

Prevalence of cardiac arrhythmias in a community based chiropractic practice

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Introduction: The prevalence of arrhythmias in chiropractic practice (the proportion of current patients who currently have arrhythmias) is unknown, but thought to be increasing. As arrhythmias influence management of chiropractic patients, the objective of this study was to determine the feasibility of screening for cardiac arrhythmias in a chiropractic clinic.

Methods: With a convenience sample from one clinic, ECG data were recorded and analyzed to identify arrhythmias.

Results: Seventy-six of ninety contacted patients participated in this study. Only 8 (~26%) of 31 patients with known or suspected cardiovascular abnormalities demonstrated arrhythmias versus 7 (~16%) of 45 subjects who were not previously aware of having an arrhythmia.

Introduction : La prévalence d'arythmie en chiropratique (la proportion de patients actuels qui ont actuellement des arythmies) n'est pas connue, mais on pense qu'elle est en augmentation. Étant donné l'influence de l'arythmie sur la gestion des patients en chiropratique, l'objectif de cette étude a été de déterminer la faisabilité de dépistage de l'arythmie cardiaque dans une clinique de chiropratique.

Méthodologie : Avec un échantillonnage pratique provenant d'une seule clinique, des données d'ECG ont été enregistrées et analysées afin de déceler les arythmies.

Résultats : Soixante-seize des quatre-vingt-dix patients sollicités ont participé à cette étude. Seulement 8 des 31 patients (~26 %) ayant des anomalies cardiovasculaires connues ou soupçonnées ont révélé une arythmie, contrairement à 7 des 45 (~16 %) patients qui n'avaient pas présenté auparavant des risques d'arythmie.

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Sources of funding: Canadian Memorial Chiropractic College

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Conclusion: *The screening of patients for cardiac arrhythmias in a community based chiropractic clinic is feasible. A 3-minute recording of ECG activity at rest is not a highly sensitive method of identifying patients with previously recognized arrhythmias, but is capable of identifying previously undiagnosed arrhythmias.*

(JCCA 2014;58(3):238-245)

KEY WORDS: screening; prevalence; arrhythmia

Introduction

The term “arrhythmia” refers to an abnormality of cardiac rhythm resulting in heart beats which occur too quickly, too slowly, or unevenly. This irregularity in heart beat can result in inefficient pumping of blood and may damage the lungs, brain and other organs. There are various types of arrhythmias, including atrial fibrillation, conduction disorders, bradycardia, premature contraction, tachycardia, and ventricular fibrillation or fluttering.¹ Arrhythmias appear to be reasonably common in the general population and some types of arrhythmias have important health implications. As early intervention can prevent or forestall negative outcomes such as stroke², it would be useful to have reliable data on prevalence, including the prevalence in asymptomatic subjects in the general population. At present, data on the prevalence of arrhythmias are incomplete. Such research as exists confirms that prevalence rises with age. A Japanese study found that the prevalence of arrhythmias increased from 1.25% among elementary school students to 2.32% among junior high students.³ An American study⁴ of healthy subjects aged 60 to 85 years demonstrated that a large proportion (in fact, the majority) of subjects had complex arrhythmias, both supraventricular (24% of the sample) and ventricular (49% of the sample). Nearly all subjects with arrhythmias were asymptomatic. Another study⁵ found that in 5,201 adults, aged 65 and older, “serious arrhythmias such as sustained ventricular tachycardia and complete atrioventricular block were uncommon, but brief episodes of ventricular tachycardia (greater than or equal to three depolarizations) were detected in 4.3% of women and 10.3% of men.”

Conclusion : *Le dépistage de l'arythmie cardiaque chez les patients dans une clinique communautaire de chiropratique est faisable. Un enregistrement à repos d'ECG de 3 minutes n'est pas une méthode très précise pour déceler des patients déjà connus pour avoir des arythmies, mais peut révéler des arythmies non diagnostiquées jusqu'alors.*

(JCCA. 2014;58(3):238-245)

MOTS CLÉS : dépistage; prévalence; arythmie

As chiropractors increasingly serve older populations, it is likely that many of their patients have previously undetected arrhythmias and would benefit from secondary preventative measures. For example, anticoagulant therapy greatly reduces the incidence of stroke in patients with atrial fibrillation.² A survey by the National Board of Chiropractic Examiners showed that chiropractors rarely recognize cardiac disorders in their clinics.⁶ However, the actual prevalence of arrhythmias in chiropractic practice remains unknown. Given that approximately 12% of the Canadian population makes use of chiropractic care⁷, community based chiropractic clinics may present an opportunity to screen for important and previously unrecognized cardiac disease. As Canadian chiropractors achieve increasing integration into the larger health care system⁸, the added value of the chiropractic clinic as a screening facility for both musculoskeletal and non-musculoskeletal conditions may provide a further argument on behalf of interprofessional cooperation.

