

ABSENCE OF SEPTAL Q WAVES**An Important Predictor of Significant Coronary Artery Disease and Mainly Proximal Stenosis of the Left Anterior Descending Artery**

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ABSTRACT • Aims: Data concerning the correlation between the absence of septal q waves and significant stenosis of proximal left anterior descending (LAD) artery shows conflicting results. This retrospective study was conducted to show that absence of septal q waves in leads V5-V6 could be of value in predicting significant coronary artery disease (CAD) and mainly significant proximal LAD coronary artery stenosis. **Methods:** Our study included 500 consecutive patients who had coronary angiography, retrospectively chosen, excluding patients with acute coronary syndromes, and patients with abnormal ECGs (abnormal QRS duration, pathological q waves and hemiblocks). ECG and angiography films were reviewed. For the 2x2 tables analysis, a chi-square test was used. **Results:** Of the 500 patients, 386 had significant CAD defined as $\geq 70\%$ luminal stenosis, and 260 had no septal q wave. Of the 386 patients with significant CAD, 233 (60%) did not have septal q waves. Of 260 who did not have septal q wave, 192 (73%) had significant stenosis of proximal LAD. Statistical analysis shows that significant CAD correlates with the absence of septal q waves, with a sensitivity of 60% and a specificity of 76%, and that stenosis of proximal LAD could be predicted by absence of septal q waves in leads V5-V6 with a sensitivity of 83% and a specificity of 74%. **Conclusion:** The absence of septal q waves in leads V5-V6 on the ECG correlates with the presence of significant CAD and is of highly predictive value in those with significant stenosis of proximal LAD ($p < 0.0001$).

Keywords: septal q wave, proximal LAD, significant stenosis, severe CAD

INTRODUCTION

The small q waves detectable in leads V5-V6 on ECG reflect the initial activation of the upper part of the interventricular septum. In normal condition, the ventricular septal depolarization starts from the side of the left ventricle and spreads to the side of the right ventricle producing an initial negative deflection, termed septal q wave, in leads with axes

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RÉSUMÉ • Objectifs: Les études concernant la relation entre l'absence de l'onde q septale et la présence d'une sténose significative au niveau de l'interventriculaire antérieure (IVA) montrent des résultats contradictoires. Cette étude rétrospective vise à révéler que l'absence de l'onde q septale au niveau des électrodes V5-V6 de l'ECG a une valeur hautement prédictive de la présence d'une maladie coronarienne surtout au niveau de l'IVA. **Méthodes:** C'est une étude rétrospective faite sur une population de 500 patients référés pour angiographie et choisis consécutivement en excluant ceux avec un syndrome coronarien aigu ou avec ECG anormal (Onde QRS prolongée, onde q pathologique, hemibloc). Les électrocardiogrammes et les films d'angiographie ont été révisés. Pour l'analyse des tables 2x2, le test chi-square a été utilisé. **Résultats:** Parmi les 500 patients, 386 ont une maladie coronarienne significative définie par une sténose luminale $\geq 70\%$ et dont 233 (60%) n'ont plus l'onde q septale. Parmi les 500 patients, 260 n'ont plus l'onde q septale et dont 192 (73%) présentent une sténose proximale de l'IVA. Les analyses statistiques montrent que l'absence de l'onde q septale peut prédire la présence d'une maladie coronarienne significative avec une sensibilité de 60% et une spécificité de 76% et surtout une sténose proximale de l'IVA avec sensibilité de 83% et une spécificité de 74%. **Conclusion:** L'absence de l'onde q septale au niveau des électrodes V5-V6 de l'ECG corrèle avec la présence d'une maladie coronarienne avec une valeur prédictive élevée d'une sténose proximale significative de l'IVA ($p < 0,0001$).

directed to the left and reflecting left-to-right forces, i.e. leads I, V5 and V6. The septal q is a small wave with a brief duration < 20 ms and low amplitude, so it can be masked by the presence of tremor or by baseline artifact.

The absence of septal q wave can be associated with structural heart disease, fibrosis of the middle third of the ventricular septum, left bundle branch block, left anterior descending coronary stenosis, alteration of mechanical function of left ventricle, and poor prognosis in patients with congestive heart failure as it can be otherwise a variant of normal.

