

Predictors of in-hospital mortality and complications in acute aortic occlusion

Lazar B. Davidovic MD, PhD, FETCS

Professor of Vascular Surgery

Dean of Medical Faculty-University of Belgrade

Clinic for Vascular and Endovascular Surgery

University Clinical Center of Serbia

Past-President of the ESCVS 2016-18

Foreign Member of the RAS



CLINIC FOR
VASCULAR AND
ENDOVASCULAR
SURGERY



Acute Aortic Occlusion

- Incidence: 1-4%
- High mortality and morbidity

J Vasc Surg 1986; 4: 211–6.

Acute aortic occlusion— A multifaceted catastrophe

Fred N. Littooy, M.D., and William H. Baker, M.D., *Maywood, Ill.*

British Journal of Surgery 2008; 95: 564–570

Outcome after abdominal aortic aneurysm repair in Sweden
1994–2005

A. Wanhainen¹, N. Bylund^{1,2} and M. Björck¹

Ann Vasc Surg 2016; 34: 178–186.

Contemporary Management of Acute Aortic Occlusion Has Evolved but Outcomes Have Not Significantly Improved

William P. Robinson,¹ Rupal K. Patel,¹ Jesse A. Columbo,¹ Julie Flahive,²
Francesco A. Aiello,¹ Donald T. Baril,³ Andres Schanzer,¹ and Louis M. Messina,¹ Worcester,
Massachusetts and Pittsburgh, Pennsylvania

Cir Esp 2015 93 (9): 573-579.

Outcomes After Treatment of Acute Aortic Occlusion

Serguei R. de Varona Frolov,^{a,*} Marcela P. Acosta Silva,^a Guido Volo Pérez,^a
Maria D. Fiúza Pérez^b

J Vasc Surg 2018; 68 (6): 1789–95.

Risk Factors for Perioperative Mortality Following Revascularization for Acute Aortic Occlusion

Abhishek Mohapatra, MD, Karim M. Salem, MD, Emade Jaman, BS, Darve Robinson, BA,
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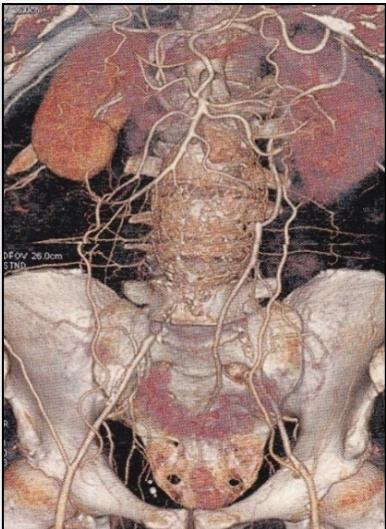


Acute Aortic Occlusion -Etiology-

• Embolism



• AAA Thrombosis

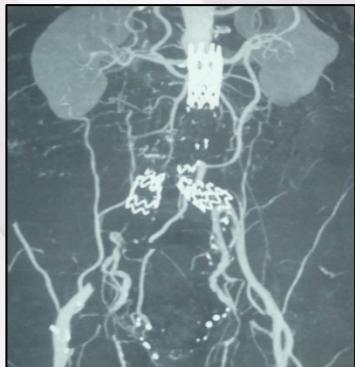


• In situ Thrombosis



• Thrombosis:

- Aortic Graft
- Aortic Stent
- Aortic Stent graft



Eur J Vasc Endovasc Surg 34, 59–65 (2007)

Limb Graft Occlusion Following EVAR: Clinical Pattern, Outcomes and Predictive Factors of Occurrence

F. Cochennec,¹ J.P. Becquemin,^{1*} P. Desgranges,¹ E. Allaire,¹ H. Kobeiter² and F. Roudot-Thoraval³

British Journal of Surgery 2008; 95: 564–570

Outcome after abdominal aortic aneurysm repair in Sweden 1994–2005

A. Wanhainen¹, N. Bylund^{1,2} and M. Björck¹

Cir Esp 2015 93 (9): 573–579.

Outcomes After Treatment of Acute Aortic Occlusion

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Ann Vasc Surg 2017; 45: 206–212

Lower Extremity Ischemia after Abdominal Aortic Aneurysm Repair

Christian-Alexander Behrendt,¹ Anand Dayama,² Eike Sebastian Debus,¹ Franziska Heidemann,¹ Nathaniel M. Matolo,² Tilo Kölbel,¹ and Nikolaos Tsilimparis,¹

J Vasc Surg 2018; 68 (6): 1789–95.

