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BRIEF ARTICLE

Anthropometric parameter-based assessment for cardiovascular disease predisposition among young Indians

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Author contributions: Anjaneyulu SR performed the research and prepared the first draft; Thiagarajan P designed the study and made major contribution to revisions.

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Abstract

AIM: To assess the predisposition for cardiovascular diseases among young Asian Indians by anthropometric data analysis.

METHODS: One hundred and thirty males and 329 females aged between 15 and 26 years, attending health care check-ups at VIT University, were included in this study. Their body mass index, systolic and diastolic blood pressure, waist circumference, waist-to-hip ratio, pulse rate and pressure, along with mean arterial pressure, were measured and the data analyzed as per World Health Organization guidelines.

RESULTS: Based on the analysis, 54% of the male population was found to be predisposed to cardiovascular disease. Of these, approximately 40% were at highest possible risk, with greater than threshold values of body mass index, waist circumference and waist-to-hip ratio. Females were found to have lower risk. Both genders showed significant correlation ($P < 0.0001$) between body mass index and waist circumference. Waist-to-hip ratio correlated significantly only in males with the former index whereas it correlated significantly with waist circumference in both genders. Receiver operating curve analysis, when performed, showed optimal sensitivity and specificity for body mass index and waist circumference.

CONCLUSION: The above results indicate that seeds of cardiovascular disease may have been sown at a young age in Asian Indian populations. Interventional measures are advised to prevent accelerated atherosclerosis leading to premature cardiovascular disease.

Key words: Cardiovascular disease predisposition; Young Asian Indians; Anthropometric biomarkers; Body mass index; Blood pressure

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INTRODUCTION

Current World Health Organization reports state that 36 million people die globally of non-communicable diseases: of these, 49% of mortality is due to cardiovascular disorders (CVD), with major causalities from India[1]. This country has undergone a rapid economic development resulting in a simultaneous epidemiological transition to a sedentary and unhealthy lifestyle[2]. Such practices result in elevated body mass index, abnormal blood pressure, *etc.*, which account for the development of non-communicable diseases such as CVD[3,4]. The World Health Organization reports that by 2020, 69%

of all deaths will be due to these diseases, with maximum contribution from cardiovascular disorders. The burden would also be severe in India as young youths are expected to be the victims. The objective of this study is to investigate young Asian Indians, who may be at risk, so that interventional measures may be initiated and awareness created among them. The focus would be mainly on controlling the modifiable risk factors which may directly or indirectly help in delaying the onset/progression of disease.

MATERIALS AND METHODS

Study data were obtained from 130 males and 329 females who attended University Health check-ups at Vellore Institute of Technology University, Vellore, India. The anthropometric parameters, *viz.,* height (cm), weight (kg), waist circumference (WC, cm), hip circumference (cm), systolic blood pressure (SBP, mmHg), diastolic blood pressure (DBP, mmHg) and pulse rate (PR, m^{-1}) were measured by standard techniques[5-7]. Using these data, body mass index (BMI) = weight/height^2 (kg/m^2), Waist-to-hip ratio (WHR), the pulse pressure (PP) = (SBP - DBP) and mean arterial pressure (MAP) = (DBP + PP/3) were calculated[8].

Following this, anthropometric data were analyzed according to World Health Organization and National Heart, Lung and Blood Institute guidelines. Accordingly, the flow chart indicated in Figure 1 was followed for screening and sorting populations as "At-Risk", "High-Risk" and "Highest-Risk".

Statistical analysis

One-way analysis of variance (ANOVA) and Spearman correlation tests were performed and receiver operation curve (ROC) was plotted using Graph Pad Prism (Trail Version). Two-tailed *P* values of less than or equal to 0.001 were regarded as significant.

RESULTS

The mean values of BMI, systolic, diastolic and mean arterial blood pressure, along with pulse parameters and waist measurements, are given in Table 1. The cut-off value of BMI as per World Health Organization guidelines is 23 (public health action point)[9,10] and our measured mean values were 23.5 and 22.93 kg/m^2 in males and females, respectively. Detailed study of the risk strategy in classifying the screened population for predisposition for cardiovascular disease revealed that 54% of the male population are "At-Risk", of which 72.9% were at "Highest Risk". In the case of females, approximately 42% are "At-Risk", and among them 59% and 52% are at "High-Risk" and "Highest-Risk", respectively (Figure 2). By World Health Organization definition, an individual's predisposition for cardiovascular disease is directly proportional to the level of risk, BMI, WC and WHR[11]. One-way ANOVA was used for comparison

Table 1 Mean values of the parameters analyzed (mean ± SD)

Parameters	Male	Female	Risk cut-off value
Body mass index (kg/m^2)	23.60 ± 3.752	22.93 ± 4.554	⩾ 23
Systolic blood pressure (mmHg)	118.07 ± 8.079	112.89 ± 7.959	⩾ 130
Diastolic blood pressure (mmHg)	85.30 ± 5.865	80.80 ± 7.131	⩾ 90
Mean arterial blood pressure	96.23 ± 4.535	91.56 ± 5.381	
Pulse rate (per minute)	75.45 ± 5.242	73.71 ± 5.312	⩾ 85
Pulse pressure	32.76 ± 10.42	32.04 ± 10.81	⩾ 40
Waist circumference (cm)	84.19 ± 11.00	75.53 ± 9.544	⩾ 85 (men) and ⩾ 80 (women)
Waist-to-hip ratio	0.93 ± 0.04	0.84 ± 0.05	⩾ 0.88 (men) and ⩾ 0.81 (women)

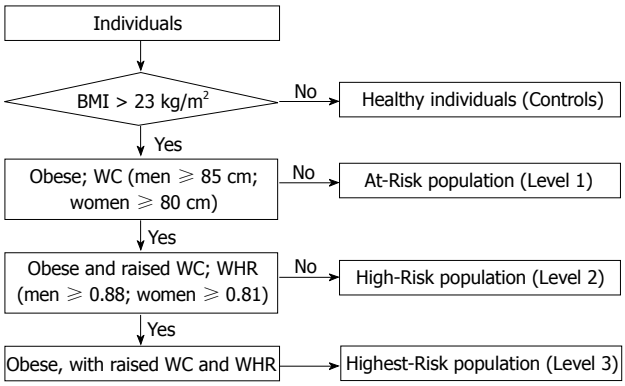

Figure 1 Risk assessment methodology. BMI: Body mass index; WC: Waist circumference; WHR: Waist-to-hip ratio.

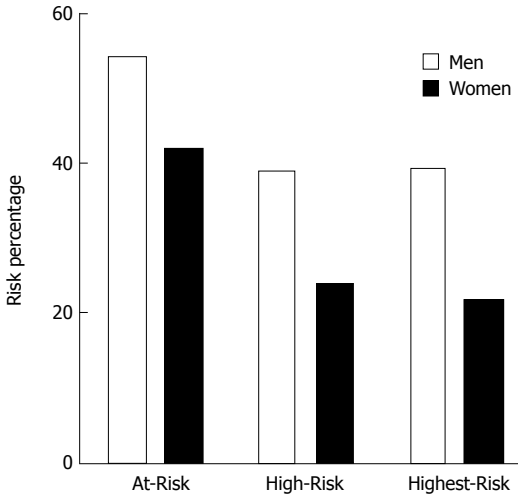

Figure 2 Risk percentage comparison (*n* = 329 women and *n* = 130 men).

of all the risk groups with controls and within each gender. Significant difference ($P < 0.0001$) was found upon comparing control group (without obesity) with obese group with and without raised WC and higher WHR in both genders together in all combinations. The values

Table 2 Spearman correlation values for men and women

Parameters	Men	Women
Correlation of BMI *vs* waist circumference	0.88[b]	0.78[b]
Correlation of BMI *vs* WHR	0.50[b]	0.09
Correlation of waist circumference *vs* WHR	0.63[b]	0.43[b]

BMI: Body mass index; WHR: Waist-to-hip ratio. [b]$P < 0.0001$.

Table 3 Receiver operating curve analysis

Parameters		Men	Women
Body mass index	Area under the curve	0.6163	0.5975
	Specificity (%)	59.04	52.53
	Sensitivity (%)	55.19	62.61
Waist circumference	Area under the curve	0.5941	0.5872
	Specificity (%)	51.81	36.36
	Sensitivity (%)	65.96	75.65
Waist-to-hip ratio	Area under the curve	0.5497	0.5108
	Specificity (%)	91.57	33.67
	Sensitivity (%)	19.15	64.00

were not significant only when controls were compared with the obese group without raised WHR in men. This significant comparison clearly proves the importance of each parameter individually and in combinations for risk evaluation (Figure 3).

The correlations between BMI, WC and WHR are shown in Table 2. BMI was highly correlated in both genders with WC, whereas the latter showed similar correlation with WHR also. The correlation between WHR and BMI was, however, lesser in the case of males and negligible in the case of females. The World Health Organization has reported elevated blood pressure as an independent marker for cardiovascular disease[12]. An individual with systolic pressure greater than 130 mmHg and/or diastolic pressure more than 90 mmHg is said to be hypertensive[13]. Based on this premise, ROC was plotted between the control and hypertensive groups, to test the level of sensitivity and specificity of BMI, WC and WHR, and results proved that these parameters can be used in combination to predict an individual's predisposition for CVD (Table 3).