Thus, the objective of this project was to determine the feasibility of screening for cardiac arrhythmias in a chiropractic patient population.

Methods

Study Design

This was a prevalence study with a convenience sample of patients recruited from a single community based clinic in southern Ontario, Canada. The study was approved by the research ethics board (REB) of Canadian Memorial Chiropractic College.

Sample Specification

The target population consisted of patients receiving treatment at a clinic in the Niagara region of Ontario. Patients were either asked to participate as they presented for care, or were called by the clinic receptionist if they had presented for care within the previous six months. There were no exclusion criteria based on demographics or age, although 75% of the sample comprised individuals aged 40 and older. There was no predetermined sample size. However, ECG recordings were reviewed as collected to determine whether or not the study was actually capturing cases of arrhythmia. In this context, Minami et al had previously reported that a similar screening methodology, on which ours was modelled, recorded arrhythmias in approximately 10% of subjects with a prior history versus 1.7% of subjects with no prior history of arrhythmia.⁹

Recruitment Process

The study commenced on February 17, 2012 and ended on March 27, 2012. Of 90 recruited patients, 14 were unable to keep their appointments for various reasons, and so recordings were obtained from 76 subjects.

The subjects were directly recruited by the receptionist or the chiropractor, and informed of the nature of the study. These patients already had a scheduled appointment on the selected study day, or were called and asked to come in to specifically participate in the study. Prior to the recording of ECG data, patients provided written informed consent and answered a short set of questions (supplementary file 1) to identify patients who had or were likely at risk of arrhythmia.

Supplementary File 1

Prevalence of Arrhythmia in Chiropractic Practice	
File ID:	Date:
Examination:	
Age (in years):	Blood Pressure (mm Hg):
Height (include units):	Weight (include units):
Patient Questionnaire:	
Do you have or have you ever been told that you have an irregular heart beat?	
<input type="checkbox"/> Yes	<input type="checkbox"/> No
Do you have or have you ever been told that you have a cardiovascular disease – a disease affecting your heart or blood vessels?	
<input type="checkbox"/> Yes	<input type="checkbox"/> No
Do you have or have you ever been told that you have high blood pressure?	
<input type="checkbox"/> Yes	<input type="checkbox"/> No
Have you recently had dizzy spells or fainting?	
<input type="checkbox"/> Yes	<input type="checkbox"/> No
Have you recently had a sense of your heart racing or beating in your chest – so called palpitations?	
<input type="checkbox"/> Yes	<input type="checkbox"/> No
Do you have or have you ever been told that you have diabetes?	
<input type="checkbox"/> Yes	<input type="checkbox"/> No
Do you smoke cigarettes?	
<input type="checkbox"/> Yes	<input type="checkbox"/> No