Risk Factors for Perioperative Mortality Following Revascularization for Acute Aortic Occlusion

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Aortic Embolism vs In situ Thrombosis

1953-93

- Embolism: 65%
- Thrombosis: 35%

(Arch Surg. 1994;129:603-608)

Acute Aortic Occlusion

A 40-Year Experience

Christos D. Dossa, MD; Alexander D. Shepard, MD; Daniel J. Reddy, MD; Cynthia M. Jones, MD; Joseph P. Elliott, MD; Roger F. Smith, MD; Calvin B. Ernst, MD

1985-97

- Embolism: 48%
- Thrombosis: 52%

Am J Surg. 1998;176:193–197.

Acute Occlusion of the Abdominal Aorta

Scott M. Surowiec, MD, Halit Isiklar, MD, Suha Sreeram, MD, Victor J. Weiss, MD, Alan B. Lumsden, MB, ChB, Atlanta, Georgia

- Elderly patients → Advanced atherosclerosis
- Cardio embolic events → Better prevention

J Vasc Surg 2014, 59: 1044-50.

A modern series of acute aortic occlusion

Jeffrey D. Crawford, MD, Kenneth H. Perrone, BS, Victor W. Wong, MD, Erica L. Mitchell, MD, Amir F. Azarbal, MD, Timothy K. Liem, MD, Gregory J. Landry, MD, and Gregory L. Moneta, MD,



Etiology: Swedish Registry

Eur J Vasc Endovasc Surg (2019) 58, 690–696

Temporal Trends and Management of Acute Aortic Occlusion: A 21 Year Experience

Olivia Grip ^{*}, Anders Wanhainen, Martin Björck

Period	Embolism	Graft/Stent/Stent Graft Thrombosis	In situ native Aortic Thrombosis
1994-2000	21.6%	6.7%	71.6%
2001-2007	22.9%	10.6%	66.5%
2008-2014	21.3%	17.4%	61.6%
p	0.89	<0.001	<0.001



Retrospective single-center cohort study

Predictors of in-hospital mortality and complications in acute aortic occlusion: a comparative analysis of patients with embolism and *in-situ* thrombosis

Stefan M. DUCIC ^{1 *}, Igor B. KONCAR ^{1, 2}, Petar M. ZLATANOVIC ¹, Perica M. MUTAVDZIC ¹,
Nikola ILIC ^{1, 2}, Milos M. SLADOJEVIC ^{1, 2}, Ivan Z. TOMIC ¹, Lazar B. DAVIDOVIC ^{1, 2}

- 28pts (20 Thrombosis & 8 Embolism)
- 2005-2018

TABLE I.—*Baseline clinical characteristics.*

Characteristics	All patients (N.=28)	AFF bypass (N.=20)	THR thrombectomy (N.=8)	P value
N. (%)				
Demographics				
Age	67.04±8.77	67.65±9.34	65.25±7.40	0.46
Obesity	12 (42.85%)	7 (35)	5 (63)	0.23
Male	14 (50%)	11 (55)	3 (38)	0.68
Risk factors				
Smoker	18 (64)	14 (70)	4 (50)	0.40
Hypertension	26 (93)	19 (95)	7 (88)	0.49
Hyperlipidemia	12 (43)	9 (45)	3 (38)	1.00
DM	8 (29)	5 (25)	3 (38)	0.65
CAD	5 (18)	3 (15)	2 (25)	0.60
Atrial fibrillation	9 (32.)	5 (25)	4 (50)	0.37
COPD	6 (21.)	3 (15)	3 (38)	0.32
CKD	3 (11)	2 (10)	1 (13)	1.00
MD	4 (14.)	1 (5)	3 (38)	0.038
Total ischemia time (hours)	13.21±8.36	14.20±8.37	10.75±8.33	0.33
Motor deficit on admission	13 (47)	6 (30)	7 (88)	<0.001
Rutherford ALI* classification				
IIA	17 (60.7)	14 (70)	3 (37.5)	0.21
IIB	11 (39.3)	6 (30)	5 (62.5)	0.23



Acute Aortic Occlusion: Treatment Options

Eur J Vasc Endovasc Surg 2019; 58:690-696.

