Walking Impairment Questionnaire score change after lower extremity revascularization and outcomes in a modern cohort of VOYAGER PAD trial

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Backgrounds

- The long-term natural course of changes in walking ability after lower extremity revascularization (LER) in peripheral artery disease (PAD) patients and their clinical impact have not been well studied.

- A previous study in chronic, stable PAD populations has shown an association between changes in Walking Impairment Questionnaire (WIQ) scores and clinical outcomes. However, this relationship has not been evaluated in patients following LER.

Walking Impairment Questionnaire (WIQ) score

Walking distance

Walking distance	Degree of difficulty					
	No difficulty	Slight difficulty	Some difficulty	Much difficulty	Unable to do	Weight
1. Walking indoors (ie, around the home)	4	3	2	1	0	20
2. Walking 50 feet?	4	3	2	1	0	50
3. Walking 150 feet? (1/2 block)	4	3	2	1	0	150
4. Walking 300 feet? (1 block)	4	3	2	1	0	300
5. Walking 600 feet? (2 block)	4	3	2	1	0	600
6. Walking 900 feet? (3 block)	4	3	2	1	0	900
7. Walking 1500 feet? (5 block)	4	3	2	1	0	1500

Walking distance score = [(20 * points for walking indoors] + (50 * points for walking 50 feet) + (150 * points for walking 150 feet) + (300 * points for walking 300 feet) + (600 * points for walking 600 feet) + (900 * points for walking 900 feet) + (1500 * points for walking 1500 feet)]/14080 * 100

Walking speed

Walking speed	Degree of difficulty					
	No difficulty	Slight difficulty	Some difficulty	Much difficulty	Unable to do	Weight
1. Walking 1 block slowly?	4	3	2	1	0	1.5
2. Walking 1 block at an average speed?	4	3	2	1	0	2
3. Walking 1 block quickly?	4	3	2	1	0	3
4. Running or jogging 1 block?	4	3	2	1	0	5

Walking speed score = [(1.5 * points for walking slowly) + (2 * points for walking at average speed) + (3 * points for walking quickly) + (5 * points for running or jogging)]/46 * 100

Stair climbing

| Stair climbing	Degree of difficulty					
	No difficulty	Slight difficulty	Some difficulty	Much difficulty	Unable to do	Weight
1. Climbing 1 flight of stairs?	4	3	2	1	0	1
2. Climbing 2 flights of stairs?	4	3	2	1	0	2
3. Climbing 3 flights of stairs?	4	3	2	1	0	3

Stair-climbing score = [(1 * points for 1 flight of chair) + (2* points for 2 flights of chairs) + (3 * points for 3 flight of chairs)]/24 * 100

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The total WIQ score was determined as the mean of those three subscale scores.
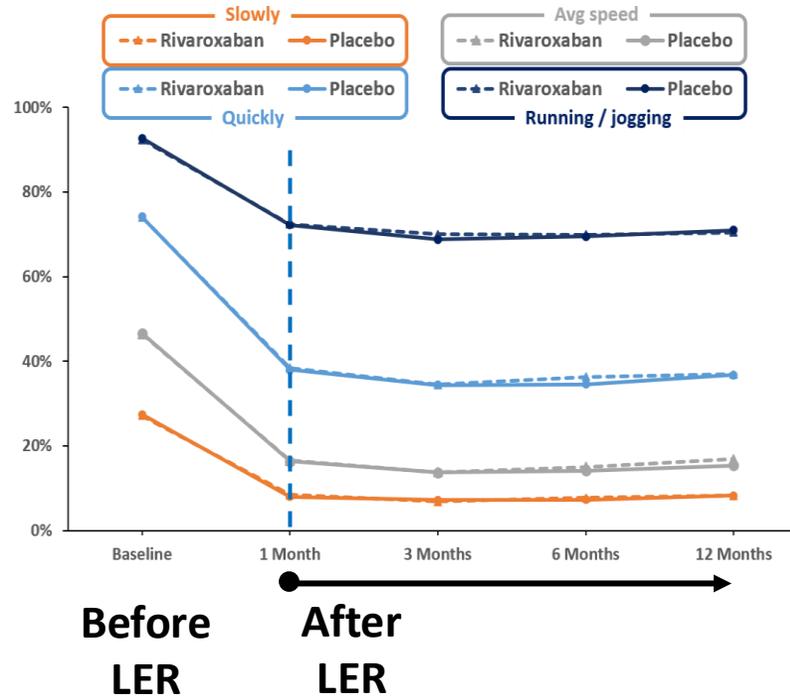
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Research Questions

