

Survival rates and quality of life of patients after thoracic endovascular aortic repair

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ABSTRACT

Aim. This study aimed to assess patients' quality of life of patients after thoracic endovascular aortic repair (TEVAR). **Methods.** The clinical data of 42 patients (mean age of 58.7±4.1 years, 32 men, 10 women) underwent TEVAR from 2016 to 2022 were analyzed. The mean follow-up period was 2.7±0.25 years. The thoracic aortic aneurysm was diagnosed in 11 out of 42 cases. TEVAR was performed in 31 of 42 patients with aortic dissection (24 cases had type B, 4 cases had type "neither A nor B", and 3 had type A). Hybrid surgeries were performed in 12 patients, including 3 significant surgeries with prosthetics of the ascending and aortic arch, 3 cases with parallel carotid-subclavian bypass, and 6 of patients with stenting of the common carotid artery and endoprosthesis replacement of the left subclavian artery. **Results.** The cumulative survival rate at 30 days was 97.6%, 6-month survival was 88.1%, and 3-year survival was 85.7%. The dynamics of assessments by SF-36 domains showed that after TEVAR, vital activity and mental health fields were the most effective. So, if before TEVAR in the binding activity domain, the average quality of life was 63.8±7.2, then after 12 months, the indicator increased with a statistically significant difference to 86.2±6.4 (P<0.001). The patient's mental health improved significantly with SF-36 scores after TEVAR rate of 77.4±4.4. Also, all other domains enhanced considerably compared to the pre-TEVAR survey results (P<0.01). **Conclusion.** TEVAR showed high efficiency with significant improvement in the general condition and quality of life of patients.

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INTRODUCTION

Aortic aneurysms and dissections are life-threatening diseases with sudden onset and are associated with severe complications. In patients with acute and subacute aortic dissection type B, according to the Stanford classification, endovascular arthroplasty (TEVAR) is considered the method of choice, adequate, and sometimes the only possible measure to save the life of patients [1-4]. In addition, it is reported that aortic remodelling after TEVAR is an important prognostic factor for achieving good treatment outcomes in this cohort of patients [5].

TEVAR has become the dominant minimally invasive treatment for aortic aneurysms and dissections in economically developed countries [6, 7]. There are a number of studies in the literature that reflect early clinical and technical results. Still, there are few reports of survival rates after TEVAR and assessment of the quality of life. TEVAR is a minimally invasive procedure, but the impact of other factors on quality of life has not yet been thoroughly evaluated. Only a few studies on patients' quality of life after TEVAR have been published [8, 9].

Thus, the present study evaluated the medium and long-term survival outcomes and quality of life in patients with thoracic aortic aneurysms and dissections after TEVAR.

MATERIALS AND METHODS

The basis of the work was the results of endoprosthetic of the thoracic aorta in 42 patients aged 27 to 80 years (mean age 58.7±4.1 years, 32 men, 10 women) who received inpatient treatment in three medical centres: Republican Specialized Scientific and Practical medical centre of surgery named after academician V. Vakhidov

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Thoracic aortic aneurysm without signs of dissection was diagnosed in 26.2% (11 of 42) cases. In the remaining 73.8% (31 of 42), TEVAR cases were performed in patients with aortic dissection. The distribution according to the modified Stanford classification showed that type B of the dissection was detected in the majority of 57.1% (24 of 42), the type "neither A nor B" was noted in 9.5% (4 of 42) of cases, and type A in 7.1% (3 out of 42) (Figure 1).

An analysis of the frequency of prehospital complications showed that patients most often presented with left-sided hydrothorax (19.0%; 8 of 42) and intramural hematoma (19.0%; 8 of 42). Aortic aneurysm-specific malperfusion syndrome with lower limb ischemia was diagnosed in only 12.0% (5 out of 42) cases. Severe pain syndrome was noted with the same frequency (Table 1).

