

# Aortic graft infection treatment - guideline update

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KLINIKA ZA VASKULARNU  
I ENDOVASKULARNU  
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CLINICAL PRACTICE GUIDELINE DOCUMENT

## Editor's Choice – European Society for Vascular Surgery (ESVS) 2020 Clinical Practice Guidelines on the Management of Vascular Graft and Endograft Infections<sup>☆</sup>

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# Carotid patch corrugation or inflammatory syndrome for aortic grafts

## Recommendation 16

When patch corrugation is found on ultrasound follow up after carotid endarterectomy further investigations may be considered to exclude a vascular graft infection.

Class	Level	References
I Ib	C	Lazaris <i>et al.</i> (2005) <sup>80</sup>

## Recommendation 21

For persistent fever or inflammatory symptoms after implantation of a thoracic graft/endograft, further diagnostic investigations are recommended in the search for infection.

Class	Level	References
I	C	Lyons <i>et al.</i> (2016) <sup>1</sup>

### Recommendation 1

Once vascular graft/endograft infection is suspected, exhaustive evaluation of clinical status, signs of infection and patient comorbidities according to the MAGIC criteria is recommended.

Class	Level	References
I	C	Lyons <i>et al.</i> (2016), <sup>1</sup> Back (2014), <sup>6</sup> Teebken <i>et al.</i> (2012) <sup>12</sup>

# MAGIC classification

**Table 5. The MAGIC classification<sup>1</sup>**

Criterion	Clinical/surgical	Radiology	Laboratory
<b>Major</b>			
	Pus (confirmed by microscopy) around graft or in aneurysm sac at surgery	Perigraft fluid on CT scan $\geq$ 3 months after insertion	Organisms recovered from an explanted graft
	Open wound with exposed graft or communicating sinus	Perigraft gas on CT scan $\geq$ 7 weeks after insertion	Organisms recovered from an intra-operative specimen
	Fistula development, e.g., aorto-enteric or aortobronchial	Increase in perigraft gas volume demonstrated on serial imaging	Organisms recovered from a percutaneous, radiologically guided aspirate of perigraft fluid
	Graft insertion in an infected site, e.g., fistula, mycotic aneurysm, or infected pseudo-aneurysm		
<b>Minor</b>			
	Low inflammatory response		Blood culture(s) positive and no apparent source except graft infection
	Few macrophages		Abnormally elevated inflammatory markers with graft infection as most likely cause, e.g., erythrocyte sedimentation rate, C reactive protein, white cell count
<b>Recommendation 9</b> <b>For patients with a clinical suspicion of vascular graft/endograft infection and with non-convincing findings on CTA, the use of 18F-FDG-PET combined with low dose CT is recommended as an additional imaging modality to improve diagnostic accuracy.</b>			
	<b>Class</b>	<b>Level</b>	<b>References</b>
	I	B	Reinders Folmer <i>et al.</i> (2018) <sup>37</sup>

CT = computed tomography; FDG-PET/CT = 18F-fluoro-D-deoxyglucose positron emission tomography/computed tomography