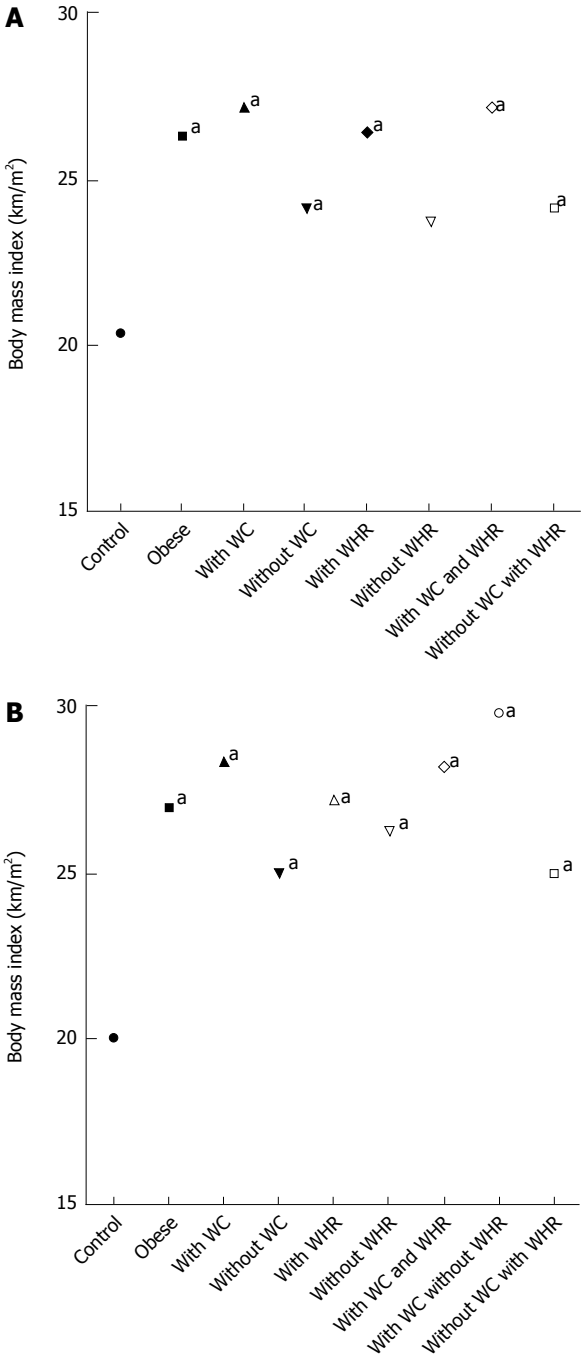

Figure 3 Control *vs* raised body mass index in men (A) and woman (B). WC: Waist circumference; WHR: Waist-to-hip ratio. [a]$P < 0.0001$ is significant.

DISCUSSION

The current study used a multivariate approach, where we included data based on an individual's anthropometric parameters such as systolic and diastolic blood pressure, mean arterial pressure, age, height, weight, body mass index, waist and hip circumferences and their ratio, pulse pressure and pulse rate of young Asian Indians. An earlier study on 1421 subjects of Omani Arab origin has reported that CVD distribution was higher among the said population by screening them with non-invasive parameters such as BMI and WC[14].

The values were found to be significantly different between males and females for BP and waist measure parameters and significant to a lesser extent ($P < 0.05$) for PR. However, for BMI and pulse pressure the mean values were not much different between sexes. These results are consistent with a previous report which suggests that the northern Indian population had raised body fat whereas their BMI was not significantly high[15]. This may be because of the fact that a maximum amount of fat deposits in the abdominal part of the body. So, when the WC is also measured and compared the accuracy of prediction increases. This is supported by earlier reports which suggests WC as an independent predictor of CVD[16,17]. The WHR in this study showed a very significant difference which is in accordance with two pre-

ceding reports, one conducted on 9206 Australians and the other on obese adult women[18,19]. However, findings from other studies showed that among the non-invasive parameters, BMI and WC correlated better than BMI and WHR[20]. Conversely, a follow-up study conducted on 25 000 participants over 6 years and other studies have proposed that WC and WHR are significantly associated with CVD[21-23]. Thus, it is suggested that the obesity parameters, BMI and WC with WHR, would lead to a better diagnosis for CVD predisposition[24]. This is also in agreement with a study performed on 1800 subjects that showed a positive relationship between the obesity parameters and CVD[25]. A recent study on detection of cardiovascular risk factors by indices of obesity in a Japanese population reported that the anthropometric data were comparable to dual energy X-ray absorptiometry[26].

In conclusion, in the screened population, 50% of males and 40% of females may be predisposed to CVD. As this population is fairly young, preventive measures when undertaken may delay the onset of atherosclerosis. This may eventually prevent cardiovascular disease. The study also shows that body mass index, WC and WHR significantly correlate with optimal diagnostic values, which can be used to evaluate the risk index.

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COMMENTS

Background

Mortality at a young age due to cardiovascular disease (CVD) has increased in recent years globally. This disorder develops in an adolescent because of their sedentary lifestyle practices. This in the later stage of their life progresses into a fatal disease. Personal evaluation of health, diet and an improved lifestyle may delay the onset of CVD. To evaluate one's personal health, anthropometric parameters may help to know whether they are within a risk category or not.

Research frontiers

Anthropometric parameters screen the population for predisposal to CVD in a non-invasive fashion. Accordingly, this study aims to identify Asian Indians predisposed to CVD within the age group 15 to 26 years, with an added objective of identifying reliable parameters for screening.

Innovations and breakthroughs

Earlier reports have emphasized the importance of anthropometric parameters by comparing them with other biochemical and genetic parameters in huge populations. The results showed that anthropometric parameter results are comparable. This study is one among the few which have studied young-age Indians and reported that a significant number of them may be predisposed to CVD. Furthermore, the study has suggested that body mass index, waist circumference, along with waist-to-hip ratio, lead to precise classification.

Applications

Through basic anthropometric parameters, this study makes it very easy for an individual to assess whether he is at risk of CVD or not, and hence preventive measures can be taken at an earlier stage so that the progression of the disease is retarded to some extent.

Peer review

The paper is very well organized and the results are justified.

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BRIEF ARTICLE

Knowledge, attitude and perception of antiplatelet therapy among dentists in Central Eastern Turkey

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Abstract

AIM: To survey the dentists in Central Eastern Turkey, testing their knowledge on coronary interventions and assessing perception of antecedent dual antiplatelet therapy.

METHODS: Two hundred and ninety-eight dentists were surveyed face-to-face by completing questionnaires, including 16 structured questions focused on general knowledge of coronary stents, and assessing periprocedural practice with regard to antiplatelet therapy.

RESULTS: All respondents were aware of such devices as coronary stents, but only one-third of the respondents knew the differences between a bare metal and a drug-eluting stent design, and associated vascular outcomes. Awareness about stent thrombosis was limited to 34%, while consequences of interrupting antiplatelet therapy were known to only 30% of surveyed dentists. Importantly, the attitudes of surveyed respondents differed substantially depending on the location of their practice, where dentists working in the urban environment (population over 10 000) were more aware of antiplatelet recommendations when compared to their colleagues from the rural areas.

CONCLUSION: Knowledge about coronary stents, associated clinical outcomes, and current guidelines with regard to surgical management of antecedent antiplatelet therapy in Central Eastern Turkey is inconsistent, and heavily dependent on the location of dental practice. Rural areas around the globe should be in a focus of continuous medical education to improve the quality of medical care.

Key words: Antiplatelet therapy; Dental; Coronary artery disease; Survey

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INTRODUCTION

An increasing number of patients suffering from heart disease in general, and coronary artery disease in particular, are routinely treated with aspirin and/or clopidogrel for prevention of major adverse ischemic occlusive events. Discontinuation of antiplatelet agents increases the risk of thrombotic complications, whereas uninterrupted antiplatelet therapy is assumed to increase the bleeding hazard after dental invasive procedures[1]. Unfortunately, there are no specific, widely accepted recommendations for the management of patients receiving antiplatelet agents during dental procedures, especially following minor surgery. Since the available evidence is very limited, with no data forthcoming from randomized trials, there is no consensus on a "real life" rate of bleeding after routine tooth extraction. Such bleeding risks are in the range of high (6%)[2] to as low as negligible or non-existent rates independent of whether dual or monotherapy with antiplatelet agents have been used[3]. Currently, due to the increasing number of coronary interventions and stent implantations justifying broad acceptance of longer duration of dual antiplatelet therapy, the American Heart Association, the American College of Cardiology, the Society for Cardiovascular Angiography and Interventions, the American College of Surgeons, the American Dental Association, and the American College of Physicians have presented a consensus document which underscores the risks of premature termination of dual antiplatelet therapy[4]. However, there is still a healthy debate with regard to optimal perioperative antiplatelet management at the time of dental procedures in high-risk patients after ischemic events[5]. While some dentists prefer to discontinue antiplatelet therapy claiming a perceived risk of perioperative bleeding, others will still proceed with surgical procedures in patients taking antiplatelet drugs for an appropriate indication. Considering these inconsistencies, physicians face practical situations in which the periprocedural bleeding risk has to be balanced against the individual risk of thrombotic complications. The purpose of the index study was to investigate the knowledge of dentists in Central Eastern Turkey regarding coronary interventions and to describe the routine management of patients receiving dual antiplatelet therapy who undergo a minor dental surgical invasion.