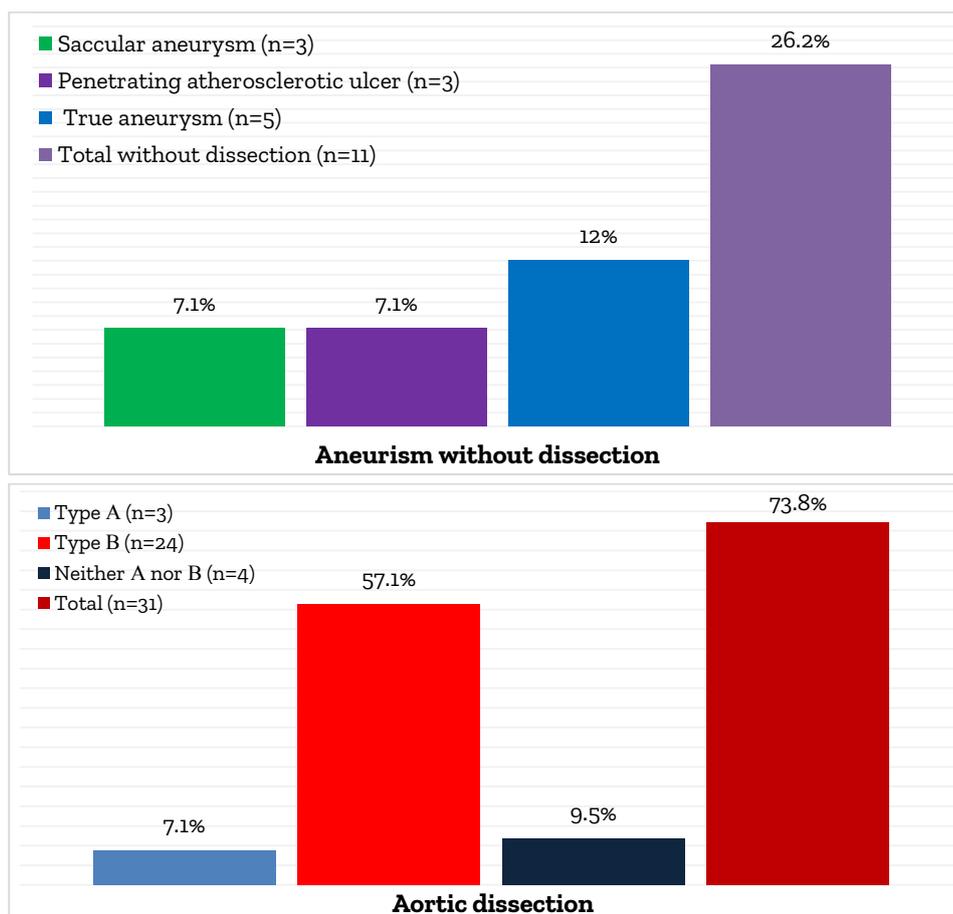


Figure 1. Distribution of patients according to the type of aneurysm and the presence of dissection of the thoracic aorta.

Table 1. Prehospital complications of thoracic aortic aneurysms

Type of prehospital complication	TEVAR (n=42)	
	n	%
Left-sided hydrothorax	8	19,0%
Intramural hematoma	8	19,0%
Hydropericardium	6	14,3%
Malperfusion syndrome / lower limb ischemia	5	12,0%
Pain syndrome	5	12,0%
Left-sided encysted hemothorax	4	9,5%
Aneurysm rupture	4	9,5%
Hemomediastinum	2	4,8%
Partial collapse of the lower lobe of the left lung	1	2,4%
Pressure n.vagus	1	2,4%
Thrombosed saccular aneurysm	1	2,4%
Subadventitial hematoma	1	2,4%
Distal stent-induced tear (dSINE)	1	2,4%
Compression of the esophagus	1	2,4%

Also, complications such as the partial collapse of the lower lobe of the left lung, compression of the n.vagus, thrombosis of a saccular aneurysm, subadventitial hematoma, difficulty in swallowing associated with compression of the oesophagus by para-aortic hematoma, and a case of development of distal stent-induced tear (dSINE) were noted in one case. after the previous TEVAR.