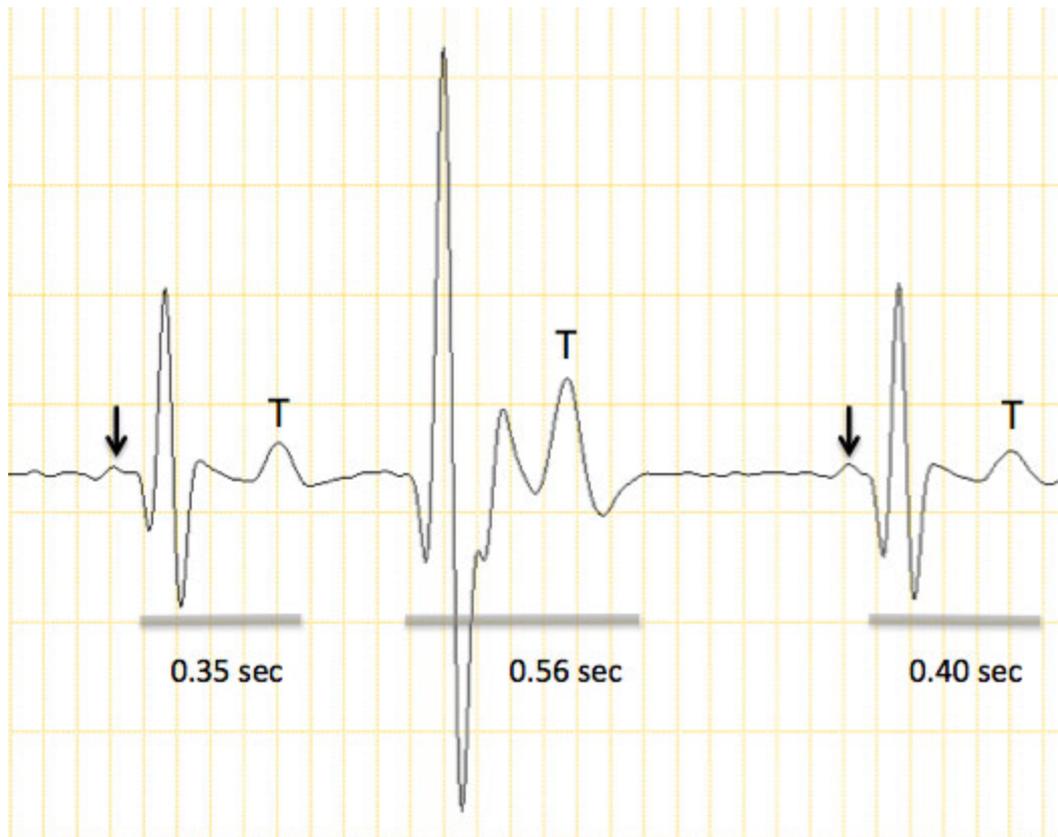


Figure 1:

ECG recording of a premature ventricular contraction

Representative ECG data from one patient who displayed multiple premature ventricular contractions. Vertical arrows indicate P-waves preceding normal QRS complexes. T's denote T-waves following QRS complexes. The horizontal bars indicate the durations of Q-T intervals. The central recording has no apparent P-wave, an abnormal QRS complex and a much prolonged Q-T interval, as is characteristic of premature ventricular contractions.

Description of Equipment, Data Collection and Data Analysis

Subjects completed health surveys and consent forms prior to data collection. Height, weight and blood pressure were measured just prior to ECG recording. ECGs were collected using a Zephyr BioHarness (ADInstruments, Boulder, Colorado) which is a 2-lead portable single chest-strap, dry harness that logs, monitors, and analyzes biological data. Data were recorded automatically via a wireless connection to a USB radio receiver, and analysis was performed using the Zephyr Bioharness software as

well as LabChart 6.0 software (ADInstruments, Boulder, Colorado). Data were recorded for three consecutive minutes while the patient sat comfortably. R-waves and ectopic beats were automatically tagged using the LabChart 6.0 software. Then, the ECGs were reviewed visually to identify anomalies such as missed beats, premature beats, and changes in wave form, as for example the prolonged QRS complex typical of premature ventricular contractions (see figure 1).

In this study, the treating chiropractor was informed of which patients appeared to have arrhythmias. These

