Antibiotic Prophylaxis of Subacute Bacterial Endocarditis for Adult Patients by Dentists in Dade County, Florida

THOMAS HASHWAY, M.D., AND LAUREN J. STONE, R.N.

SUMMARY To determine compliance with 1977 American Heart Association (AHA) recommendations for antibiotic prophylaxis (AbP) of subacute bacterial endocarditis (SBE), we mailed a questionnaire to 1019 licensed dentists from Dade County, Florida. Of the 614 practicing dentists who responded, 97.7% believe that AbP prevents SBE and 94.2% always obtain a cardiac history from new patients. AbP is given to patients with known rheumatic or other valvular heart disease by 98.9% of respondents and to patients with known prosthetic heart valves by 81.5%. The majority of dentists prescribe the antibiotics recommended by the AHA, but the dosage, route, frequency and duration of therapy are usually not according to AHA guidelines. AbP completely consistent with these guidelines is prescribed by 15.4% of dentists for patients with heart disease and by only 6.7% of dentists for patients with prosthetic heart valves. The AHA recommends parenteral AbP for most patients with prosthetic heart valves, but approximately 80% of dentists use only oral agents for these patients. We conclude that most dental patients predisposed to SBE receive AbP, but not in accordance with AHA guidelines. The widest deviation occurs among patients with prosthetic heart valves.

SUBACUTE bacterial endocarditis (SBE) is a preventable, potentially devastating complication of heart disease. Often, dental procedures have been implicated causally because they are temporally related to the onset of symptoms and because the alphahemolytic streptococcus, which is indigenous to the oral cavity, is the most common infective organism.

The American Heart Association (AHA) has established guidelines for the prophylaxis of SBE among predisposed patients.1,2 The current 1977 guidelines are largely based on experimental animal research.3,4 They provide the practitioner with the choice of oral or parenteral penicillin, with or without parenteral streptomycin, for patients without a prosthetic heart valve who are not allergic to penicillin. For patients with penicillin allergy, oral erythromycin alone or with parenteral vancomycin is recommended. Parenteral antibiotics are suggested before the dental procedure for most patients with prosthetic heart valves, to be followed by a course of oral antibiotics; however, some patients with prosthetic valves and "a high level of oral health . . . may be offered oral antibiotic prophylaxis for routine dental procedures."1

In this report, we outline the patterns of antibiotic use by dentists in Dade County (includes greater Miami, Florida), for prophylaxis of SBE in adults. The 1977 AHA guidelines were the basis for comparing these patterns.

Methods

Between February 5, 1981, and June 17, 1981, each of the 1019 dentists licensed by the Florida Board of Dentistry as of December 31, 1979, who had an office listed in Dade County, was mailed a questionnaire and a cover letter explaining the background and importance of the survey. Nonresponders were mailed a second and, if necessary, a third questionnaire, each time

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reinforcing the importance of every response. For the second and third mailings, Spanish translations of the cover letter and questionnaire were mailed with the original English versions to dentists with Spanish-sounding surnames. Finally, if all mailed requests were unanswered, the nonresponding dentist was telephoned until either the dentist himself or his receptionist was contacted and his participation personally requested. A synopsis of the questionnaire is presented in the appendix.

Of the 1019 dentists surveyed, 663 (65%) responded. Of the nonresponders, 63 had moved, died, or had no office listing in either the area telephone directory or by telephone operator assistance. Of the 663 responders, 49 reported that they were not practicing in Dade County at the time of the survey. The remaining 614 responders form the basis of this analysis.

Results

Demographics

Demographic data were available on 538 (87.6%) of the 614 responders. Of these, 508 (94.4%) graduated from American dental schools and 436 (81%) practiced general dentistry, while the remainder practiced various dental specialties (i.e., orthodontics, oral surgery, endodontics, periodontics, prosthodontics and pedodontics). The decades of graduation were: before 1950, 107 (19.9%); 1950–1959, 142 (26.4%); 1960–1969, 171 (31.8%); 1970–1979, 118 (21.9%).

