10], it seems probable that the direct consequences of operation—including its acuity—wear off with time. Nevertheless, it remains sound also from a HRQOL perspective to advocate elective, prophylactic surgery on the ascending aorta—even if it includes procedures on the root and/or an open distal anastomosis—to avoid acute aortic events with their inherent increased mortality, morbidity, and potential impact on HRQOL, directly or mediated by early or late complications [11].

HRQOL after aortic root surgery has been reported in previous retrospective studies. Stalder et al. [5]

reported no procedure-related differences (aortic root replacement versus aortic valve with ascending aorta replacement versus ascending aorta only) and no differences compared to the general population regarding postoperative (26.6 ± 8 months) HRQOL as measured by SF-36 and a designated questionnaire in 229 patients [5]. Franke et al. [6] compared postoperative HRQOL (SF-36) up to six years after composite aortic root replacement or valve-sparing root repair and found worse SF-36 domain scores for PF, GH, VT, RE), and MH with composite graft operation. For this group, all SF-36 domain scores were lower than those of the general population. However, they also noted that late complications were significantly more common in this group (28% versus 11%, $P = 0.008$) during the follow-up period. Among the shortcomings of these studies, we especially note 1) no description of how the "general population" comparison group was constructed, 2) no use of the physical and mental component summary scores to reflect overall HRQOL outcomes, but, most importantly, 3) no use of multivariable statistical methods to explain the differences between the study groups, and hence, no knowledge of what factors independently contributed to the findings. Although these are interesting observations, no conclusions can be drawn regarding the effect of the surgical procedure per se on postoperative HRQOL. The findings of the present study suggest that the operative procedure is of subordinate importance in this respect and, more specifically, that a concomitant procedure on the aortic valve (including replacement) does not result in worse HRQOL. Notably, current anticoagulant therapy was not related to HRQOL in multivariable analysis.

The strategy for the distal anastomosis—on clamp or open, and if so, with or without different methods of cerebral perfusion—may also affect HRQOL. Immer et al. [3] have studied the effects of deep hypothermia and cerebral perfusion on postoperative HRQOL. In a study of 125 aortic surgery patients utilizing DHCA, they found impaired SF-36 scores in the PF, role physical (RP), and GH domains, compared to the general population. With nonsignificant differences in the remaining domains, they judged the overall outcome good, but also noted worse HRQOL in the subgroup of patients ($n = 69$) operated for acute Type A aortic dissection. A more recent report from the same group [4] compared HRQOL outcomes in patients managed with (11%) or without (89%) selective antegrade cerebral perfusion during the interval of DHCA and DHCA periods <20, 21-34, or >35 minutes, respectively. Findings indicated worse SF-36 scores with increasing DHCA periods and also improved HRQOL with use of ACP, regardless of DHCA duration. Our findings did not corroborate those of Immer et al. [4]. We found no independent relationship between DHCA (versus no DHCA), DHCA duration, or use of ACP and HRQOL outcomes. Again, the importance of multivariable statistical models to discern independent associations between variables and outcomes, as well as inclusion of relevant clinical variables other than those clearly related to the operation itself, is underscored. The findings of the present study also corroborate those of an earlier study [1]: no statistically significant impact on postoperative HRQOL ascribable to acuity, surgical procedure, or cerebral protection. Notably, our findings present no argument against the use of, for example, valve reimplantation procedures or (antegrade) cerebral perfusion, which we also employ routinely. Rather, it indicates that, given a comparably successful surgical outcome, other variables may be more influential on HRQOL in the long-term. Knowledge, control, and adequate management of such variables may help achieve the best possible outcomes, also in the setting of operated TAD.

Study Limitations

There are several study limitations to acknowledge. First, this study, too, is retrospective with cross-sectional follow-up, with the inherent weaknesses of such study design, including the inability to establish causality. Second, the study group is heterogeneous regarding aortic pathology and surgical procedures. Third, we agree that the use of generic questionnaires such as the SF-36 may not truly reflect HRQOL in specific patient groups, especially when not formally validated [12]. Lack of validation affects a key issue in HRQOL comparisons—the magnitude of the so-called "minimum clinically important difference". Comparability remains its main advantage in this respect.

Conclusion

The present study reestablishes overall good or near-to-normal HRQOL when compared to age- and sex-matched controls. Such knowledge is vital when introducing and comparing with new therapeutic options including hybrid and endovascular procedures, but also when informing and educating patients, families, caregivers, and other parties involved in the decision-making processes related to surveillance, treatment, and follow-up. To delineate the impact of the operation and its various technical options, prospective studies evaluating HRQOL both pre- and postoperatively are necessary.

Comment on this Article or Ask a Question

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EDITOR'S COMMENTS AND QUESTIONS

Editor's comments:

This paper provides the very reassuring information that quality of life matches that of the normal population after surgery on the ascending aorta and/or aortic arch. Furthermore, the data find that even for patients undergoing deep hypothermic circulatory arrest, quality of life is maintained. All of this information is reassuring and provides further evidence in favor of a surgical approach to these virulent aortic pathologies. With current techniques, we know that these operations can be performed with a high degree of safety. Thanks to this paper, we now know that there are no hidden late detriments in the quality of life of the surviving patients.

Editor's Questions:

1. Please say a few words about the meaning and interpretation of your "footprint" diagrams.

To summarize SF-36 scores graphically is challenging. The "footprint" (polar plot, spydergram) is a simple yet effective means of presenting the eight domains of the SF-36 score, usable for individuals and groups alike. Differences in footprint shape and size are readily apparent and can be used for comparisons over time, between treatment groups, or even diseases. We argue that such differences could be relevant even if not corresponding to statistically significant differences in individual domain scores.

2. It was interesting and surprising that use of Coumadin did not decrease quality of life. This contrasts with the general perception that use and monitoring of Coumadin is very annoying. This seems a potentially important ancillary finding of your study. Can you comment, please?

We agree, this is an interesting and somewhat counterintuitive finding. Again, as in the case of our *conception of thoracic aortic disease as a "ticking bomb" (in Part I of this study not reflected by decreased mental component scores), prejudice is not always vindicated by study findings. In fact, literature supporting the idea of decreased quality of life due to Coumadin therapy is relatively scant. Perhaps an argument for tempering the increased use of bioprostheses at increasingly younger ages?*

Statistical Commentary:

Dr. John A. Rizzo, Professor, Stony Brook University, NY, USA

This paper employs health-related quality of life (HRQOL) data using the SF-36 instrument to investigate how thoracic aortic disease (TAD; eg, aneurysm or dissection) affects HRQOL in comparison to an age- and sex-matched cohort without TAD following surgery for repair of the proximal aorta. This study is a follow-up to a companion piece that examined HRQOL in TAD patients who were managed medically.

My overall impressions of the Part I study again apply to the Part II follow-up. More specifically, the quantile regression approach is nonstandard and requires some justification. That said, I believe that the results with the quantile regression approach or the more standard linear regression approach convey the same message; namely, that long-term HRQOL in surgically treated TAD patients is the same or nearly the same as that in an age- and sex-matched cohort without TAD. I think this is useful and encouraging news.