MATERIALS AND METHODS

We conducted a survey in Central Eastern Turkey from June 2011 to January 2012, by completing a face-to-face questionnaires in 5 dental clinics (1 teaching facility, and 4 public hospitals) among 298 currently practicing dentists. The sample size was not based on any statistical considerations, since any dentist practicing in the area, and willing to participate, qualified for the study. The geographical area where the survey has been conducted is outlined in Figure 1. Two interviewers (final year nursing students) were trained to conduct such surveys by 2 attending cardiologists, and received detailed instructions with regard to appropriate questioning, and filling the responses. The questionnaire included 16 structured questions which were developed and focused to adequately assess periprocedural practice regarding the management of patients receiving antecedent antiplatelet therapy at the time of dental invasions.

Figure 1 The surveyed geographical area in Central Eastern Turkey.

Table 1 Survey questions

Do you know what is a coronary stent?
Do you know the difference between a bare metal and a drug-eluting stent?
Do you know what is the optimal duration of clopidogrel therapy after bare metal stents?
Do you know what is the optimal duration of clopidogrel therapy after drug eluting stents?
Do you know what is clopidogrel?
Do you know what is prasugrel?
Do you know what is ticagrelor?
Do you suspend treatment with aspirin before a dental invasion in your patients?
Do you suspend treatment with clopidogrel before a dental invasion in your patients?
Do you consult with a cardiologist before interrupting antiplatelet medication(s)?
Do you ever wait until antiplatelet treatment is completed before per forming procedure?
Do you know the consequences of interrupting treatment with clopidogrel?
Do you know the rate of stent thrombosis after clopidogrel withdrawal?
Do you know the mortality rate associated with stent thrombosis?
Do you know how important is dual antiplatelet treatment in preventing thrombosis after stent implantation?
Are you aware of the guidance recommendations produced by the United States clinical societies?

Survey questions

The survey aimed to assess the awareness, knowledge, and perception about modern coronary devices and optimal antiplatelet strategies at the time of dental invasions. For these purposes, sixteen questions were included in the survey (Table 1).

Dental procedures

A dental intervention was defined as repairs or tooth extractions, performed under local anesthesia, with no need for sutures.

Statistical analysis

Descriptive statistics were used to report percentages of positive or negative responses. We used Continuity

Table 2 Survey summary

Question	Rural area (n = 74)	Urban area (n = 224)	P value
Do you know what is a coronary stent?	100% (74)[1]	100% (224)	NS
Do you know the difference between a bare metal and a drug-eluting stent?	32.4% (24)	79% (177)	< 0.001
What is the optimal duration of clopidogrel therapy after bare metal stent implantation?	4.1% (3)	26.3% (59)	< 0.001
Do you know the optimal duration of clopidogrel therapy after drug eluting stent implantation?	4.1% (3)	26.3% (59)	< 0.001
Do you know what is clopidogrel?	94.6% (70)	89.3% (200)	0.250 (NS)
Do you know what is prasugrel?	0	0	NS
Do you know what is ticagrelor?	0	0	NS
Do you suspend treatment with aspirin before a procedure in your patient?	93.2% (69)	88.8% (199)	0.374 (NS)
Do you suspend treatment with clopidogrel before a procedure in your patients?	93.2% (69)	88.8% (199)	0.374 (NS)
Do you consult with a cardiologist before interrupting antiplatelet medication?	100% (74)	100% (224)	NS
Do you prefer to wait until antiplatelet treatment is discontinued before performing procedure?	32.4% (24)	79% (177)	< 0.001
Are you aware of the consequences of interrupting treatment with clopidogrel?	23% (17)	37.9% (85)	0.027
Do you know how frequently thrombosis occurs after suspending treatment with clopidogrel in a patient with a coronary stent?	32.4% (24)	29% (65)	0.682 (NS)
Do you know the mortality rate associated with stent thrombosis?	9.5% (7)	10.3% (23)	0.597 (NS)
Do you know the importance of dual antiplatelet therapy for stent thrombosis prevention?	32.4% (24)	79% (177)	< 0.001
Are you aware of the guidance document produced by the American societies?	32.4% (24)	79% (177)	< 0.001

[1]Number of respondents. "Yes" answers are counted as positive for each survey question. NS: Not significant.

Correction or Fisher's Exact test to determine the association between the dentists working in different areas and knowledge of antiplatelet strategies. A P value of less than 0.05 was considered significant. The statistical analysis was carried out using version 15.0 of SPSS (Chicago, IL, United States).

RESULTS

The response rate to the survey was 100%, suggesting that all 298 dentists provided a complete set of answers. Of these respondents, 74 dentists (25%) indicated working in rural areas (inhabited with less than 10 000 population), while the majority of 224 (75%) had practicies in the urban areas. The summary of combined responses is outlined in Table 2.

Coronary stents and thrombosis

When asked about coronary stents, all respondents were aware and had general knowledge that such devices exist. In contrast, only about one-third of the respondents reported knowing the differences between bare metal and drug-eluting stents, and the associated adverse outcomes. When asked about their level of awareness about stent thrombosis, only 30% of the surveyed dentists had knowledge about the consequences of interrupting treatment with clopidogrel and, similarly, only 30% were aware of the high mortality rates associated with stent thrombosis.

Antiplatelet therapy, optimal duration, bleeding and thrombotic risks

When asked how familiar they were with the guidance recommendations document produced by numerous United States clinical societies, 67% of respondents were aware about such a consensus document. However, when asked about their willingness to perform dental procedures in patients with implanted coronary stents, and in those undergoing antecedent antiplatelet treatment, all of the respondents were cautious, and expressed willingness to consult a cardiologist before interrupting aspirin or/and clopidogrel. Most dentists are well aware of such drugs as clopidogrel (90.6%); however, none of the respondents recognized the names of the new generation antiplatelet agents (such as prasugrel or ticagrelor). When asked about the optimal duration of clopidogrel therapy after drug-eluting stent implantation, only a quarter of responders knew the correct answer (1 year).

When asked about their attitude toward suspension of treatment with aspirin and clopidogrel before a dental procedure, nine out of ten respondents practice discontinuation of antiplatelet agents. On the other hand, when asked about their perceptions towards waiting until antiplatelet treatment is completed before performing a dental procedure, two-thirds of the survey respondents prefer such a delayed strategy for elective invasive dentistry. Importantly, the attitudes of surveyed respondents differed substantially depending on the location of their practice, where dentists working in an urban environment were more aware of antiplatelet strategies when compared to their colleagues working in the rural areas. This discrepancy was especially evident with regard to the knowledge of the differences between a bare metal and a drug-eluting stent design ($P < 0.001$), optimal duration of chronic antiplatelet therapy after bare and drug-eluting stent implantation ($P < 0.001$), the importance of dual antiplatelet treatment in preventing stent thrombosis ($P < 0.001$); which were all significantly higher for urban area dentists. Moreover, dentists in urban areas had a better knowledge of the guidance consensus documents, and intended to wait until antiplatelet treatment was permanently discontinued before performing procedures ($P < 0.001$).

DISCUSSION

This observational study was intended to provide an

insight into the current trends for decision-making with regard to periprocedural antiplatelet treatment among the practicing dentists in Eastern Central Turkey. The practical importance of such a goal is hard to overestimate since optimal potency and duration of maintenance antiplatelet therapy is still not clear, and is barely supported by the evidence-based medicine. Therefore, poor adherence of the dentists to the guidelines is common, and not surprising. Our survey suggests that dentists experience reasonable concerns with regard to escalated periprocedural bleeding risks that frequently lead to premature cessation of antiplatelet therapy in their daily practice, which is against the current guidelines[4]. Importantly, all dentists claimed that they consulted with a cardiologist prior to interrupting antiplatelet therapy. This fact is quite reassuring that optimal medical strategies are being applied. The management of long-term antiplatelet therapy after stent implantation is a critical issue for well-being, and even for survival of patients with implanted stents. Although the reasons for the development of stent thrombosis are multifactorial, premature cessation of antiplatelet therapy has been established as the most important risk factor after coronary stenting, especially with regard to late[6], and very late[7], stent thrombosis. Based upon data from the Percutaneous Coronary Intervention - Clopidogrel in Unstable Angina to Prevent Recurrent Events trial[8], it has been recommended that, if not contraindicated, clopidogrel should not be discontinued for at least one year at the conventional 75 mg/d dose[4]. The most common reasons for premature cessation of dual antiplatelet therapy seem to be non-compliance, bleeding, allergic reactions, and noncardiac surgery. In fact, planned surgery represents the number one verifiable reason for premature discontinuation of antiplatelet therapy, and occurs in about 30% of such patients. Our data suggest that dentists in Turkey are mostly unaware of the differences in the recommended duration for optimal duration of antiplatelet therapy dependent on stent design. It will also be important to establish how these data may affect strategies after general non-cardiac surgery. Some reliable evidence has suggested that when compared to controls, the risk of prolonged immediate bleeding was higher in dental patients on dual antiplatelet therapy [relative risk (RR) = 177.3, 95% CI: 43.5-722, $P < 0.001$] but not in patients on aspirin alone (RR = 6.3, 95% CI: 0.6-68.4, $P = 0.2$) or clopidogrel alone (RR = 7.4, 95% CI: 0.7-79.5, $P = 0.18$). Importantly, all immediate bleeding complications in all treatment groups were successfully managed with local hemostatic measures, with no patient developing any late hemorrhage[1]. On the other hand, the rate of vascular events was doubled in the first 4 wk after invasive dental treatment and gradually returned to the baseline rate within 6 mo. The positive association remained after exclusion of patients with diabetes, hypertension, or coronary artery disease[5].

