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Revascularization of multiple tibial arteries Does it make a difference?

Hater Haitam, MD

The department of vascular surgery

The Chaim Sheba Medical Center, Tel Hashomer

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Revascularization of multiple tibial arteries is not associated with improved limb salvage

Haitam Hater, MD • Moshe Halak, MD • Hakam Sunoqrot, MD • Boris Khaitovich, MD • Daniel Raskin, MD • Daniel Silverberg, MD

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Background

- CLTI - Chronic limb-threatening ischemia results in high rate of limb loss if untreated
- Favorable limb salvage rates with distal bypasses
- Endovascular revascularization : First line of treatment

Advances in lower extremity endovascular techniques

- Simultaneous revascularization of several BTK arteries
- Controversy regarding the efficacy of multi-vessel revascularization when treating BTK arterial disease

Clinical effects of single or double tibial artery revascularization in critical limb ischemia patients with tissue loss

Norihiro Kobayashi, MD, Keisuke Hirano, MD, Masahiro Yamawaki, MD, PhD, Motoharu Araki, MD, Hideyuki Takimura, MD, Yasunari Sakamoto, MD, Shinsuke Mori, MD, *and* Yoshiaki Ito, MD, *Kanagawa, Japan*

ABSTRACT

Objective: The achievement of single vessel inflow to the wound is an acceptable end point of peripheral vascular intervention for patients with critical limb ischemia (CLI) with tissue loss. However, CLI patients often have multitibial artery lesions. We evaluated the clinical effects of single or double tibial artery revascularization for CLI patients.

Methods: This study was conducted retrospectively in a single center. Between April 2007 and January 2015, we treated 123 CLI patients (137 limbs) who had lesions in both the anterior tibial artery and the posterior tibial artery. Of these, single tibial artery (anterior or posterior tibial artery) revascularization was performed in 84 limbs (group S) and double tibial artery (both anterior and posterior tibial arteries) revascularization was performed in 53 limbs (group D).

Results: Th ntly higher (87% vs 79%; *P* = as shorter (median, 8 eat peripheral vascular inter = .03) in group D th rate was nearly similar betw w clinical stage as as ery Wound, Ischemia, and fo n group S; *P* = .20); ho significantly higher in group ge (85% vs 72%; *P* = .007).

Conclusions: The achievement of double vessel inflows to the wound by double tibial artery revascularization positively affects wound healing, particularly in severe CLI patients. (J Vasc Surg 2017;65:744-53.)

84 limbs

53 limbs

Single vessel revascularization

Two-vessel revascularization

- Better healing rate (87 vs 79%)
- Less reinterventions (15% vs 35%)

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J Vasc Surg 2017

Clinical Results of Single versus Multiple-Vessel Infrapopliteal Intervention

Jeremy D. Darling[1], **John C. McCallum**[1], **Peter A. Soden**[1], **John J. Hon**[2], **Raul J. Guzman**[1], **Mark C. Wyers**[1], **Hence J. Verhagen**[3], and **Marc L. Schermerhorn**[1]

