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MICROBIOLOGICAL ISOLATES AND IT'S RESISTOTYPE FROM CLINIC OF VASCULAR SURGERY FOR THE FIRST QUATER OF 2022

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Abstract: One of the most common complications of surgical exposures is the surgical site infection (SSI). Although it varies between different surgical profiles, it can reach up to one third of all complications. In vascular surgery patients ischemic ulcers are very common, as well as factors, compromising the immune system such as diabetes, chronic kidney disease etc. One of the main surgical exposures in vascular surgery is inguinal, providing access to the femoral artery and its bifurcation. Although it allows a wide range of reconstructions, implanting different types of prosthetic materials, stents and providing anastomosis site, it contains lymph nodes, which can contaminate the reconstruction and cause SSI with severe consequences. Patients, prone to SSI due to concomitant diseases, are threatened by sepsis, limb loss and even death, which makes prevention of those type of complications essential.

Aim: To investigate etiological spectrum of microbiological isolates and their resistance against most common antimicrobials among vascular surgery patients.

Materials and methods: The study is retrospective, conducted in the period 01 January 2022 – 31 March 2022. All of the samples were obtained from patients of Clinic of Vascular Surgery. After isolation of pure culture from the samples, the strains were identified by MALDI TOF MS and Vitec – 2 Compact. Antibiotic resistance was determined with Bauer-Kirby disk diffusion method.

Results: From all 419 of the patients, hospitalized in the Clinic of Vascular surgery for this period, 28 isolates from 26 (6,21%) patients were obtained, of which Gram-negative were 19 (67,86%) and Gram-positive - 9 (32,14%). From Gram-negative - enterobacteria – 14 (73,68%), and non-fermenting gram-negative bacteria (NFGNB) were 5 (26,32%). Only 3 (21,43%) from all enterobacteria were extended spectrum beta-lactamases producing strains (ESBLs). No strains, resistant to carbapenems (RCP) were isolated. Five (55,55%) of the Gram-positive isolates were Staphylococcus aureus, 4 (80%) of which were methicillin resistant Staphylococcus aureus (MRSA). Two of the Gram-positive species isolated were Enterococcus faecalis, of which 1 with a high-level aminoglycoside resistance (HLAR). No Vancomycin resistant enterococci (VRE) were discovered. There were no colistin-resistant Acinetobacter baumannii and Pseudomonas aeruginosa strains.

Conclusion: From all 28 isolates 8 (28,57%) were with acquired types of antimicrobial resistance. With almost one third of the isolates that are problematic in terms of antibiotic susceptibility, treatment of those patients can be challenging. Prevention of in hospital contamination with polyresistant strains, associated with medical care it is crucial for reducing the number of severe complications, decreasing of hospital stay and cost for treatment.

Keywords: Vascular surgery, Surgical site infection, Microbiological isolates, Resistotype

Introduction

The prevalence of peripheral artery disease (PAD) is reaching almost 15% in patients above 45 years of age and up to 20% in patients aged above 70 years (Andras, 2014; Cacoub, 2009; Norgren, 2007; Ohman, 2006; Olin, 2010; Beaumier, 2020). A recent study of the general population in Germany revealed an increase in the prevalence of PAD among the general population from 1,85% in 2009 to 3,14% in 2018 with annual prevalence of Rutherford class 5-6 (Critical limb ischemia and tissue loss) varying between 4,5-7% (Rammos, 2021). One of the most common complications of surgical exposures is the surgical site infection (SSI). Although it varies between different surgical profiles, it can reach up to one third of all complications (WHO GGPSSI, 2019; PHE, 2019; GIVE, 2021). Main causes for SSI in vascular surgery are break in the aseptics, contact of the graft with patient's flora harboured in lymphatic nodes injured intraoperatively (Back, 2005; Bandyk, 1991). In addition, concomitant diseases such as diabetes, kidney failure etc. are independent factors for decreasing local immunity and can lead to SSI (Inui, 2015; Trinidad, 2019; Wiseman, 2015; GIVE, 2021). Considering the possibility for bacterial lymphatic metases in animal models (Siggins, 2020) and the reported frequencies of infections associated with vascular

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prosthesis varying between 0.2 and 5% depending on the vascular exposure (Bandyk, 1991; Dean, 1978; Fry, 1966; Liekweg, 1977; O'Hara, 1986; Calligaro, 1992; Campbell, 1994; Durham, 1986; Goldstone, 1974; Lorentzen, 1985; Naylor, 2002; Ohki, 2001; Rosenthal, 1990; Szilagyi, 1972; Hallett, 1977)

Aim

To investigate etiological spectrum of microbiological isolates and their resistance against most common antimicrobials among vascular surgery patients.