Temporal Trends and Management of Acute Aortic Occlusion: A 21 Year Experience

Olivia Grip *, Anders Wanhainen, Martin Björck

Table 2. Methods of revascularisation

	Total	Native artery thrombosis	Saddle embolus	Occluded graft/stent /stent graft	p value
Number of cases	693	458	152	83	
Aortobi-iliac/femoral bypass	139 (20.1)	118 (25.8)*	13 (8.6)	8 (9.6)	<.001
Axillobifemoral bypass	132 (19.0)	101 (22.1)	9 (5.9)*	22 (26.5)	<.001
Thrombo-embolectomy	221 (31.9)	102 (22.3)	96 (63.2)*	23 (27.7)	<.001
Stent/stent graft	44 (6.3)	32 (7.0)	11 (7.2)	1 (1.2)	.12
Thrombolysis	157 (22.7)	105 (22.9)	23 (15.1)*	29 (34.9)*	.002



In situ Aortic Thrombosis: Treatment Options

- AFF bypass
 - better long-term patency
 - renal/SMA involvement
- AxFF bypass
 - older and high risk pts

J Vasc Surg 1996; 23:263-71.

Comparison of axillofemoral and aortofemoral bypass for aortoiliac occlusive disease

Marc A. Passman, MD, Lloyd M. Taylor, Jr., MD, Gregory L. Moneta, MD, James M. Edwards, MD, Richard A. Yeager, MD, Donald B. McConnell, MD, and John M. Porter, MD, Portland, Ore.

Ann Vasc Surg 2016; 34: 178–186.

Contemporary Management of Acute Aortic Occlusion Has Evolved but Outcomes Have Not Significantly Improved

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Am J Surg 1979, 138:293-5.

Management of Acute Aortic Occlusion

Sharon B. Drager, MD, New York, New York
Thomas S. Riles, MD, New York, New York
Anthony M. Imparato, MD, New York, New York

Am J Surg 1998;176:193–197.

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Eur J Vasc Endovasc Surg 2019; 58:690-696.

Temporal Trends and Management of Acute Aortic Occlusion: A 21 Year Experience

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Acute Aortic Occlusion -Thrombolytic Therapy-

Surgery 1983, 93 (4):541-4.

Response of an abdominal aortic thrombotic occlusion to local low-dose streptokinase therapy

Marshall Wade Cunningham, M.D., Stuart May, M.D., William Y. Tucker, M.D., and Amil J. Gerlock, Jr., M.D., Shreveport, La.

- Healthy Aorta/Arteries
- High Risk Patient
- Graft/Stent/Stent Grafts Thrombosis

Eur J Vasc Endovasc Surg 19, 143–157 (2000)

A Systematic Review of Intra-arterial Thrombolytic Therapy for Lower-limb Ischaemia*

S. J. Palfreyman[†], A. Booth² and J. A. Michaels¹

J Vasc Surg 2014, 59: 1044-50.

A modern series of acute aortic occlusion

Jeffrey D. Crawford, MD, Kenneth H. Perrone, BS, Victor W. Wong, MD, Erica L. Mitchell, MD, Amir F. Azarbal, MD, Timothy K. Liem, MD, Gregory J. Landry, MD, and Gregory L. Moneta, MD,



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Acute Aortic Occlusion: Endovascular Treatment

Eur J Vasc Endovasc Surg 2019; 58:690-696.

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- 1994-2000: 15.1%
- 2001-2007: 23.5%
- 2008-2014: 45.1%

Ann Vasc Surg. 2017 Feb;39:285: 1-3.

Endovascular Treatment of Acute Aortic Occlusion with Critical Limb Ischemia using an AngioJet Device

Mete Gursoy,¹ Egemen Duygu,² Umut Karabulut,² Idil Çakır,³ and Abdulkadir F. Hokenek,¹



Fig. 1. Angiography shows total occlusion of the abdominal aorta.



Fig. 2. Angiography shows incomplete opening of the aorta following thrombus evacuation.

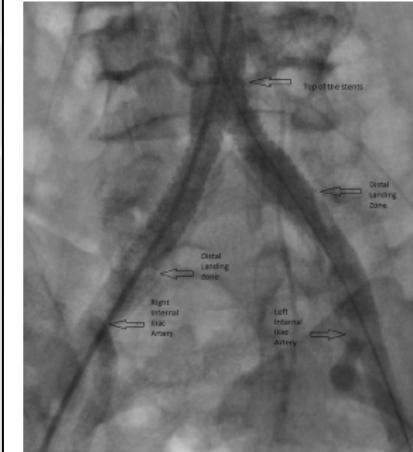


Fig. 3. Angiography shows reconstruction of aortoiliac patency with peripheral covered stents creating new aortic bifurcation.



