INFECTIVE ENDOCARDITIS CAUSED BY DENTAL PROBLEMS CORRELATED WITH BICUSPID AORTIC VALVE.

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RUNNING TITLE

Infective endocarditis correlated with bicuspid aortic valve.

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CONFLICT OF INTERESTS

no conflict of interest

ABSTRACT

The aim of the study was to emphasize the importance of prophylaxis of infective endocarditis. Also, the influence of heart failure and bacterial etiology on the treatment was analyzed. This study presents a case report of a patient who was suffering from IE. He was treated in the Cardiology Ward at the Medical University of Lublin. 47-year-old man has resected his tooth in a dental surgery. After a few days at home, he presented non-specific symptoms like fever and chest pain. Bicuspid aortic valve was diagnosed at the Cardiology Ward. Furthermore, vegetation on aortic valve was recorded in echocardiography. That is why IE diagnosis was made. After the therapy with Vancomycin, vegetation on aortic valve was still present. Regurgitation in 3rd state was developed by the patient. New valve was implanted. A few days after operation the patient had subfebrile state. He was treated with Vancomycin and Clindamycin. Currently, he is receiving ciprofloxacin as prophylaxis of IE. Heart failure is a risk factor of IE. These patients should get antibiotic prophylaxis before dental surgery. Patients with heart defect can develop more severe type and treatment in these cases is more difficult. Everyone should undergo non-specific prophylaxis of infective endocarditis.
BACKGROUND

Endocarditis is an inflammation of the inner tissues of a heart. It may include one or more heart valves, the mural endocardium, or a septal defect. Its intracardiac effects include severe valvular insufficiency, which may lead to intractable congestive heart failure and myocardial abscesses. If left untreated, IE is generally fatal [1]. Infective endocarditis usually concerns aortic valve or mitral valve, rarely tricuspid valve (correlated with drug addiction). Very rarely IE involves ventricles, atria and endothelium of great vessels in the thorax (for example aortic coarctation). It is sometimes caused by extraneous factor such as electrodes of heart pacemaker. Bacteremia precedes infective endocarditis (about 2 weeks in 80% of cases and it sometimes ranges from 2 to 5 months). Bacterial etiology constitutes 90% of cases. Approximately 70% of infections in NVE are caused by Streptococcus species, including S viridans, Streptococcus bovis, and enterococci. Staphylococcus species cause 25% of cases and generally demonstrate a more aggressive acute course (see the images below) [1]. In the past, Streptococcus viridans was the most frequent reason of infective endocarditis affecting natural valve. Less often these were Enterococcus spp., Chlamydia, Mycoplasma. In 10% of cases etiological factor cannot be found.

The most common symptoms are: high fever, joint pain, myalgia, astia, nausea, night sweats, asthenia, petechiae weight loss and shivers [2]. Murmurs can be found in 80% of cases during auscultation [3]. Sometimes there could be pneumonia, pulmonary embolism, or ecchymosis. Diagnosis can be established as definite IE, possible/rejected IE or rejected IE. To make definite diagnosis we need two major criteria, or 1 major and 3 minor criteria, or 5 minor criteria [4]. Criteria of IE and diagnostic algorithm can be seen in the diagram below.

The aim of the study was to analyze the case of infective endocarditis in the context of the most frequent etiology and the results of treatment. Furthermore, we wanted to emphasize the importance of prophylaxis of common cases in the future.

MATERIAL AND METHODS

The study involved a case of a patient treated in the Cardiology Ward at the Medical University of Lublin. Attention was paid to the initial symptoms, diagnosis, treatment and prognosis. Complications were compared with available literature.

