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Research Article

Staphylococcal Meningitis: Review of Five Cases

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Abstract

The aim of this study is to analyze the clinical characteristics, laboratory results, therapy and outcomes of five cases of staphylococcal meningitis (SM), treated at University Hospital – Pleven, Bulgaria since 2010. The cases were aged 7-69-years; three male and two female. Three of the cases were acquired in society. Two patients were operated because of brain tumor and meningitis appeared secondary. Fever (4/5), headache (3/5), nausea (2/5), photophobia and hyperacusis (1/5) were registered. Neck rigidity and pathological reflexes were found in all patients. Two cases were in comma. Investigations of cerebrospinal fluid (CSF) revealed increased protein level, neutrophil pleocytosis and variable glucose level. The glycorhachia/glicemia ratio was 0.45. Staphylococcus aureus,

haemoliticus and hominis (in three, one and one, respectively) were found by the culture of cerebrospinal fluid (CSF) and Latex agglutination. Sphenoiditis, hemorrhagic vascular incident and a massive cerebellar tumor (in one case, respectively) were detected by computed tomography. Ceftazidim, vancomycin, amikacin and metronizadol (in combinations) and meropenem solely were administered. Supportive treatment with corticoids, diuretics, fluids and blood products was carried out. The duration of treatment was 5-13 days. All cases successfully recovered. The Conclusion is that Staphylococcal meningitis is uncommon but severe disease and requires correct diagnosis and prompt adequate treatment.

Keywords: Staphylococcal meningitis, Staphylococcus aureus, postoperative meningitis.

Introduction

Despite constantly increasing infections, staphylococci are still uncommon reason for bacterial meningitis. Staphylococcal meningitis (SM) is a challenging disease and its epidemiology is not fully clear. The first proven case of SM was described by Galippe in 1889 after pustulised fistulae of the lower jaw in a 23-year-old patient (quoted in Rodrigues et al., 2000). The cases caused by staphylococci are usually secondary and may start as nosocomial infection after surgical intervention (most often neurosurgical) or as community-acquired disease after serious accompanying illnesses (endocarditis, osteomyelitis, arthritis, otitis etc.) (Buckwold et al., 1977, Rodrigues et al., 2000, Pedersen et al., 2006, Pintado et al., 2012, and Ritchie et al., 2007). Aguilar et al. (2010) described cases of SM in intravenous drug addicts.

Staphylococci cause more than 80% of the suppurative-inflammatory cases and nosocomial infections. The most widely-spread strain is *Staphylococcus aureus*, which is the commonest causative agent of SM. The newborns, immunocompromised and elder people are at highest risk and they need a serious treatment. There are two types of *Staphylococcus aureus*: methicillin-sensitive (MSSA) and methicillin-resistant (MRSA). According to Chang et al. (2001), meningitis caused by both types does not differ in clinical manifestations and prognosis. The once significant importance is the route of transmission of infection. MSSA meningitis is more often community-acquired whereas MRSA meningitis is nosocomial infection after neurosurgical interventions. Another widely-spread staphylococcus is *Staphylococcus epidermidis*, which concerns mainly newborns and prematurely born at continuous treatment.

The clinical characteristic is similar to that in other bacterial neuroinfections, in which fever, headache, meningeal and focal neurological symptoms, spasms and comatose state are often seen. In research studies of Rodrigues et al. (2000), and Pintado et al. (2012) is mentioned that destroyed psychic behavior is often observed in SM cases. Investigations of cerebrospinal fluid (CSF) show pleocytosis, proteinorrachia and hypoglucorachia, which are typical of bacterial meningitis, but Pintado et al. (2012) recently mentioned that the cause of the disease is not always clear when CSF and blood culture tests are carried out.

Difficulties in treatment of SM are connected with the choice of antimicrobials because of increased frequency of MRSA. Vancomycin is mainly used, as well as rifampin, linesolid,

teicoplanin, trimethoprim/sulfamethoxazole (Aguilar et al., 2010, Pedersen et al., 2006, and Pintado et al., 2012).

The mortality rate of staphylococcal meningitis is high and varies from 31% to 56% (Aguilar et al., 2010, Pedersen et al., 2006, and Pintado et al., 2012). Cases after neurological interventions have a more favorable outcome than community-acquired. Studies in children had not registered any lethality at all (Kaneva, 1986).

The aim of this study was a retrospective clinical-epidemiological review of cases of staphylococcal meningitis.

Patients and Methods

Data from the hospital records of five patients with SM were

used. Patients were treated at University Hospital – Pleven during four-year period (2010-2013).

Results

The five studied cases were aged 7-69, mainly 60-70-years-old (3/5); three were male and two female. Two of them were hospitalized in Clinic of Infectious Diseases, two were sent from Clinic of Neurosurgery and one from Clinic of Otorhinolaryngology. The meningitis in three cases was community-acquired. Two patients were operated because of brain tumor and meningitis at them appeared secondary. In all patients was registered co-morbidity – hypertonic disease, diabetes, cardiomyopathy. A preliminary treatment with antibiotics was carried out only at one patient, who was sent

from Clinic of Otorhinolaryngology with diagnosis of acute sphenoiditis.

Only one of cases was without fever. Three of patients reported a headache, two – nausea, one reported photophobia, hyperacusis and one hyperesthesia. In two of cases generalized seizures were registered. Neck rigidity was manifested in all cases, upper Brudzinski' sign in three of the patients, lower Brudzinski' sign was not observed, and Kernig' sign was registered in four of the patients. Pathological reflexes from Babinsky' group were found in all patients. Two of patients were in comma.

