Darf die linke Arterie subclavia überstentet werden? – PRO

Si può coprire l´arteria succlavia sinistra? – A favore

Josef Klocker

Universitätsklinik für Gefäßchirurgie

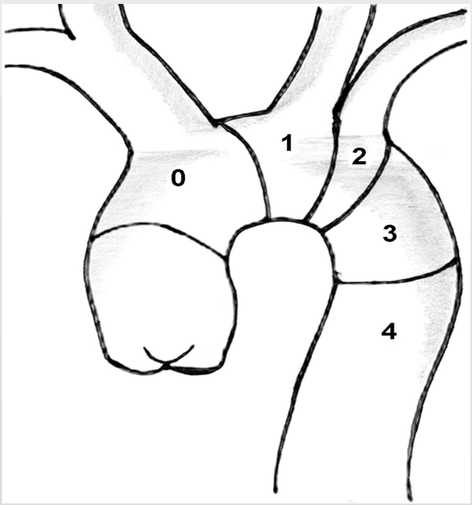
Medizinische Universität Innsbruck

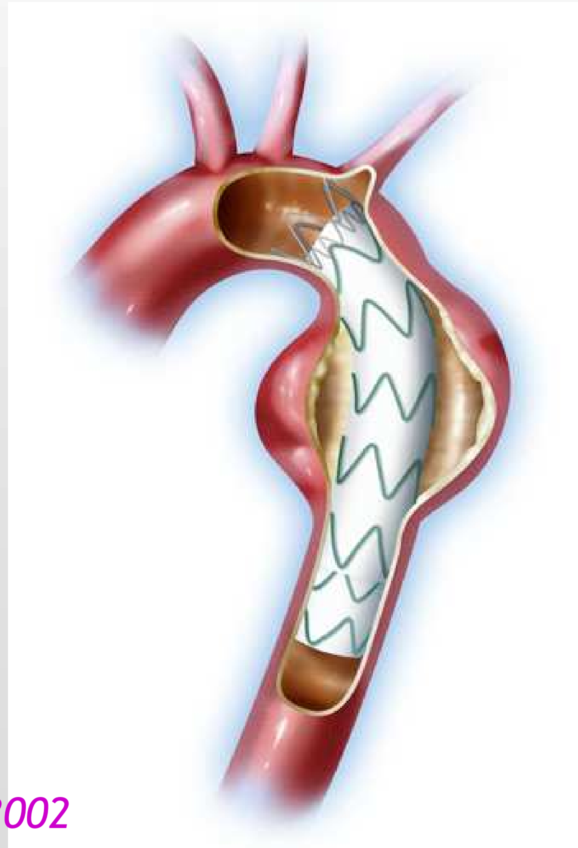
Le mie conoscenze della lingua italiana bastano appena per ordinare in caffè o un bicchiere di vino, ma non per fare la seguente relazione.

Background

Endovascular Repair (Stentgraft) in Thoracic Aortic Disease (TEVAR)

- requires adaequate landing zones
- proximal and distal
- = 15 mm (in elective cases)





Mitchell, Ishimaru et al. 2002

Background

Classification of landing zones (TEVAR) - Ishimaru

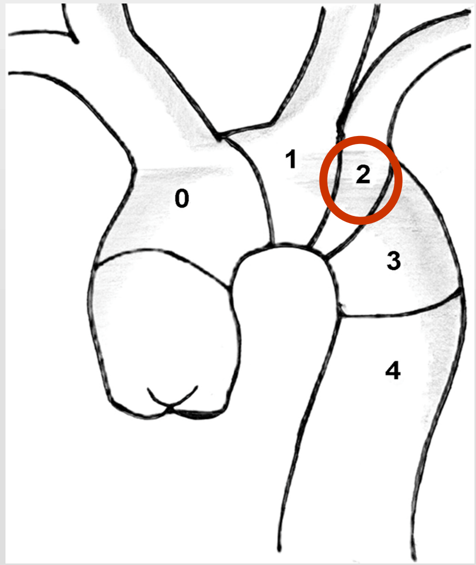
- zone 0 - **Truncus brachiocephalicus**
- zone 1 - **A. carotis communis sinistra**

} **debranching-operation**

- zone 2 - **A. subclavia sinistra ? ???**

- zone 3
- zone 4

} **NO debranching-operation**



Mitchell, Ishimaru et al. 2002

Background

Classification of landing zones (TEVAR) - Ishimaru

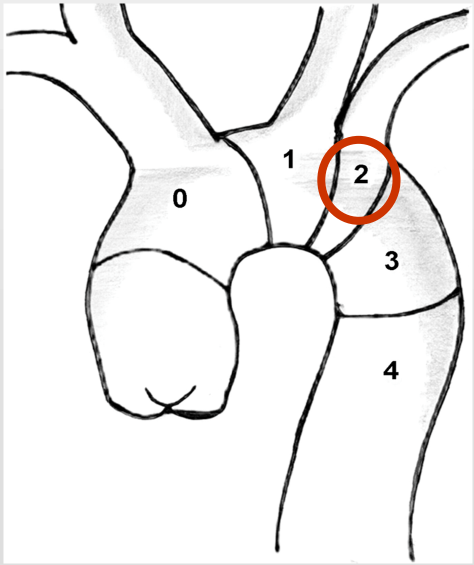
- zone 0 - Truncus brachiocephalicus
- zone 1 - A. carotis communis sinistra