Therefore, the optimal treatment strategy for tooth extractions, the most frequent minor dental surgical procedure, in the expanding cohort of patients receiving long-term antiplatelet therapy is a challenging issue, since the documented thrombotic risk of antiplatelet withdrawal needs to be balanced against the putative hemorrhagic risk of uninterrupted antiplatelet treatment. Uninterrupted dual antiplatelet therapy is currently recommended in patients with drug-eluting stents who undergo dental procedures, although there are only a few prospective and retrospective studies specifically assessing the reasoning behind this approach[4]. Altering a patient's medication, even for the short term, is always risky, and should be balanced.

Our paper is the first to show the remarkable differences in the general medical awareness about antiplatelet therapy among dentists dependent on the practice area. Indeed, those practicing in the urban areas were well aware of recent scientific developments, while rural practice dentists were much less knowledgeable probably due to lack of access to educational resources.

There are a few limitations worth mentioning. Some questions in our survey were purely subjective, with a limited value of "Yes" or "No" answers. A multiple choice type question would have been much more informative, and should be employed in future studies. Also, age, sex, seniority, education background and duty may also be important determinants of the knowledge, attitude and perception of antiplatelet therapy. It is also important to record whether or not participating dentists were practicing in hospitals with cardiac catheterization laboratories. The frequency of cardiac patients experiencing serious bleeding or ischemic events is also important. Another issue is whether it is unclear if answering questions to a survey was reasonable in terms of quality control assurance. Finally, the index data cannot be generalized, since practice patterns in other regions of the world may be different. Future studies should at least report, or attempt to match these variables for better representation.

We conclude that the knowledge about coronary stents, associated clinical outcomes, and current guidelines with regard to invasive management of antecedent antiplatelet therapy in Central Eastern Turkey is inconsistent, and heavily depends on the location of dental practice. Rural areas around the globe should be in a focus of continuous medical education to improve the quality of medical care.

ACKNOWLEDGMENTS

We wish to thank interviewers and administrative personnel for their outstanding effort.

COMMENTS

Background

Many patients with coronary disease routinely undergo minor dental surgery while receiving dual antiplatelet therapy. This dangerous combination is like a double-edged sward, since stopping antiplatelet therapy may cause adverse ischemic events, but keeping the patients on such strategy may increase the

bleeding risks.

Research frontiers

Two hundred and ninety-eight dentists were surveyed face-to-face by completing questionnaires, including 16 structured questions focused on general knowledge of coronary stents, and assessing periprocedural practice with regard to antiplatelet therapy.

Innovations and breakthroughs

All respondents were aware of such devices as coronary stents, but only one-third of the respondents knew the differences between a bare metal and a drug-eluting stent design, and associated vascular outcomes. Awareness about stent thrombosis was limited to 34%, while consequences of interrupting antiplatelet therapy were known to only 30% of surveyed dentists. Importantly, the attitudes of surveyed respondents differed substantially depending on the location of their practice, where dentists working in the urban environment (population over 10 000) were more aware of antiplatelet recommendations when compared to their colleagues from the rural areas.

Applications

Knowledge about coronary stents, associated clinical outcomes, and current guidelines with regard to surgical management of antecedent antiplatelet therapy in Central Eastern Turkey is inconsistent, and heavily dependent on the location of dental practice. Rural areas around the globe should be in a focus of continuous medical education to improve the quality of medical care.

Peer review

The authors performed a survey among 298 dentists to explore their basic knowledge about stents and anti-platelet agents. Specifically, they were interested to know what would they do if planning simple dental extraction. As could be anticipated basic knowledge was different between urban and rural régions. Overall, all dentists claimed that they would consult a cardiologist prior to proceeding to dental extraction. This is pretty reassuring and seems to be important.

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CASE REPORT

Implantable cardioverter defibrillator lead-related methicillin resistant Staphylococcus aureus endocarditis: Importance of heightened awareness

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Abstract

Methicillin resistant Staphylococcus aureus (MRSA) septicemia is associated with high morbidity and mortality especially in patients with immunosuppression, diabetes, renal disease and endocarditis. There has been an increase in implantation of cardiac implantable electronic devices (CIED) with more cases of device-lead associated endocarditis been seen. A high index of suspicion is required to ensure patient outcomes are optimized. The excimer laser has been very efficient in helping to ensure successful lead extractions in patients with CIED infections. We present an unusual case report and literature review of MRSA septicemia from device-lead endocarditis and the importance of early recognition and prompt treatment.

Key words: Endocarditis; Methicillin resistant Staphylococcus aureus; Sepsis; Pacemakers; Implantable cardioverter-defibrillator

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INTRODUCTION

The implantable cardioverter-defibrillator (ICD) reduces total mortality in patients with structural heart disease[1]. Infections of these devices have increased over the last two decades[2] and are associated with an 8.4%-11.6% increased risk of mortality when compared to hospitalizations attributed to noninfectious, cardiac device-related complications[3]. We present a case and literature review of persistent methicillin resistant Staphylococcus aureus (MRSA) septicemia that was found to be secondary to a biventricular ICD infection without any signs of device pocket infection.

CASE REPORT

An 80 year-old male with coronary artery disease status post coronary artery bypass graft surgery and implantation of a biventricular ICD 15 years ago presented with a 2-d history of fever and abdominal pain. Physical ex-

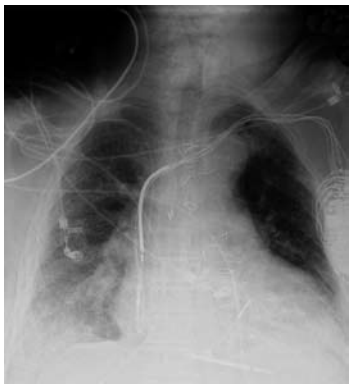

Figure 1 Chest X-ray before the implantable cardioverter-defibrillator lead extraction.

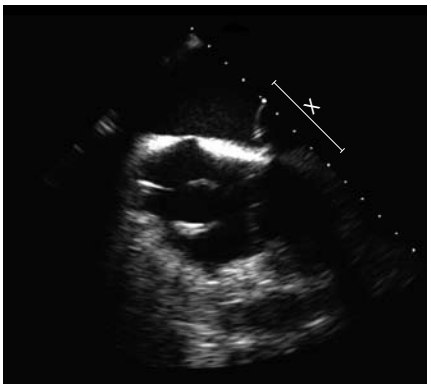

Figure 2 Transesophageal echocardiogram showing 1.5 cm vegetation in the right atrium.

amination revealed fever, tachycardia and hypotension. Initial blood work revealed acute renal failure and MRSA bacteremia. His chest X-ray (CXR) is seen in Figure 1. Despite 2 wk of appropriate antibiotics, his blood cultures remained positive.

The patient's central lines were removed. Comprehensive radiologic evaluations were unremarkable. The skin overlying his implantable device was normal. Further workup with a transesophageal echocardiogram (TEE) revealed 1.5 cm vegetation in his right atrium contiguous with his device leads as seen in Figure 2. He was subsequently referred for device extraction.

Under general anesthesia, an incision was made over the ICD generator. The ICD was encased in a capsule of fibrous tissue. A capsulotomy was performed and all four indwelling leads were completely removed with the use of a 16Fr excimer laser sheath (Spectranetics, Colorado Springs, CO). Microbiologic specimens taken at the time of the procedure grew MRSA. He was continued on intravenous Vancomycin with eventual clearance of his blood cultures. He underwent reimplantation of a new biventricular ICD and was discharged in stable condition.

DISCUSSION

Device-related infections are increasing and can often present with nonspecific signs and symptoms. Often these infections are secondary to skin-related flora. In fact, *S. aureus* bacteremia can be the sole manifestation of device infection in many individuals[4]. A high index of suspicion is necessary in patients with an ICD who present with septicemia and no evidence of pocket infection. Echocardiography is usually utilized to help in the diagnosis and treatment of cardiac implantable electronic device infections (CIED). Eight percents of vegetations on pacemaker leads can be seen by transthoracic echocardiography (TTE) as compared to 80% *via* TEE hence TEE should be used early in cases with a high suspicion for CIED[5]. In our case, TEE should have been used early in order to help guide the diagnosis and treatment of his condition. In a recent study, 91% of their patient population had TEE performed which helped in their outcomes with a calculated TTE sensitivity of 25.5%[6]. In urgent cases like septic or cardiogenic shock accompanied by a delay in the decrease of inflammatory markers (especially if there is a high suspicion for lead-associated endocarditis), TEE should be done immediately to help in improving the patients' treatment outcomes[7].