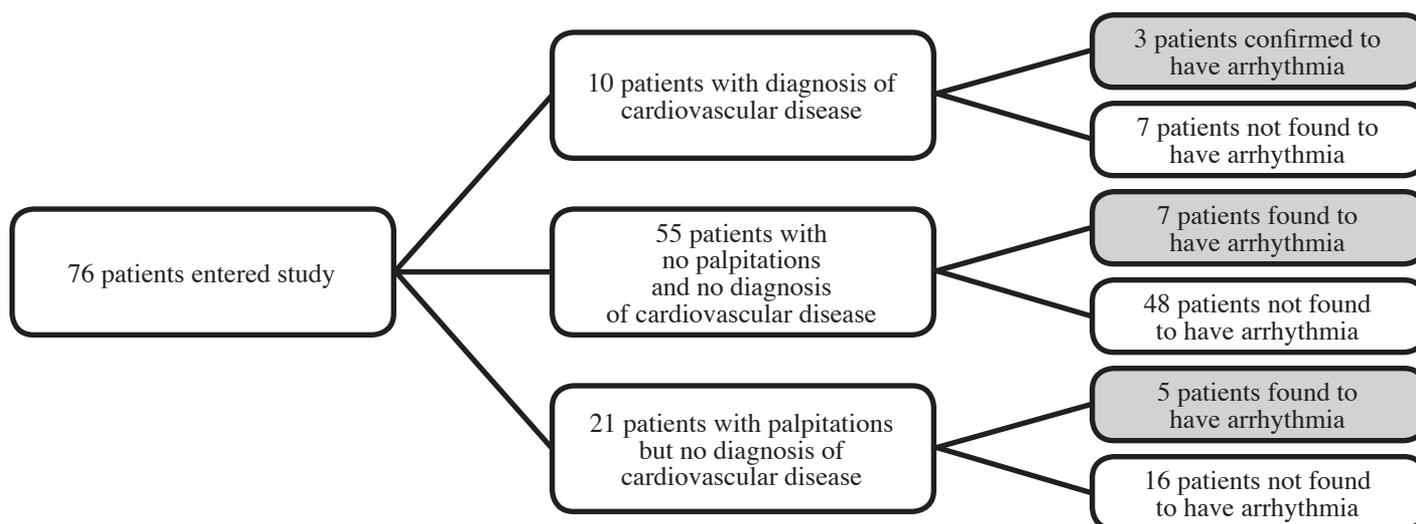


Figure 2:
Medical histories and screening results of patients

The 76 patients recruited into the study could be classified into 3 cohorts based on their histories: previously diagnosed with cardiovascular disease; no previous diagnosis of cardiovascular disease or history of palpitations; history of palpitations but no diagnosis of palpitations. In each of these three cohorts, there were patients who were and were not found to have arrhythmias during a 3-minute screening ECG.

patients were then advised by the chiropractor to consult with their family physician for follow-up and a letter with a representative tracing was provided for the physician.

Results

ECGs were obtained from a total of 76 patients (45 females, 31 males, mean age 51 ± 14 years, mean body-mass index 29.0 ± 6.6). In more detail, the age distributions were: 2 subjects, aged 13 and 17 years, respectively; 2 subjects aged 20 and 29 years, respectively, 11 subjects aged 30 to 39 years; 16 subjects aged 40 to 49 years, 27 subjects aged 50 to 59 years; 14 subjects aged 60 to 69 years; 2 subjects aged 72 years and 2 subjects aged 86 years. Nineteen subjects (25%) had body mass indices (BMIs) of between 25.0 and 29.9, conventionally regarded as overweight, and 38 (50%) had BMIs of 30.0 or greater, conventionally regarded as obese.

As shown in figure 2, of the 76 patients, 10 (13%) reported having cardiovascular disease (2 of these patients also reported palpitations). Additionally, 21 (28%) reported experiencing palpitations or a 'racing heart' in the absence

of a medical diagnosis of frank cardiovascular disease and did not equate their experience of palpitations with 'cardiovascular disease.' Of the 10 patients reporting cardiovascular disease, 3 were found to have an arrhythmia. Of the 21 patients in total who reported experiencing palpitations or racing of the heart in the absence of frank disease, 5 were found to have an arrhythmia. Further, of the 19 (25%) patients who were told, as part of a previous medical diagnosis, that they had an arrhythmia (regardless of whether they had a subjective sense of palpitations), 4 displayed arrhythmias during their 3-minute ECGs. Thus, of the 31 patients in total who either had a diagnosis of cardiovascular disease or symptoms suggestive of arrhythmia, 8 displayed arrhythmia during the 3-minute screening.

Of the 15 patients whose ECGs showed arrhythmias (9 of whom were not aware that they had arrhythmias), 8 displayed premature ventricular contractions (PVCs), 3 had premature atrial contractions (PACs), 2 had atrial fibrillation, 1 had missed beats and 1 had a bundle branch block. All 15 of the patients with ECG abnormalities had BMIs above 25.0 (mean BMI: 31.6).

Discussion

Fifteen of 76 patients (~20%) in this study displayed cardiac arrhythmias. This prevalence of arrhythmias is consistent with the findings of other epidemiological studies. A previous study⁴ found that 49% of subjects aged 60 years or older had arrhythmias of ventricular origin, such as PVCs, and 24% of subjects had supraventricular arrhythmias. Among the factors influencing prevalence of arrhythmias are age (prevalence increases in essentially a linear fashion between ages 45 and 95), gender (prevalence is greater in males than females) and ethnicity (prevalence is greater in African Americans than in American Caucasians).^{10,11} In this regard, a recent study found that 38% of patients visiting chiropractors in the United States of America were over 50 years old.⁶ In our sample, 45 of 75 patients (~59%) were over 50 years of age.

Of the 76 subjects that participated in the study, 31 had indicated that either they had been told they had a cardiovascular disease and/or an arrhythmia, or that they had experienced subjective palpitations/racing of the heart. From this group of 31 individuals, only 8 had ECG readings displaying an arrhythmia, the other 23 individuals had normal readings. In this regard, it is to be noted that arrhythmias may be transient or episodic so that a 3-minute recording is likely to have an imperfect sensitivity, but is more sensitive than the common 20 second screening ECG.⁹ There was also a group of 9 subjects (~12% of our sample) who were not aware of having an arrhythmia (regardless of whether they had a history of cardiovascular disease) and yet their 3-minute ECG recordings did display arrhythmias.