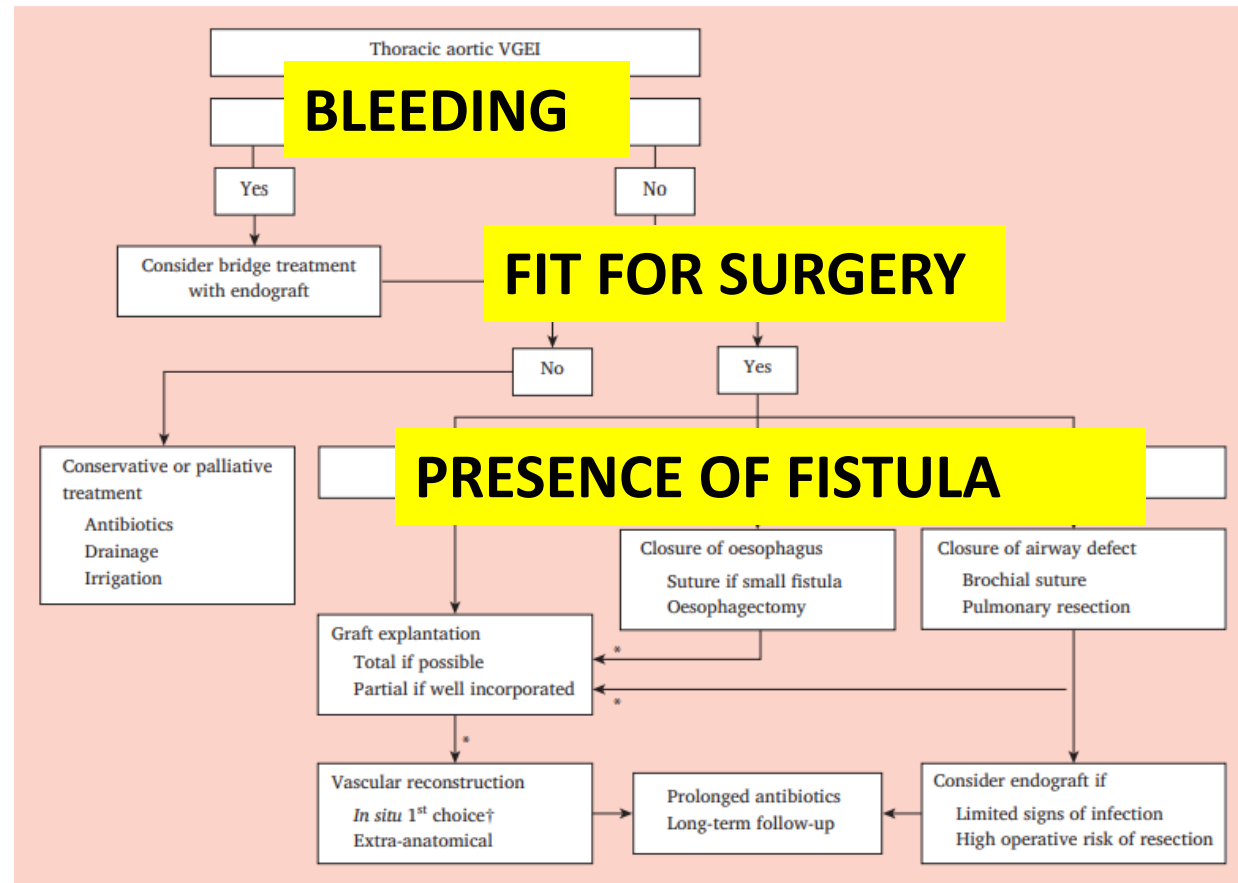
# CENTRALISED TREATMENT

## Recommendation 15

For the diagnosis and treatment of vascular graft/endograft infection it is recommended that the patient be transferred to specialised high volume centre with multidisciplinary experience in this pathology.

Class	Level	References
I	C	Consensus of expert opinion

# Treatment options in thoracic aortic graft infections



# Fit patients – total graft explantation I/B

## Recommendation 22

For fit patients with proven thoracic/thoraco-abdominal vascular graft/endograft infection, total graft explantation is recommended.

Class	Level	References
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I	B	Kahlberg <i>et al.</i> (2019), <sup>100</sup> Moulakakis <i>et al.</i> (2013) <sup>117</sup>
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# Cryopreserved material as a first choice IIB/C

## Recommendation 27

For the reconstruction of thoracic/thoraco-abdominal vascular graft/endograft infection, cryopreserved allografts may be considered the first choice graft material.

Class	Level	References
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IIB	C	Smeds <i>et al.</i> (2016) <sup>110</sup>
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# Omental flap coverage of the stump or *in situ* graft

## Recommendation 23

For patients with *in situ* reconstructions of thoracic/thoraco-abdominal vascular graft/endograft infection, coverage of the newly inserted graft with autologous, and ideally vascularised, tissue is recommended.

Class	Level	References
I	C	Spiliotopoulos <i>et al.</i> (2018), <sup>66</sup> Roselli <i>et al.</i> (2014) <sup>101</sup>

## Recommendation 28

After extra-anatomic reconstruction for thoracic/thoraco-abdominal vascular graft/endograft infection, reinforcement of the aortic stump with autologous, and ideally vascularised, tissues should be considered.

Class	Level	References
IIa	C	Roselli <i>et al.</i> (2014) <sup>101</sup>

# Major risk for surgery – conservative treatment

## Recommendation 24

For patients with thoracic vascular graft/endograft infection that are at major risk of surgery, conservative treatment may be considered.