In a recent study by Tarakji *et al*[8], 41% of 412 patients had an intact-appearing pocket despite having systemic signs and symptoms of infection with an in-hospital mortality of 4.6%. The authors noted that Staphylococcus species have consistently been the most common pathogen isolated in most cases of CIED with 44% of *S. aureus* infections being MRSA. In the Multicenter Electrophysiologic Device Infection Cohort, they found that a remote source of infection was usually present 38% of the time in late lead-associated endocarditis (LAE) unlike 8% for early LAE ($P < 0.01$). The in-hospital mortality was low for the two groups, 7% for early LAE and 6% for late LAE[9]. Patients with an implantable cardiac device who present with MRSA or methicillin-sensitive Staphylococcus aureus bacteremia should be aggressively screened for device infections especially if there are no other identifiable sources. The data are less clear for gram-negative bacteremia.

Transient bacteremia could occur during brushing of the teeth, tooth extraction or dental cleaning but the risk of its resulting in persistent MRSA bacteremia is low[10]. The American Heart Association (AHA) guidelines for antimicrobial prophylaxis before dental procedures considered patients with cardiac devices as low risk and thus not requiring routine prophylaxis[11]. Rather, improved oral health and hygiene has been encouraged to reduce the incidence of transient bacteremia that could progress to lead- associated endocarditis[11]. In patients who have had previous infective endocarditis or prosthetic cardiac valves, it is recommended that they should receive antimicrobial prophylaxis before dental procedures[12].

Managing device infections

When device-related infections occur, complete extraction is necessary to eradicate the infection. Cardiac implantable electronic device extraction is usually performed in tertiary referral centers because of the avail-

ability of expertise and the need for cardiac surgery back-up[13]. There are several methods used in lead extraction that includes traction/countertraction, grasping devices, and excimer laser sheaths aimed to debulk connective tissue surrounding leads. The ultraviolet excimer laser is particularly effective in facilitating extraction with minimal risk of perforating the vein or heart especially with chronic indwelling leads that have significant amounts of fibrous tissue surrounding them[14]. Our patient was able to undergo lead extraction without complications using the excimer laser. His follow up TTE and CXR were unremarkable.

Complications related to lead extractions and timing of reimplantation

Complications related to lead extractions have been studied in two large clinical trials. The Plexes Trial prospectively randomized 301 subjects with 465 chronic pacemaker leads and found a 94% procedural success rate in the laser group with 1.96% associated major complication[15]. In the Lexicon study, the all-cause in-hospital mortality for laser-assisted lead extraction was 1.86%: 4.3% when associated with endocarditis, 7.9% when associated with endocarditis and diabetes, and 12.4% when associated with endocarditis and creatinine $\geqslant 2$[16]. According to the Heart Rhythm consensus statement, major complications include death, cardiac and vascular avulsion or tear, pulmonary embolism, respiratory arrest, stroke and pacing system related infection of non-infected site[13]. Some of the risk factors for complications include female gender, long implantation time, and lack of experience of the operator and ICD lead type[14].

Finally, it is important to ensure that blood cultures are negative before implanting another ICD device. Current AHA guidelines recommend a period of 72 h of negative blood cultures before implantation of a new CIED in patients with previously positive lead vegetation on TEE and blood cultures[17].

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CASE REPORT

Emerging and under-recognized Chagas cardiomyopathy in non-endemic countries

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Abstract

Due to recent population emigration movements, an epidemic of Chagas disease is currently menacing most developed countries. The authors report the case of a 53-year-old Brazilian woman living in Europe for the last 10 years who developed heart failure symptoms, having a previous symptomatic sinus node disease with a pacemaker implant at age of 40 years. The diagnosis was based on serology and myocardial biopsy and the patient was treated with nifurtimox. The authors emphasize the need of a high level of suspicion in patients with suggestive epidemiology and the need of populational screening of specific high risk groups. New treatment options are also discussed.

Key words: Chagas disease; Chagas cardiomyopathy; Dysrhythmia; Emigration; Non-endemic countries; Benznidazole; Nifurtimox

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INTRODUCTION

Chagas disease (CD) is one of the parasitic diseases with a high economic burden throughout Latin America. It affects around 10 million people and has now become global due to recent population movements and migration[1]. Being one of the 17 neglected tropical diseases, it still afflicts the poor and "promotes poverty". Its presence outside Latin America is primarily the result of migration but it has also been reported among travellers and in adopted children. Important transmission routes in Europe are transfusion, vertical or organ transplantation[2]. The challenge in treatment of chronic CD is due to limitations of the currently available specific treat-

ments, benznidazole and nifurtimox, and also to the lack of biological markers for the early evaluation of anti-parasitic drug efficacy and clinical response[3]. Chronic chagasic cardiomyopathy (CCC) is the most serious and common etiology of CCC in Latin America and occurs in 20%-30% of infected subjects, usually 10-30 years after infection by *Trypanosoma cruzi*[4].

In this report, we emphasize the implications of a very great latent time until CD diagnosis and emergent opportunities in treatment and surveillance programs. A brief presentation of new therapeutic options is also presented at the end of the paper.

CASE REPORT

In January 2011, a 53-year-old Brazilian woman was referred for assessment in our Cardiology Clinic and Infectious Diseases Department due to complaints of heart failure and after taking into account her epidemiological background.

She had experienced worsening dyspnea with marked limitation of activity and orthopnea for the last 3 mo, and was currently graded as class Ⅲ New York Heart Association (NYHA). She denied any gastrointestinal symptoms or constitutional symptoms.

Her comorbidities were diabetes and hypertension. Moreover, in 2002 she was diagnosed with symptomatic (syncopal) sinus node disease, presenting with sinus bradycardia of 40 beats/min and frequent sinus pauses and non-sustained ventricular tachycardia with runs of less than 5 beats. At that time, echocardiography revealed normal left ventricular systolic function and no further relevant changes. A DDD-R permanent pacemaker was then implanted and some years later she was lost to follow-up. She was currently medicated with metformin/sitagliptin, an angiotensin receptor blocker and nitrates.

She had lived in a rural area in the Goiás state of Brazil, located in the central part of the country, until the age of 12 years. Her family house was a typical one of suburban areas in Goiás, with plenty of palm trees in the vicinity. No bed nets were used for protection. She had one blood transfusion during her first delivery (age 24 years). Her mother died when she was 60 years old with the diagnosis of CD. Additionally, she reported two sisters and one aunt living in Brazil, also diagnosed with CD recently, and her father with the diagnosis of gastrointestinal CD. She had been living in Portugal for the last 10 years.

On physical examination, a systolic grade Ⅱ/Ⅵ murmur and basal rales were found. Her electrocardiography (ECG) revealed atrial pacing and ventricular sensing with normal QRS morphology and duration alongside frequent ventricular premature beats. On chest X-ray cardiomegaly could be easily spotted. Transthoracic echocardiogram showed a dilated (59 mm diastolic diameter/1.62 m^2 body surface = 36.42 mm/m^2) and hypokinetic LV was found. Ejection fraction was estimated to be 35% using Simpson method and a grade Ⅱ-Ⅲ/Ⅳ mitral regurgitation was found (Figure 1). On 24-h Holter monitoring, occasional non-sustained ventricular tachycardia runs (4 beats) were found. She had a normal coronary angiogram and an elevated (28 mmHg) mean pulmonary artery pressure was recorded on catheterization. Left ventricle (LV) angiogram confirmed a dilated LV with generalized hypokinesia, blood stasis and grade Ⅲ mitral regurgitation.

A myocardial biopsy was performed and showed plenty of pseudocysts full of amastigotes compatible with *T. cruzi* without inflammatory infiltrate (Figure 2). Anti-*T. cruzi* antibodies were detected by the indirect immunofluorescent antibody test (IFAT; MarDX Diagnostics, Inc.) and by enzyme-linked immunosorbent assay (ELISA; bioELISA Recombinant antigens V 3.0). Polymerase chain reaction (PCR) for *T. cruzi* was not performed at this stage.

She was implanted with a cardioversor defibrillator. A beta-blocker, warfarin and amiodarone were added to her usual medication.

Her two sons (30 and 31 years old, respectively) were screened for CD using ELISA and IFAT and they were both negative. The patient started antitrypanosomal therapy with nifurtimox 10 mg/kg per day, administered orally in four divided doses, for 90 d. Side-effects were significant: 12 kg weight loss, decreased short-term memory, nausea, headache, dizziness and mood changes. Despite this, the patient strictly complied with her treatment. Monitoring of blood count, hepatic enzymes, serum creatinine, and urea was performed before, monthly and at end of treatment. One month after the end of treatment anti-*T. cruzi* antibodies were still detected by IFAT and ELISA and nested-PCR for *T. cruzi* was inconclusive.

