# Aortic Vascular Graft and Endograft Infections: Guided Aspiration to Determine the Microbiological Aetiology

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**ABSTRACT**

Aortic vascular graft or endograft infection can compromise both open and endovascular aortic repair. Confirming the microbiological aetiology is critical to giving the best possible treatment for VGEI patients. The major goal of this study was to describe and report the diagnostic utility of Direct Aneurysm Sac Guided Aspiration (DASGA) in establishing the microbiological aetiology in a group of patients with VGEIs. This was a retrospective observational single-center research conducted in Malmö, Sweden, from 2011 to 2020. The research comprised patients who had a suspected aortic VGEI and had a DASGA conducted at the Vascular Centre. In all, 31 guided aspirations were conducted on 27 patients (25 males [93%]; median age 77 [range 57–82 years]). In 25/31 (81%) DASGAs, the combination of culture and 16S rRNA/18S rRNA revealed a microbial aetiology. Importantly, if three cases where infection was ruled out are excluded, the prevalence rises to 89 percent. Six (24 percent) of the patients had a polymicrobial aetiology. Cutibacterium spp. (n = 8) and Listeria monocytogenes (n = 4) were the most frequent bacteria detected. Overall, the major aetiology could be classified as either normal gut flora (n = 12; 48%) or skin commensals (n = 8; 32%). There was no long-term morbidity associated with the DASGA in any of the patients. The microbiological aetiology of open and endovascular graft infections may be determined by DASGA. This approach appears to be safe, with a high success rate for proving the microbiological aetiology of VGEIs, especially when paired with normal culture procedures and 16S rRNA/18S rRNA. Finding the causative microbial aetiology is critical, and trans lumbar puncture may be utilized without substantial problems in the great majority of instances.

**Key Words:** *Abdominal aortic aneurysms; Biofilm infections; Microbiology*

## INTRODUCTION

An aortic vascular graft or endograft infection can complicate both Open Surgical Repair (OSR) and Endovascular Aortic Repair (EVAR) for Abdominal Aortic Aneurysms (AAAs). The incidence of aortic VGIs varies depending on the aortic level, but it is predicted to be 0.19 percent after OSR and 0.16 percent after EVAR in the abdominal aorta. Multidisciplinary management should include vascular surgeons, infectious disease experts, microbiologists, radiologists, and, in some cases, general surgeons. Long courses of antibiotic medication and, in certain circumstances, explanations of infected grafts are used to treat the infection. Regardless, the overall one-year all-cause death rate is between 56 and 66 percent. Securing the microbiological aetiology is a vital factor in giving the best available therapy to patients with VGEIs, according to the European Society for Vascular Surgery (ESVS). Directly Acquired Specimens (DOS) from the site of infection are preferred since blood cultures only provide the microbiological aetiology in only one-third of cases. However, the effectiveness of DOS is restricted if the contaminated tissue is not resected or drained. On the other hand, if the microbiological aetiology is determined by DOS, timely therapy can be given. This gives the best therapy for the patient and enhances the likelihood of treatment success, while also having a lower influence on the environment and the individual microbiota because wide spectrum medicines are generally avoided. Furthermore, if antimicrobial treatment difficulties arise, an identifiable aetiology with a matching antibiogram facilitates antibacterial therapy adjustments. Despite this, research on the microbiological aetiology of VGEIs is scarce, particularly when no major surgical intervention is used. It's unclear if this is related to a lack of diagnostic aspiration at the infection site or a lack of reporting.

Staphylococcus aureus, Coagulase Negative Staphylococci (CoNS), Enterococcus spp., Streptococcus spp., Enterobacterales, Pseudomonas spp., anaerobes, and Candida spp. are common aetiologies of VGEIs. VGEIs are difficult to treat because these microorganisms create a biofilm on the surface of vascular grafts. 16S ribosomal ribonucleic acid (16S rRNA) is a Polymerase Chain Reaction (PCR) technique used to detect ribosomal DNA and consequently bacterial aetiology in specimens acquired from ordinarily sterile areas. "Narrow" range PCR primers, on the other hand, can be used to more definitely identify particular bacteria. Furthermore, chosen bacterial strains can be sequenced in order to look for genes that code for antibiotic resistance. When cultures are negative or antibiotic therapy has already been started when the cultures were acquired, PCR is utilized. Furthermore, utilizing 16S rRNA, bacteria that are difficult to cultivate, such as anaerobic bacteria, may be recognized to a higher extent. In addition to traditional culturing procedures, studies exploring the microbiological aetiology of VGEIs utilizing 16Sr RNA PCR are uncommon. In parallel, 18S rRNA may be utilized to find a fungal aetiology in a similar way. With this in mind, it's critical to think about culture and PCR results in the context of a set of diagnostic criteria, since the results might represent contamination rather than the microorganisms that cause VGEI. The main goal of this study was to describe and report the diagnostic usefulness of direct aneurysm sac guided aspiration (DASGA) for identifying microbiological aetiology in a group of patients with suspected VGEIs. The secondary goals were to see if utilizing 16S rRNA and 18S rRNA together might help determine the microbiological aetiology, as well as to report DASGA problems.