Proportion of Patients with Functional Impairment Before and After Revascularization
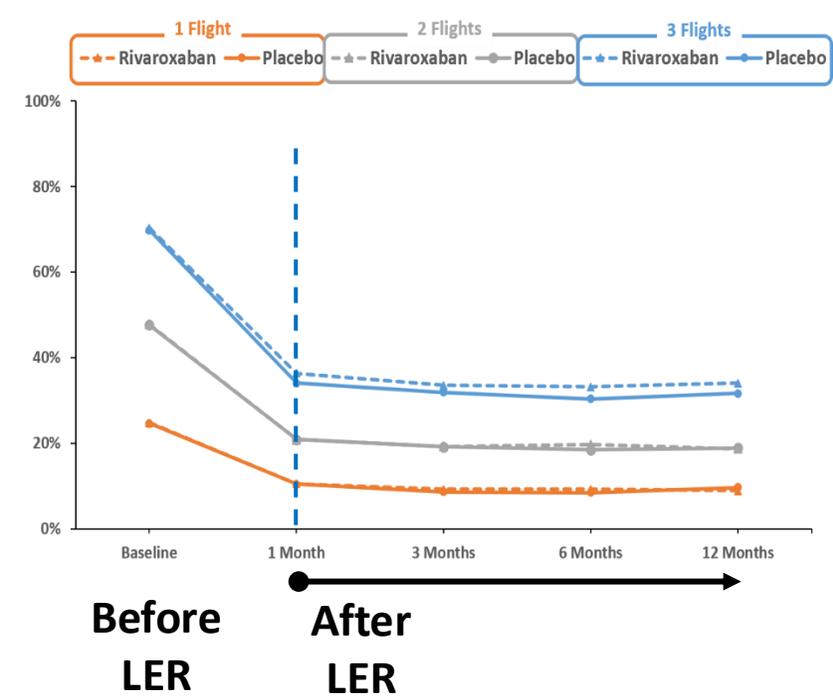### _Unable to do or Able with Much Difficulty_
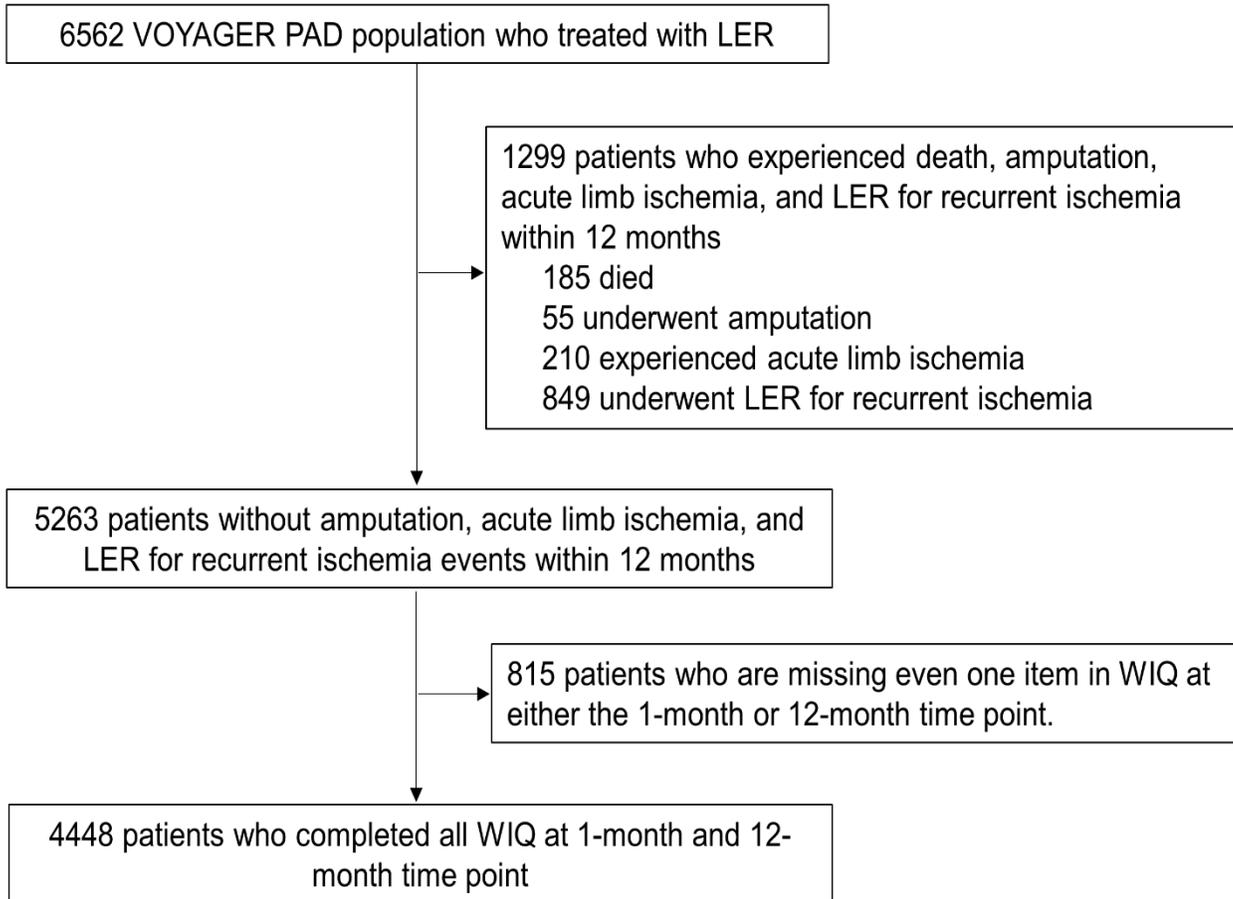