RESULTS

A 47–year-old man has a tooth resection in a dental surgery. After two days at home he suffered from malaise, fever, shivers and chest pain. After his visit in a GP office he was admitted to the Cardiology Ward on 17th April 2007. Vegetation on the aortic valve was discovered with the use of echocardiography. Moreover, it turned out that the aortic valve was bicuspid, which could constitute a risk factor of infective endocarditis. IE diagnosis was made. Unfortunately, hemoculture was negative and it resulted in empiric antibiotic therapy. The patient was treated with Vancomycin. Since he was allergic to acetaminophen, which he had taken at home, he developed toxic and allergic dermatitis. That is why he received Prednisone, Calcium, Omeprazole, Lactobacillus acidophilus, Cilium and Methylprednisolone in ointment. As a result of IE, the patient developed aortic valve regurgitation at 3rd stage. On 3rd July 2007 the patient was transferred to Cardiosurgery Department, where artificial aortic valve was implanted. Results of laboratory tests before the operation were as follows: CRP: 28.68; WBC: 12530; creatinine 0.8 mg%; troponin I: 0.0 ng/ml. The surgery was conducted in precipitated procedure as a result of continued vegetation on aortic valve which was recorded in echocardiography. There were no complications during the procedure. After the operation Vancomycin treatment was continued. Starting with the 3rd day the patient had a subfebrile state peaking 38.6 C, CRP: 48.41; 59.90; 89.28 mg/l. There was no increase in the hemoculture test. Vancomycin Clindamycin, Atenolol, Acenocumarol, Omeprazole, Spiranolactone, Atenolol, Lorazepam. Metamizol were ordered. INR was 2.0 – 3.0. On 26th July no vegetation was observed in echocardiography. The swab showed growth of Streptococcus viridians. Chest X-ray revealed cardiomegaly. Currently, the patient under the care of cardiology dispensary – CRP: 7.84 mg/l; INR: 2.6; WBC<4000. The patient is receiving Ciprofloxacin as prophylaxis of IE.

DISCUSSION

This research is important because it shows two problems arising while treating IE at the same time. First of them is bicuspid aortic valve (BAV). Patients with BAV have a higher tendency of Staphylococcal origin (38.9 vs. 21.5%, P=0.137), and 55.6% showed peri-valvular complications (TAV 16.1%, P=0.001) BAV was the only predictive factor of peri-valvular complications [5]. These patients usually require an early surgery which was confirmed by this case. Secondly, this case shows the importance of antibiotic prophylaxis of peri – dental procedures. However, other research shows the opposite: “In a large unselected cohort of patients with IE, the incidence of preceding dental procedures was minimal. The number of cases potentially preventable by means of AP was negligible” [6]. Our case proves that even if it is not a statistically important problem, it should be the subject of discussion in medical practice.

CONCLUSION

Antibiotic procedures must be limited to patients with the highest risk of IE (e.g. congenital heart disease) undergoing dental procedures. Amoxicillin or clindamycin are recommended antibiotics. The alarming thing is that a high number of people is not diagnosed and classified to the group of high risk of IE. That is why non-specific prevention is so important. Disinfection of wounds, dental and cutaneous hygiene, regular yearly dental follow-up (in high risk patients twice a year) and avoidance of piercing and tattooing are the examples of basic prophylaxis. On the other hand, patients with IE exposed to high risk factors can develop more complications of
therapy and additional treatment may be needed. Furthermore, non-specific symptoms like fever or chest pain, if persisting, require clinical tests.

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2. Wytyczne ESC dotyczące leczenia infekcyjnego zapalenia wsięregia w 2015r. Kardiologia Polska 2015;
4. Recomendations of Polish Society of Cardiology.

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Indications for echocardiography in suspected infective endocarditis

- **Clinical suspicion of IE**
  - TTE
  - TEE

- **Prosthetic valve**
  - Echocardiography

- **Non-diagnostic TTE**
  - TEE

- **Positive TTE**
  - TEE

- **Negative TEE**
  - TEE

**Clinical suspicion of IE**

- **TOE**
  - High
  - Low
  - Stop

- If initial TOE is negative but high suspicion for IE remains, repeat TTE and/or TOE within 5–7 days.

**TTE** = transthoracic echocardiography; **TEE** = transesophageal echocardiography

**TAB. 4. NON-SPECIFIC PREVENTION MEASURES SHOULD BE APPLIED TO THE GENERAL POPULATION AND PARTICULARLY REINFORCED IN HIGH-RISK PATIENTS.**

- **Non-specific prevention measures** should be applied to the general population and particularly reinforced in high-risk patients:
  - **Strict dental and cutaneous hygiene.** Dental follow-up should be performed twice a year in high-risk patients and yearly in the others.
  - **Disinfection of wounds.**
  - **Eradication or decrease of chronic bacterial carriage skin, oral.**
  - **Curative antibiotics for any focus of bacterial infection.**
  - **No self-medication with antibiotics.**
  - **Strict aseptic control measures** for any at-risk procedure.
  - **Discourage piercing and tattooing.**
  - **Limit the use of infusion catheters and invasive procedure when possible.** Favor peripheral over central catheters, and systemic replacement of the peripheral catheter every 3–4 days. Strict adherence to care bundles for central and peripheral cannulae should be followed.