} debranching-operation

- zone 2 - A. subclavia sinistra ? up to 40%

- zone 3
- zone 4

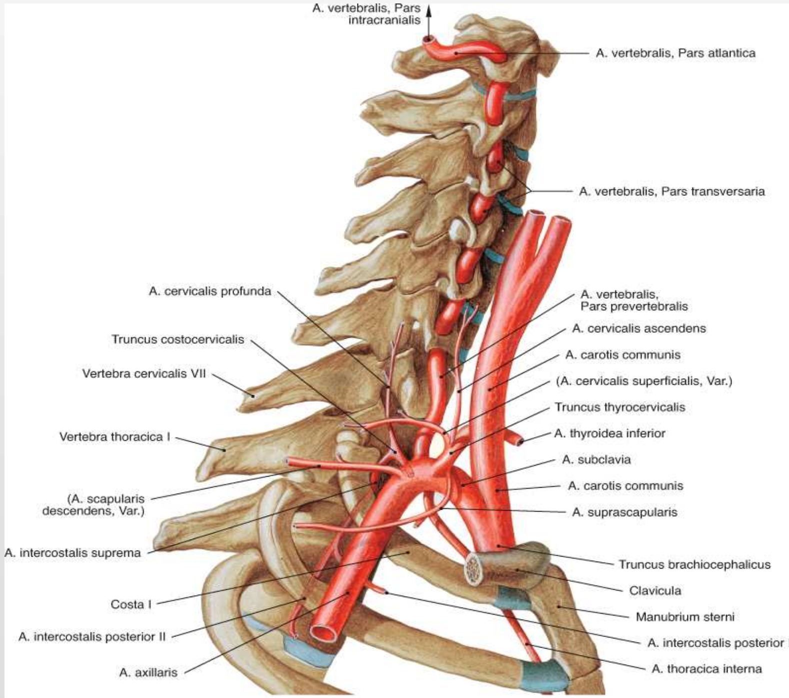
} NO debranching-operation



Mitchell, Ishimaru et al. 2002

Background

Potential risks of LSA coverage (during TEVAR)



Putz / Pabst: Sobotta Atlas der Anatomie in einem Band, 22.A. © Elsevier GmbH. www.studentconsult.de

Critical Arteries

? LSA
  -> shoulder girdle/upper extremity

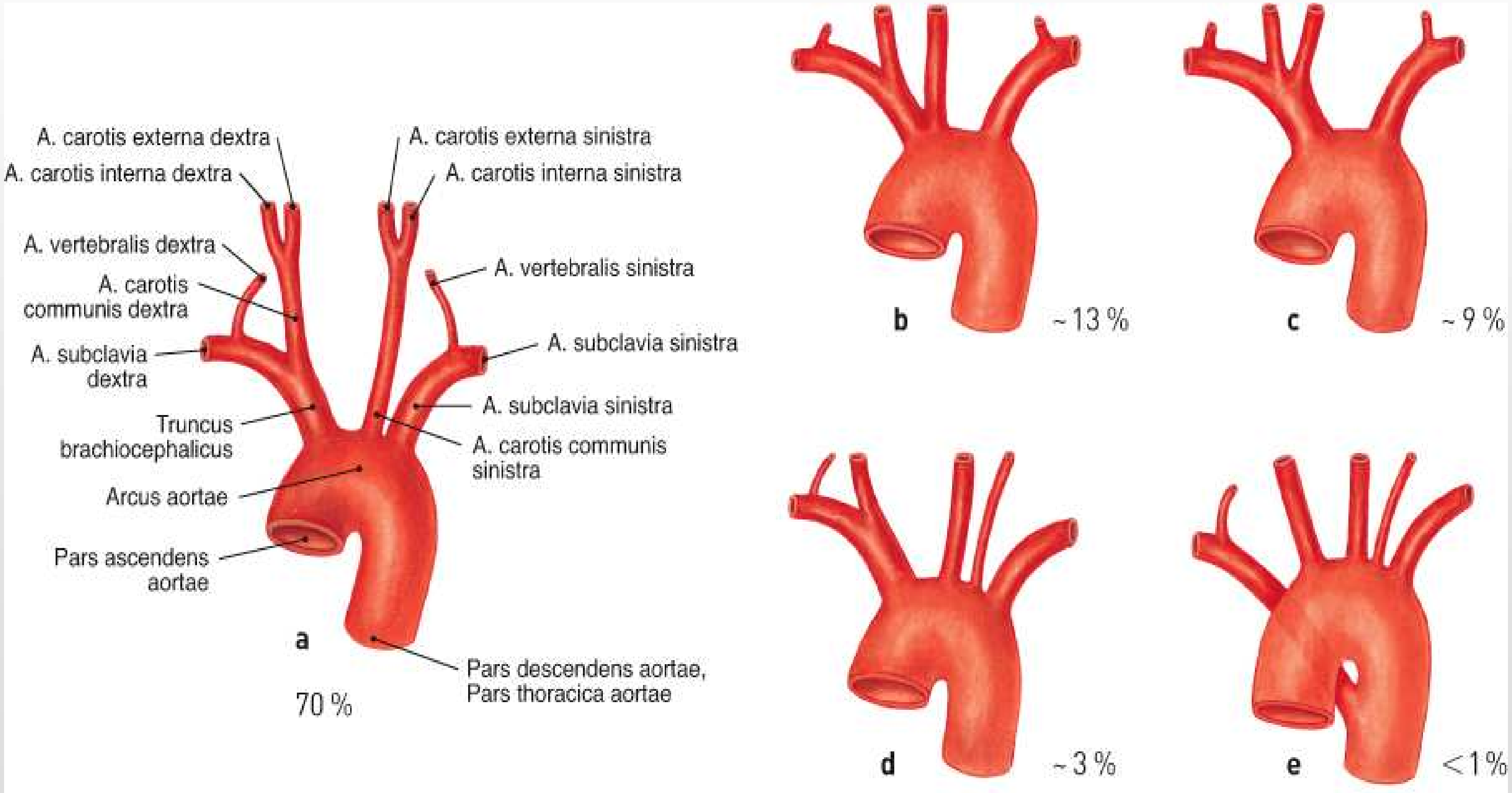
? vertebral artery
  -> brain (posterior circulation) and spinal cord