In this study, our aim is to prove that the absence of septal q waves in a standard 12 leads ECG reveals the presence of significant coronary artery disease (CAD) (lesion $\geq 70\%$) and mainly a predictor of significant stenosis in the proximal left anterior descending (LAD) ($\geq 70\%$) coronary artery.

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As cardiovascular disease is still the leading cause of death worldwide, the results of this study could help in screening patients with ischemic heart disease and in particular those with proximal LAD stenosis.

Using the ECG, the oldest, inexpensive and non invasive cardiovascular test, with a simple criterion, we could stratify the risk of significant CAD and in particular in the proximal LAD, before having to recourse to more advanced, more expensive and sometimes higher risk tests [1-8].

METHODS

A retrospective study of 500 consecutive patients referred to NDSUH (Notre-Dame de Secours University Hospital) for coronary angiography was conducted. The sample was chosen randomly. The ECG was reviewed for presence or absence of septal q waves and the angiography films were also thoroughly reviewed.

Patients with acute coronary syndromes and abnormal ECGs (especially abnormal QRS duration, presence of blocks and hemiblocks, presence of pathological q waves) were excluded. Patients with known structural heart disease were excluded. Patients with inserted pacemakers were excluded.

The study was approved by the ethics committees at NDSUH and written consent was obtained from the hospital to allow data collection.

Septal q waves were defined as q waves up to 30 ms in leads V5-V6. Absence of septal q waves were defined by the complete absence of septal q waves in leads V5-V6.

Significant proximal LAD stenosis was defined as a stenosis of more than 70% before the first major septal perforator. Significant CAD was defined by the presence of a lesion $\geq 70\%$ in any coronary arteries.

A *p* value of less than 0.05 was considered to be significant. For the 2x2 table analysis, a chi-square test was used.

RESULTS

Five hundred patients with a mean age of 56 years were studied. Table I shows the summary of some demographic data.

According to angiography films, 386 (77.2%) patients had significant CAD (lesion $\geq 70\%$) and 114 (22.8%) had non significant CAD. Two hundred and thirty (46%) patients had significant stenosis of proximal LAD ($\geq 70\%$) and 270 (54%) did not.

According to standard 12 leads ECG, 260 (52%) patients had absence of septal q waves in leads V5-V6 and 240 (48%) did not.

Considering the relationship between the absence of septal q waves and significant CAD, among the 260 patients who had absent septal q waves on the ECG, 233 patients (89.6%) had significant CAD and 27 (10.4%) did not. One hundred and fifty-three (63.75%) out of the 240 patients with presence of septal q waves on the ECG had significant CAD and 87 (36.25%) did not (Chart 1 & Table II).

Considering the presence of significant stenosis of the proximal LAD among the 260 patients with absent septal q waves on the ECG, 192 patients (73.84%) had significant stenosis of proximal LAD and 68 (26.16%) did not. Thirty-eight (15.83%) out of the 240 patients with present septal q waves on the ECG had significant stenosis of proximal LAD and 202 (84.17%) did not (Chart 2 & Table III).

Statistical analysis showed that *significant CAD* can be predicted by the absence of septal q waves on the ECG with a sensitivity of 60%, a specificity of