Aneurysm ruptures occurred in 4 (9.5%) patients who underwent emergency TEVAR. These patients also had left-sided encysted hemothorax. In addition to hypertension and hypertension, which occur in almost all patients with aortic aneurysms, patients with thoracic aortic aneurysms were also characterized by the development of chronic heart failure (21.4%; 9 of 42), anaemic conditions (21.4%; 9 of 42), ischemic heart disease (14.2%; 6 out of 42). Also, 4 (9.5%) patients had a stroke, and another 4 (9.5%) had chronic renal failure.

Before TEVAR, three patients with type A thoracic aortic dissection underwent ascending aortic grafting – 2 open surgeries and one hybrid surgery using the “frozen elephant trunk” technique. Also, two patients with coronary artery disease underwent coronary artery bypass grafting. Thus, from the data presented above, it can be concluded that the tactics of TEVAR depended on the presence or absence of dissection, the type and stage of dissection, and the associated specific cardiovascular complications. TEVAR in the classical form (TEVAR) was performed in 9 (21.4%) patients; in 21 (50%) cases, the SF-TEVAR technique with doctor-modified fenestration in the stent graft was used (Table 2). Hybrid surgeries were performed in 12 (28.6%) patients, including 3 (7.1%) significant surgeries with prosthetics of the ascending and aortic arch and 3 (7.1%) cases with parallel carotid-subclavian bypass and 6 (14.2%) of patients with stenting of the common carotid artery and endoprosthesis replacement of the left subclavian artery (Table 2). The proximal landing zone was located in Z-0 (all patients with Stanford type A dissection) in 21.4% (3 with true aneurysms and 6 with dissection) of points in the Z-one. The vast majority (54.9%; 23 of 42) of proximal landing sites were in Z-2, including 5 (12.0%) patients with aneurysms without dissection and 18 (42.9%) with thoracic aortic dissection. In the remaining 7 (16.6%) patients, the landing zone was Z-3-4 (Figure 2).

During statistical processing of the data, the obtained value of Fisher's exact test P more than 0.05 indicated the absence of significant differences and the importance of P less than 0.05 indicated their presence. The quality of life of patients was studied using the SF-36 Health Status Survey, according to which 36 items of the latter are formed into eight scales, and the results are presented in the form of scores, compiled in such a way that a higher score indicates a higher level of QOL.

Table 2. Types of TEVAR in patients with thoracic aortic aneurysms

Type of TEVAR	n	%
Pure endovascular interventions	30	71.4%
SF-TEVAR	21	50%
TEVAR	9	21.4%
Hybrid procedures	12	28.6%
TEVAR after ascending aortic replacement	3	7.1%
TEVAR with carotid-subclavian bypass	3	7.1%
TEVAR with left common carotid artery stenting and left subclavian artery plasty	6	14.2%