Class	Level	References
I Ib	B	Czerny <i>et al.</i> (2014), <sup>97</sup> Kahlberg <i>et al.</i> (2019), <sup>100</sup> Chiesa <i>et al.</i> (2010) <sup>111</sup>

# Drainage and antimicrobial therapy or partial explantation IIb/C

## Recommendation 25

For patients with suspected thoracic graft/endograft infection, in the absence of fistulisation to the oesophagus or airway, or generalised sepsis, prolonged antimicrobial therapy combined with drainage of peri-graft fluid and/or irrigation, may be considered.

Class	Level	References
IIb	C	Kahlberg <i>et al.</i> (2019) <sup>100</sup>

## Recommendation 26

For patients with thoracic/thoraco-abdominal vascular graft/endograft infection, partial explantation may be considered if infection is limited.

Class	Level	References
IIb	C	Kahlberg <i>et al.</i> (2019) <sup>100</sup>

In presence of  
fistula  
explantation  
and fistula  
repair I/B and  
IIb/C

### Recommendation 33

In patients with aortobronchial or aortopulmonary fistula complicating thoracic/thoraco-abdominal vascular graft/endograft infection, closure of the airway defect and explantation of the infected material with *in situ* reconstruction should be considered as definitive treatment.

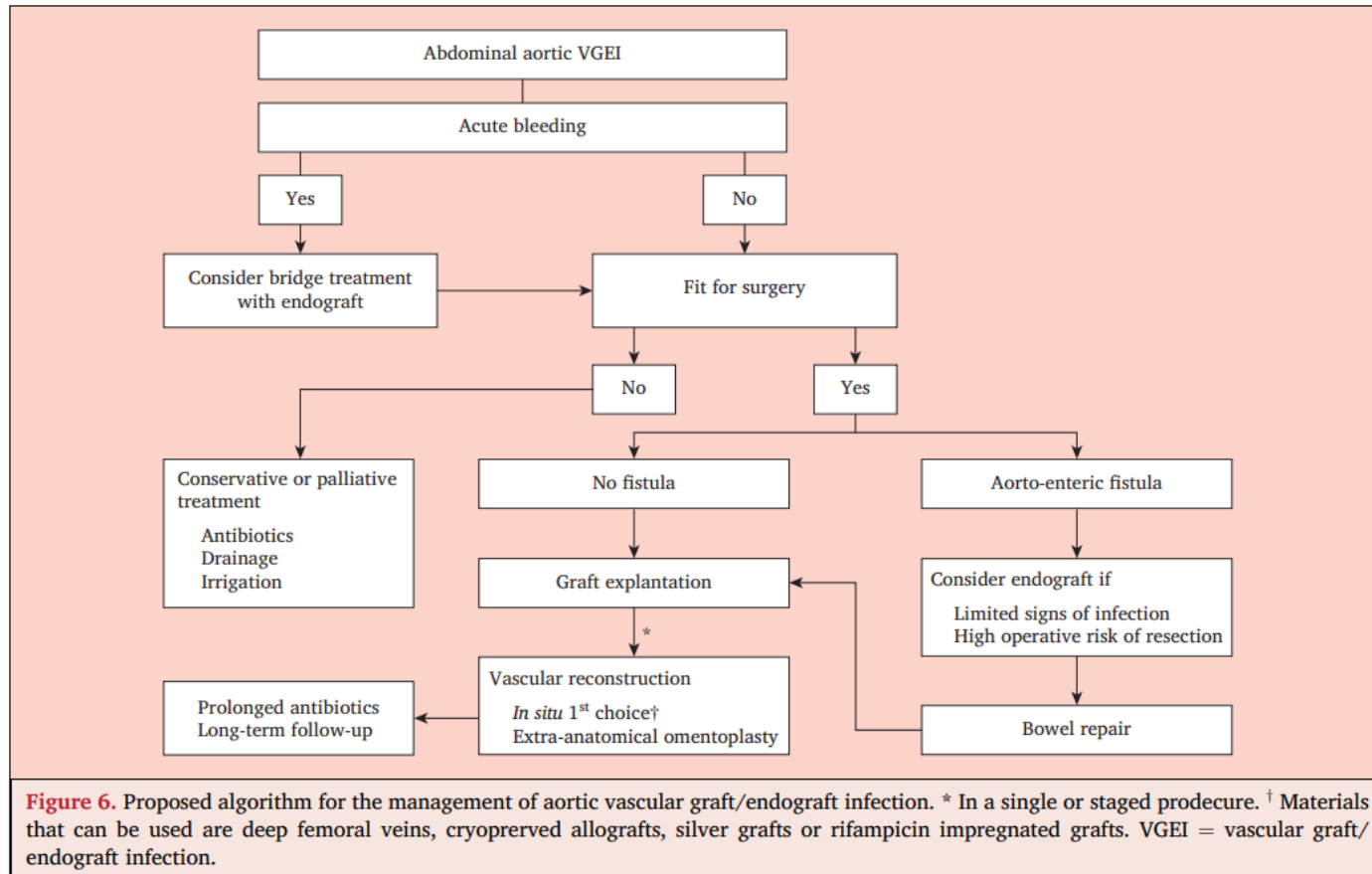
Class	Level	References
IIa	C	Czerny <i>et al.</i> (2015), <sup>98</sup> Chiesa <i>et al.</i> (2010), <sup>99</sup> Chiesa <i>et al.</i> (2010) <sup>111</sup>