Walking distance
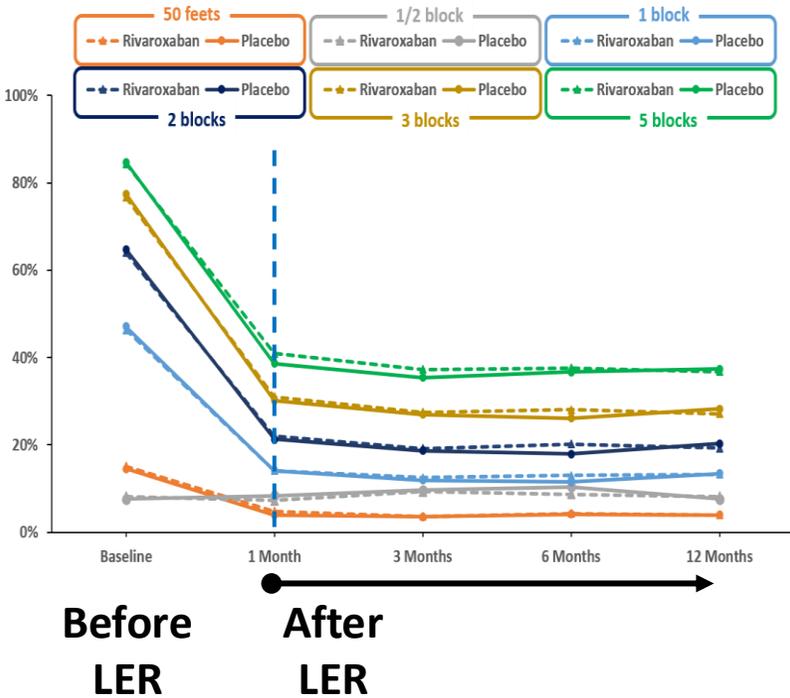
Walking speed

Stair climbing

This study aimed to evaluate the association between functional changes during the first year after LER and subsequent clinical outcomes using a large, contemporary cohort from the VOYAGER PAD trial, especially focusing on patients who remained stable after the procedure.

Methods

Selection of the study population

6562 VOYAGER PAD population who treated with LER

↓

1299 patients who experienced death, amputation, acute limb ischemia, and LER for recurrent ischemia within 12 months
- 185 died
- 55 underwent amputation
- 210 experienced acute limb ischemia
- 849 underwent LER for recurrent ischemia

↓

5263 patients without amputation, acute limb ischemia, and LER for recurrent ischemia events within 12 months

↓

815 patients who are missing even one item in WIQ at either the 1-month or 12-month time point.