**TAB. 5. MAIN PRINCIPLES OF PREVENTION OF INFECTIVE ENDOCARDITIS**

- **Main principles of prevention of infective endocarditis**
  1. The principle of antibiotic prophylaxis when performing procedures at risk of IE in patients with predisposing cardiac conditions is maintained.
  2. Antibiotic prophylaxis must be limited to patients with the highest risk of IE undergoing the highest risk dental procedures (dental procedures requiring manipulation of the gingival or periapical region of the teeth or perforation of the oral mucosa).
  3. Patients with a prosthetic valve, including transcatheter valve, or a prosthetic material used for cardiac valve repair:
    - **Patients with previous IE.**
    - **Patients with congenital heart disease.**
  4. Any cyanotic congenital heart disease.
  5. Congenital heart disease repaired with prosthetic material whether placed surgically or by percutaneous techniques, up to 6 months after the procedure or lifelong if there remains residual shunt or valvar regurgitation.

**TAB. 6. ESC 2015 ALGORITHM FOR DIAGNOSIS OF IE.**

- **ESC 2015 algorithm for diagnosis of IE**
  - **Clinical suspicion of IE**
    - **Modified Duke Criteria (6)**
      - Define IE
      - Possible/rejected IE but high suspicion
      - Rejected IE

**Definite IE**

- Native valve
- Prosthetic valve

**Possible IE**

- Native valve
- Prosthetic valve

**Rejected IE**

- Native valve
- Prosthetic valve

**In summary, echocardiography, BC, and clinical features remain the cornerstone of diagnosis of IE. When BC are negative, further microbiological studies are needed. The sensitivity of Duke Criteria can be improved by new imaging modalities (MRI, CT, PET/CT) that allow the diagnosis of embolic events and of cardiac involvement when TTE/TOE are negative or doubtful. These criteria are useful but they do not replace the clinical judgement of the ‘Endocarditis Team’.**
TAB. 7. ANATOMIC AND ECHOCARDIOGRAPHIC DEFINITIONS.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Surgery/Microscopy</th>
<th>Echocardiography</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetation</td>
<td>Infected mass attached to an endocardial structure, or on implanted intracardiac material</td>
<td>Oscillating or non-oscillating intracardiac mass on valve or other endocardial structures, or on implanted intracardiac material</td>
</tr>
<tr>
<td>Abscess</td>
<td>Perivalvular cavity with necrosis and purulent material not communicating with the cardiovascular lumen</td>
<td>Thickened, non-homogeneous perivalvular area with echodense or echolucent appearance</td>
</tr>
<tr>
<td>Pseudoaneurysm</td>
<td>Perivalvular cavity communicating with the cardiovascular lumen</td>
<td>Pulsatile perivalvular echo-free space, with colour-Doppler flow detected</td>
</tr>
<tr>
<td>Perforation</td>
<td>Interruption of endocardial tissue continuity</td>
<td>Interruption of endocardial tissue continuity traversed by colour-Doppler flow</td>
</tr>
<tr>
<td>Fistula</td>
<td>Communication between two neighbouring cavities through a perforation</td>
<td>Colour-Doppler communication between two neighbouring cavities through a perforation</td>
</tr>
<tr>
<td>Valve aneurysm</td>
<td>Saccular outpouching of valvular tissue</td>
<td>Saccular bulging of valvular tissue</td>
</tr>
<tr>
<td>Dehiscence of a prosthetic valve</td>
<td>Dehiscence of the prosthetic valve</td>
<td>Paravalvular regurgitation identified by TTE/TEE, with or without rocking motion of the prosthesis</td>
</tr>
</tbody>
</table>

(Adapted from Habib et al. with permission.)