Predictors of in-hospital mortality and complications in acute aortic occlusion: a comparative analysis of patients with embolism and *in-situ* thrombosis

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Male	14 (50%)	11 (55)	3 (38)	0.68
Risk factors				
Smoker	18 (64)	14 (70)	4 (50)	0.40
Hypertension	26 (93)	19 (95)	7 (88)	0.49
Hyperlipidemia	12 (43)	9 (45)	3 (38)	1.00
DM	8 (29)	5 (25)	3 (38)	0.65
CAD	5 (18)	3 (15)	2 (25)	0.60
Atrial fibrillation	9 (32.)	5 (25)	4 (50)	0.37
COPD	6 (21.)	3 (15)	3 (38)	0.32
CKD	3 (11)	2 (10)	1 (13)	1.00
MD	4 (14.)	1 (5)	3 (38)	0.038
Total ischemia time (hours)	13.21±8.36	14.20±8.37	10.75±8.33	0.33
Motor deficit on admission	13 (47)	6 (30)	7 (88)	<0.001
Rutherford ALI* classification				
IIA	17 (60.7)	14 (70)	3 (37.5)	0.21
IIB	11 (39.3)	6 (30)	5 (62.5)	0.23



TABLE II.—*Periprocedural data.*

Characteristics	All patients (N=28)	AFF (N=20)	THR (N=8)	P value
N. (%)				
Preoperative lactate	4.74±3.37	3.61±2.20	5.87±4.55	0.039
Thrombus proximal propagation				
Infrarenal	21 (75)	15 (75)	6 (75)	1.00
Suprarenal	7 (25)	5 (25)	2 (25)	1.00
Hypogastric arteries patency				
Both	1 (4)	1 (5)	0 (0)	1.00
One occluded	15 (54)	10 (50)	5 (62.5)	0.68
Both occluded	12 (43)	9 (45)	3 (38)	1.00
Proximal clamping site				
Infrarenal		11 (55)	-	-
Suprarenal		9 (45)	-	-
Infrarenal clamp duration		21.05±7.82	-	-
Suprarenal clamp duration		20.40±5.65	-	-
Total clamping site		20.72±6.73	-	-
Intraoperative hypotension*	3 (11)	1 (5)	2 (25)	0.045
Intraoperative oliguria*	9 (32)	4 (20)	5 (63)	0.024
Blood loss (mL)	932.43±570.66	1181.33±574.18	683.53±567.14	0.021
Cell saver	440.19±348.95	562.27±497.85	330.12±200.05	0.145
Operation length (minutes)	128.74±49.84	163.12±58.07	94.37±41.61	<0.001

The Journal of Cardiovascular Surgery 2021 April;62(2):146-52

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Nikola ILIC ^{1, 2}, Milos M. SLADOJEVIC ^{1, 2}, Ivan Z. TOMIC ¹, Lazar B. DAVIDOVIC ^{1, 2}



Early Outcome

TABLE III.—Postoperative data, intrahospital mortality and complication rates.

Characteristics	All patients (N.=28)	AFF (N.=20)	THR (N.=8)	P value
N. (%)				
Acute coronary syndrome	2 (7)	2 (25)	0 (0)	0.074
Congestive heart failure	5 (18)	4 (50)	1 (5)	0.038
Pneumonia	2 (7)	1 (13)	1 (5)	0.49
Severe hemorrhage	2 (7)	2 (10)	0 (0)	0.48
Wound infection	1 (4)	1 (5)	0 (0)	1.00
Severe acute kidney injury	11 (39)	5 (25)	6 (75)	0.038
Hemodialysis	6 (21)	3 (15)	3 (38)	0.19
Bowel ischemia	4 (14)	3 (15)	1 (13)	1.00
Fasciotomy	5 (18)	1 (5)	4 (50)	<0.001
Prolonged mechanical ventilation (more than 48 h)	11 (39)	6 (30)	5 (63)	0.044
Stroke	1 (4)	1 (5)	0 (0)	1.00
Deep venous thrombosis	2 (7)	1 (5)	1 (13)	0.49
Death	10 (36)	5 (20)	5 (63)	0.019

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•In hospital mortality:
36%



Mortality Predictors

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TABLE IV.—*Mortality predictors*.

Variables	Univariate OR	95% CI	P value
Motor deficit	4.4	1.88-21.78	0.039
Lactate before operation	1.2	1.09-1.83	0.02
Severe acute kidney injury	3.1	1.42-14.66	0.038
Hemodialysis	10.7	1.64-109.78	<0.001
Bowel ischemia	5.2	1.58-55.63	0.019

(Arch Surg. 1994;129:603-608)

Acute Aortic Occlusion

A 40-Year Experience

Christos D. Dossa, MD; Alexander D. Shepard, MD; Daniel J. Reddy, MD; Cynthia M. Jones, MD;
Joseph P. Elliott, MD; Roger F. Smith, MD; Calvin B. Ernst, MD

- Moderate to severe motor or sensory deficit → Mortality ↑
- Failure to clear lactate → Mortality ↑

TABLE V.—Summary on existing literature regarding hospital mortality, major amputation, bowel ischemia and renal failure rate after acute aortic occlusion (AAO).