? ascending cervical artery
  -> spinal cord

? deep cervical artery
  -> spinal cord

? internal mammary
  -> potential donor for CABG

Background



Putz / Pabst: Sobotta Atlas der Anatomie in einem Band, 22.A. © Elsevier GmbH. www.studentconsult.de

Background

Potential risks of LSA coverage (during TEVAR)

- ? posterior circulation stroke
- ? spinal cord ischemia
- ? subclavian steal syndrome
- ? upper limb ischemia
- ? ENDOLEAK Type II

- ? (coronary ischemia)

LSA - Revascularisation - Strategien

- „prophylactic“ LSA revascularization of ALL patients undergoing LSA coverage prior to TEVAR

  to prevent ischemic complications

  versus

- selective LSA revascularization

  primary – in pts considered high – risk for ischemic complications (prior to TEVAR)

  secondary – in pts with ischemic complications (after TEVAR)

Primary selective LSA - Revascularisation

- hypoplastic right / dominant left vertebral artery
- distal occlusion of right vertebral artery (incomplete Circle of Willis)
- aortic arch anomalities (A. lusoria; common origin of LCCA+LSA)
- left internal mammary artery (LIMA) – graft for CABG
- functioning dialysis fistula in the left arm
- prior concomitant infrarenal aortic replacement
- left- handed worker (e.g. pianist)

Kotelis et al., JVS 2009

Background

Potential risks of LSA coverage (during TEVAR)

? posterior circulation stroke	*baseline risk:*	2 %
? spinal cord ischemia		4 %
? subclavian steal syndrome		??
? upper limb ischemia		6 %
? ENDOLEAK Type II		??

Rizvi et al., JVS 2009

Background

Potential risks of LSA coverage (during TEVAR)

? posterior circulation stroke — *basel… k:* 2 %

? spinal cord ischemia — 4 %

? subclavia… — ??

? upper lim… — 6 %

? ENDOLEAK Type II — ??

anterior circulation stroke 5 %

Rizvi et al., JVS 2009

Questions to be raised

-> do data support prophylactic LSA revascularization prior to LSA coverage ??

no prospective trials

systematic reviews

metaanalyses

guidelines

Literature

Systematic Review and Meta-analysis

The effect of left subclavian artery coverage on morbidity and mortality in patients undergoing endovascular thoracic aortic interventions: A systematic review and meta-analysis

Adnan Z. Rizvi, MD,[a,b] M. Hassan Murad, MD, MPH,[a,c] Ronald M. Fairman, MD,[d] Patricia I
and Victor M. Montori, MD, MSc,[a,c] *Rochester, Minn, Minneapolis, Minn, and Philadel*

Objectives: Thoracic endografts (stent grafts) have emerged as a les
lesions. The intentional coverage of the left subclavian artery ... ated
with several complications including stroke, spin ... ynthesize the
available evidence regarding the complica
Methods: We searched electronic ... through February 2008 for
studies that included pat ... al LSA coverage. Eligible studies had a
control group ... age or had primary revascularization prior to
covera ... and extracted descriptive, methodological and outcome
... eto odds ratio (OR) and 95% confidence intervals (CI) to describe
... and complications; the I^2 statistic described the proportion of inconsistency
... due to chance.
... observational studies. LSA coverage was associated with significant increase in the risk of
... ; CI, 9.9-229.3; I^2 = 72%, 19 studies) and vertebrobasilar ischemia (OR 10.8; CI, 3.17-36.7; I^2 =
... udies); and nonsignificant increase in the risk of spinal cord ischemia (OR 2.69; CI, 0.75-9.68; I^2 = 40%; eight
udies) and anterior circulation stroke (OR 2.58; CI, 0.82-8.09; I^2 = 64%, 13 studies). There were no significant associations between LSA coverage and death, myocardial infarction, or transient ischemic attacks. The incidence of phrenic nerve injury as a complication of primary revascularization was 4.40% (CI, 1.60%-12.20%). Data on perioperative infection were sparse and rarely reported.
Conclusions: Very low quality evidence suggests that LSA coverage increases the risk of arm ischemia, vertebrobasilar ischemia, and possibly spinal cord ischemia and anterior circulation stroke. (J Vasc Surg 2009;50:1159-69.)

Very low quality evidence...

Rizvi et al., JVS 2009

Literature

Practice Guidelines

SVS PRACTICE GUIDELINES

The Society for Vascular Surgery Practice Guidelines: Management of the left subcl... artery with thoracic endovascul...

Jon S. Matsumura, MD,[a] W. Anthony L...
Mohammad Hassan Murad, MD...
Hazim J. Safi, MD...
Palo Alto...

... present their ... recommendations. ...al seal necessitates coverage of ..., despite the very low-quality evidence ... an anatomy that compromises perfusion to critical ...ongly recommended, despite the very low-quality evidence ...ts who need urgent TEVAR for life-threatening acute aortic syndromes ...ecessitates coverage of the left subclavian artery, we suggest that revascularization ...addressed expectantly on the basis of anatomy, urgency, and availability of surgical expertise ...). (J Vasc Surg 2009;50:1155-8.)

