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A standardized conventional evaluation of the mechanism of syncope in patients with bundle branch block

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Background The finding of bundle branch block in patients with syncope suggests that paroxysmal AV block may be the cause of syncope, even though its prevalence is unknown.

Methods We evaluated 55 consecutive patients with syncope and bundle branch block (mean age 75 ± 8 years; median of two syncopal episodes per patient) referred to three Syncope Units. The hierarchy and appropriateness of diagnostic tests and the definitions of the final diagnoses followed standardized predefined criteria.

Results *Cardiac* syncope was diagnosed in 25 patients (45%): AV block in 20, sick sinus syndrome in 2, sustained ventricular tachycardia in 1, aortic stenosis in 2. *Neurally mediated* syncope was diagnosed in 22 (40%): carotid sinus syndrome in 5, tilt-induced syncope in 15, adenosine-sensitive syncope in 2. Syncope remained *unexplained* in 8 (15%).

Conclusions Less than half of the patients with bundle branch block have a final diagnosis of cardiac syncope; in these patients, paroxysmal AV block is the most frequent but not the only mechanism supposed.
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Key Words: Syncope, bundle branch block, structural heart disease, ventricular tachyarrhythmias, carotid sinus syndrome, cardiac conduction tissue disease.

Introduction

While several cardiac and non-cardiac mechanisms may produce syncope, the finding of bundle branch block on standard electrocardiography suggests that paroxysmal AV block is a likely mechanism of the syncope. Prophylactic permanent pacing therapy is considered when other likely causes have been excluded[1]. However, the mechanism of syncope has not yet been systematically evaluated and the prevalence of AV block as the cause of syncope remains uncertain. In one study[2] performed in the 1980s, the risk of developing AV block was 2% in patients without syncope and 17% in patients with syncope during a mean follow-up of $42{\cdot}4 \pm 8{\cdot}5$ months. In selected populations of patients undergoing electrophysiological study, abnormalities predictive of paroxysmal AV block, defined as an HV interval ≥ 70 ms or an intraHisian block during atrial pacing, were found in 37% of patients[3–5] and the adjunct of a drug challenge increased the positivity rate by a further 15%[6–10]. Therefore, in many patients the cause of syncope remained unexplained. Recent advances in the diagnostic management of syncope have provided established methods of evaluating syncope[11–12]. These have not yet been systematically validated in patients with bundle branch block.

In this study we applied a standardized diagnostic work-up in a series of consecutive patients with syncope and bundle branch block in order to calculate the prevalence of patients with syncope presumed to be due to paroxysmal AV block and to evaluate whether some historical findings can identify those patients who are more likely to have syncope due to paroxysmal AV block.

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Methods

Of 347 patients referred to the cardiology departments of three hospitals (Lavagna, Reggio Emilia and Cento, Italy) from November 1998 to December 1999 for evaluation of syncope, 55 had chronic bundle branch block in absence of previous documentation of advanced AV block and were enroled in this study. The hierarchy and appropriateness of diagnostic tests and the definition of the diagnostic criteria followed standardized diagnostic protocols[11,12].

In brief, all patients underwent the following cardiac examinations in this sequence: standard electrocardiography, echocardiography, Holter monitoring, exercise test (if syncope occurred during exercise or with ischaemia) and electrophysiological study. The sequence was interrupted as soon as a test proved diagnostic. Electrocardiography was deemed diagnostic in the event of sinus bradycardia <40 ppm or sinus pause >3 s, alternating left and right bundle branch block, intermittent 2nd or 3rd degree AV block, hypotensive rapid atrial tachyarrhythmias, or sustained ventricular tachycardia. Echocardiography was deemed diagnostic if severe aortic stenosis or other forms of severe obstruction of cardiac output were detected. Holter was defined as diagnostic when a correlation between syncope and an ECG abnormality was detected. Exercise test was defined as diagnostic in the event of exercise-induced AV block. Electrophysiological study was defined as diagnostic in the event of sinus node recovery time >2 s, basal HV>70 ms, 2nd or 3rd degree infraHisian block during atrial pacing or after Ajmaline infusion, or induction of syncopal or hypotensive supraventricular or ventricular tachyarrhythmias.