No improvement was observed in the patient's ejection fraction, which remained stable at 12-mo follow-up. She is currently graded as NYHA Ⅱ on regular follow-up at the Cardiology and Infectious Diseases clinics in our hospital. She has been advised not to donate blood or organs in the future and not to undergo further pregnancies due to the risk of transmission.

DISCUSSION

In Portugal, CD is an emerging imported parasitosis. According to the World Health Organization (WHO) Working Group on Chagas disease, there are an estimated 1255 people infected with *T. cruzi* (prevalence rate of 1%) in Portugal, but only 8 cases have been diagnosed by laboratory testing[1]. Unfortunately, all these cases were lost to follow-up. Our patient is the ninth to be diagnosed. This means an index of underdiagnosis of 99.4%. The index of underdiagnosis of the other eight European countries that participated in that surveillance study shows that, in general, between 95% and 96% of expected cases are not diagnosed[1]. This enormous percentage is probably due to illegal immigrants and due to the fact of limited experience in the detection and man-

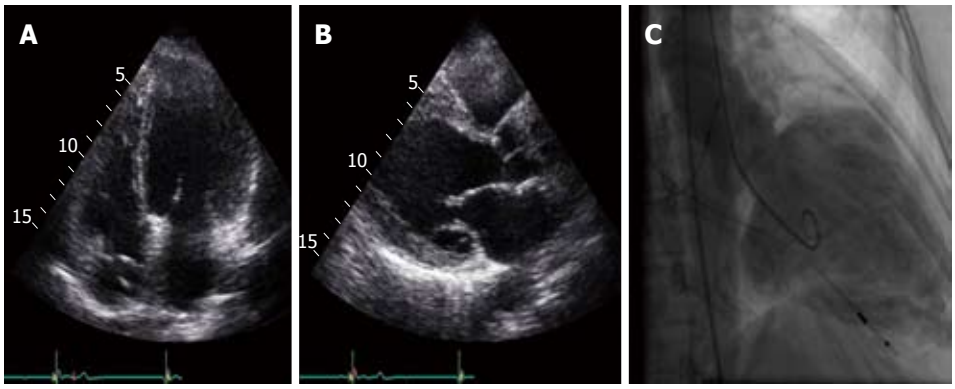

Figure 1 Transthoracic echocardiogram: apical 4-chamber view (A), parasternal long-axis (B); and (C) left ventricle angiogram showing a dilated and aneurysmatic left ventricle (36.37 mm/m^2 end diastolic and 31.44 mm/m^2 end systolic diameter) with generalized hypokinesia.

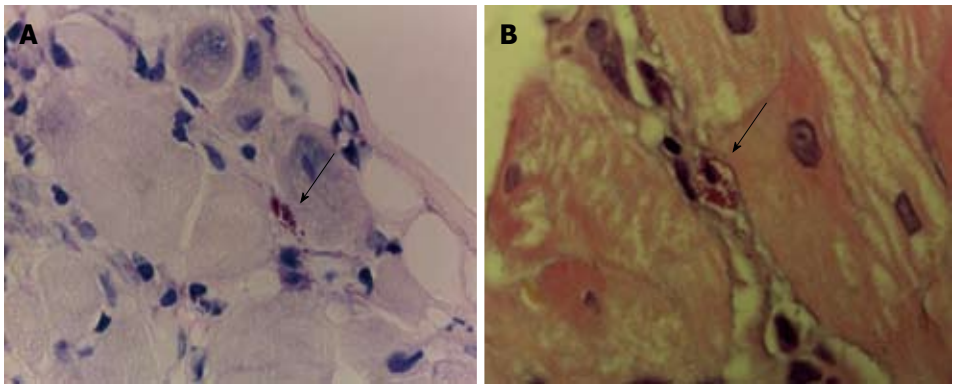

Figure 2 *T. cruzi* pseudocyst (arrow). A: Heart muscle, Giemsa staining, 100×; B: Heart muscle, hematoxylin-eosin staining, 100×.

agement of CD of most European health professionals.

In the Northern Goiás State of Brazil, where our patient was born, the presence of triatomides in dwellings or evidence of triatomide colonization was found to be statistically correlated with seropositivity in children[5]. Our case report could be a vector-borne transmission supported by the very typical correlation with mud houses, such as the one inhabited by our patient during her childhood. Less likely, it could have been a blood-borne infection due to transfusion. It seems unlikely to be a congenital transmission since the mortality rate among such infected children is very high, mainly due to acute meningoencephalitis and myocarditis, and this transmission is greatly related to abortion and low-birth weight[6].

The most frequent ECG finding in CD individuals is the presence of right bundle branch block alone or in association with left anterior fascicular block. Other ECG changes are also frequent, such as atrial and ventricular premature beats, intraventricular or atrioventricular conduction disturbances, and primary ST-T wave changes[7]. Sinus node disease, as an early presentation in a patient with no extensive myocardial involvement (and subsequent LV systolic function compromise), may suggest an abnormality in the innervation of the sinus node[8]. A 10% to 45% prevalence of sick sinus disease according to the level (more prevalent in advanced forms) of chagasic cardiomyopathy has been reported[9]. Other authors have reported prevalence rates ranging from 26.8% (in subjects with normal LV systolic function) to 83.3% in those having compromise[10]. Auto-antibodies resulting from a molecular mimicry mechanism may also be involved in the pathogenesis of sick sinus disease[10]. Sinus bradycardia and chronotropic incompetence are therefore common in these patients. In more advanced disease states, marked atrial remodeling and dilatation alongside atrial arrhythmias may also occur[11].

Congestive heart failure and sudden cardiac death are the main causes of death among chagasic patients. The average prevalence of malignant arrhythmias in these patients is unknown, but risk factors have been identified: regional contractile abnormalities and mild left ventricle dysfunction[12], apical lesions[13], moderate or severe LV systolic dysfunction[14], exercise-induced ventricular arrhythmia[15], non-sustained ventricular arrhythmia[16], New York Heart Association functional class Ⅲ-Ⅳ and absence of β-blocker treatment[17].

According to the I Latin American guidelines for the diagnosis and treatment of Chagas cardiomyopathy[18], the patient's drug therapy would have the following classes of recommendation and levels of evidence: angiotensin receptor blocker (I-C); β-blocker, oral anticoagulants (I-C); amiodarone (I-B); and nitrate (Ⅱa-C). Further therapy can be introduced in the future if the patient develops congestive symptoms and deteriorates into Ⅲ or Ⅳ NYHA class: spironolactone (I-B); diuretic (I-C) for congestive symptoms; and digitalis (Ⅱa-C).

Digitalis, angiotensin-converting enzyme inhibitors[19] and beta-blockers[20] have proven to be useful in reducing neurohormonal activation in patients with advanced Chagas cardiomyopathy.

The implantable cardiac defibrillator (ICD) has proven to be effective in terminating life-threatening arrhythmias, in a registry including mostly patients under secondary prevention[21]. These patients have a very high

incidence of electrical storms, reaching 15.7% in an ICD registry[21].

Patients should be selected for this type of therapy according to the international guidelines[22]. However, some authors propose that patients with non-sustained ventricular arrhythmia without straight indication for ICD should be referred for programmed ventricular stimulation[23]. Radiofrequency ablation is another option for treating these patients, but sometimes an epicardial approach may be necessary in order to more effectively target the arrhythmia substrate[24].

According to the scoring system defined by Rassi *et al*[25], this patient would be assigned 15 points based on: NYHA Ⅲ class (5 points), cardiomegaly on chest X-ray (5 points), LV systolic dysfunction on echocardiography (3 points) and non-sustained ventricular tachycardia on 24-h Holter monitoring (2 points). This score puts her in the high-risk category (risk of death in the next 10 years of 84%).

PCR for *T. cruzi* was not performed initially because serology is the gold-standard for diagnosis of chronic CD[26,27], despite being affected by cross-reactions with antibodies induced by other parasites, namely *Leishmania* and *T. rangeli*[28]. Due to this, two different serologic tests were performed to confirm the results. PCR is used for post-treatment follow-up to look for failure of therapy in achieving parasitological response, but its variability in sensitivity may be explained by the intermittent presence and quantity of circulating parasites at the time of blood collection[29].

Our patient was not cured as antibody titres did not decrease significantly and did not become negative. However, this result is often not observed until 8 to 10 years post-treatment and then only in approximately 15% of treated adult subjects[27]. The main impact of the great latent time until the diagnosis of CCC is the lack of efficacy of the two approved drugs for anti-trypanosomal therapy in chronically-infected patients. Conversely, in acute disease the cure rate is reported to be around 85%[30] and in congenital transmission it can reach 100%[6]. It is clear that efficacy declines markedly with the duration of infection[3]. Uncertainty remains regarding the degree of efficacy, mainly because of the lack of a reliable test of cure, as explained above.