Materials and methods

The study is retrospective, conducted in the period 01 January 2022 – 31 March 2022. All of the samples were obtained from patients of Clinic of Vascular Surgery with wet gangrene, ulcers or clinical suspicions of surgical site infection after vascular reconstruction. The specimens were immediately placed in Amies transport medium. After delivery in Department of Microbiology, samples were cultured on 5% sheep blood agar, eosin methylene blue (EMB) agar, chocolate agar and chromagar candida. The incubation was performed on 35-37oC for 24-48 hours. The isolated pure cultures were identified by MALDI TOF MS and Vitec – 2 Compact. Antibiotic resistance was determined by EUCAST 2022 protocol.

Results

For the observed period 419 patients were hospitalized in the Clinic of Vascular surgery.

Table 1

Twenty-eight isolates from 26 (6,21%) patients were obtained. Isolated microorganisms originated from 13 geniuses. Most of the isolates were presented by Order Enterobacteriales, followed by NFGNB and Staphylococcus spp. No fungal isolates for the period were found (Table 1).

Microorganism	Isolates number
Acinetobacter baumanii	2
Citrobacter freundii	2
Enterobacter cloacae	1
Enterococcus faecalis	2
Klebsiella oxytoca	2
Klebsiella pneumoniae	3
Morganella morganii	2
Proteus vulgaris	1
Pseudomonas aeruginosa	2
Raoutella ornitholytica	1
Serratia liquefaciens	2
Staphylococcus aureus	5
Coagulasa negative staphylococci	2
Stenotrophomonas maltophilia	1
Total	28

Among the isolated microorganisms in the period Gram-negative bacteria were prevalent almost three times fold to Gram-positive. Most isolated bacteria from Gram /+/ group were Staphylococcus spp. - Staphylococcus aureus was 5 (55,6%) and Coagulase-negative Staphylococci 2 (22,2%). Other isolated Gram-positive cocci were Enterococcus faecalis. (Figure 1)

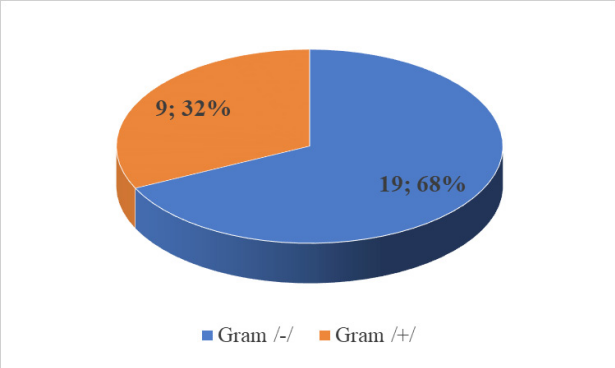

Figure 1

Gram-negative isolates consisted from two major groups – Order Enterobacteriales and non-fermenting gram-negative bacteria, as enterobacteriales were found in ¾ from all of the Gram/-/ isolates. (Figure 2)

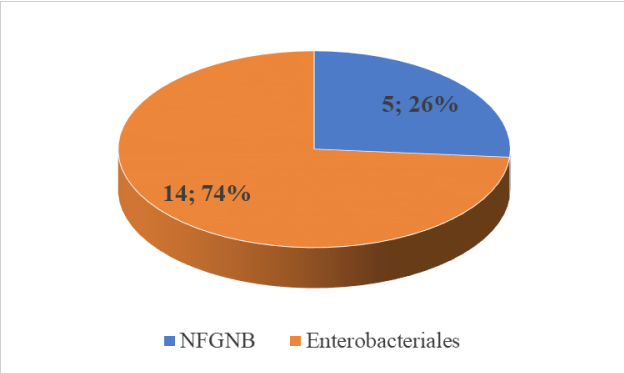

Figure 2

Most isolated species from all positive cultures was Staphylococcus aureus - 5 (17,6%). Methicillin sensitive Staphylococcus aureus was found in one (20%) of the cases and MRSA in four (80%). (Figure 3). Three (60%) of the strains were resistant to Clindamycin, but all 5 were susceptible Trimethoprim-sulfamethoxazole and Ceftaroline.

High-level of aminoglycosides resistant (HLAR) strain of Enterococcus faecalis was found in one case (50%).