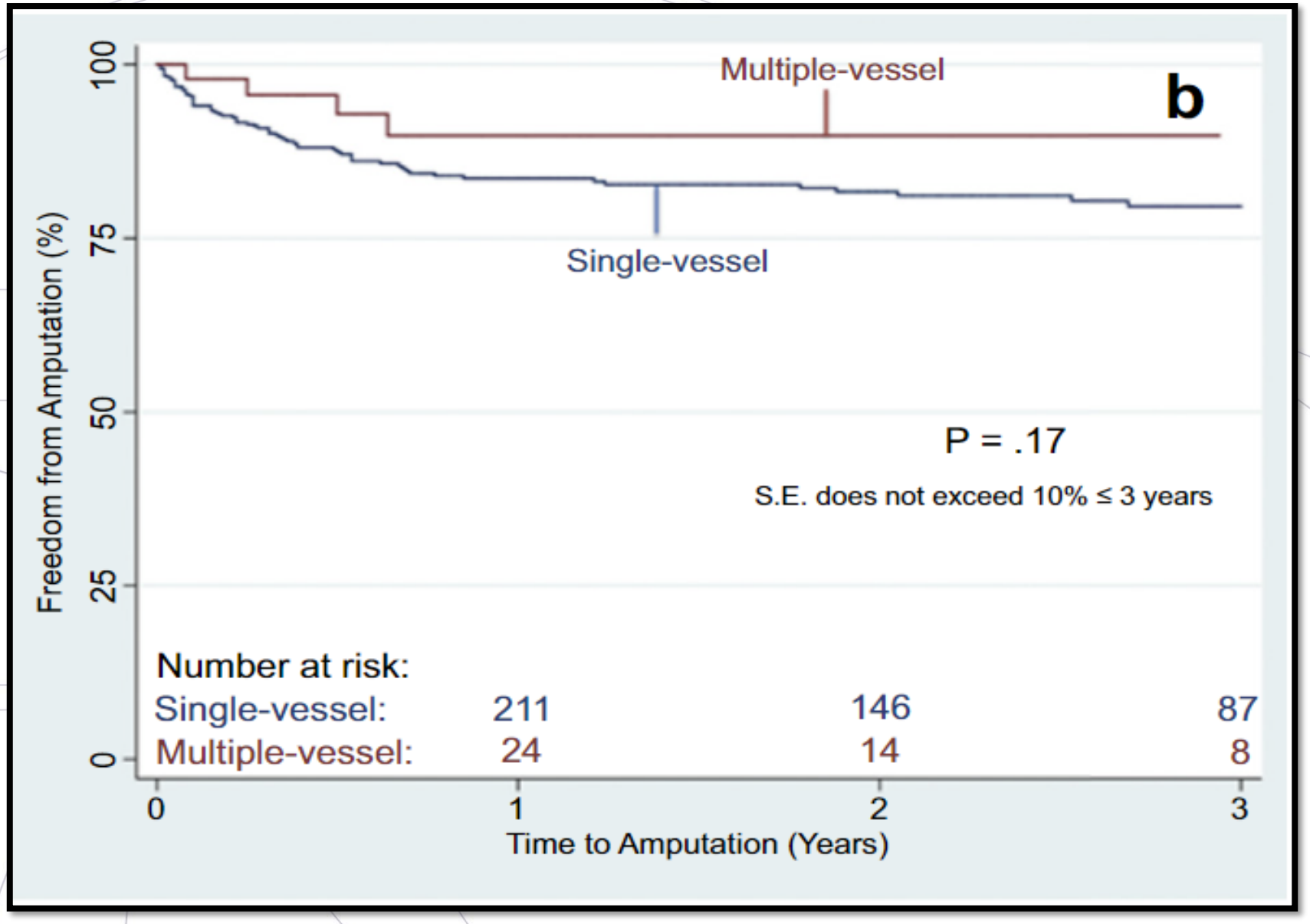
[1]Division of Vascular and Endovascular Surgery, Beth Israel Deaconess Medical Center, Harvard Medical School, Boston, MA [2]Geisel School of Medicine at Dartmouth [3]Department of Vascular Surgery, Erasmus University Medical Center, Rotterdam, The Netherlands

Abstract

OBJECTIVES—The effects of concomitant endovascular interventions on multiple infrapopliteal vessels are not well known and the short-term and long-term sequelae of such procedures have not been reported.

528 patients (673 limbs) with CLTI

Single vs multiple BTK artery revascularization



Kaplan meier analysis - Freedom from amputation between single-vessel vs multiple-vessel infrapopliteal interventions

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Purpose

To determine if multiple tibial artery revascularization result in improved limb salvage rates in CLTI

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Methods

- Single-center
- Retrospective study
- 2012 - 2019
- Patients with CLTI
- Treated with below-the-knee endovascular interventions

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Inclusion criteria

A diagnosis of CLTI

- Ischemic rest pain, nonhealing ulcers and gangrene
- (Rutherford classification, 4-6)

Successful revascularization of at least 1 tibial artery

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Exclusion criteria

PAD with intermittent claudication

(Rutherford classification, 1-3)