The reason why this patient was treated with nifurtimox was due to WHO stock shortage of benznidazole, which seems to be a better tolerated drug[30]. The Benznidazole Evaluation for Interrupting Trypanosomiasis, a large, multicenter, double-blind, randomized, placebo-controlled trial of benznidazole for patients with mild-to-moderate CCC, is ongoing and the results will not be known until end of 2012[31]. Despite most physicians often being reluctant to treat patients with CCC who are above 50 years of age because of the frequent side effects, the inability to confirm cure conclusively, and lack of efficacy of the two currently available drugs, some authors have shown a reduction in the rate of progression toward advanced cardiopathy compared to untreated patients[3,4,30,31]. It is obvious that new treatments are urgently needed, and the antifungal triazoles, namely posaconazole, have demonstrated potential for therapeutic switching[3,30,32]. Unfortunately, only one clinical case has been published of a previous treatment failure with benznidazole and subsequent successful treatment with posaconazole using PCR as follow-up[3].

In the face of relative unsuitability of Chagas patients for heart transplant due to the risks of increased parasitemia when under immunosuppression, the possibility of using stem cells to treat chagasic cardiomyopathy has been viewed with enthusiasm[33].

In 2004, Soares *et al*[34] demonstrated that intravenous injection of bone marrow cells into chronic chagasic mice resulted in migration to the heart and a significant reduction in inflammatory infiltrates and interstitial fibrosis. Guarita-Souza *et al*[35] have administered autologous skeletal myoblasts and mesenchymal stem cells from bone marrow to Wistar rats and observed a significant improvement in LV ejection fraction and reduction in LV end-systolic and end-diastolic function. Similar changes were found by another group using bone marrow cells in mice[36]. It has been recently proposed that the beneficial immunomodulatory effect of this therapy may be related to transcriptomic recovery, a measure of the genes that are either up- or downregulated by the presence of the disease[37]. The first clinical trial was conducted by the group of Vilas-Boas and colleagues in 28 patients using autologous bone marrow cells. A significant improvement during an 180-d follow-up was observed in LV ejection fraction (20.1% ± 6.8% to 28.3% ± 7.9%; $P < 0.03$), NYHA functional class (3.1 ± 0.3 to 1.8 ± 0.5; $P < 0.001$), Minnesota quality of life questionnaire (50.9 ± 11.7 to 25.1 ± 15.9; $P < 0.001$) and 6-min walk test[38]. Nevertheless, a larger randomized, double-blind, placebo-controlled clinical trial is needed.

Chagas disease is associated with heart failure, the presence of left ventricular apical aneurysm, left atrial dysfunction, cardiac arrhythmias, a proinflammatory status and several other factors that predispose to stroke[39,40]. Furthermore, the presence of Chagas disease is in itself an independent risk factor for stroke[41]. The possible existence of a prothrombotic disease state is still controversial[42,43]. Sometimes, stroke can be the first sign of Chagas disease in asymptomatic patients or in those with mild systolic dysfunction[44]. Recurrence is estimated to be around 20%, so secondary prevention is recommended[39]. No randomized studies have been conducted so far regarding the role of anticoagulation for primary prevention of thromboembolism in Chagas disease. However, Sousa *et al*[45] have developed a cardioembolic risk score including 4 variables: systolic dysfunction (2 points), apical aneurism (1 point), primary alteration on ventricular repolarization (1 point) and age > 48 years (1 point). According to this score, our patient would achieve 4 points, placing her under a risk category that has an annual stroke rate of 4.4% and therefore has benefit from oral anticoagulation. The

decision to use aspirin or warfarin to prevent thromboembolism in these patients remains an open and challenging question[39].

Another interesting issue regarding chagasic therapy is the role of supplementation with selenium (Se), which is an essential micronutrient and an antioxidant at the cellular level[46]. Data from Souza *et al*[47] indicate that Se treatment prevents right ventricular chamber increase and thus can be proposed as an adjuvant therapy for cardiac alterations already established by *T. cruzi* infection. Moreover, this author had previously demonstrated that a Se-deficient diet contributed to an increased susceptibility to this infection in experimental models and higher mortality during *T. cruzi* infection[48], whereas oral Se supplementation at low doses alleviated heart damage[49].

The index of underdiagnosis estimated for eight European countries with culture and linguistic proximity to Latin American countries is a good indicator of the limited epidemiological impact of CD in the context of European health and surveillance systems. Since subjects with CD have low economic resources, the pharmaceutical companies are not particularly interested in supporting research and development of new drugs. Delay in diagnosis may result in progression of cardiac disease. New therapeutic options are promising a better future for CD, but their efficacy and safety still need to be tested. The priority should be the implementation of screening programs for target populations (women of childbearing age and a high suspicion level in young patients with heart failure or dysrhythmias at risk of having been infected earlier in endemic countries) and the training of professionals in the detection of possible cases, as well as implementation of rigorous protocols for blood and organ donation, are essential to limit the impact of Chagas disease in countries where there is no vector transmission.

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CASE REPORT

Thrombosed prosthetic valve in Ebstein's anomaly: Evaluation with echocardiography and 64-slice cardiac computed tomography

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Abstract

Ebstein's anomaly (EA) is a rare cardiac congenital malformation with displacement of septal and posterior tricuspid leaflets, resulting in atrialization of the right ventricle. We report a case of EA in which the etiology of a malfunctioning prosthetic tricuspid valve is depicted on cardiac computed tomography to be as a result of thrombus lodged in the valve.

Key words: Adult; Ebstein Anomaly/pathology; Tomography; X-ray computed/methods

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INTRODUCTION

Ebstein's anomaly (EA) is a rare cardiac congenital malformation characterized by apical displacement of the septal and posterior tricuspid leaflets, resulting in atrialization of the right ventricle. Surgical replacement of the tricuspid valve is performed in cases of severe tricuspid regurgitation. Follow-up of tricuspid prosthetic valves is typically performed with transthoracic echocardiography. We describe the case of a malfunctioning thrombosed tricuspid valve in a patient with EA. Cardiac computed tomography allowed the detection, localization and extent of the thrombus to be depicted.

CASE REPORT

A 68-year-old woman with known EA underwent echocardiography for evaluation of dyspnea. She complained of a 3-mo history of progressive breathlessness, reduced exercise tolerance (New York Heart Association grade 2) and increasing leg swelling. She had been diagnosed with EA at the age of 50 years and had been treated successfully with an angiotensin-converting-enzyme inhibitor until 2001, when her symptoms deteriorated. An echocardiogram demonstrated severe tricuspid regurgitation, and she underwent tricuspid valve replacement. Subsequent echocardiography at 6 mo post-procedure demonstrated malfunction of the prosthesis leaflets with fixation

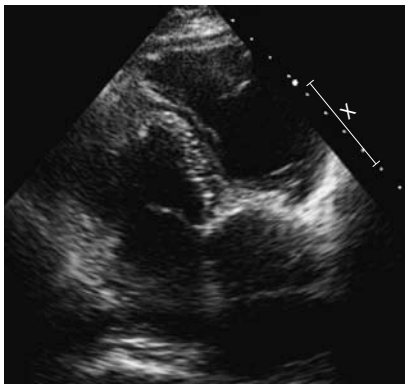

Figure 1 Echo four-chamber image of the tricuspid valve with metallic artifact making visualization of the components of the prosthesis suboptimal.

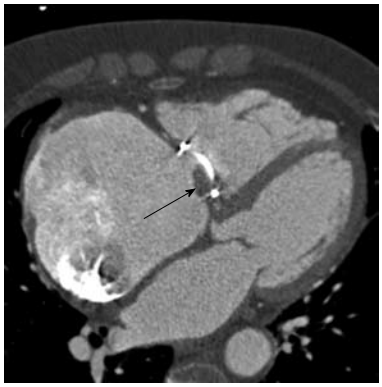

Figure 2 Coronary computed tomography image demonstrated atrialization of the right ventricle, a markedly dilated right atrium and prosthetic tricuspid valve. Thrombus was identified between the septal flap and the valve ring of the prosthesis (arrow).

throughout the cardiac cycle. On the current admission, a 64-slice cardiac computed tomography (CT) was undertaken to exclude hemodynamically significant coronary disease. It demonstrated no evidence of coronary atherosclerosis, and clearly depicted the characteristic features of EA including an enlarged right atrium and atrialization of the right ventricle (Figure 1). Thrombus was identified lodged between the medial valve flap and the valve ring (Figures 2 and 3). Multiphasic cine CT throughout the cardiac cycle demonstrated immobility of the tricuspid valve leaflets. The patient refused redo-valve replacement surgery. Her symptoms remain moderate.

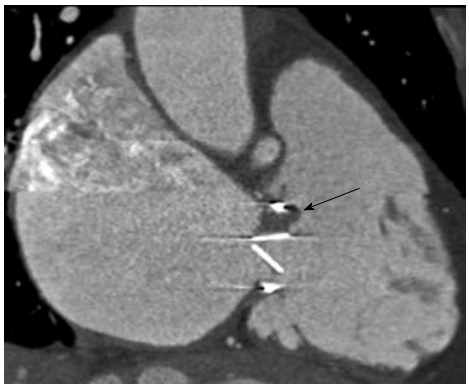

Figure 3 Cardiac computed tomography sagittal oblique multiplanar reformat demonstrated thrombus on the septal side of the prosthetic valve ring (arrow). The right atrium was markedly dilated.