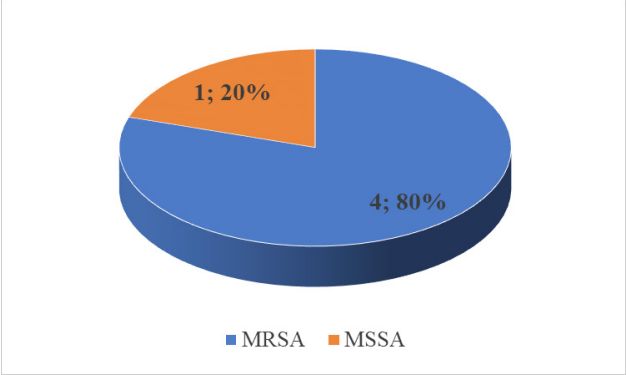

Figure 3

From all of the Enterobacteriales orders, ESBLs producing strains were found in 3 (21%), the other 11 (79%) strains were susceptible to penicillines and cephalosporines. (Figure 4)

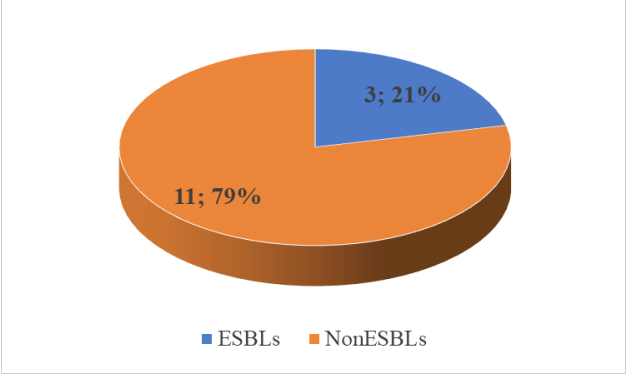

Figure 4

Overall, 20 (71%) of the isolated strains were highly susceptible to tested antimicrobials. In 8 (29%) of the positive cultures showed different mechanisms of an acquired resistance. (Figure 5)

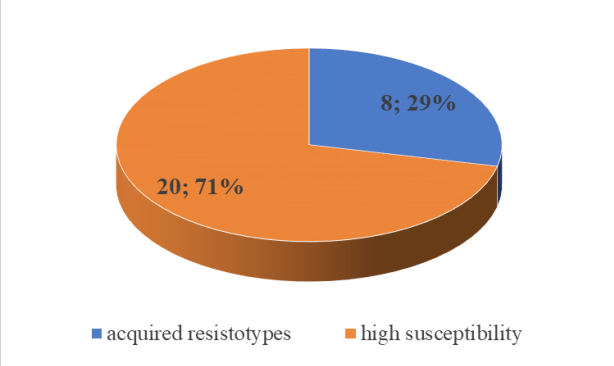

Figure 5

Discussions

From all of the isolated strains problematic resistotype was found in eight of the cases for the period. Methicillin-resistant *Staphylococcus aureus*, ESBLs producing strains and HLAR reach almost 1/3 of the isolates. No Vancomycin-resistant enterococci (VRE) and resistant to carbapenems strains were isolated for the period. According to the world literature the etiological spectrum of SSI in vascular surgery is very broad, with prevalence of *Staphylococcus aureus* and *Enterobacteriales*, which can lead to an increase of acqired antimicrobial resistance in those microorganisms (Back M.R., 2019). Broad spectrum-beta-lactamases producing strains also are in major consideration, reaching 21% of all of the *Enterobacteriales*, which approximate other autors observations (Jolivet, 2018). Surgical site infection (SSI) can be found in 2% to 5% of all surgeries, performed in the United States (Martone, 1998). Known risk factors for MRSA contamination include diabetes, chroniodialysis, peripheral vascular disease, prolonged antibiotic exposure, and extended length of stay in the ICU (Drinka, 997; Ibelings, 1998). The overall compromised local and systemic immunity in vascular patients can allow a local opportunist infection evolve in systemic one. (Inui, 2015; Trinidad, 2019; Wiseman, 2015; GIVE, 2021; WWIWP Canada, 2022).

Conclusions

From all 28 isolates 8 (28,57%) were with acquired types of antimicrobial resistance. With almost one third of the isolates that are problematic in terms of antibiotic susceptibility, treatment of those patients can be very challenging in terms of costs and final outcome. Prevention of in hospital contamination with polyresistant strains, associated with medical care it is crucial for reducing the number of severe complications, decreasing of hospital stay and cost for treatment.

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