Unsuccessful revascularization of at least 1 BTK artery

Previous surgical revascularization

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Goal

- Revascularize as many tibial arteries as possible
- To treat pedal arteries when feasible
- Proximal lesions always treated

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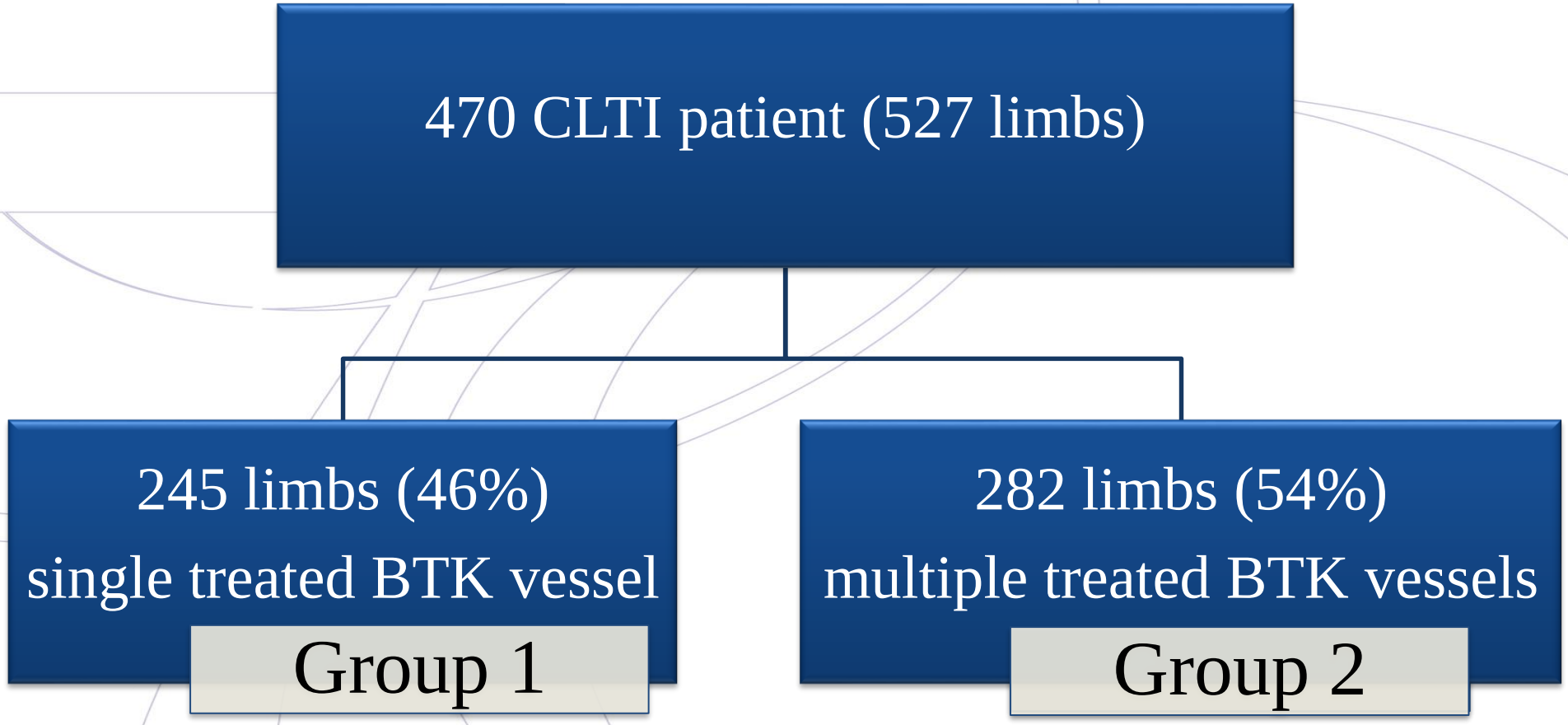
Endpoints

- Primary endpoint
  - Freedom from major amputation
- Secondary endpoints
  - Freedom from reintervention and all-cause mortality

Study cohort



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Demographics and Comorbidities