↓

4448 patients who completed all WIQ at 1-month and 12-month time point
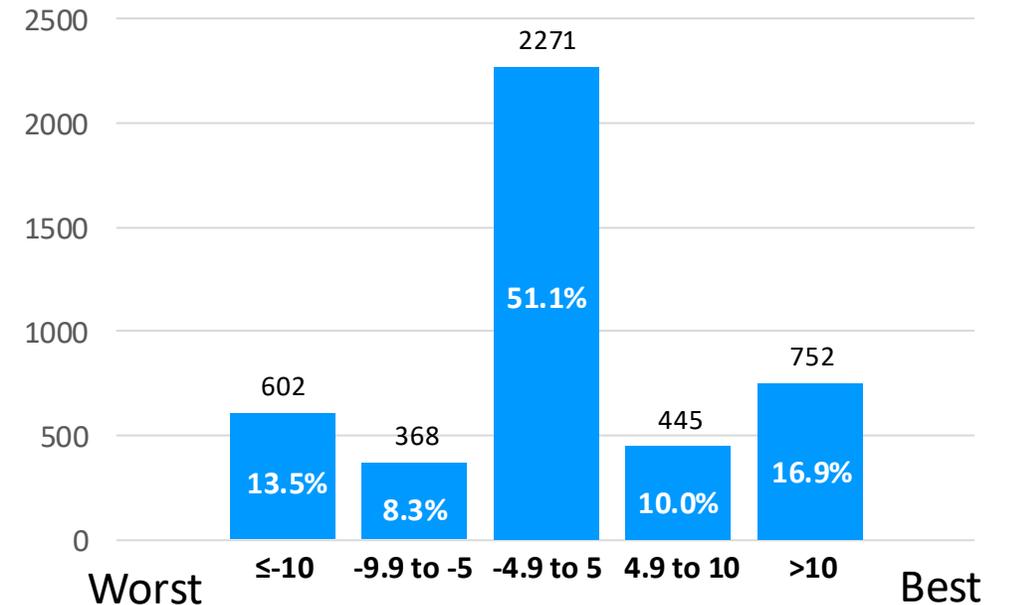
We calculated the change in total WIQ scores between 1 and 12 months

Distribution of total WIQ score changes
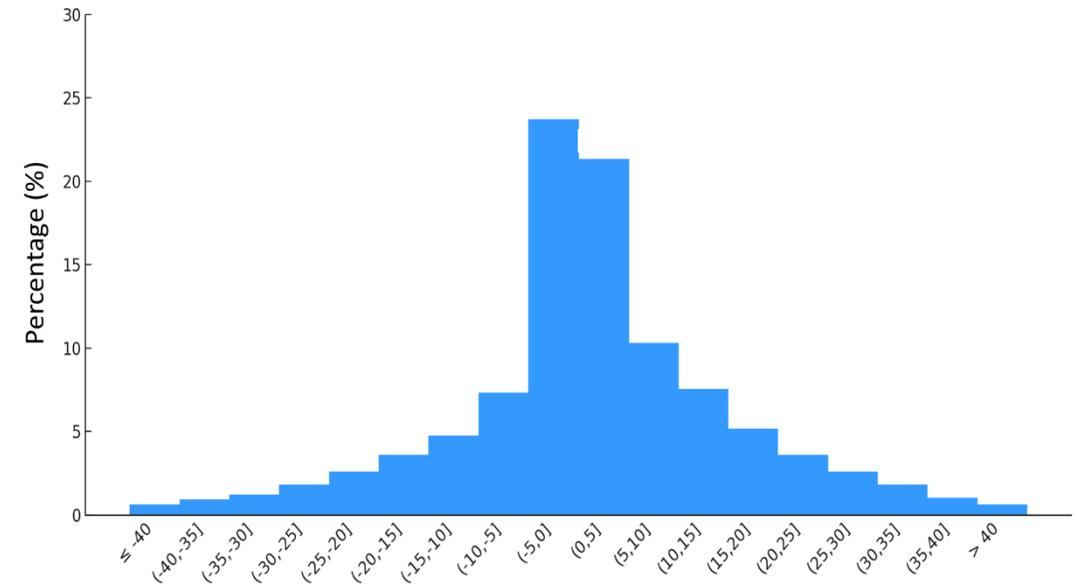
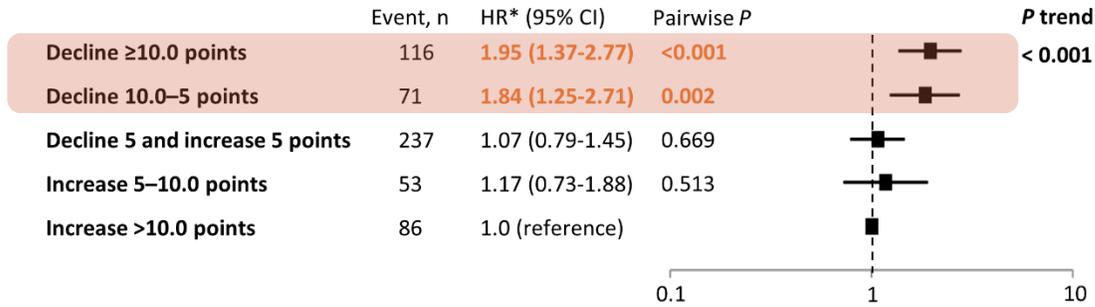## Categories of total WIQ score changes

