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Original Contribution

MOST COMMON BACTERIA AS CAUSATIVE AGENTS OF FOURNIER'S GANGRENE

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ABSTRACT
PURPOSE: Fournier's gangrene is a form of necrotizing fasciitis, whose main treatment is surgery, followed by adequate antibiotic therapy. In the present study, we have investigated the most common bacteria acting as causative agents of Fournier's gangrene. We have also attempted to determine their antibiotic sensitivity. METHOD: The object of the study are 17 patients with Fournier's gangrene, treated in the Clinic of Urology of St. Anna Multiprofile Hospital for Active Treatment in Varna from 2021 to 2023. RESULTS: Gram-negative bacteria were found in 13 cases, and Gram-positive bacteria in 15 cases. Gram-negative bacteria showed good sensitivity to aminopenicillins, third-generation cephalosporins, carbapenems, fluoroquinolones and aminoglycosides, with the exception of *Acinetobacter* and *Pseudomonas*. All Gram-positive bacteria were sensitive to vancomycin. CONCLUSIONS: In the empiric initial choice of antibiotic, it is appropriate to take into account the high frequency of Gram-positive bacteria, mainly susceptible to vancomycin.

Keywords Enterococci, staphylococci, streptococci, Gram-positive bacteria, Gram-negative bacteria

INTRODUCTION

Fournier's gangrene is a form of necrotizing fasciitis involving the soft tissues of the perineum, external genitalia, and the perianal region (1). In the treatment it is of paramount importance to completely remove dead tissues up to 24 hours after hospital admission via surgery (2). Usually, during the operative treatment of the wound, samples for aerobic and anaerobic cultivation of bacteria are collected. Along with that, empirical antibiotic therapy with third-generation cephalosporins with gentamicin and metronidazole or clindamycin is initiated immediately. It can be adjusted after several days when the culture results are ready (3). In the present study, we have investigated the most common bacteria as causative agents of Fournier's gangrene. We have also attempted to determine their antibiotic sensitivity.

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MATERIALS AND METHODS

This study includes patients with Fournier's gangrene, treated at the Clinic of Urology of St. Anna Multiprofile Hospital for Active Treatment in Varna. Seventeen patients were hospitalised from 01 March 2021 to 01 March 2023. All of them presented with evidence of microbial causative agents (including an antibiogram).

RESULTS

The patients ranged from 42 to 99 years of age, or 67.8 years on average. In 6 cases (35.3%) diabetes mellitus was concomitant, whereas one patient (5.9%) had liver cirrhosis. Four cases (23.5% of all) ended with *exitus lethalis* (non-diabetic, aged 85 on average).

Table 1 shows the isolated bacteria.

Gram-negative bacteria were found in 13 cases, and Gram-positive bacteria in 15 cases. We found two causative agents in six of the cases (35.3%), and five causative agents in one of the patients (after two consecutive culture examinations).

Table 1. *Isolated bacteria and number of cases*

Isolated bacteria	Number of cases
Streptococci	1
Staphylococci	6
Enterococci	5
Corynebacteria	3
Proteus	1
Klebsiella	1
Escherichia coli	6
Enterobacter	2
Pseudomonas	1
Acinetobacter	2

Regarding the sensitivity of bacteria to antibiotics, we obtained the following results:

- *Acinetobacter* were sensitive only to colistin.
- The remaining Gram-negative bacteria showed good sensitivity to aminopenicillins, third generation cephalosporins, carbapenems, fluoroquinolones and aminoglycosides (possibly with the exception of *Pseudomonas*).
- Gram-positive bacteria, such as *Enterococci* were particularly problematic, despite being commonly sensitive to ampicillin/sulbactam (80% of cases) and sulfamethoxazole/trimethoprim (80% of cases).
- All Gram-positive bacteria were still susceptible to vancomycin.
- For *Staphylococci* and *Streptococci*, doxycycline, clindamycin, rifampicin, erythromycin, linezolid may also be considered (almost 100% sensitivity to the indicated antibiotics).

DISCUSSION

According to literature data (4, 5), mortality from Fournier's gangrene varies from 16% to 40% (in our patients: 23.5%). At the same time, various scores have been developed to assess the severity of the disease. The main risk factor for death in our patients was advanced age (85 years on average), not so much the presence of comorbidities (none of the deceased patients was, for example, diabetic).

Among the additional treatment modalities being studied, we can also mention the treatment with hyperbaric oxygen therapy. A comparative series of cases in 2015 shows a certain success, but the evidence is not very consistent yet (6, 7). No evidence of a positive effect from negative-pressure (vacuum) wound therapy has been reported.

As noted at the beginning, in addition to surgical treatment (which is also the main one), an important factor is the exact antibiotic treatment aimed at the bacteria isolated in the culture. In our study, there was a high frequency (15 cases) of Gram-positive bacteria - not only *Staphylococci* (6 cases) and *Streptococci* (1 case), but also *Enterococci* (5 cases) and *Corynebacteria* (3 cases). In such cases, the antibiotic of choice is likely to be vancomycin, which is a strategic antibiotic. However, it may be more appropriate, when possible, to substitute it with one of the abovementioned alternatives (e.g. ampicillin/sulbactam if susceptible *Enterococci* have been isolated).

Gram-negative bacteria occurred less often (13 cases), although they are the main cause of urinary tract infections. Good sensitivity to the most commonly used antibiotics (aminopenicillins, third generation cephalosporins, carbapenems, fluoroquinolones and aminoglycosides) was observed. Only one case with *Pseudomonas* was sensitive to sulperazone, aminoglycosides and colistin.

As a drawback of the present study, we should note the lack of isolated typical anaerobic bacteria, such as *Bacteroides*, *Fusobacteria*, *Clostridia*, which are traditionally found in Fournier's gangrene. This is probably related to their considerably more difficult cultivation compared to aerobes. In addition, timely and competent surgery can practically eliminate them, so that any subsequent culture would find a superimposed aerobic, but not anaerobic infection.

CONCLUSIONS

Fournier's gangrene is a life-threatening infection where prompt surgical treatment is key to patients' survival. In the empiric initial choice of antibiotic, it is appropriate to take into account the high frequency of Gram-positive bacteria, mainly sensitive to vancomycin.

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