Table 1. Frequency of Antibiotic Prophylaxis for Prevention of Subacute Bacterial Endocarditis According to Heart Condition*

<table>
<thead>
<tr>
<th>Condition</th>
<th>Dentists prescribing antibiotics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rheumatic or other valvular heart disease</td>
<td>552 (98.9%)</td>
</tr>
<tr>
<td>History of bacterial endocarditis</td>
<td>495 (88.7%)</td>
</tr>
<tr>
<td>Prosthetic heart valve</td>
<td>455 (81.5%)</td>
</tr>
<tr>
<td>Congenital heart disease</td>
<td>399 (71.5%)</td>
</tr>
<tr>
<td>A heart murmur, even if cause unknown</td>
<td>278 (49.8%)</td>
</tr>
<tr>
<td>Intracardiac pacemakers</td>
<td>275 (49.3%)</td>
</tr>
</tbody>
</table>

*Based on responses to question 4 (appendix) by 558 dentists.

Table 2. Frequency of Antibiotic Prophylaxis for Prevention of Subacute Bacterial Endocarditis According to Type of Dental Procedure*

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Dentists prescribing antibiotics</th>
</tr>
</thead>
<tbody>
<tr>
<td>All dental procedures</td>
<td>212 (38.0%)</td>
</tr>
<tr>
<td>Only bloody procedures</td>
<td>239 (42.8%)</td>
</tr>
<tr>
<td>Only with obvious oral infection</td>
<td>42 (7.5%)</td>
</tr>
<tr>
<td>Both bloody procedures and with obvious oral infection†</td>
<td>65 (11.7%)</td>
</tr>
</tbody>
</table>

*Based on responses to question 5 (appendix) by 558 dentists.†Both the second and third alternatives to question 5 (appendix) were chosen.

Philosophy and Practice

Analysis of the responses to questions 1–3 in the appendix indicates that the overwhelming majority of dentists (97.7%) believe that prophylactic antibiotics prevent SBE in predisposed patients. A history of heart murmurs or other heart disease is always inquired of new patients by 94.2% of dentists, while another 3.6% obtain this history at least 50% of the time. To prevent SBE in predisposed patients, 91% of dentists prescribe antibiotics. Most of those who do not prescribe leave prophylaxis to the discretion of the patients' private physicians.

Table 1 indicates the frequency with which prophylaxis is prescribed according to type of heart condition (question 4, appendix). In 1977, the AHA recommended prophylaxis for most patients with congenital heart diseases (excluding uncomplicated secundum atrial septal defects), rheumatic or other acquired valvular heart diseases, prosthetic heart valves, and documented previous episodes of infective endocarditis, even without clinically detectable heart disease. Prophylaxis for patients with cardiac pacemakers is left to the discretion of the practitioner. No recommendation is made concerning the patient with a heart murmur of unknown cause.

Table 2 indicates the types of dental procedures for which prophylaxis is given (question 5, appendix). The AHA recommends prophylaxis for "all dental procedures (including routine professional cleaning) that are likely to cause gingival bleeding. . . ." but not for simple adjustment of orthodontic appliances or shedding of deciduous teeth.

Table 3 outlines the patterns of antibiotic use by the responders. Clearly, although most dentists use the recommended antibiotics, they do not adhere to the dosage, route, frequency and duration of administration suggested by the AHA. The discrepancy is most apparent for patients with prosthetic heart valves, for whom the majority of dentists (79%) prescribe oral penicillin for patients not allergic to penicillin and oral erythromycin (82%) for patients allergic to penicillin (table 4). Although the AHA suggests additional antibiotic coverage for dental work for patients taking continuous oral penicillin to prevent rheumatic fever, 31.8% of dentists do not prescribe any additional coverage (table 3).