The diagnostic usefulness of guided aneurysm sac aspiration in a cohort of patients with VGEIs was documented in this single-center observational research. It also showed how combining cultures with 16S rRNA/18S rRNA PCR might help physicians figure out what's causing VGEIs microbiologically. Because PCR results might disclose impurities, they should be taken with caution, and the ultimate diagnosis of aortic VGEIs must rely on clinical presentation, radiological, surgical, biochemical, and microbiological findings. DASGA was discovered to be safe and to disclose the microbiological aetiology in over 90% of individuals with suspected VGEIs. When normal culture procedures yielded a negative result in the majority of instances with a VGEI (58 percent), 16S rRNA/18S rRNA PCR was used to determine the aetiology of the VGEIs.

In this investigation, there were few significant problems associated with guided aspiration in general and trans lumbar puncture in particular. This corresponds to the outcomes of the same approach for various indications. The aspiration operation for one infected thoracic endovascular aortic repair

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was hampered by pneumothorax, a common consequence of pulmonary CT guided biopsies. There were no major difficulties with guided aspirations in AAAs. When directly collected specimens must be safeguarded, it is suggested that this procedure is safe and most valuable. While there is a danger of infection if a needle is inserted while an infection is suspected but not proven, the possible advantages are thought to outweigh the risk. In addition to antibiotic therapy, source control gained by infection drainage is crucial if an infection has been detected.

The study's successful aetiology rate was high; when patients where no infection diagnosis was given were excluded, the percentage climbed to 89 percent. Despite this, the percentage is lower than that reported by Erb et al. who discovered the infecting microbe in 98.4% of patients. If antibiotic therapy had been discontinued before to DOS and at least three samples for culture and 16S rRNA/18S rRNA PCR had been acquired in each DOS, it is probable that better findings would have been achieved in the current study. However, as previously reported, this work emphasizes the diagnostic significance of conducting 16S rRNA/18S rRNA PCR on microbiological samples. Each DOS should send at least three samples for culturing if feasible. When puncturing, needles of various diameters might be used to reduce the risk of complications while maintaining the specimen's quality. To get to the bottom of this, more research is needed. The most prevalent pathogen detected in this study was Corynebacterium acnes, a microbe renowned for its capacity to develop biofilm on prosthetic materials and implanted devices. It was previously identified as a source of VGEIs. In an aortic VGEI, whether C. acnes and CoNS are real pathogens or commensals is debatable, and the data should be read with caution when assessing these individuals. A few things about the microbiological aetiology uncovered in this investigation are also noteworthy. If only cases with an aetiology were included, the gut microbiota (48 percent) and skin microbiota (28 percent) were the most common sources of VGEIs (32 percent). Three of the four cases of aorto-enteric fistula discovered were, predictably, linked to gut flora.

*L. monocytogenes* was found in cultures and 16S rRNA in four diagnostic punctures in two individuals. While Listeria spp. is unusual as a cause of VGEI, one research found that it may produce both VGEI and mycotic aortic aneurysms, the latter of which is also uncommonly caused by this bacterial pathogen. Legionella pneumophila produced a VGEI in one patient, which is highly unusual but has previously been reported in vascular graft infections. This patient had pneumonia caused by L. pneumophila, which had occurred a few months before the VGEI. This demonstrates that PCR has the potential to alter our understanding of the range of organisms that infect vascular grafts. Antimicrobial resistance was discovered to be strongly linked to several bacteria, including Enterobacter cloacae, Enterococcus faecium, and Klebsiella pneumoniae. This is concerning, as global resistance rates continue to rise, making oral antibiotic treatment more challenging. This research has certain drawbacks. It was a retrospective, single-center study, with a small cohort size and the possibility of selection bias. This tiny sample size, which was acquired over a ten-year period, reflects the reality that DASGA is only needed by a small number of patients. The presented technique, on the other hand, is useful since it allows for targeted antibiotic therapy in patients who are then treated conservatively or as a preventative measure for those who are afterwards treated with radical surgery. This will need to be evaluated in larger research in the future.

## CONCLUSION

The microbiological aetiology of aortic transplant infections can be determined by guided aspiration. When normal culturing techniques are used with 16S rRNA/18S rRNA PCR, the procedure is safe and has a good success rate for determining the microbiological aetiology of a VGEI. Finding the causative microbial aetiology is critical, and trans lumbar puncture may be utilized without substantial problems in the great majority of instances.