### Recommendation 29

For patients with aorto-oesophageal fistula complicating thoracic/thoraco-abdominal vascular graft/endograft infection, explantation of the infected material, repair of the oesophagus, and coverage with viable tissue is recommended as definitive treatment.

Class	Level	References
I	B	Kahlberg <i>et al.</i> (2019), <sup>100</sup> Moulakakis <i>et al.</i> (2013) <sup>117</sup>

# ABDOMINAL GRAFT INFECTION





# Autologous vein first all other grafts second choice for in situ reconstruction IIa/C

## Recommendation 39

For patients with an abdominal aortic vascular graft/endograft infection, *in situ* reconstruction with autologous vein should be considered as the preferred method.

Class	Level	References
IIa	C	Batt <i>et al.</i> (2018), <sup>17</sup> Spiliotopoulos <i>et al.</i> (2018), <sup>66</sup> Dorigo <i>et al.</i> (2003), <sup>69</sup> Dorweiler <i>et al.</i> (2014), <sup>142</sup> Heinola <i>et al.</i> (2016), <sup>143</sup> Ali <i>et al.</i> (2009), <sup>145</sup> Harlander-Locke <i>et al.</i> (2014), <sup>148</sup> O'Connor <i>et al.</i> (2006), <sup>180</sup> Rodrigues dos Santos <i>et al.</i> (2014) <sup>200</sup>

## Recommendation 40

For patients with abdominal aortic vascular graft/endograft infection, cryopreserved allografts, silver coated grafts, rifampicin bonded polyester grafts, or bovine pericardium should be considered as alternative solutions.

Class	Level	References
IIa	C	Batt <i>et al.</i> (2018), <sup>17</sup> Spiliotopoulos <i>et al.</i> (2018), <sup>66</sup> Dorigo <i>et al.</i> (2003), <sup>69</sup> Dorweiler <i>et al.</i> (2014), <sup>142</sup> Heinola <i>et al.</i> (2016), <sup>143</sup> Ali <i>et al.</i> (2009), <sup>145</sup> Harlander-Locke <i>et al.</i> (2014), <sup>148</sup> O'Connor <i>et al.</i> (2006), <sup>180</sup> Rodrigues dos Santos <i>et al.</i> (2014) <sup>200</sup>

# Partial excision or extraanatomic bypass

## Recommendation 41

Partial excision of infected an aortic vascular graft/endograft may be considered when infection is documented as limited and the remaining material is well incorporated.

Class	Level	References
IIb	C	Mirzaie <i>et al.</i> (2007), <sup>163</sup> Simmons <i>et al.</i> (2017), <sup>186</sup> Phang <i>et al.</i> (2019) <sup>187</sup>

## Recommendation 42

For patients with abdominal aortic vascular graft/endograft infection and a large abscess or multiresistant micro-organisms, extra-anatomic reconstruction may be considered.

Class	Level	References
IIb	B	Oderich <i>et al.</i> (2006) <sup>144</sup>

# Graft infection in peripheral arteries

- ❑ Graft **explantation** and reconstruction if graft removal **leads to ischemia**
- ❑ **Autologous vein** first choice
- ❑ **Cryopreserved graft** second choice
- ❑ Local irrigation and NPWT **after graft explantation or in unfit** patients
- ❑ Muscle/musculocutaneous **flap** to promote healing following graft removal

# CONCLUSION

- The document is a guiding principle, decision is based on the individual conditions
- Guidelines are not legal standard of care in all patients
- Educational material – very usefull to read and learn

**THANK YOU FOR YOUR ATTENTION**