For elective TEVAR -> routine pre-OP LSA revascularization (Grade 2C)
despite very low quality evidence

In emergency TEVAR -> individualized - expectantly on the basis of anatomy, urgency and availability of surgical expertise (Grade 2C)

Matsumura et al., JVS 2009

Literature

Practice Guidelines

SOCIETY FOR VASCULAR SURGERY® DOCUMENTS

Endovascular repair of traumatic thoracic aortic injury: Clinical practice guidelines of the S
for Vascular Surgery

W. Anthony Lee, MD,[a] Jon S. Mats
Roy K. Greenberg, MD,
Ronald M. Fai

systemic
was also surveyed on
rs, the majority opinions of the
on of minimal aortic defects, selective (vs
that spinal drainage is not routinely required in these

Near unanimity of opinion for selective LSA revascularization depending on the status of the vertebral anatomy

Minority opinion favoring routine LSA revascularization

Preservation of antegrade perfusion on the side of the dominant vertebral artery !!

Lee et al., JVS 2011

Literature

Practice Guidelines

ACCF/AHA Guideline

2010 ACCF/AHA/AATS/ACR/…
Guidelines for the Diag…

A Report of …
Task F…

For intentional LSA coverage, it is recommended that **the patency of the contralateral right subclavian and vertebral arteries be determined** preoperatively by CT, MR, or invasive angiography.

Additionally, **verification that vertebral arteries communicate at basilar artery** by either transcranial Doppler or angiography is recommended.

If these steps are taken to ensure that the contralateral posterior circulation is intact, **the need to perform LSA revascularization** postoperatively for arm claudication or vertebral basilar insufficiency **is infrequent.**

…D, FACC, FAHA;
…, FAHA†††;
…ner, MD, FACC, FAHA;
…mura, MD, FACC, FAHA†††;
…arbara Riegel, DNSc, RN, FAHA***;
…an G. Tarkington, RN; Clyde W. Yancy, MD, FACC, FAHA

Hiratzka et al., Circulation 2010

Questions to be raised

-> what are the potential risks of LSA revascularization ??

Literature

Systematic Review and Meta-analysis

The effect of left subclavian artery coverage on morbidity and mortality in patients undergoing endovascular thoracic aortic interventions: A systematic review and meta-an

Adnan Z. Rizvi, MD,[a,b] M. Hassan Murad, MD,
and Victor M. Montori, MD, MSc,[a,c]

Objectives: Thoracic en ... thoracic aortic lesions. The in ... endografts is associated with ... in this review, we synthesize the

...) from January 1990 through February 2008 for ... and had intentional LSA coverage. Eligible studies had a ... without LSA coverage or had primary revascularization prior to ... mined trial eligibility and extracted descriptive, methodological and outcome ... analyses estimated Peto odds ratio (OR) and 95% confidence intervals (CI) to describe ... between coverage and complications; the I^2 statistic described the proportion of inconsistency ... ect among studies not due to chance.

... We found 51 eligible observational studies. LSA coverage was associated with significant increase in the risk of arm ischemia (OR 47.7; CI, 9.9-229.3; I^2 = 72%, 19 studies) and vertebrobasilar ischemia (OR 10.8; CI, 3.17-36.7; I^2 = 0%; eight studies); and nonsignificant increase in the risk of spinal cord ischemia (OR 2.69; CI, 0.75-9.68; I^2 = 40%; eight studies) and anterior circulation stroke (OR 2.58; CI, 0.82-8.09; I^2 = 64%, 13 studies). There were no significant associations between LSA coverage and death, myocardial infarction, or transient ischemic attacks. The incidence of phrenic nerve injury as a complication of primary revascularization was 4.40% (CI, 1.60%-12.20%). Data on perioperative infection were sparse and rarely reported.

Conclusions: Very low quality evidence suggests that LSA coverage increases the risk of arm ischemia, vertebrobasilar ischemia, and possibly spinal cord ischemia and anterior circulation stroke. (J Vasc Surg 2009;50:1159-69.)

The incidence of phrenic nerve injury as a complication of LSA-revascularization was 4.4% (CI: 1.6%-12.2%)

Rizvi et al., JVS 2009

Questions to be raised

Potential risk of LSA revascularization

	Bypass grafting n/N (%)	Transposition n/N (%)
30 days mortality	6/507 (1.2)	6/511 (1.2)
Mortality during follow-up	59/409 (14.4)	64/415 (15.4)
Nerve injury	46/500 (9.2)	51/452 (11.2)
Stroke	33/500 (6.6)	20/452 (4.4)
Lymphatic leak	10/472 (2.1)	11/452 (2.4)
Postoperative thrombosis*	16/460 (3.5)	4/452 (0.9)
Graft infection	5/428 (1.2)	0
Hematoma	3/381 (0.8)	4/452 (0.9)

Cina et al., JVS 2002

How would Prof. A. Greiner argue??

New data?

Own series?

Excellence of LSA revascularization?