Discussion

Our study shows that most Dade County dentists do not adhere strictly to the 1977 AHA guidelines, although they tend to use the recommended antibiotics. In 1975, Durack reported the results of a survey of Oxfordshire (England) dentists regarding their practices to prevent SBE. Of 71 responders, 60 indicated penicillin was their first choice; tetracycline (33 responders) and erythromycin (20 responders) were the choices for patients allergic to penicillin.

In 1980, Brooks reported on the compliance of Michigan dentists with AHA guidelines for prevention of bacterial endocarditis. She found that 14.5% of 359 responders followed the 1977 guidelines for penicillin...
TABLE 3. Antibiotic Use to Prevent Subacute Bacterial Endocarditis in Adults*

<table>
<thead>
<tr>
<th>Antibiotic usage</th>
<th>Pts with congenital or valvular heart disease</th>
<th>Pts with prosthetic heart valves†</th>
<th>Pts taking penicillin for prevention of rheumatic fever</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Not allergic to penicillin</td>
<td>Allergic to penicillin</td>
<td>Not allergic to penicillin</td>
</tr>
<tr>
<td>1977 AHA guidelines</td>
<td>83 (15.4%)</td>
<td>66 (12.6%)</td>
<td>30 (6.7%)</td>
</tr>
<tr>
<td>1972 AHA guidelines</td>
<td>5 (0.9%)</td>
<td>5 (0.9%)</td>
<td>—</td>
</tr>
<tr>
<td>Other penicillin or streptomycin‡</td>
<td>389 (72.2%)</td>
<td>—</td>
<td>372 (83.4%)</td>
</tr>
<tr>
<td>Other erythromycin or vancomycin‡</td>
<td>—</td>
<td>410 (78.0%)</td>
<td>—</td>
</tr>
<tr>
<td>Other antibiotics</td>
<td>62 (11.5%)</td>
<td>45 (8.5%)</td>
<td>44 (9.9%)</td>
</tr>
<tr>
<td>No additional antibiotics</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>No. of dentists responding to each question</td>
<td>539</td>
<td>526</td>
<td>446</td>
</tr>
</tbody>
</table>

*Based on responses to questions 6–10 (appendix).
†The 1972 AHA guidelines do not include recommendations for prosthetic valves.
‡Includes usage of listed antibiotics, but dosage, route, frequency, and duration of administration not according to 1977 AHA guidelines.

Abbreviation: AHA = American Heart Association.

References


Appendix

The following are selected questions and answer options (in parentheses) from the Dental Survey:

1. Do you believe that prophylactic antibiotics are proven to prevent subacute bacterial endocarditis in predisposed patients? (Yes/no)
2. How often do you inquire of new patients about the presence of heart murmurs and/or a history of heart problems? Please check only one. (Always; not always, but at least 50% of the time; not always, and less than 50% of the time; never)
3. Do you prescribe antibiotics to prevent bacterial endocarditis in predisposed patients? (Yes/no)
4. Please indicate those groups of patients for whom you most often prescribe antibiotics prophylactically. (Congenital heart disease; rheumatic or other valvular heart disease; prosthetic heart valves; intracardiac pacemakers; a heart murmur, even if the cause is unknown; a past history of bacterial endocarditis; other — specify)
5. In what situation do you most often prescribe prophylaxis to these patients? Please check only one. (In all dental procedures; only for dental procedures that are likely to cause gingival bleeding; only

TABLE 4. Parenteral vs Oral Antibiotic Use for Patients with Prosthetic Heart Valves*

<table>
<thead>
<tr>
<th>Antibiotic use</th>
<th>Number (%) of dentists prescribing antibiotics</th>
<th>Patients not allergic to penicillin</th>
<th>Patients allergic to penicillin</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parenteral</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>According to 1977 AHA guidelines</td>
<td>30 (6.7%)</td>
<td>38 (8.8%)</td>
<td></td>
</tr>
<tr>
<td>Not according to 1977 AHA guidelines</td>
<td>27 (6.0%)</td>
<td>12 (2.8%)</td>
<td></td>
</tr>
<tr>
<td>Oral only</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Penicillin alone</td>
<td>353 (79.2%)</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>Erythromycin alone</td>
<td>—</td>
<td>355 (82.4%)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>36 (8.1%)</td>
<td>26 (6.0%)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>446</td>
<td>431</td>
<td></td>
</tr>
</tbody>
</table>

*Based on responses to questions 8 and 9 (appendix).