Worst ≤-10: 602 (13.5%); -9.9 to -5: 368 (8.3%); -4.9 to 5: 2271 (51.1%); 4.9 to 10: 445 (10.0%); >10: 752 (16.9%) Best
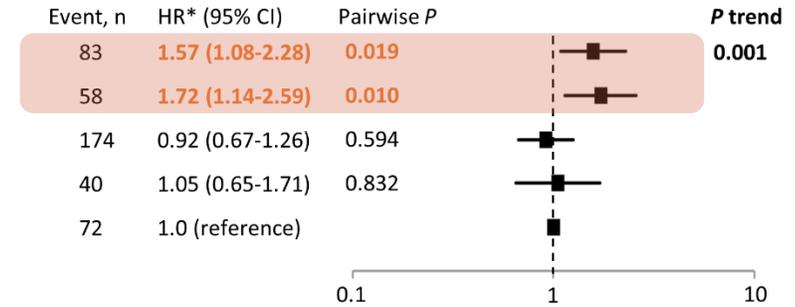
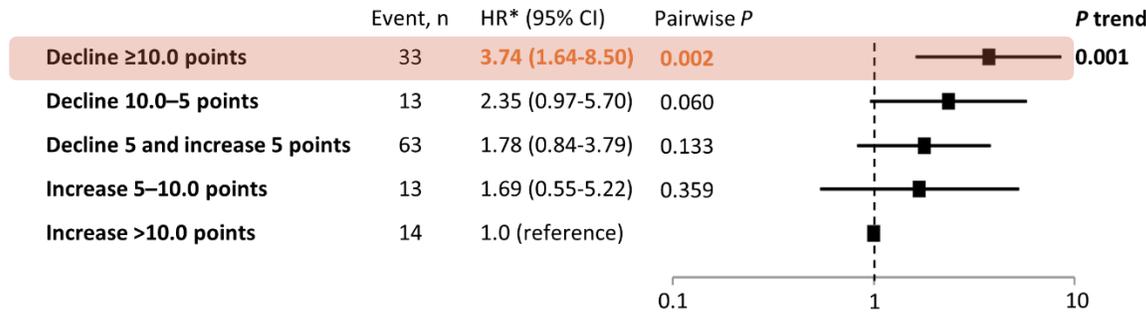# Clinical outcomes according to total WIQ score changes categories

Primary efficacy outcome (Acute limb ischemia, major amputation for a vascular cause, myocardial infarction, ischemic stroke, or death from cardiovascular cause)
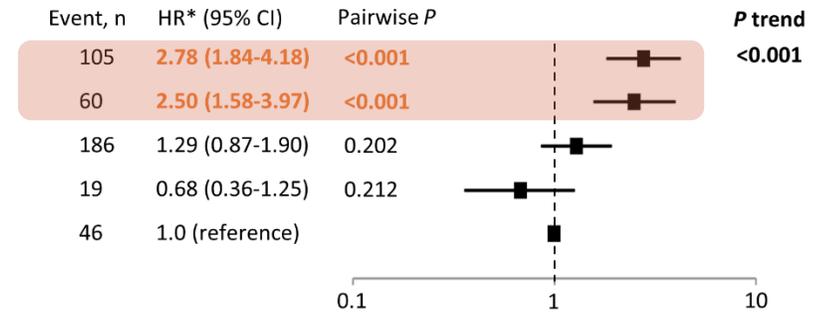
	Event, n	HR* (95% CI)	Pairwise P		P trend
Decline ≥10.0 points	116	1.95 (1.37-2.77)	<0.001		< 0.001
Decline 10.0–5 points	71	1.84 (1.25-2.71)	0.002		
Decline 5 and increase 5 points	237	1.07 (0.79-1.45)	0.669		
Increase 5–10.0 points	53	1.17 (0.73-1.88)	0.513		
Increase >10.0 points	86	1.0 (reference)			