Literature

Vascular distribution of stroke and its relationship to perioperative mortality and neurologic outcome after thoracic endovascular aortic repair

Brant W. Ullery, MD,[a] Michael McGarvey, MD,[b] Albert T. Cheung, MD,[c] Ronald M. Fairman, MD,[a] Benjamin M. Jackson, MD,[a] Edward Y. Woo, MD,[a] Nimesh D. Desai, MD,[d] and Grace J. Wang, MD,[a]
Philadelphia, Pa

Objective: This study assessed the vascular distribution of stroke after thoracic endovascular aortic repair (TEVAR) and its relationship to perioperative death and neurologic outcome.
Methods: A retrospective review was performed for patients undergoing TEVAR between 2001 and 2010. Aortic arch hybrid and abdominal debranching cases were excluded. Demographics, operative variables, and neurologic complications were examined. Stroke was defined as any new focal or global neurologic deficit lasting >24 hours with radiographic confirmation of acute intracranial pathology.
Results: Perioperative stroke occurred in 20 of 530 patients (3.8%) undergoing TEVAR. The cohort was 55% male and a mean age of 75.2 ± 8.9 years (range, 57-90 years). Among patients with perioperative strokes, the indication for surgery was degenerative aneurysm in 14 (mean diameter, 6.8 cm), acute type B dissection in four, penetrating atherosclerotic aneurysm in one, and aortic transection in one. Cases were performed urgently or as an emergency in 60%. The proximal landing zone was zone 2 in 11 or zone 3 in nine. All strokes were embolic. The vascular distribution of stroke involved the anterior cerebral (AC) circulation in eight (zone 2, n = 5) and the posterior cerebral (PC) circulation in 12 (zone 2, n = 6). Laterality of cerebral infarction included five right-sided, eight left-sided, and seven bilateral strokes. Nine strokes were diagnosed <24 hours after operation. There was no difference in baseline demographics, aortic pathology, acuity, zone coverage, preoperative left subclavian artery revascularization, number of stents, or estimated blood loss between stroke groups based on vascular distribution. Independent risk factors for any perioperative stroke were chronic renal insufficiency (odds ratios [OR], 4.65; 95% confidence interval [CI], 1.22-17.7; *P* = .02) and history of prior stroke (OR, 4.92; 95% CI, 1.69-14.4; *P* = .004); the risk factor for AC stroke was prior stroke (OR, 7.67; 95% CI, 1.25-46.9; *P* = .03) and the risk factors for PC stroke were age (OR, 1.11; 95% CI, 1.00-1.23; *P* = .04), prior stroke (OR, 7.53; 95% CI, 1.78-31.8; *P* = .006), zone 2 coverage (OR, 6.11; 95% CI, 1.15-32.3; *P* = .03), and penetrating atherosclerotic ulcer (OR, 32.7; 95% CI, 1.33-807.2; *P* = .03). Overall in-hospital mortality was 20% (n = 4), with those sustaining PC strokes observed to trend toward increased mortality (33% vs 0%; *P* = .12). Patients with AC strokes were more likely than those with PC strokes to achieve complete recovery of neurologic deficits before discharge (75% vs 17%; *P* = .02).
Conclusions: Perioperative stroke after TEVAR is primarily an embolic event. Although infrequent, stroke was associated with significant morbidity and death, particularly among those with strokes involving the PC circulation. (J Vasc Surg 2012;56:1510-7.)

Ullery et al., JVS 2012

Literature

Perioperative stroke occurred in 20 of 530 patients (**3.8%**) undergoing TEVAR

anterior stroke: n = 8
posterior stroke: n = 12

n = 11 proximal landing zone 2
n = 9 proximal landing zone 3

7 of 20 stroke patients underwent a left carotid-to-subclavian bypass **(prior to TEVAR)**

anterior stroke: n = 4
posterior stroke: n = 3

Ullery et al., JVS 2012

Literature

Table IV. Multivariate analysis of independent predictors of perioperative stroke

Variable	*OR (95% CI)*	P
Any stroke		
Prior stroke	4.92 (1.69-14.4)	.004
CRI[a]	4.65 (1.22-17.7)	.02
Anterior circulation stroke		
Prior stroke	7.67 (1.25-46.9)	.03
Posterior circulation stroke		
Prior stroke	7.53 (1.78-31.8)	.006
Age	1.11 (1.00-1.23)	.04
Zone 2 coverage[b]	6.11 (1.15-32.3)	.03
PAU	32.7 (1.33-807.2)	.03

CI, Confidence interval; *CRI*, chronic renal insufficiency; *OR*, odds ratio; *PAU*, penetrating atherosclerotic ulcer.

[a]Creatinine ≥1.5 mg/dL.

[b]Endovascular coverage from the left common carotid artery to the left subclavian artery.

Ullery et al., JVS 2012

Literature

Left subclavian artery coverage during thoracic endovascular aortic aneurysm repair does not mandate revascularization

Thomas S. Maldonado, MD,[a] David Dexter, MD,[a] Caron B. Rockman, MD,[a] Frank J. Veith, MD,[a] Karan Garg, MD,[a] Frank Arko, MD,[b] Hernan Bertoni, MD,[c] Sharif Ellozy, MD,[d] William Jordan, MD,[e] and Edward Woo, MD,[f] *New York, NY; Dallas, Tex; Buenos Aires, Argentina; Birmingham, Ala; and Philadelphia, Pa*