Abbreviation: AHA = American Heart Association.
for procedures with obvious oral infection, such as abscessed tooth extractions; other — explain)

Please answer questions 6–10 by writing in the antibiotic, dosage, route of administration, frequency of administration and timing of therapy before and after the dental procedure. If a combination of agents is used, please complete the items for each antibiotic used.

6. Which antibiotic or combination of antibiotics do you most often prescribe, both before and after a dental procedure, for an adult patient with heart disease requiring prophylaxis for subacute bacterial endocarditis?

7. Which antibiotic or combination of antibiotics do you most often prescribe for an adult patient allergic to penicillin but requiring prophylaxis for endocarditis?

8. Which antibiotic or combination of antibiotics do you most often prescribe for an adult patient with a prosthetic heart valve for prophylaxis against endocarditis?

9. Which prophylactic antibiotic or combination of antibiotics do you most often prescribe for an adult patient with a prosthetic valve who is allergic to penicillin?

10. Which prophylactic antibiotic or combination of antibiotics do you most often prescribe to an adult patient who is receiving continuous oral penicillin for prevention of rheumatic fever?

Sequence and Timing of Ventricular Wall Motion in Patients with Bundle Branch Block
Assessment by Radionuclide Cineangiography

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SUMMARY We determined the sequence and timing of inward ventricular wall motion by least-square phase analysis of radionuclide cineangiograms in 10 patients with left bundle branch block (LBBB), five patients with right bundle branch block (RBBB) and 11 patients with normal conduction. All LBBB and RBBB patients had normal coronary arteries and no segmental wall motion abnormalities. The left ventricle (LV) was divided into eight segments and the right ventricle (RV) into three; sequence and timing were scored by three observers.

In normal subjects, wall motion begins in either or both ventricles and ends in the LV or both ventricles. In patients with LBBB it begins in the RV and ends in the LV; in patients with RBBB is begins in the LV and ends in the RV or both ventricles. The intraventricular wall motion is also altered in the ventricle ipsilateral to a bundle branch block. In LBBB, the mean time of onset of LV wall motion is delayed 1.9 frames (38 msec), whereas RV wall motion is normal. In RBBB, the onset of RV wall motion is delayed 1.3 frames (26 msec), whereas LV wall motion is not delayed.

The sequence and timing of ventricular wall motion in normal conduction and bundle branch block, as represented by least-square phase analysis of radionuclide cineangiograms, conform with previous angiographic and electrophysiologic studies. Thus, this method may be useful in analyzing other conditions characterized by abnormal ventricular activation.

MUCH INFORMATION is available concerning the pathogenesis and electrophysiology of both right and left bundle branch block (RBBB and LBBB).

Little information has been obtained on the mechanical correlates of these electrical abnormalities and even less concerning their effects on the sequence and timing of ventricular wall motion. We have used least-square phase analysis (LSPA) of equilibrium radionuclide cineangiograms to identify normal initial sites of ventricular activation.

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Methods
Patient Selection Criteria

All patients with conduction abnormalities in the present study had a complete bundle branch block on a standard 12-lead ECG. Patients with isolated left hemiblocks or incomplete bundle branch block were excluded. RBBB was defined as QRS prolongation to 0.12 second or greater in conjunction with an S wave in leads I, V$_5$, and V$_6$, and an R' in leads V$_1$, V$_5$, and V$_6$. The criteria for LBBB included QRS prolongation to 0.12 second or greater with neither a Q wave nor an S wave in leads I, aV$_1$, V$_5$, and V$_6$, and an RR' complex in leads V$_5$ and V$_6$. All patients with bundle branch block
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