Variable	Single vessel (n = 245)	Multivessel (n = 282)	*P* value
Demographics			
Age, years	71.6 ± 10.8	70.5 ± 10.6	.14
Gender			
Male	171 (69.8)	211 (74.8)	.19
Female	74 (30.2)	71 (25.2)	.2
Comorbidity			
Diabetes	202 (82.4)	230 (81.6)	.79
Hypertension	175 (71.4)	220 (78)	.08
Dyslipidemia	144 (58.8)	175 (62.1)	.44
Smoking history	90 (36.7)	103 (36.5)	.96
Coronary artery disease	137 (55.9)	159 (56.4)	.91
Congestive heart failure	52 (21.2)	58 (20.6)	.85
Atrial fibrillation	53 (21.6)	65 (23)	.69
Chronic renal failure	63 (25.7)	82 (29.1)	.38
Dialysis dependence	38 (15.5)	57 (20.2)	.16

Variable	Single vessel (n = 245)	Multivessel (n = 282)	*P* value
Medication			
Statins	200 (81.6)	242 (85.8)	.19
Insulin	127 (51.8)	145 (51.4)	.92
Oral antidiabetic	114 (46.5)	132 (46.8)	.94
NOAC	16 (6.5)	23 (8.2)	.47
Aspirin	194 (79.2)	214 (75.9)	.36
Clopidogrel	196 (80)	225 (79.8)	.95
Enoxaparin	23 (9.4)	47 (16.7)	.01
Warfarin	12 (4.9)	16 (5.7)	.69

Indications for intervention

Variable	Single vessel (n = 245)	Multivessel (n = 282)	*P* value
Indication			
Rest pain	12 (4.9)	14 (5.0)	.62
Ulcer	155 (63.3)	173 (61.3)	.78
Gangrene	78 (31.8)	95 (33.7)	.71

Disease severity

Variable	Single vessel (n = 245)	Multivessel (n = 282)	*P* value
TASC II classification			
Femoropopliteal			
TASC A	12 (5)	14 (5)	.84
TASC B	61 (25)	56 (20)	.95
TASC C	74 (30)	112 (40)	.34
TASC D	98 (40)	98 (35)	.87
Tibial			
TASC A	24 (10)	14 (5)	.78
TASC B	61 (25)	70 (25)	.93
TASC C	74 (30)	98 (35)	.97
TASC D	86 (35)	98 (35)	.89

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Procedural details

Variable	Single vessel (n = 245)	Multivessel (n = 282)	*P* value
Access site			
Femoral only	213 (87)	271 (96)	<.01
Pedal only	21 (8)	3 (1)	<.01
Combined (femoral, pedal)	11 (4)	8 (3)	.43
Multilevel intervention	228 (93.1)	230 (81.6)	<.01
Iliac intervention			
Common iliac	29 (11.8)	19 (6.7)	.04
External iliac	17 (6.9)	14 (5.0)	.33
Femoropopliteal intervention			
Common femoral	16 (6.5)	2 (0.7)	<.01
Superficial femoral	193 (78.8)	179 (63.5)	<.01
Popliteal	153 (62.4)	146 (51.8)	<.01
Isolated IP intervention	17 (6.9)	52 (18.4)	<.01

