Cardiovascular Pathology 25 (2016) 461–467

Contents lists available at ScienceDirect

Cardiovascular Pathology

Original Article

A retrospective study of postmortem heart weight in an adult Norwegian population

Ane Christine Skurdal [a,*], Ivar Skjåk Nordrum [b,c]

[a] Innlandet Hospital, Division Lillehammer
[b] Department of Laboratory Medicine, Children's and Women's Health, Faculty of medicine, Norwegian University of Science and Technology
[c] Department of Pathology and Medical Genetics, St. Olavs Hospital – Trondheim University Hospital

ARTICLE INFO

Article history:
Received 15 April 2016
Received in revised form 4 July 2016
Accepted 16 July 2016
Available online xxxx

Keywords:
Heart weight
Organ weight
Autopsy
Reference tables
Forensic pathology
Cardiovascular pathology

ABSTRACT

The aim of the study is to get a better understanding of what a normal heart weight is and to provide updated reference tables applicable in a Caucasian population. Most previous studies are outdated and often based on other ethnic populations, and these studies are often used in reference tables in pathology textbooks.
We included 692 Caucasian subjects, age 20–98 years, out of 2834 autopsies performed at the Department of Pathology and Genetics, St. Olavs Hospital–University Hospital of Trondheim between 2003 and 2012. Subjects with various heart or other chronic diseases were excluded. Regression analysis was applied to evaluate the relationship between heart weight and age, gender, body weight, height, body mass index and body surface area. We provide updated reference tables and discuss different approaches to the estimation of heart weight.
© 2016 Elsevier Inc. All rights reserved.

1. Introduction

1.1. Significance of heart weight

When performing an autopsy, assessment of the heart weight is important to determine if cardiac disease or other chronic diseases that may cause cardiac hypertrophy is present. Total heart weight is a valid predictor of left ventricular hypertrophy because there is a linear relationship between left ventricle mass and total heart weight [1]. Left ventricle hypertrophy can be a result of various diseases: cardiomyopathies, valvular disease, cardiovascular disease (CVD), hypertension, and other chronic conditions [2–5]. These conditions should be carefully considered at autopsy and should be investigated further with histological examination. Reference tables showing expected normal values for heart weight enable comparison of the heart weight measured at autopsy to the estimated upper weight value of a normal heart. It is therefore important that the reference tables used for the assessment are accurate and are applicable to the population in question [6].

1.2. Factors affecting heart growth and existing literature

A number of diseases, such as CVD, cardiomyopathy, hypertension, and valvular disease [2–5], increases heart weight, but lifestyle factors can also influence heart weight. Several studies show that heart weight increases with a high level of physical activity [7,8] and also with high alcohol consumption [9]. Smoking and adiposity can increase risk of CVD and thus lead to cardiac hypertrophy [5,10–12].

Most studies on postmortem heart weight are old, like the studies performed by Zeek [13] from 1942 and Kitzman [14] from 1988, and these are often the studies used in reference books. The study by Zeek from 1942 is used in the reference tables in "Autopsy Pathology – A Manual and Atlas" from 2009 [15]. Several studies are based on non-Caucasian populations, such as in the study by Hayes and Lovell [16] where the population is Jamaican, and the study by Hitosugi et al. [17] where the population is Japanese and are not applicable on a Norwegian population. Newer studies such as the study done by de la Grandmaison [6] in 2001 and by Vanhaebost et al. [18] in 2014 emphasized that regional reference values are needed. In some studies, inclusion and

Novel contributions:

- Updated reference tables for heart weight in a Caucasian population
- Correlation between heart weight and age, gender, body weight, height, BMI, and body surface area

Conflict of interest: The authors confirm that there are no known conflicts of interest associated with this publication and there has been no significant financial support for this work that could have influenced its outcome.

Ethics: This study was approved by the Regional Committee for Medical and Health Research Ethics (REK, ref. #2014/606).

This article is based upon a student thesis written by the first author when studying medicine at the Norwegian University of Science and Technology.

Funding: This study has been funded by Norwegian University of Science and Technology with necessary recourses for completion (computer access, necessary software) but not with money.

* Corresponding author.
E-mail address: anecskur@hotmail.no (A.C. Skurdal).

http://dx.doi.org/10.1016/j.carpath.2016.07.003
1054-8807/© 2016 Elsevier Inc. All rights reserved.

exclusion criteria are not exhaustive, and comparison between study populations can be challenging [14,17,19].

1.3. Aim of study

In other studies, body surface area (BSA), body weight, and body mass index (BMI) were usually the parameters that correlated best with heart weight but with varying degree. BSA and BMI are often stated as the strongest predictors of heart weight, explaining some 50% of the variance [6,18,20]. Our main goal is to map out normal heart weight in the relationship between gender, age, body weight, height, BMI, and BSA. We will provide tables to help estimate normal heart weight ranges.

2. Material and method

2.1. Material

This study is based on autopsy reports from 1584 forensic autopsies and 1250 medical autopsies performed at the Department of Pathology and Genetics, St. Olavs Hospital–University Hospital of Trondheim in a 10-year period (2003–2012). The Department of Pathology and Medical Genetics covers the mid part of Norway (Møre and Romsdal, South- and North-Trøndelag counties) with a population of about 0.5 million.