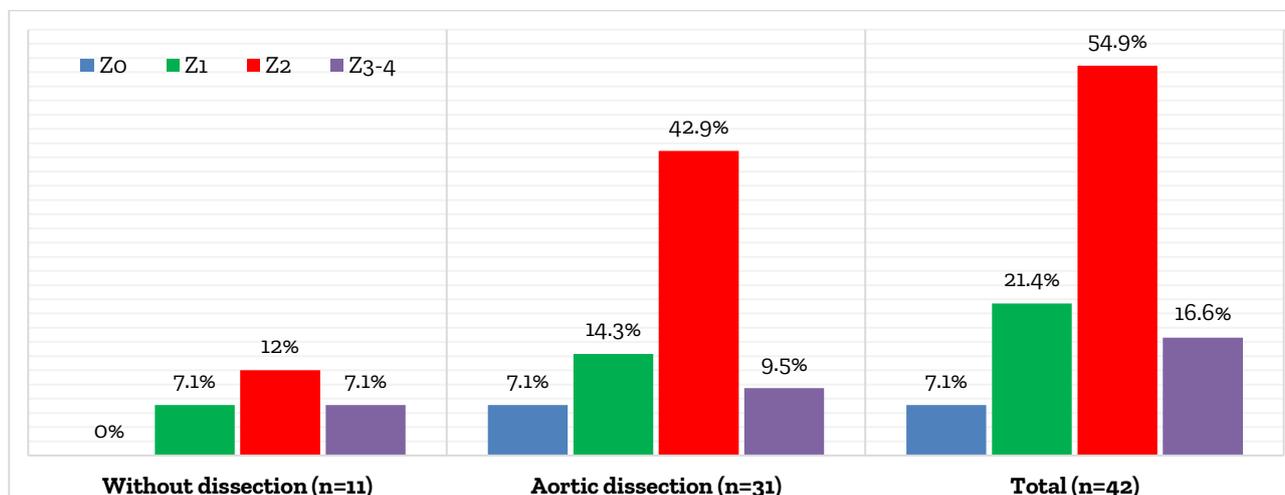


Figure 2. The distribution of patients depends on the landing zone of the proximal part of the stent graft

RESULTS

Overall mortality after all TEVARs within 30 days was 2.4% (1 of 42), in-hospital mortality was 0.0%, and long-term mortality was 11.9% (5 of 42). The overall all-cause mortality after all TEVARs over the study period was 14.3% (6 out of 42). The analysis showed higher mortality after TEVAR in aortic dissections than in aneurysms - 16.1% (5 of 31) versus 9.1% (1 of 11), $p = 0.551$ (Figure 3). The leading causes of death were stroke and progression of MODS in 1 case, acute myocardial infarction in 1 point, and intracranial aneurysm rupture noted in 1 case. In 2 patients, the cause of death was COVID-19 infection and associated severe pneumonia. Also, one patient was diagnosed with cancer, cancer of the oesophagus, which also caused the patient's death. Analysis of fatalities after TEVAR did not show any stent-graft-associated causes of mortality (Table 4). An analysis of baseline values for eight domains of SF-36 showed a significant impact on the diagnosis of abdominal aortic aneurysms and resulting pathological conditions on role restrictions due to physical problems role functioning with a score of 26.8 ± 4.3 points and physical functioning with an indicator of 26.8 ± 5.2 issues. Table four shows that during the initial examination in the preoperative period, the average assessment of the quality of life of patients from the data of the SF-36 questionnaire was equal to 32 ± 4.8 points for the physical component and 42 ± 6.1 points for the psychological part. Also, in contrast to the results of the SF-36 scale for the domains of vitality, mental health and social functioning of patients. The least impact was noted for role-restriction domains due to role emotional. The assessment of the quality of life-based on Bodily pain had a range of 30 to 50 points, as well as the general health. The dynamics of assessments by SF-36 domains (Figure 7) showed that after TEVAR, the parts of vital activity and mental health were the most effective. So, if before TEVAR in the binding activity domain, the average quality of life was 63.8 ± 7.2 , then after 12 months, the indicator increased with a statistically significant difference ($P < 0.001$) to 86.2 ± 6.4 points. The patient's mental health improved significantly with SF-36 scores after TEVAR of 77.4 ± 4.4 .