These observed irregularities in the cardiac rhythm took various forms: 8 ECGs displayed PVCs, 3 had PACs, 2 had atrial fibrillation, 1 had missed beats and 1 had a bundle branch block. A PVC results from ectopic foci in the ventricles leading to premature depolarization that therefore propagates along an abnormal and often lengthened pathway. On ECG, this appears as a widened QRS complex, measuring greater than 0.12 seconds, with no visible P wave (figure 1). Isolated PVCs are of little clinical consequence, but when they occur in series they may represent a risk of serious cardiac dysfunction including ventricular fibrillation.¹² With a PAC, an ectopic focus within the atria initiates a depolarization with an irregular P wave.¹³ Individual PACs present little

risk, but trains of PACs inducing tachycardia may be distressing and predispose to more serious consequences. Atrial fibrillation is a relatively common arrhythmia. From the point of view of cardiac function, it may seem relatively inconsequential, as the atria make a relatively minor contribution to ventricular filling. However, atrial fibrillation is, by virtue of clot generation, an important risk factor for ischemic stroke.¹³ A missed beat likely originates from an intrinsic dysfunction of the sinoatrial node. Bundle branch block is due to damage which impairs conduction in one bundle branch. This may produce a delayed or prolonged depolarization of the ventricles, which represents a risk for more serious arrhythmia such as fibrillation.¹⁴

Arrhythmias may manifest as chest pain, dizziness, palpitations, dyspnea, or weakness. The frequency, duration, and severity of symptoms can differ greatly, with some patients being totally asymptomatic while others experience debilitating symptoms.¹⁵ In this regard, asymptomatic arrhythmias may be as clinically important as symptomatic arrhythmias, and are associated with such complications as stroke and heart failure.^{14,16} Furthermore, secondary prevention (identification and early intervention) are important in mitigating negative outcomes.¹⁷ Implementation of anticoagulant therapy in patients with atrial fibrillation has been associated with substantial reduction in the incidence of stroke and reduction in mortality.² Hence, the community-based chiropractic clinic may provide an important opportunity to contribute to public health through screening for cardiac arrhythmias.

Study Limitations:

The true prevalence of arrhythmias in our sample is likely higher than our data suggest. To identify possible abnormalities in rhythm, a simple 2-lead ECG screening tool was used for this study, whereas the hospital standard is a 12-lead ECG. Nonetheless, for the purpose of screening only for common arrhythmias (bradycardia, tachycardia, missed and extra beats) a 2-lead device is adequate as long as R-waves can be reliably identified.^{18,19} Nonetheless, certain diagnostic features might have been missed. Thus, the identification of, for example, a bundle branch block in one subject, would require confirmation. Additionally, with convenience samples there must always be caution in extrapolating to the greater patient population. Patients who knew or suspected that they had a cardiac

abnormality might have been more or less inclined to participate in this study, and the recruiters may have been more or less inclined to recruit such patients.

In this study, it was not possible to calculate the sensitivity or specificity of the screening process, as it is not possible to identify 'true positives' and 'true negatives.' Given that arrhythmias are often intermittent complaints, it would be necessary to monitor patients over much longer periods of time and during normal activities in order to approach perfect diagnostic accuracy. Twenty-four or even 48-hour recordings are now used in advanced screenings, although a parsimonious interpretation of the technology might conclude that there is no 'gold standard' by which to judge whether patients truly ever or never have an arrhythmia. Thus, a pragmatic evaluation might ask whether a given screening process leads to an improved outcome for patients.

Conclusions

This study found a high point prevalence of arrhythmias in a cohort of chiropractic patients, consistent with the previously reported high prevalence in older adults. Screening for arrhythmias in this cohort identified patients who had previously-undetected arrhythmias and who might well benefit from early detection and intervention. The screening process was not disruptive of the clinic routine, and the high rate of compliance suggests that this sort of screening is well-accepted by patients. All patients who had, but were not previously aware of having, arrhythmias with potentially serious consequences were referred for further medical investigation.

This feasibility study suggests that chiropractic patient pools are worthwhile targets for screening for arrhythmias. This is not to imply that there should be a stream of chiropractic care for cardiovascular disease which is separate from the current medical system. Within the context of the jurisdiction where this study was conducted, there is a trend towards integration of chiropractic services into not only private, but also publically funded hospitals and health centers. That chiropractic practices provide an opportunity for screening for cardiovascular disorders may speak to their value as components of a system of integrated health care.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

All authors contributed to the conception of this study. SP and NP performed data collection. SP, NP and BB performed data analysis. All authors contributed to and approved the final manuscript.

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