If cardiological investigations were inconclusive, carotid sinus massage, tilt-table testing and ATP (adenosinetriphosphate) test were performed in this sequence. Carotid sinus syncope was defined when carotid sinus massage, performed in both the supine and upright positions, induced syncope in the presence of bradycardia and/or hypotension. Tilt-induced syncope was defined when the loss of consciousness was induced during tilt testing in the presence of bradycardia and/or hypotension. Adenosine-sensitive syncope was defined when a bolus of 20 mg ATP induced a cardiac pause >6 s.

If these tests were also inconclusive, the mechanism of syncope was classified as unexplained.

Results

Patient characteristics

The 55 patients (38 men and 17 women; mean age 75 ± 8 years) had had a median of two syncopal episodes (interquartile range 1–5). The electrocardiographic conduction abnormalities were: right bundle branch block in 16 cases, right bundle branch block with superior/inferior axis in 25, left bundle branch block in 14. Structural heart disease was present in 9 patients: valvular heart disease in 4, dilated cardiomyopathy in 3, and ischaemic heart disease in 2. Severe left ventricular dysfunction was present in 5 patients.

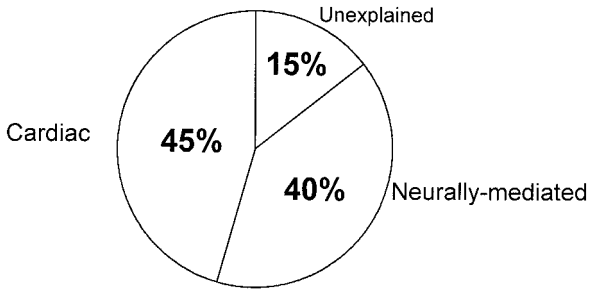

Figure 1 **Final diagnosis.**

Findings

Cardiac syncope was diagnosed in 25 patients (45%): AV block in 20, sick sinus syndrome in 2, sustained ventricular tachycardia in 1, and aortic stenosis in 2. *Neurally mediated* syncope was diagnosed in 22 (40%): carotid sinus syndrome in 5 (cardioinhibitory in 2 patients, mixed or vasodepressive in 3 patients), tilt-induced syncope in 15 (mixed (VASIS 1) in 8 patients, vasodepressive (VASIS 3) in 6, cardioinhibitory (VASIS 2A) in 1)[13], and adenosine-sensitive syncope in 2. Syncope remained *unexplained* in 8 (15%) (Fig. 1). In the 25 patients with cardiac syncope, the diagnosis was made by standard electrocardiography in 3 cases (intermittent 3rd degree AV block), by echocardiography in 2 cases (aortic stenosis), by Holter monitoring in 8 cases (6 atrio-ventricular block, 2 sinus arrest), and by electrophysiological study in 12 cases (11 infraHisian block, 1 induced ventricular tachycardia). In the 22 patients with neurally mediated syncope, the diagnosis was made by carotid sinus massage in 5 cases, tilt testing in 15 cases and ATP test in 2 cases. Clinical features suggestive of situational syncope were present in 3 patients; no patient had typical vasovagal syncope (Table 1).

Out of 21 clinical variables, seven were predictive of the cause of syncope on univariate analysis and five of these remained predictive on multiple regression analysis (Statsoft software, version 5.0) (Table 1). A cardiac cause was likely when syncope occurred in the supine position or during effort (specificity 97%), when syncope was preceded by blurred vision (specificity 93%), when patients had had >2 episodes of syncope in the previous year (specificity 80%) or had left bundle branch block (specificity 87%). Conversely, a cardiac cause of syncope was unlikely when patients had a history of syncope lasting >3 years, when syncope was preceded or followed by nausea or vomiting, or there was right bundle branch block without axis deviation.

Table 1 Clinical features of patients with cardiac and non-cardiac syncope

	Cardiac n=25	Non-cardiac n=30	*P* (univariate)	*P* (multivariate)
Age	74 ± 10	76 ± 7		
Male gender	19 (76)	19 (63)		
Clinical features suggestive of vasovagal syncope*	0 (0)	0 (0)		
Clinical features suggestive of situational syncope**	0 (0)	3 (10)		
Symptomatic orthostatic hypotension	0 (0)	2 (7)		
Number of syncopal episodes >3	10 (40)	9 (30)		
Number of syncopal episodes during last year >2	11 (44)	6 (20)	0·05	0·05
History of syncope lasting >3 years	5 (20)	16 (53)	0·01	(0·06)
Presyncopal episodes	7 (28)	12 (40)		
Absence of prodromal symptoms	9 (36)	12 (40)		
Syncope during effort or supine	9 (36)	1 (3)	0·002	0·02
Blurred vision before syncope	9 (36)	2 (7)	0·008	0·05
Nausea and vomiting	3 (12)	11 (36)	0·04	0·05
Sweating	8 (32)	9 (30)		
Post-prandium	2 (8)	6 (20)		
Weakness	10 (40)	7 (23)		
Recovery time >1 min	10 (40)	11 (36)		
Mental confusion after syncope	7 (28)	8 (26)		
Jerking movements	2 (8)	0 (0)		
Palpitations	2 (8)	0 (0)		
ECG pattern: right BBB	2 (8)	14 (47)	0·002	0·05
right BBB+superior/inferior axis deviation	13 (52)	12 (40)		
left BBB	10 (40)	4 (13)	0·03	