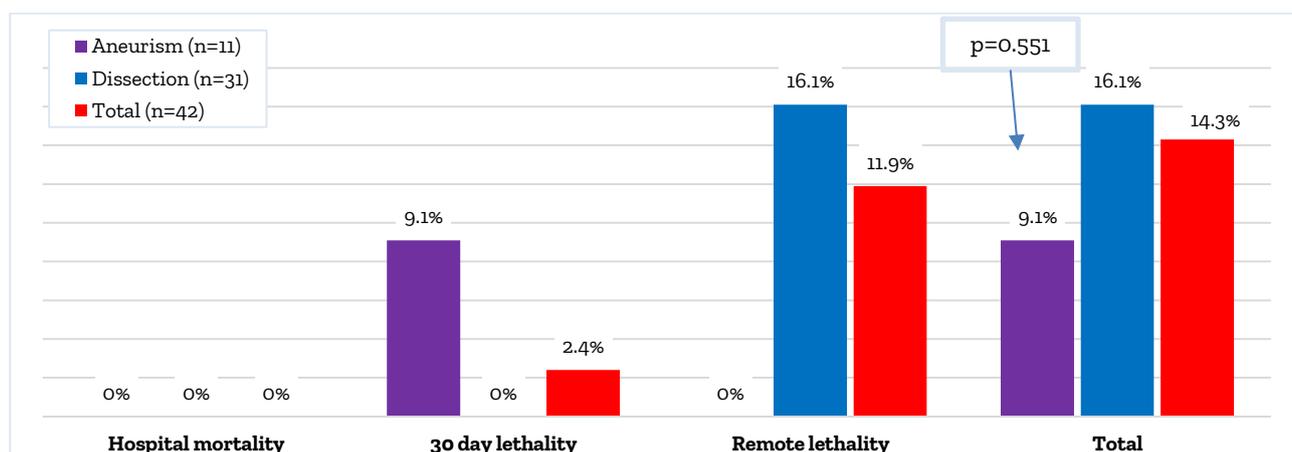


Figure 3. Mortality rates after TEVAR

Table 3. Deaths in the near and long term and their causes after TEVAR

Cause of death	Total, n=42	With aortic dissection, n=31	Without aortic dissection, n=11
Stroke	1	0	1
Pulmonary embolism	0	0	0
Myocardial infarction	1	1	0
Intracranial aneurysm with rupture	1	1	0
Oncological disease	1	1	0
COVID-19	2	2	0
Total	6/42 (14,3%)	5/31 (16,1%)	1/11 (9,1%)

Table 4. Preoperative indicators of quality of life SF-36 "Health Status Survey" in the TEVAR group (M±m)

Index	Average
Physical functioning	26,8±5,2
Role restrictions due to physical health	26,8±4,3
Role restrictions due to emotional issues	82,2±3,2
Vital activity	63,8±7,2
Emotional well-being	70,7±4,3
Social functioning	54,4±3,6
Pain	35,1±4,6
General Health	48,6±4,9