Authors	Sample size	Mortality N. (%)	Major amputation N. (%)	Bowel ischemia N. (%)	Renal failure N. (%)
Bell, 1967 ¹³	6	100	16.6	50	16.6
Danto, 1972 ¹⁴	9	22.2	11.1	0	44.4
Johanson, 1974 ¹⁵	7	57.1	0	0	42.8
Drager, 1979 ⁶	6	16.7	0	0	33.3
Busuttil, 1983 ¹⁶	26	11.5	3.8	0	7.6
Littooy, 1986 ¹⁷	18	50	0	0	55.5
Pietri, 1987 ¹⁸	10	60	10	/	/
Webb, 1988 ¹²	10	50	10	0	30
Ross, 1990 ¹⁹	26	30.8	15.3	15.3	19.2
Meagher, 1991 ²⁰	8	62.5	12.5	/	/
Bradbury, 1993 ²¹	14	14.3	7.1	14.2	50
Dossa, 1994 ⁷	46	34.8	6.5	10.8	23.9
Babu, 1995 ²²	48	52.1	18.7	6.25	/
Suwowiec, 1998 ²³	33	21.2	12	6	15
Crawford, 2014 ¹¹	29	24.1	20.6	14	52
Lihan, 2015 ²⁴	18	5.6	0	0	5.5
Verona Frolov, 2015 ²	29	20.7	6.8	13.7	48.2
Robinson, 2016 ²⁵	31	32	6.4	/	32.
Mohapatra, 2018 ¹	65	27.7	15.4	10.8	56.9
Ducic, 2019	28	35.7	0	14.2	39.28

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Eur J Vase Endovasc Surg 2019; 58:690-696.

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Period	Mortality
1994-2000	25.5%
2001-2007	20.7%
2008-2014	15.5%
p=0. 007	

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Am J Surg 1988, 105: 405-7.

Acute Aortic Occlusion

Kent H. Webb, MD and M. Alex Jacocks, MD, FACS, Oklahoma City, Oklahoma

J Vasc Surg 2014, 59: 1044-50.

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Cir Esp 2015 93 (9): 573-579.

Outcomes After Treatment of Acute Aortic Occlusion

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Amputation rate

- Our study: 0 (0.0%)
- Literature data: 3.8%- 20.6%

Ann Vasc Surg 2016; 34: 178–186

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J Vasc Surg 2018, 68 (6): 1789-95.

Risk factors for perioperative mortality after revascularization for acute aortic occlusion

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Eur J Vasc Endovasc Surg 2019; 58:690-696.

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Olivia Grip ^a, Anders Wanhainen, Martin Björck



Acute Renal Failure: 5.5-57%

Eur J Vasc Surg 1993, 7: 320-23.

Acute Thrombosis of the Non-aneurysmal Abdominal Aorta

A. W. Bradbury, P. A. Stonebridge, T. G. John, C. V. Ruckley, A. McL. Jenkins and J. A. Murie

J Vasc Surg 2014, 59: 1044-50.

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Ann Vasc Surg 2016, 34: 178-86.

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J Vasc Surg 1995, 21: 567-75.

Acute aortic occlusion—Factors that influence outcome

Sateesh C. Babu, MD, Pravin M. Shah, MD, and Jim Nitahara, BA, Valhalla, N.Y.

Cir Esp 2015 93 (9): 573-579.

Outcomes After Treatment of Acute Aortic Occlusion[☆]

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Risk factors for perioperative mortality after revascularization for acute aortic occlusion

Abhisekh Mohapatra, MD, Karim M. Salem, MD, Emade Jaman, BS, Darve Robinson, BA, Ethymios D. Avgerinos, MD, Michel S. Makaroun, MD, and Mohammad H. Eslami, MD, Pittsburgh, Pa

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Conclusions

- Acute aortic occlusion- uncommon and “life threatening” event
- Prompt diagnosis and treatment
- Aortic graft/stent/stent graft thrombosis ↑
- Treatment modality (*Embolectomy, AFF, AxFF,..*)
- Endovascular therapy: selected patients
- Reperfusion Injury