Objective: This study assessed the risk of left subclavian artery (LSA) coverage and the role of revascularization in a large population of patients undergoing thoracic endovascular aortic aneurysm repair.
Methods: A retrospective multicenter review of 1189 patient records from 2000 to 2010 was performed. Major adverse events evaluated included cerebrovascular accident (CVA) and spinal cord ischemia (SCI). Subgroup analysis was performed for noncovered LSA (group A), covered LSA (group B), and covered/revascularized LSA (group C).
Results: Of 1189 patients, 394 had LSA coverage (33.1%), and 180 of these patients (46%) underwent LSA revascularization. In all patients, emergency operations (9.5% vs 4.3%; P = .001), renal failure (12.7% vs 5.3%; P = .001), hypertension (7% vs 2.3%; P = .01), and number of stents placed (1 = 3.7%, 2 = 7.4%, ≥3 = 10%; P = .005) were predictors of SCI. History of cerebrovascular disease (9.6% vs 3.5%; P = .002), chronic obstructive pulmonary disease (9.5% vs 5.4%; P = .01), coronary artery disease (8.5% vs 5.3%; P = .03), smoking (8.9% vs 4.2%) and female gender (5.3% men vs 8.2% women; P = .05) were predictors of CVA. Subgroup analysis showed no significant difference between groups B and C (SCI, 6.3% vs 6.1%; CVA, 6.7% vs 6.1%). LSA revascularization was not protective for SCI (7.5% vs 4.1%; P = .3) or CVA (6.1% vs 6.4%; P = .9). Women who underwent revascularization had an increased incidence of CVA event compared with all other subgroups (group A: 5.6% men, 8.4% women, P = .16; group B: 6.6% men, 5.3% women, P = .9; group C: 2.8% men, 11.9% women, P = .03).
Conclusions: LSA coverage does not appear to result in an increased incidence of SCI or CVA event when a strategy of selective revascularization is adopted. Selective LSA revascularization results in similar outcomes among the three cohorts studied. Revascularization in women carries an increased risk of a CVA event and should be reserved for select cases.
(J Vasc Surg 2013;57:116-24.)

Maldonado et al., JVS 2013

Literature

Aim:

to better define the role and outcome of selective LSA revascularization in patients who require coverage

Methods:

? retrospective review of prospectively collected data

? **consecutive patients** undergoing TEVAR

? **six high-volume centers** > **150 TEVAR experience**

? n = 1189 patients

Maldonado et al., JVS 2013

Literature

Aim:

to define role and outcome of selective LSA-revascularization in patients who require coverage

Methods:

? retrospective review of prospectively collected data
? consecutive patients undergoing TEVAR
? six high-volume centers (> 150 TEVAR experience each)
? n = 1189 patients
? decision for LSA revascularization: physician dependent
? **no** routine or mandatory LSA revascularization in any center

Maldonado et al., JVS 2013

Literature

Methods:

primary endpoints at 30 days:
- ? Stroke
- ? Spinal Cord Ischemia
- ? Death

subgroup analysis for:
- ? non-covered LSA (group A)
- ? covered LSA without revascularization (group B)
- ? covered and revascularized LSA (group C)

Maldonado et al., JVS 2013

Literature

Results:

- ? non-covered LSA (group A) n = 795
- ? covered LSA without revascularization (group B) n = 214
- ? covered and revascularized LSA (group C) n = 180

total n = 1189

Event	No. (%)
Paraplegia	74/1189 (6.2)
Stroke	77/1189 (6.5)
Mortality at 30 days	147/1189 (12.4)

Maldonado et al., JVS 2013

Literature

Results:

? covered LSA without revascularization (group B) n = 214
? covered and revascularized LSA (group C) n = 180

Group	SCI No. (%)	CVA No. (%)	Death No. (%)
Group A	50/791 (6.3)	53/791 (6.7)	108/789 (13.7)
Group B	16/212 (7.5)	13/212 (6.1)	24/212 (11.3)
Group C	7/172 (4.1)	11/173 (6.4)	13/173 (7.5)
P	.2	.9	.5

Maldonado et al., JVS 2013

Literature

Results: Stroke

? covered LSA without revascularization (group B) n = 214
? covered and revascularized LSA (group C) n = 180

Variable	*Group B*	P	*Group C*	P
Urgency				
Emergency	9/123 (7.3)	.432	4/44 (9.1)	.4
Elective	4/86 (4.7)		7/128 (5.5)	
Indication				
Aneurysm	5/109 (4.6)	.52	11/144 (7.6)	.5
Dissection	6/67 (9.0)		0/19 (0)	
Ulcer	0/10 (0)		0/5 (0)	
Trauma	1/23 (4.3)		0/5 (0)	
Gender				
Female	4/76 (5.3)	.9	8/67 (11.9)	.03
Male	9/136 (6.6)		3/106 (2.8)	

[a]Only female gender differed between groups, with an increased risk of stroke in female patients undergoing left subclavian artery revascularization

Maldonado et al., JVS 2013

Literature

Results: Stroke

? multivariate analysis

Variable	*OR (95% CI)*	P
Female gender	1.941 (1.013-3.720)	.046
CAD	0.985 (0.514-1.888)	.964
COPD	1.614 (0.0828-3.145)	.160
Cerebrovascular disease	2.423 (1.237-4.592)	.01
Smoking	2.267 (1.119-4.592)	.023

CAD, Coronary artery disease; *CI*, confidence interval; *COPD*, chronic obstructive pulmonary disease; *CVA*, cerebrovascular accident; *OR*, odds ratio.

[a]Only a history of cerebrovascular disease (*P* = .01), smoking (*P* = .023), and female gender (*P* = .046) remained significant predictors of CVA.

Maldonado et al., JVS 2013

Literature

Results: Spinal Cord Ischemia

? multivariate analysis

Variable	*OR (95% CI)*	P
Elective status	0.38 (0.204-0.710)	.002
Hypertension	2.63 (0.788-8.775)	.166
Lumbar drain	2.33 (1.226-4.410)	.01
Renal failure	2.54 (1.236-5.228)	.011
No. of stents implanted	1.35 (0.907-2.013)	.139

CI, Confidence interval; *OR*, odds ratio.