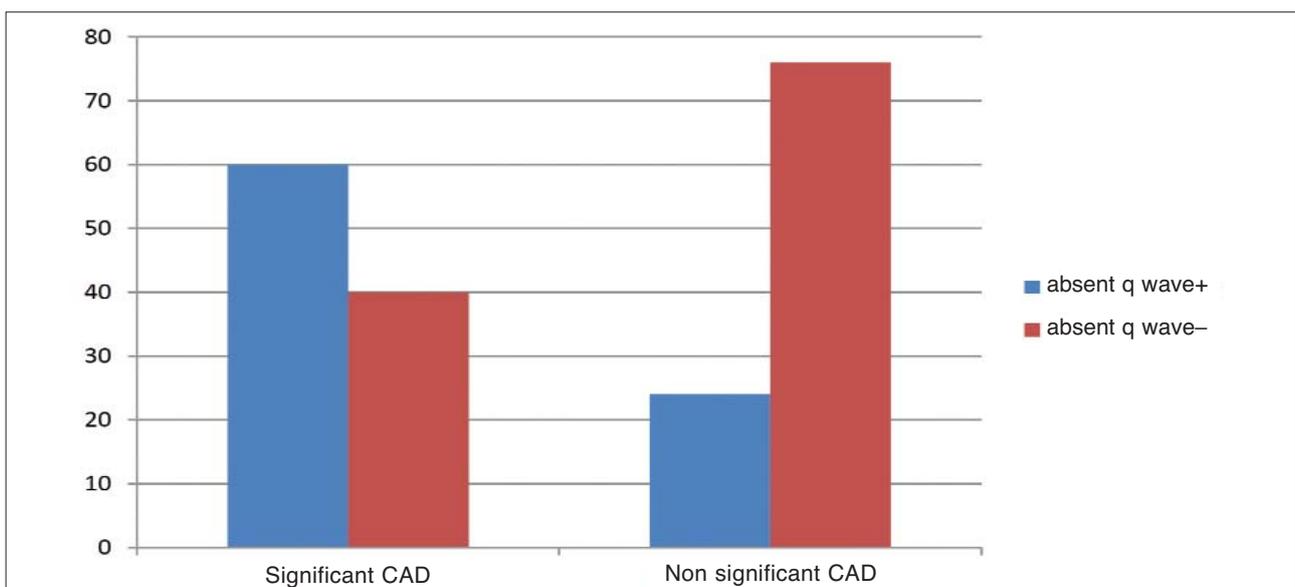


CHART 1. Prevalence of absent septal q waves in patients with significant coronary artery disease (CAD)

TABLE I
PATIENTS DEMOGRAPHIC DATA

Variable	N (%)
Gender	
Male	350 (70%)
Female	150 (30%)
Diabetic patients	237 (47.4%)
Hypertensive patients	240 (48%)
Mean age	56 ± 10 years

TABLE II
CORRELATION BETWEEN ABSENCE OF SEPTAL Q WAVE AND SIGNIFICANT CAD

Absence of septal q waves	Significant CAD	Non significant CAD	Total
+	233	27	260
-	153	87	240
Total	386	114	500

OR = 4.907 95% CI = [3.044; 7.91] Se (sensitivity) = 60%
Sp (specificity) = 76% CAD: coronary artery disease

TABLE III
CORRELATION BETWEEN ABSENCE OF SEPTAL Q WAVE AND SIGNIFICANT PROXIMAL LAD STENOSIS

Absence of septal q waves	Significant stenosis in proximal LAD	Non significant stenosis of proximal LAD	Total
+	192	68	260
-	38	202	240
Total	230	270	500

OR = 15 95% CI = [9.633; 23.384] Se (sensitivity) = 83%
Sp (specificity) = 74% LAD: coronary artery

76%, a positive predictive value of 89.61% and a negative predictive value of 62.14%, and that *significant stenosis of the proximal LAD* can be predicted by the absence of q wave on the ECG with a sensitivity of 83%, a specificity of 74%, a positive predictive value of 73.84% and a negative predictive value of 84.16%.

Statistical results show significant relationship between the absence of septal q waves on the ECG and significant CAD (OR = 4.907, 95 CI = [3.044; 7.91]) mainly proximal stenosis of LAD (OR = 15, 95 CI = [9.633; 23.384]) with *p* value < 0.0001.

DISCUSSION

Absent septal q waves can be a sign of disease and possibly of CAD and in particular of the proximal LAD, especially if the patient has otherwise a normal ECG and no known structural heart disease as in the population we studied above. The reason for our strict exclusion criteria is to remove all possible factors other than CAD which could be a reason for septal q waves disappearance (structural heart disease, fibrosis of the middle third of the ventricular septum, left bundle branch block, left anterior descending coronary stenosis, alteration of mechanical function of left ventricle).

Studies done before have controversial results.

MacAlpin reviewed 4174 ECGs and found that absence of septal q waves in an otherwise normal tracing was of no significance, however they did not correlate with any cath findings [1].