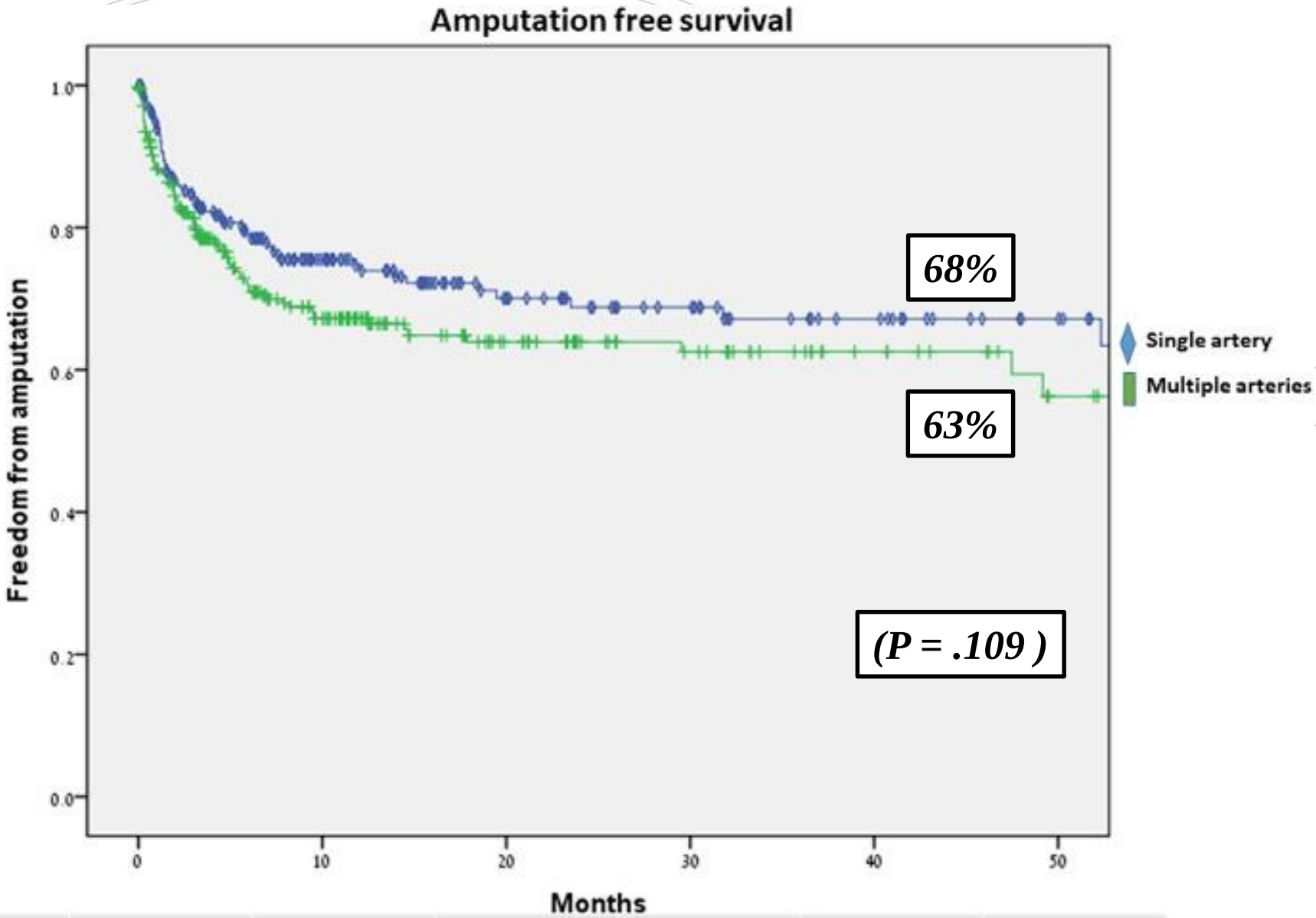
Variable	Single vessel (n = 245)	Multivessel (n = 282)	*P* value
Target vessel intervention			
Anterior tibial	145 (59.2)	249 (88.3)	<.01
TPT	60 (24.5)	102 (36.2)	<.01
Posterior tibial	68 (27.8)	210 (74.5)	<.01
Peroneal	56 (22.9)	160 (56.7)	<.01
Pedal intervention	84 (34.3)	122 (43.3)	.03
Type of BTK treatment			
PTA	245 (100)	282 (100)	1.00
Drug-eluting balloon	1 (0.4)	2 (0.7)	.64
Stent	46 (18.8)	61 (21.6)	.41
Drug-coated stent	7 (2.9)	7 (2.5)	.79
Reintervention	52 (21.2)	47 (16.7)	.13

