Non-sustained ventricular tachycardia as a predictor of sudden cardiac death in patients with left ventricular dysfunction: a meta-analysis

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CRD summary
This review concluded that non-sustained ventricular tachycardia was a significant predictor for arrhythmic events in patients with left ventricular dysfunction, regardless of aetiology and left ventricular ejection fraction. Although this was a generally a well-conducted review, the limitations of the available evidence may compromise the reliability of the pooled estimates.

Authors' objectives
To determine the accuracy of non-sustained ventricular tachycardia as a predictor of sudden cardiac death in patients with left ventricular dysfunction.

Searching
PubMed, LILACS and SciELO (Scientific Electronic Library Online) were searched up to July 2007 for studies published in English, Portuguese and Spanish. Search terms were reported. References of retrieved papers were scanned.

Study selection
Prognostic studies evaluating non-sustained ventricular tachycardia as a risk factor for major arrhythmic events (sudden cardiac death, resuscitated ventricular fibrillation or sustained ventricular tachycardia) detected using 24-hour ambulatory electrocardiography in at least 100 patients with symptomatic or asymptomatic left ventricular dysfunction were eligible for inclusion. Studies of patients with ischaemic left ventricular systolic dysfunction were included. Studies of patients with acute myocardial infarction and studies of patients with previous major arrhythmic events were excluded. Included studies recruited patients with mean left ventricular ejection fraction ranging from 18.6 per cent to 42 per cent. Mean age ranged 41 years to 66 years. The proportion of males ranged from 69 per cent to 85 per cent. Prevalence of non-sustained ventricular tachycardia ranged from 19 per cent to 61 per cent. The definition of non-sustained ventricular tachycardia varied widely across studies (frequencies ranged from 70 to 150 beats per minute), as did the use of digoxin, diuretics and ACE inhibitors. Duration of follow-up ranged from 13 to 60 months. Two reviewers applied the inclusion criteria; disagreements were resolved by consensus with senior authors.

Assessment of study quality
Although there was no quality assessment presented in the paper, the authors provided a post hoc assessment of study quality using the QUADAS (Quality Assessment of Diagnostic Accuracy Studies Assessment) criteria.

Data extraction
Data required to construct 2x2 tables were extracted, from which sensitivity, specificity, positive and negative likelihood ratios, and the diagnostic odds ratio were calculated, all with corresponding 95% confidence intervals (CI). Two reviewers extracted data; disagreements were resolved by consensus with senior authors.

Methods of synthesis
Summary estimates of positive likelihood ratio, negative likelihood ratio and diagnostic odds ratio were calculated using a random-effects method. Heterogeneity was assessed using Cochran's Q and the I² test. The threshold effect was explored by investigating the correlation between sensitivity and specificity using summary receiver operating curves (sROC) and Spearman's correlation co-efficient. The area under the curve was calculated. Diagnostic performance was summarised using the Q index. Meta-regression was used to evaluate the relationship between ejection fraction and the log odds ratio of non-sustained ventricular tachycardia as a predictor of sudden death. Subgroup analyses were conducted on patients with or without ischaemia. Publication bias was assessed using a funnel plot and Kendall's tau b test.

Results of the review
Eleven studies met the inclusion criteria (n= 4,387, range 157 to 1,080). The post hoc assessment using QUADAS showed all studies recruiting a representative patient sample; all but one study clearly reported selection criteria. Eight studies reported the analysis of death being blinded to the index test results. None of the studies reported on uninterpretable results or withdrawals. Given the prognostic nature of the studies and the use of mortality as the reference standard, verification and incorporation bias were avoided, and progression bias was not a relevant criteria.

The summary negative likelihood ratio was 0.62 (95% CI: 0.55 to 0.69) and diagnostic odds ratio was 3.03 (95% CI: 2.44 to 3.76) for non-sustained ventricular tachycardia as a predictor of sudden cardiac death was; there was no statistically significant heterogeneity for either analysis.

The summary positive likelihood ratio was 1.86 (95% CI: 1.56 to 2.21); statistically significant heterogeneity was observed.

There was evidence of a threshold effect, with a Spearman's correlation coefficient between sensitivity and specificity of -0.818 (p=0.002); the area under the curve was 0.675 (standard error 0.0156). Meta-regression showed no significant relationship between mean left ventricular ejection fraction and log diagnostic odds ratio.

There was no evidence of publication bias.

Authors' conclusions
Non-sustained ventricular tachycardia was a statistically significant predictor for arrhythmic events. Its absence indicated a low probability of sudden cardiac death in patients with left ventricular dysfunction, regardless of aetiology and left ventricular ejection fraction.

CRD commentary
The authors addressed a clear research question that was supported by appropriate inclusion criteria. Relevant sources were searched, although there was no search for unpublished studies. Publication bias was investigated. There was a limited search for non-English language studies, but language bias could still have been present. Study selection and data extraction were conducted in duplicate, reducing the potential for error and bias. The authors did not assess study quality and did not provide sufficient study details for readers to make their own determination.

The authors provided a post hoc assessment using QUADAS (Quality Assessment of Diagnostic Accuracy Studies Assessment). The studies generally performed well using the QUADAS criteria, however, these criteria are designed for diagnostic accuracy studies, and there was no modification of the criteria to make the assessment review specific. Given the index test being evaluated, it is unclear whether the lack of reporting of uninterpretable results would impact on the reliability of the pooled estimates. The authors pooled data separately depending upon aetiology.

There was clinical heterogeneity between studies was observed, and there was evidence of a threshold effect. Therefore, although this was a generally well-conducted review, the reliability of the overall pooled estimates may be compromised.

Implications of the review for practice and research
Practice: The authors stated that the results of the review were not applicable to patients with a recent myocardial infarction.

Research: The authors stated that a risk score including non-sustained ventricular tachycardia should be evaluated in prospective studies.

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