Laboratory investigations revealed: leucocytosis ($9.4 - 18.5 \times 10^9 / L$), increased fibrinogen level (up to 9.9 g/L), extremely increased C-reactive protein (CRP) (up to 611 mg/L).

Investigations of cerebrospinal fluid (CSF) revealed increased protein level (0.89 – 5.5 g/L), pleocytosis (613 – 13,483/ μ L) with granulocytes up to 0.93, and hypoglycorachia (0.61 – 3.75 mmol/L). The glycorachia/glicemia ratio had varied from 0.14 to 0.45. Higher rate was due to the high level of blood glucose level in a patient with diabetes. Culture of CSF and Latex agglutination assay was carried out in all cases. Microbiological investigation was performed by culture of CSF sediment on blood agar (5% sheep blood), chocolate agar and Levine media, followed by selective investigation in bottles BACTEC PLUS Aerobic (Becton Dickinson, USA). Latex agglutination assay was used for direct confirmation of bacterial antigens in CSF by PASTOREX™ MENINGITIS (Bio-Rad, France). Staphylococcus aureus (in three cases), Staphylococcus haemolyticus and

Staphylococcus hominis (in one case, respectively) were found. All of isolated strains were MSSA.

Computerized tomography (CT) was performed in three patients. Acute sphenoiditis, hemorrhagic vascular incident and a massive process in the vermis of cerebellum (in one case, respectively) were detected.

A combined treatment was carried out. The following antibiotic combinations were administered: ceftazidim and vancomycin (2/5), ceftazidim, amikacin and metronizadol (1/5), cephtriaxon, metronizadol and gentamycin (1/5) and monotherapy with meropenem (1/5). The duration of antimicrobial treatment was from 5 to 10 days. Dexamethazone was administered in all patients. Supportive treatment with mannitol 10%, glucose 5%

and physiologic saline 0.9% was carried out. Blood products (plasma, human albumin 20% and immunovenin) were infused. The duration of the treatment was 5-13 days. All cases successfully recovered and were discharged without any sequels.

Discussion

Despite of data of Aguilar et al. (2010), Cheng-Hsien et al. (2000), Rodrigues et al. (2000), and Nørgaard et al. (2003), we had not registered high number of cases of SM. There are 910 beds in the University Hospital – Pleven and in the Clinic of Infectious Diseases – 20 beds. On that base, five cases of SM within four years are few. During that period, 29 cases with bacterial meningitis were treated in our Clinic. Etiological structure is as follows: *S. pneumoniae* (8/29), *S. aureus* (3/29), *Staphylococcus*

haemoliticus and Staphylococcus hominis (1/29, respectively), L. monocytogenes (2/29), E. coli (2/29), N. meningitides (1/29), and H. influenzae type B (1/29). Tuberculous etiology was confirmed in one case, and in remainder nine the causative agent was unclear. The patients with SM were 17.24% of all cases of bacterial meningitis within four years (2010-2013). The sample size is small (only five cases), but we consider that staphylococcal meningitis requires an attention because of severity and therapeutic difficulties (especially in cases due to MRSA). SM is uncommon in children (Kaneva, 1986) and in our study there was only one seven-years-old child, who was infected after a neurosurgical intervention because of cerebellar tumor. In our previous studies upon bacterial infections of the central nervous system (CNS) in nine newborns, staphylococcus was isolated only at one (from blood culture). In the present study, all of patients

were with co-morbidity and meningitis was secondary, in accordance to all mentioned above authors.

Clinical characteristic of all patients was similar to the data mentioned in the study of Rodrigues et al. (2000). Neck rigidity was more often observed than the other meningeal symptoms.

Laboratory investigations of CSF are frequently commented, but the attention has focused mainly to predict a causative agent on the base of type of onset, epidemiological data and any specificity of the levels of protein and glucose in CSF, and pleocytosis (Cheng-Hsien et al., Rodrigues et al., 2000, and Pintado et al., 2012). According to Pintado et al. (2012) hypoglucorachia is found only in 30%. In our study, there were also cases with slightly elevated CSF protein (0.89 g/l), moderate pleocytosis

(613/ μ L) and normal CSF glucose, but in all cases staphylococcus had been isolated by culture of CSF. Staphylococcus aureus was the commonest agent (isolated in three of five treated patients).

The patients with SM require prompt and adequate etiological and supportive treatment. Antibiotics, administered at our patients are in unison with literature data. In recent studies, vancomycin is preferred, and amikacin, cephalosporins, rifampin, flucloxacillin, daptomycin and others also are recommended, according to the sensitivity of isolated agent (Aguilar et al., 2010, Lee et al., 2008, Rodrigues et al., 2000, and Ritchie et al., 2007). We administered corticoids to resolve brain edema and prevent relapses and neurological complications.

The quoted in literature studies involve a large number of patients for long period of time with high lethality. The cases, which we studied for the period from 2010-2013 were few, but all were with favorable outcome. We consider that the short hospital treatment (5 to 13 days) and the favorable outcome without any sequels are a novelty to the current literature.

Conclusion

Staphylococcal infections of CNS are not common, but severe diseases. When the diagnosis is correct and an adequate treatment begins without delay, the outcome is successful and without sequels.

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