Pre and post ABI/TBI

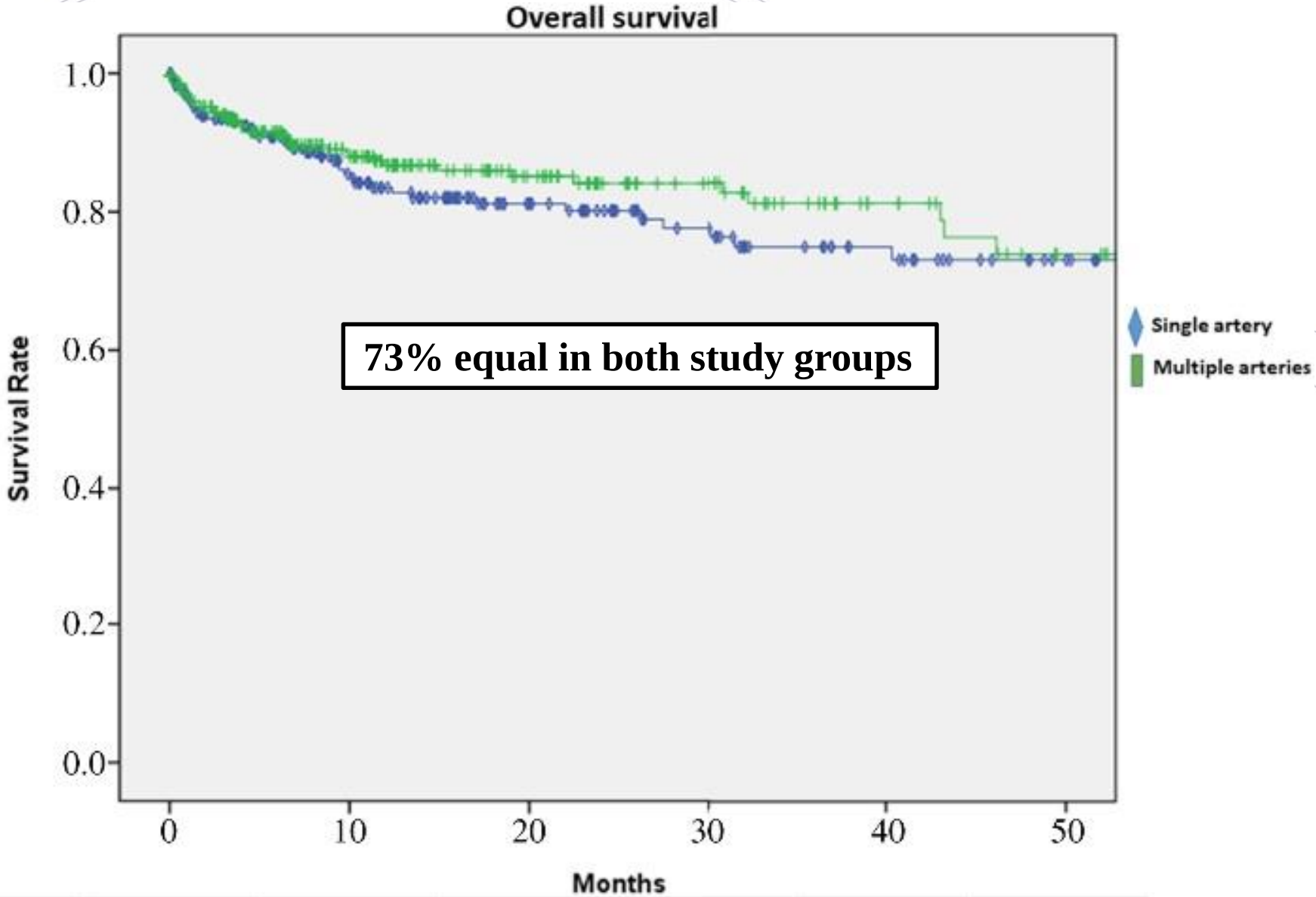
Variable	Single vessel (n = 245)	Multivessel (n = 282)	*P* value
ABI			
Before intervention	0.5 ± 0.4	0.6 ± 0.4	.68
After intervention	0.9 ± 0.3	1.0 ± 0.3	.99
TBI			
Before intervention	0.4 ± 0.3	0.4 ± 0.1	.67
After intervention	0.8 ± 0.2	0.9 ± 0.3	.89
Side			
Left leg	112 (45.7)	144 (51.1)	.22
Right leg	133 (54.3)	138 (48.9)	.25