Parsa *et al.* looked at the absence of septal q waves, in a relatively smaller number of patients (261) and correlated it with coronary angiography results, limited only to LAD analysis, and found a lower predictive value than our study; this is probably because of the lower

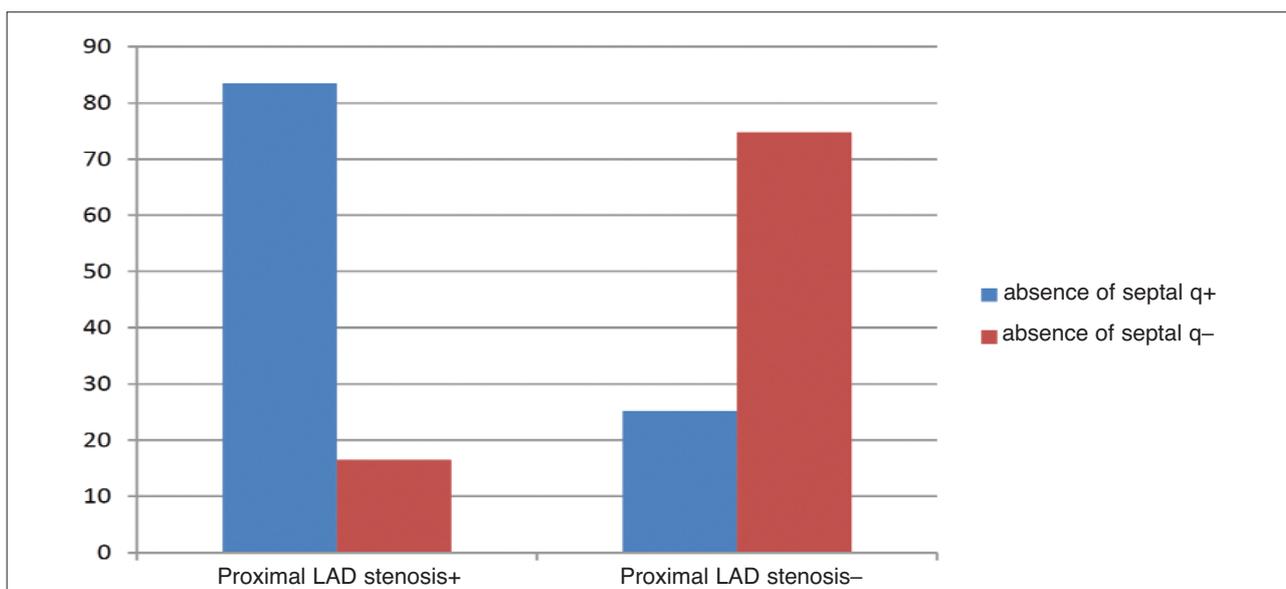


CHART 2. Prevalence of absent septal q waves in patients with left anterior descending (LAD) coronary artery proximal stenosis

number of patients and the less strict exclusion criteria (only wide QRS and acute coronary syndromes were excluded) [2]. We excluded all patients with abnormal ECGs or abnormal structural heart disease except for CAD.

Shabestari *et al.* examined a much smaller number of patients than our study and looked only at the LAD, looking at both presence and absence of septal q waves, including all catheterized patients, they found a significant correlation of absent septal q waves with proximal LAD stenosis [3].

Our study shows a strong correlation between the absence of septal q waves in V5 and V6 and the presence of CAD in particular in the proximal LAD, and a strong correlation between their presence and the absence of proximal LAD significant stenosis. Our more significant results with higher specificity and sensitivity are probably related to the larger number of patients, and the strict exclusion criteria, which will remove patients with absent septal q waves related to other than CAD. So most patients included were for diagnostic purposes to rule out CAD.

Limitations of the study are its retrospective nature, since all our work was based on reviewing the charts and coronary angiography CDs. Positional changes could be a factor, but in our institution ECGs are done in the same way.

CONCLUSION

Absence of septal q waves in V5 and V6 on the ECG has a strong correlation in a CAD population or a population at high risk for CAD and especially in the proximal

LAD, it could still be a normal variant, but should not be ignored if absent and clinical correlation for further evaluation is to be initiated.

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