Numbers in parentheses are percentages.
*If precipitating events such as fear, severe pain, emotional distress, instrumentation or prolonged standing were associated with typical prodromal symptoms.
**If syncope occurred during or immediately after urination, defaecation, coughing or swallowing.
BBB=Bundle branch block.

Discussion

The main finding of this study is that less than half of the patients with syncope and bundle branch block received a final diagnosis of cardiac syncope at the end of the conventional standardized evaluation. Of these, paroxysmal AV block was the most frequent supposed mechanism, but other arrhythmias were also found. The percentage of cardiac syncope — 45% — was far higher than that seen in the general population of patients referred for evaluation of syncope, which averaged 17% in pooled data from six population-based studies[14–19] and was 18% in a recent referral study[11]. Thus, the present study confirms that the presence of bifascicular block (right with axis deviation or left), but not monofascicular block (right, no axis deviation), increases the probability that the syncope has a cardiac cause. In particular, the presence of bundle branch block increases the probability of diagnosis of paroxysmal AV block in comparison with the general population of syncopal patients[11,14–19]. On the other hand, a final diagnosis of neurally mediated syncope was also very frequent in patients with bundle branch block, suggesting that the finding of bundle branch block is not very specific and that bundle branch block alone cannot be used to diagnose bradyarrhythmic syncope. Some authors[20,21] have suggested that the tilt test is nonspecific in evaluating patients with syncope and bundle branch block. The specificity of carotid sinus massage has also been questioned in patients with heart disease[22,23]. Nevertheless, a positive response to these tests can be accepted as diagnostic of the cause of syncope in the absence of any other competing diagnosis, as in the case of the present study. The association of bundle branch block and neurally mediated syncope identifies a particular subset of patients characterized by very advanced age and a low prevalence of the typical clinical features, suggesting a reflex mechanism, that are usually found in patients with neurally mediated syncope.

A few clinical features were able to differentiate between cardiac and non-cardiac cause of syncope (Table 1), but none of these was so specific and sensitive to be diagnostic per se. The only possible exception is syncope occurring during exercise or in the supine position, which strongly suggests a cardiac mechanism. This finding has already emerged in patients without bundle branch block[11]. Although nausea, vomiting and a long history of syncope were more likely in non-cardiac syncope, the presence of such features cannot definitely exclude a cardiac mechanism. We were unable to confirm the results of other studies[11,14,24], in which several other clinical features were predictive of the cause of the syncope. However, we cannot rule out the possibility that, in a larger patient population, these features might also be helpful in patients with bundle branch block.

Despite a complete work-up, the cause of syncope remained unexplained in 15% of the patients. This figure

is lower than that reported in previous studies performed in the 1980s, which averaged 34%[14–19]; this probably depends on the more extensive use of the head-up tilt test and carotid sinus massage. A recent study[25] has shown that, in patients in whom syncope remains unexplained at the end of the conventional investigation, the probability of AV block is still very high and that the implantation of a loop recorder helps to identify those at risk.

The present study has practical implications with regard to pacing therapy, which is widely used in clinical practice in patients with syncope and bundle branch block, even in the absence of a clear diagnosis. In a current guideline[1] prophylactic permanent pacing therapy is considered when other likely causes have been excluded. If this recommendation is seen in the context of the present study, pacing therapy should be restricted to less than half of the patients.

Limitation

Although the criteria used to consider examinations as positive or negative were very strict, they cannot rule out another possible diagnosis, i.e., patients with positive tilt-test and syncope due to AV block.

Conclusions

The prevalence of cardiac and non-cardiac mechanisms is similar in patients with syncope and bundle branch block. Some clinical features can help to identify the mechanism in a minority of patients.

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