[a]On multivariate analysis, only urgency of operation ($P = .002$), renal failure ($P = .011$), and intraoperative use of lumbar drain ($P = .01$) remained significant predictors (Table IV, *A*).

Maldonado et al., JVS 2013

TEVAR – Experience / Innsbruck

	Patients n (%)	Technical Success (TEVAR)	
TAA arteriosclerotic	**64** (46%)	98%	n=1 conversion (persist. endoleak 1A)
TAI (post-)traumatic	**38** (28%)	100%	
Aortic dissection Type B	**36** (26%)	100%	
ALL	**138** (100%)		

LSA - Revascularisation Strategy

avoid full coverage of LSA if possible!

Imaging of aortic arch and supraaortic arteries including cerebral circulation in order to assess potential collaterals, anomalies & AOD

-> **Sufficient collaterals** present
-> LSA coverage without prior revascularization („wait and see“)

Revascularization prior to LSA coverage in high-risk patients only

Primary selective LSA - Revascularisation

- **hypoplastic right / dominant left vertebral artery**
- **distal occlusion of right vertebral artery (incomplete Circle of Willis)**
- **aortic arch anomalities (**A. lusoria; common origin of LCCA+LSA**)**
- **left internal mammary artery (LIMA) – graft for CABG**
- **functioning dialysis fistula in the left arm**
- **prior concomitant infrarenal aortic replacement**
- **left- handed worker (**e.g. pianist**)**

Kotelis et al., JVS 2009

TEVAR – Experience / Innsbruck

primary LSA revascularization (prior to TEVAR)

	patients n	primary revascul	indication
TAA arteriosclerotic	63	5	n=2 landing zone 0 n=2 dom. A. vertebr sin. n=1 LIMA Bypass n=1 St.p. AAA (OP)
TAI (post-)traumatic	38	1	n=1 landing zone 1
Aortic dissection Type B	36	3	n=1 landing zone 1 n=1 paraplegia n=1 simultaneous AAA-OP
ALL	137	9 (6.5%)	

TEVAR – Experience / Innsbruck

primary LSA revascularization (prior to TEVAR)

	patients n	primary revascul	neurologic outcome
TAA arteriosclerotic	63	5	-
TAI (post-)traumatic	38	1	stroke (n=1)
Aortic dissection Type B	36	3	paraplegia: persisting
ALL	137	9 (6,5%)	

TEVAR – Experience / Innsbruck

LSA coverage - results I

	patients n	LSA Coverage	LSA - occlusion (partial or complete)
TAA arteriosclerotic	**63**		**9** (+5) (14%)
TAI (post-)traumatic	**38**		**21** (+1) (55%)
Aortic dissection Type B	**36**		**10** (+3) (28%)
ALL	**137**	**73** (53%)	**40** (29%)

TEVAR – Experience / Innsbruck

LSA coverage - results I

	patients n	LSA - occlusion (partial or complete)	neurologic outcome
TAA arteriosclerotic	63	9 (+5)	stroke + paraplegia + ischemia left hand (n=1)
TAI (post-)traumatic	38	21 (+1)	o.B.
Aortic dissection Type B	36	10 (+3)	o.B.
ALL	137	40 (29%)	1

TEVAR – Experience / Innsbruck

secondary LSA revascularization (after TEVAR)

	patients n	LSA - occlusion (partial or complete)	
TAA arteriosclerotic	63	9 (+5)	stroke + paraplegia + ischemia left hand (n=1)
TAI (post-)traumatic	38	21 (+1)	LCCA + LSA coverage (unintentional) (n=1)
Aortic dissection Type B	36	10 (+3)	-
ALL	137	40 (29%)	**2**

TEVAR – Experience / Innsbruck

neurologic complications (within 30 days after TEVAR)

	patients n	stroke	other
TAA arteriosclerotic	6 / 63 (9.5%)	4	Paraplegie (n=2) ICH (n=1)
TAI (post-)traumatic	1 / 38 (2.6%)	1	0
Aortic dissection Type B	0 / 36	0	0
ALL	7 / 137 (5.1%)	5	

TEVAR – Experience / Innsbruck

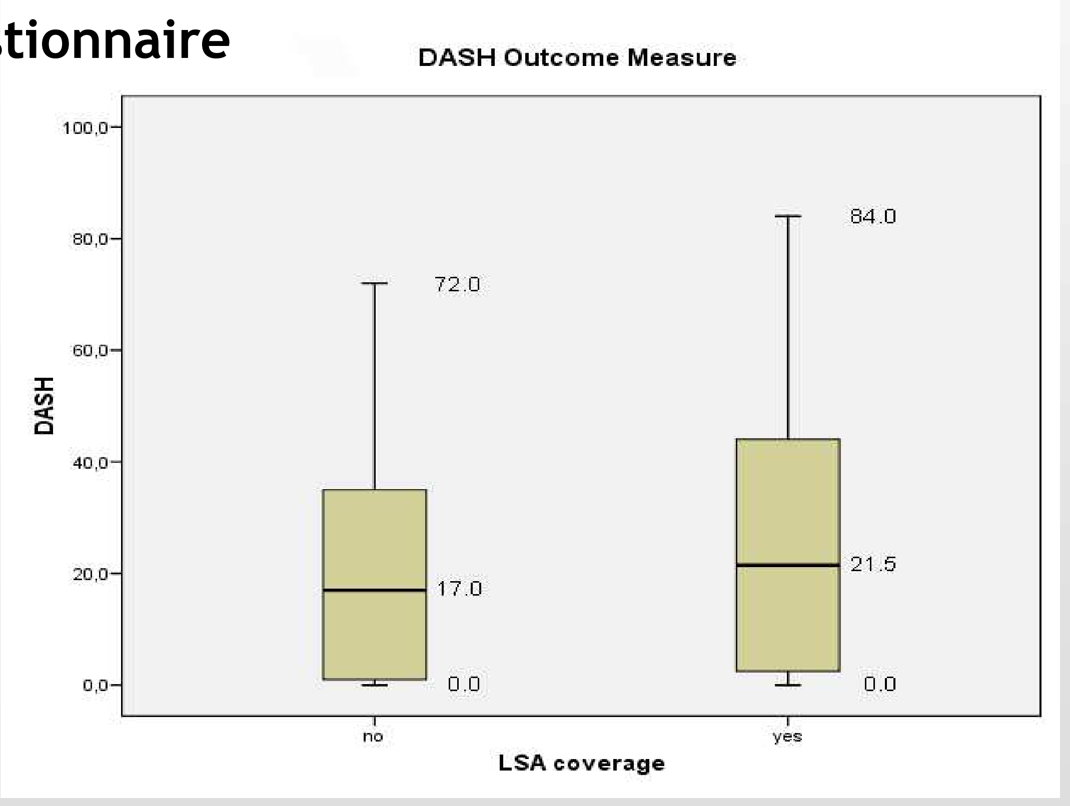
neurologic complications (within 30 days after TEVAR)