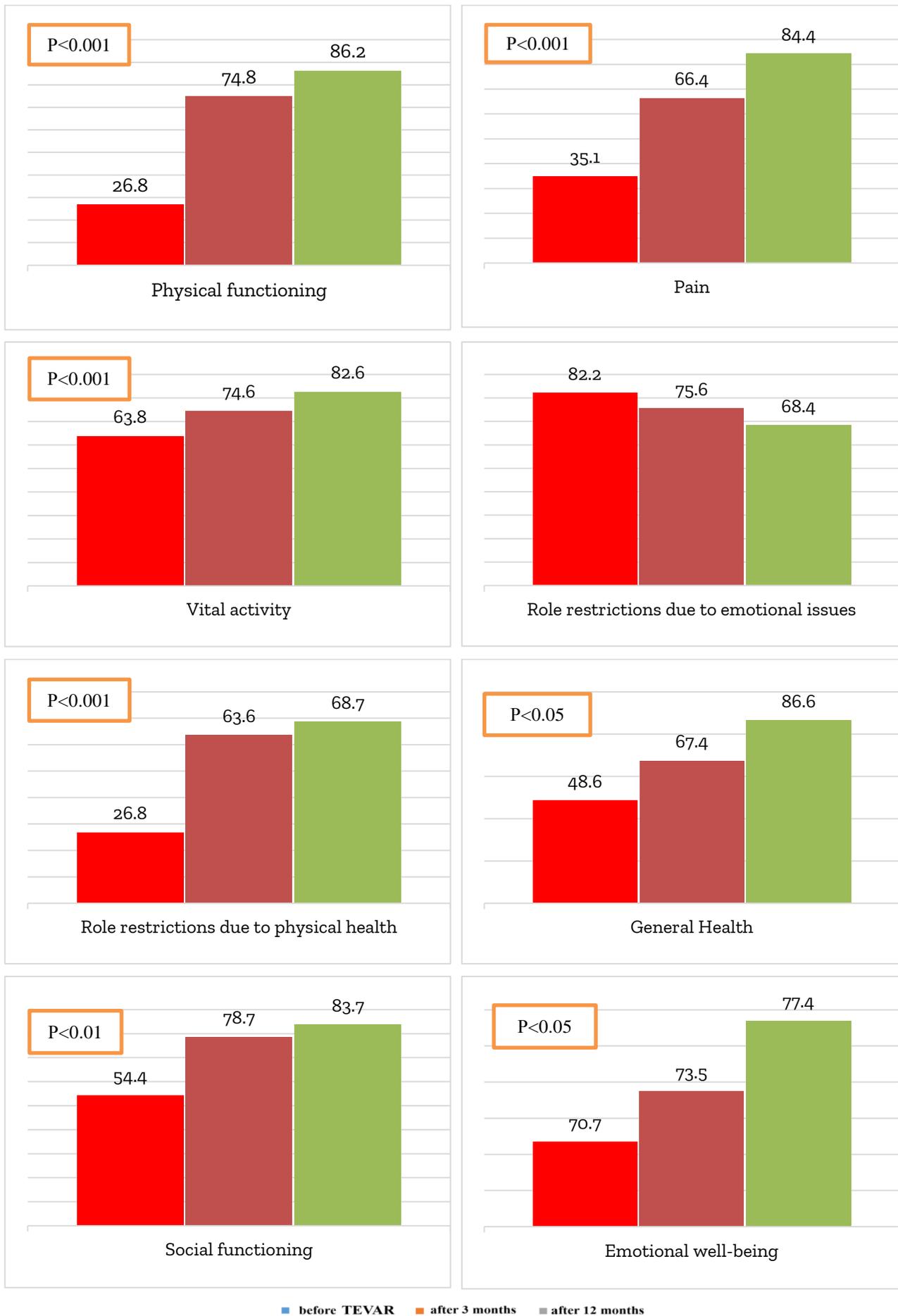


Figure 4. Dynamics of quality of life indicators according to SF-36 "Health Status Survey" in the group of patients after TEVAR (n=42)

DISCUSSION

The prevalence of descending thoracic aortic pathologies, comprising mainly of aneurysm and dissection, which eventually rupture if not recognized and treated appropriately, are increasing [10]. Despite remarkably improved operative techniques and maximized organ protection, open repair of the descending thoracic aorta is still associated with high complications, including intraoperative and postoperative death, haemorrhage, stroke, and paraplegia [11].

An alternate method - TEVAR - provides better clinical outcomes in patients deemed high risk for open repair or were typically considered nonsurgical candidates. TEVAR has shown significantly improved early quality of life versus open repair and a general trend toward better short-term perioperative survival and freedom from significant complications [12, 13].

Quality of life following aortic surgery on the whole is acceptable and often comparable (even in the elderly and high-risk patients) to a healthy age- and sex-matched population. Baseline characteristics of patients with descending thoracic aortic disease tend to be poorer and this may be related to the multiple comorbidities these patients tend to have. There is only one prospective randomized trial in the whole of the aortic surgery literature examining HRQOL outcomes. This probably reflects the fact that it is seen as a 'soft' outcome in current evidence-based aortic policymaking. This represents a misunderstanding of the utility of HRQOL, as preservation or improvement should be the principal goal of all elective aortic surgery [12, 13].

According to our data, a study of the quality of life of patients with thoracic aortic aneurysms after TEVAR showed that most patients reported that their condition improved significantly after surgery compared with 12 months earlier. And except for role-playing emotions, vitality, and mental health, all other domains improved significantly compared to pre-TEVAR survey results.

CONCLUSION

Endovascular prosthesis for aneurysms and dissections of the thoracic aorta showed high efficiency with significantly improving the general condition and quality of life of patients.

DECLARATIONS

Ethical approval

The review board and ethics committee of RSCS named after acad. V.Vakhidov approved the study protocol and informed consents were taken from all the participants.

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Authors' contributions

All authors contributed equally to this work.

Competing interests

The authors declare that they have no competing interests.

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