MACE (MI, Ischemic stroke, Death from cardiovascular causes)

	Event, n	HR* (95% CI)	Pairwise P		P trend
	83	1.57 (1.08-2.28)	0.019		0.001
	58	1.72 (1.14-2.59)	0.010		
	174	0.92 (0.67-1.26)	0.594		
	40	1.05 (0.65-1.71)	0.832		
	72	1.0 (reference)			

MALE (Acute limb ischemia and major amputation for vascular causes)

	Event, n	HR* (95% CI)	Pairwise P		P trend
Decline ≥10.0 points	33	3.74 (1.64-8.50)	0.002		0.001
Decline 10.0–5 points	13	2.35 (0.97-5.70)	0.060		
Decline 5 and increase 5 points	63	1.78 (0.84-3.79)	0.133		
Increase 5–10.0 points	13	1.69 (0.55-5.22)	0.359		
Increase >10.0 points	14	1.0 (reference)			

Unplanned index- limb revascularization for recurrent limb ischemia

	Event, n	HR* (95% CI)	Pairwise P		P trend
	105	2.78 (1.84-4.18)	<0.001		<0.001
	60	2.50 (1.58-3.97)	<0.001		
	186	1.29 (0.87-1.90)	0.202		
	19	0.68 (0.36-1.25)	0.212		
	46	1.0 (reference)			

Hospitalization for coronary or peripheral event of a thrombotic nature

	Event, n	HR* (95% CI)	Pairwise P		P trend
Decline ≥10.0 points	376	1.99 (1.58-2.51)	<0.001		< 0.001
Decline 10.0–5 points	197	1.66 (1.29-2.13)	<0.001		
Decline 5 and increase 5 points	685	0.96 (0.78-1.17)	0.658		
Increase 5–10.0 points	121	0.81 (0.59-1.11)	0.187		
Increase >10.0 points	240	1.0 (reference)			

Death from any cause

	Event, n	HR* (95% CI)	Pairwise P		P trend
	47	1.48 (0.95-2.29)	0.081		0.035
	25	1.31 (0.79-2.19)	0.293		
	98	0.87 (0.60-1.26)	0.459		
	21	0.92 (0.54-1.56)	0.749		
	41	1.0 (reference)			

Factors associated with a decline of ≥10 points in the total WIQ score

Characteristics	Unadjusted OR (95% CI)	P value	Adjusted OR (95% CI)	P value
Age	1.008 (0.997–1.018)	0.149	1.012 (0.001–1.024)	0.041
Female	0.965 (0.790–1.178)	0.725	0.916 (0.744–1.129)	0.411
BMI	1.023 (1.004–1.042)	0.019	1.016 (0.996–1.037)	0.111
Black race	1.550 (0.920–2.611)	0.100	1.392 (0.817–2.371)	0.223
Hypertension	1.139 (0.910–1.426)	0.255	0.969 (0.747–1.258)	0.814
Hyperlipidemia	1.154 (0.967–1.377)	0.112	1.012 (0.825–1.241)	0.909
Current smoker	1.143 (0.957–1.366)	0.140	1.254 (1.036–1.517)	0.020
Diabetes	1.122 (0.941–1.336)	0.199	1.015 (0.840–1.225)	0.881
Chronic kidney disease	0.986 (0.794–1.225)	0.899	0.889 (0.703–1.123)	0.323
Symptomatic CAD	1.330 (1.112–1.591)	0.002	1.278 (1.055–1.547)	0.012
Baseline ABI	1.822 (1.136–2.921)	0.013	1.397 (0.834–2.339)	0.204
Rutherford grade 3	1.353 (1.091–1.679)	0.006	1.384 (1.106–1.733)	0.005
Rutherford grade 4	1.079 (0.785–1.484)	0.638	1.214 (0.866–1.700)	0.260
Rutherford grade 5-6	0.964 (0.688–1.351)	0.833	1.084 (0.760–1.546)	0.657
Baseline total WIQ score	0.996 (0.988–1.004)	0.276	0.996 (0.988–1.004)	0.347
Endovascular treatment	1.456 (1.204–1.761)	<0.001	1.351 (1.073–1.702)	0.011
Use of statin	1.113 (0.893–1.387)	0.340	0.990 (0.773–1.268)	0.938
Use of ACE inhibitor or ARB	1.227 (1.023–1.472)	0.027	1.150 (0.934–1.416)	0.188
Use of rivaroxaban	0.984 (0.798–1.126)	0.543	0.946 (0.796–1.125)	0.530
Use of clopidogrel at randomization	1.275 (1.073–1.515)	0.006	1.072 (0.876–1.313)	0.501