Initials	Pathology	LSA revascularisation	neurologic event	region	day
H.A.	Traumat. TAA (chronic)	**yes (prior to TEVAR)** Hypoplastic RVA, zone 1 landing	Stroke Incomplete ligation of LVA	posterior	day 0
H.H.	TAA St.p. AAA repair	no **LSA patent**	stroke	posterior	day 0
H.W.	Rupt.TAA	no **LSA patent**	Stroke (embolic)	diffuse	day 8
L.F.	TAA	no **LSA patent**	stroke (embolic)	diffuse	day 0
M.H.	TAA	no **LSA patent**	ICH choroid plexus papilloma	ventricular system	day 0
M.O.	TAA	**yes (after TEVAR)** **LSA coverage** **carotids + vertebral arteries patent**	Transient paraplegia, LAI Minor stroke (embolic)	MCA/SCI	day 1
V.R.	TAA	no **LSA patent**	Paraplegia	SCI	day 1

TEVAR – Experience / Innsbruck

functional assessment of the left upper limb

DASH Questionnaire



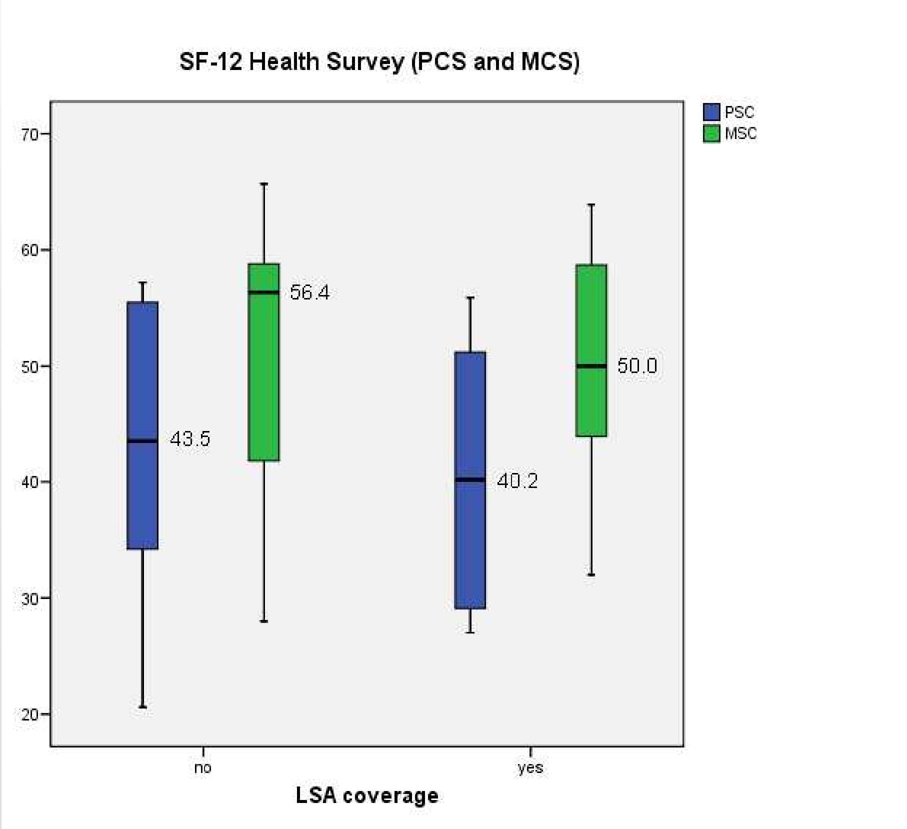
TEVAR – Experience / Innsbruck

quality of life in patient with / without LSA coverage

SF-12 Questionnaire
(Short Form / SF-36)

PSC - physical component

MSC - mental component



Conclusions

Intentional LSA coverage during TEVAR is well tolerated and may be managed expectantly - with a few exceptions

(Primary) LSA revascularization may itself lead to (neurologic) complications (female > male)

Imaging of supraaortic arteries is essential to select patients at risk (those that should undergo primary LSA revascularization)

The majority of neurologic events during TEVAR are caused by emboli

LSA coverage does not affect left arm function and quality of life