Follow-up

- Mean follow-up : 19 ±18 months
- Follow-up was available for 90% of the patients



Single artery	245	108	63	46	32	21
Multiple arteries	282	118	62	43	26	15



Single artery	245	131	84	58	39	25
Multiple arteries	278	159	93	63	36	24

- <u>Reinterventions rate:</u>

- 21.2% Single BTK vessel
- 16.7% Multiple BTK vessel
- P = 0.13

Odds ratios of risk factors associated with amputation

	univariate analysis			multivariate analysis		
	OR	CI95%	P value	OR	CI95%	P value
Male	1.4	0.95-2.08	0.15	1.35	0.91-1.99	0.14
Diabetes	1.48	0.94-2.39	0.19			
CAD	0.82	0.59-1.12	0.22			
Dialysis	1.70	1.70-1.18	0.004	1.68	1.16-2.45	0.006
CKD	1.12	0.79-1.59	0.52			
Smoking	1.18	0.85-1.65	0.3			
Dysplipidemia	1.47	1.04-2.09	0.027	1.37	0.96-1.94	0.07
Multi level disease	1.05	0.7-1.2	0.7			
No. arteries treated		0.94-1.8	0.11	1.25	0.90-1.74	0.18
> 1	1.3					
1	1					
Indication	-	1.57-2.98	<0.001	2.08	1.50-2.98	<0.001
Gangrene	2.16					
Other	1					

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Conclusion

- No benefit from multiple tibial artery revascularization in terms of limb salvage and overall survival
- No difference in results even when adjusted for severity of ischemia (rest pain, wounds, gangrene)
- Attempt to revascularize all tibial arteries increases complexity and procedure time but is not justified

Newsweek

NEWSWEEK RANKS SHEBA MEDICAL CENTER **AMONGST WORLD'S TOP 10 BEST HOSPITALS**

20 MARCH, 2019

Newsweek SIGN IN SUBSCRIBE

NEWSWEEK MAGAZINE

The 10 Best Hospitals in the World

BY **NOAH MILLER** ON 3/20/19 AT 9:55 AM EDT

1. THE MAYO CLINIC
2. CLEVELAND CLINIC
3. SINGAPORE GENERAL HOSPITAL
4. JOHNS HOPKINS HOSPITAL
5. CHARITÉ
6. MASSACHUSETTS GENERAL HOSPITAL
7. TORONTO GENERAL HOSPITAL
8. UNIVERSITY OF TOKYO HOSPITAL
9. LAUSANNE UNIVERSITY HOSPITAL
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So, why Does it not make a difference?

- Limited patency of the treated tibial arteries
- High restenosis rates
- Requirement for reinterventions

So, why Does it not make a difference?

- Challenging follow-up
- No clear guidelines for surveillance and reintervention

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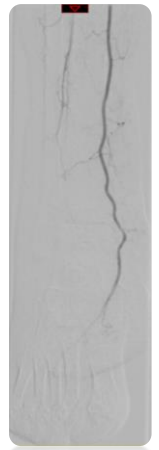
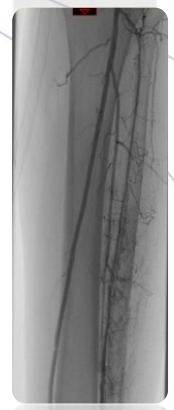
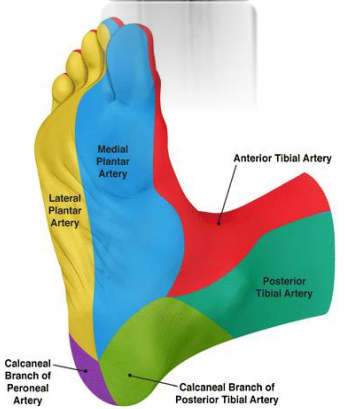
Approaches to BTK artery revascularization

- Indirect revascularization
- Revascularization as many BTK vessels as possible
- Angiosome targeted







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Limitation

- Retrospective cohort study
- Maybe there are still differences between the study groups that were unaccounted
- Not all the treated BTK arteries had provided pulsatile flow to the foot (peroneal)