ABI indicates ankle-brachial index; ACE, angiotensin converting enzyme; ARB, angiotensin receptor blocker; BMI, body mass index; CAD, coronary artery disease; CI, confidence interval; CLI, critical limb ischemia; LER, lower extremity revascularization; OR, odd ratio; WIQ, walking impairment questionnaire

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Effect of rivaroxaban on changes in functional ability.

Mean Changes in WIQ Scores from 1 month to 12 months after revascularization

Walking distance score: 2.61 (1.30–3.91) / 1.50 (0.20–2.79) — P = 0.237

Walking speed score: 0.14 (-0.08–0.37) / 0.31 (0.09–0.54) — P = 0.296

Stair climbing score: 0.14 (0.07–0.21) / 0.06 (-0.01–0.14) — P = 0.131

Total WIQ score: 0.96 (0.47–1.46) / 0.63 (0.44–1.11) — P = 0.341

Change in WIQ score from 1 month to 12 months after revascularization

■ Rivaroxaban ■ Placebo
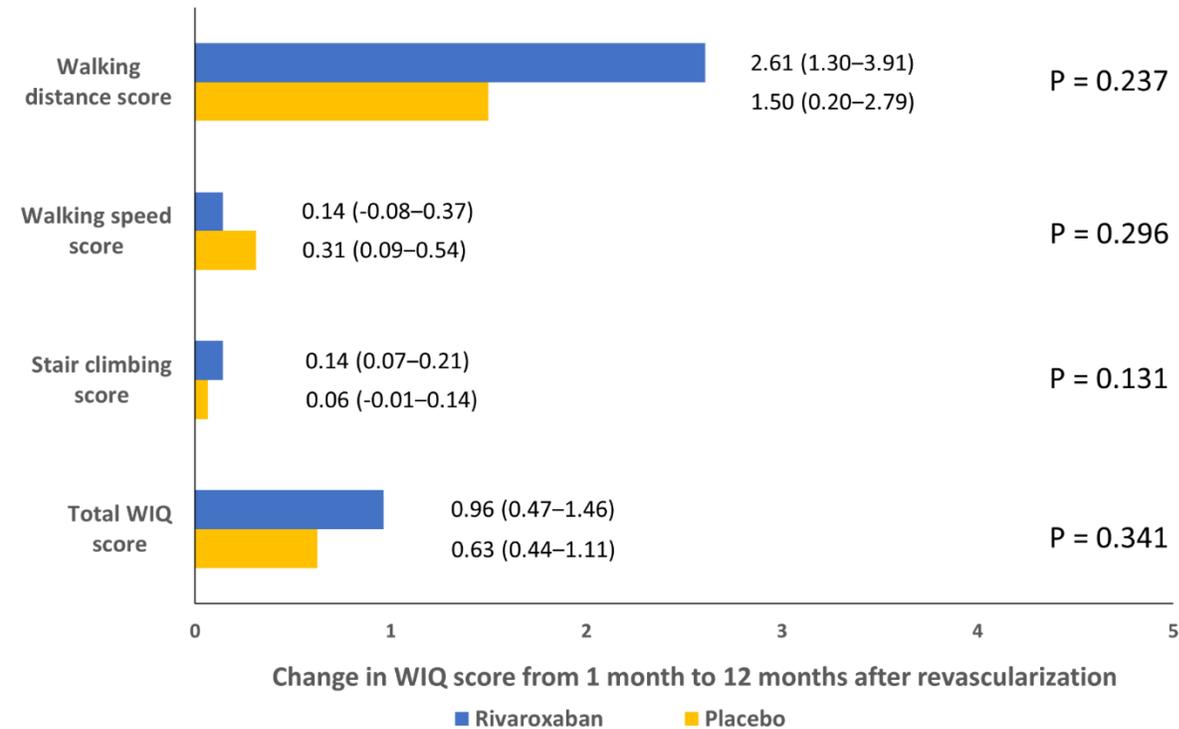
Percentage of participants in each total WIQ score change category by treatment groups