DISCUSSION

EA is a rare congenital cardiac malformation characterized by apical displacement of the septal and posterior tricuspid leaflets, resulting in atrialization of the right ventricle[1,2]. Medical management includes treatment for heart failure and complex cardiac arrhythmias. Surgical tricuspid valve repair is undertaken in severe cases of tricuspid regurgitation[3]. Echocardiography is the investigation of choice for valve appraisal. Recent technical advances in cardiac CT, using multiphasic electrocardiography-gated image reconstruction, have allowed evaluation of both native and prosthetic cardiac valves. In the current report, echocardiography suggested the underlying abnormality, but the thrombus was more clearly depicted using cardiac CT. Cardiac CT also excluded obstructive coronary artery disease as a potential etiology for the patient's symptoms. Our report highlights the increasing versatility of cardiac CT in detecting non-coronary, cardiac pathology.

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Events Calendar 2012

January 18-21, 2012
Ninth Gulf Heart Association Conference
Muscat, Oman

January 27, 2012
ESC Global Scientific Activities at the 23rd Annual Conference of the Saudi Heart Association
Riyadh, Saudi Arabia

January 29–31, 2012
Integrated management of acute and chronic coronary artery disease
Innsbruck, Austria

January 30, 2012
Webinar on "Best of Euroecho 2011"
Sophia Antipolis, France

February 1-3, 2012
American Heart Association and American Stroke Association International Stroke Conference 2012
New Orleans, Louisiana, United States

February 3-5, 2012
6th Asian-Pacific Congress Of Heart Failure 2012
Chiang Mai, Thailand

February 9, 2012
4th British Society for Heart Failure Medical Training Meeting
London, United Kingdom

February 23–25, 2012
Advanced Invasive Cardiac Electrophysiology
Sophia Antipolis, France

February 24–26, 2012
International Congress of Cardiology
Hong Kong, China

February 28, 2012
Echocardiography evaluation of patient with multivalvular disease
Sophia Antipolis, France

February 29-March 3, 2012
Winter ISHNE 2012
Zakopane, Poland

March 8–10, 2012
Cardiac Pacing, ICD and Cardiac Resynchronisation
Vienna, Austria

March 8–10, 2012
24th Colombian Congress of Cardiology and Cardiovascular Surgery
Cali, Colombia

March 10-11, 2012
23rd International Meeting "Cardiology Today"
Limassol, Cyprus

March 14-18, 2012
Ninth Mediterranean Meeting on Hypertension and Atherosclerosis
Antalya, Turkey

March 15-17, 2012
e-Cardiology 2012
Osijek, Croatia

March 15-18, 2012
China Interventional Therapeutics 2012-CIT
Beijing, China

March 16-17, 2012
12th Annual Spring Meeting on Cardiovascular Nursing
Copenhagen, Denmark

March 16-17, 2012
3rd European Meeting: Adult Congenital Heart Disease
Munich, Germany

March 16-18, 2012
JCS2012 - The 76th Annual Scientific Meeting
Fukuoka, Japan

March 20–23, 2012
32nd International Symposium on Intensive Care and Emergency Medicine
Brussels, Belgium

March 25-29, 2012
16th International Symposium On Atherosclerosis 2012
Sydney, Australia

March 28–31, 2012
Rome Cardiology Forum 2012
Rome, Italy

March 28–31, 2012
Annual Spring Meeting of the Finnish Cardiac Society 2012
Helsinki, Finland

March 30-April 1, 2012
Frontiers In CardioVascular Biology 2012
London, United Kingdom

April 5-7, 2012
EAE Teaching Course on New echocardiographic techniques for myocardial function imaging
Sofia, Bulgaria

April 12-14, 2012
Cardiovascular Risk Reduction: Leading The Way In Prevention 2012
National Harbor, MD, USA

April 12-15, 2012
NHAM Annual Scientific Meeting 2012
Kuala Lumpur, Malaysia

April 18-21, 2012
World Congress of Cardiology Scientific Sessions 2012
Dubai, United Arab Emirates

April 19-21, 2012
Delivering Patient Care in Heart Failure
Sophia Antipolis, France

April 20-22, 2012
7th Clinical Update on Cardiac MRI and CT
Cannes, France

April 25-27, 2012
Angioplasty Summit 2012
Seoul, South Korea

April 25-28, 2012
The 61st International Congress of the European Society of Cardiovascular and Endovascular Surgery
Dubrovnik, Croatia

April 28-29, 2012
24th Annual Scientific Meeting of the SCS
Singapore, Singapore

May 3–5, 2012
EuroPRevent 2012
Dublin, Ireland

May 15–18, 2012
EuroPCR Congress 2012
Paris, France

May 17-20, 2012
2nd International Meeting On Cardiac Problems In Pregnancy 2012
Berlin, Germany

May 19-22, 2012
Heart Failure 2012
Belgrade, Serbia

May 23-26, 2012
46th Annual meeting of the Association for European Pediatric and Congenital Cardiology
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INSTRUCTIONS TO AUTHORS

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Acknowledgments

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2 **Lin GZ**, Wang XZ, Wang P, Lin J, Yang FD. Immunologic effect of Jianpi Yishen decoction in treatment of Pixu-diarrhoea. *Shijie Huaren Xiaohua Zazhi* 1999; **7**: 285-287

In press

3 **Tian D**, Araki H, Stahl E, Bergelson J, Kreitman M. Signature of balancing selection in Arabidopsis. *Proc Natl Acad Sci USA* 2006; In press

Organization as author

4 **Diabetes Prevention Program Research Group**. Hypertension, insulin, and proinsulin in participants with impaired glucose tolerance. *Hypertension* 2002; **40**: 679-686 [PMID: 12411462 PMCID:2516377 DOI:10.1161/01.HYP.0000035706.28494.09]

Both personal authors and an organization as author

5 **Vallancien G**, Emberton M, Harving N, van Moorselaar RJ; Alf-One Study Group. Sexual dysfunction in 1, 274 European men suffering from lower urinary tract symptoms. *J Urol* 2003; **169**: 2257-2261 [PMID: 12771764 DOI:10.1097/01.ju.0000067940.76090.73]

No author given

6 21st century heart solution may have a sting in the tail. *BMJ* 2002; **325**: 184 [PMID: 12142303 DOI:10.1136/bmj.325.7357.184]

Volume with supplement

7 **Geraud G**, Spierings EL, Keywood C. Tolerability and safety of frovatriptan with short- and long-term use for treatment of migraine and in comparison with sumatriptan. *Headache* 2002; **42** Suppl 2: S93-99 [PMID: 12028325 DOI:10.1046/j.1526-4610.42.s2.7.x]

Issue with no volume

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No volume or issue

9 Outreach: Bringing HIV-positive individuals into care. *HRSA Careaction* 2002; 1-6 [PMID: 12154804]

Books

Personal author(s)

10 **Sherlock S**, Dooley J. Diseases of the liver and billiary system. 9th ed. Oxford: Blackwell Sci Pub, 1993: 258-296

Chapter in a book (list all authors)

11 **Lam SK**. Academic investigator's perspectives of medical treatment for peptic ulcer. In: Swabb EA, Azabo S. Ulcer disease: investigation and basis for therapy. New York: Marcel Dekker, 1991: 431-450

Author(s) and editor(s)

12 **Breedlove GK**, Schorfheide AM. Adolescent pregnancy. 2nd ed. Wieczorek RR, editor. White Plains (NY): March of Dimes Education Services, 2001: 20-34

Conference proceedings

13 **Harnden P**, Joffe JK, Jones WG, editors. Germ cell tumours V. Proceedings of the 5th Germ cell tumours Conference; 2001 Sep 13-15; Leeds, UK. New York: Springer, 2002: 30-56

Conference paper

14 **Christensen S**, Oppacher F. An analysis of Koza's computational effort statistic for genetic programming. In: Foster JA, Lutton E, Miller J, Ryan C, Tettamanzi AG, editors. Genetic programming. EuroGP 2002: Proceedings of the 5th European Conference on Genetic Programming; 2002 Apr 3-5; Kinsdale, Ireland. Berlin: Springer, 2002: 182-191

Electronic journal (list all authors)

15 Morse SS. Factors in the emergence of infectious diseases. Emerg Infect Dis serial online, 1995-01-03, cited 1996-06-05; 1(1): 24 screens. Available from: URL: http://www.cdc.gov/ncidod/eid/index.htm

Patent (list all authors)

16 **Pagedas AC**, inventor; Ancel Surgical R&D Inc., assignee. Flexible endoscopic grasping and cutting device and positioning tool assembly. United States patent US 20020103498. 2002 Aug 1

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Write as mean ± SD or mean ± SE.

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Express *t* test as *t* (in italics), *F* test as *F* (in italics), chi square test as χ^2 (in Greek), related coefficient as *r* (in italics), degree of freedom as υ (in Greek), sample number as *n* (in italics), and probability as *P* (in italics).

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