Percentage of patients (%)

P=0.758

■ Rivaroxaban ■ Placebo

Decline ≥10 points: 6.6% 6.9%
Decline 10.0–5 points: 4.2% 4.1%
Decline 5 and increase 5 points: 25.3% 25.7%
Increase 5–10.0 point: 5.2% 5.1%
Increase >10.0 points: 8.8% 8.1%

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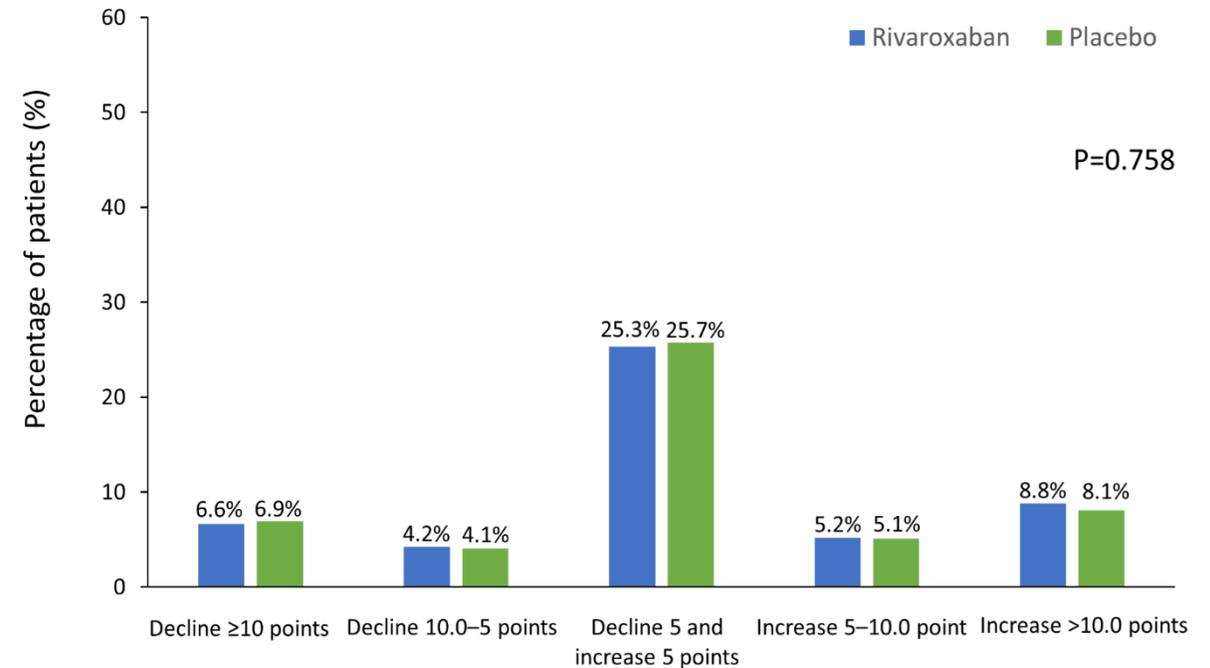
Conclusions

- In patients who remained event-free for 12 months after LER, declines in WIQ scores between 1 and 12 months were associated with higher risks of subsequent adverse limb and cardiovascular outcomes.

- These findings suggest that changes in walking ability during the stable post-LER phase may have prognostic value in PAD.

- The antithrombotic therapy with low dose rivaroxaban plus aspirin reduced thrombotic events but did not influence changes in WIQ scores, underscoring a disconnect between event prevention and functional recovery.