Physicians in specialization supervised by specialists in pathology performed all autopsies. The records routinely include body weight, height, and weight of internal organs. The heart was removed with 1–2 cm of the aorta and scissored open. The epicardial fat was kept, but blood and clots were washed away. The heart was weighed using a calibrated electronic weight to nearest gram. In the medical autopsies, a summary of the clinical history is usually included; in the forensic autopsies, clinical history is often very brief — depending on the information in the police documents. The autopsy records always include external and internal examination and a systematic description of the organs, except the parathyroids. Specimen from the heart, lungs, liver, kidneys, and organs with macroscopically changes is examined histologically.

From the autopsy reports, we recorded diseases referred to in the clinical history section, measurements (height and weights), and disease findings (e.g., heart infarction, valvular pathology, atherosclerosis, tumor, liver steatosis, liver cirrhosis etc.) from the autopsy itself and the immediate and underlying causes of death. Statements of, for instance, chronic alcohol abuse, were not controlled by asking for the clinical journal at the hospital or the general practitioners' journal on the diseased. Diseases registered from clinical history section in the autopsy report included CVD (valvular disease, arrhythmia, atherosclerosis, hypertension), diabetes mellitus Type 1 and 2, chronic obstructive pulmonary disease (COPD), other chronic lung disease, cancer, and other chronic diseases classified by organ system.

Findings at autopsy registered were gender, age, height, weight, body weight, heart weight, liver weight, total kidney weight, atherosclerosis, aneurism of the aorta, myocardial infarction (old and new), cancer, central nervous system pathology, lung and airway pathology, gastrointestinal pathology, pathology in reproductive organs, pathology in muscle and skeletal system, skin pathology, pathology in endocrine organs, pathology in the urinary tract including kidneys and other signs of pathology (i.e., indication of iv drug abuse or alchoholism) and, finally, the cause of death. In the forensic autopsies, we also registered method of death, such as blunt force trauma, sharp force trauma, intoxication, strangulation, hypothermia, and others.

Due to the nature of the population, both medical and forensic autopsies, we needed to run some analysis to decide if our exclusion criteria were appropriate.

2.2. Statistical analysis

Generalized linear model (GLM) was used to analyze the effect of heart infarction (old and new), other heart disease, vascular disease, hypertension, diabetes mellitus (Type 1 and 2), COPD, other chronic lung disease, cancer, chronic alcoholism, and cause of death on heart weight. Univariate linear regression analysis was used to analyze the correlation between heart weight and the external parameters: age, gender, height, weight, BMI, and BSA. BMI was calculated as weight (kg)/height^2 (m^2) [21]. BSA was calculated as height$^{(0.725)}\times$weight$^{(0.425)}\times$71.84, according to the de Bois formula [22]. The heart weight reference limits were established in the reference population using regression analysis. Statistical analysis was performed using the IBM SPSS Statistics program.

2.3. Selection

Six hundred ninety-two cases out of the 2834 autopsies were included in the study, all above 20 years of age and without known diseases that might have affected the heart weight as explained below The subjects were all Caucasoid and with a Norwegian citizenship. Tourists from abroad severely putrefied bodies; subjects that died in fire accidents and partial autopsies (n=16) were excluded. In 0.05% (n=133) of the autopsies' organ weight, body weight or height was not recorded, and these cases were therefore excluded from out database.

Before determining exclusion criteria, we used a GLM analysis to survey the influence various diseases had on heart weight. The results of the GLM analysis is presented in Table 1, and it demonstrates that old infarction, heart disease (valve stenosis or leakage, cardiomyopathies, genetic disorders, patent foramen ovale, cor pulmonale, heart failure), vascular disease (atherosclerosis, aneurysms, AV-malformations), hypertension, and chronic alcohol abuse [#1, 2 (information/history of chronic alcohol abuse or findings consistent with alcohol abuse (liver steatosis and/or cerebellar atrophy) in combination with a history of alcohol abuse)] had a significant influence on heart weight. A fresh infarct did not significantly increase heart weight, but it is a sign of coronary heart disease or other heart disease, and subjects with a fresh infarct were excluded. COPD and other chronic lung diseases showed no significant influence on heart weight, but this may be due to the small component the right ventricle makes up in total heart weight [1]. Diabetes had a P=.066, and therefore, we chose to exclude these subjects. Based on these observations, the exclusion criteria were evidence of heart infarct, heart disease, vascular disease, hypertension, COPD, other chronic lung diseases, diabetes (Type 1 and 2), and chronic alcohol abuse.

Table 1
Disease impact on heart weight

Disease	Mean BMI	Mean heart weight (g)	P-value
Fresh heart infarction	25,82	498,28	.202
Old heart infarction	25,22	499,28	<.001
Other heart disease[1]	25,18	514,90	<.001
Vascular disease[2]	25,35	475,79	<.001
Hypertension	26,03	488,19	<.001
Diabetes mellitus[3]	26,87	495,33	.066
COPD	24,22	468,19	.532
Other chronic lung disease[4]	34,72	443,61	.931
Cancer	24,67	442,60	.450
Chronic alcoholism	23,52	366,97	<.01

The effect of different diseases on heart weight in the total case material (n=2834) according to general linear model analyses.

[1] Includes valvular disease, amyloidosis of the heart, congenital conditions, patent foramen ovale, cardiomyopathies, and heart failure.

[2] Includes atherosclerosis in coronary arteries (moderate and severe), severe atherosclerosis of aorta or other great vessels, aortic aneurisms, subjects with vascular surgery such as bypass and graft.

[3] Type 1 and 2.

[4] Includes subjects with sequela from tuberculosis treatment, asthma, chronic bronchitis, and bronchiectasis.

Download English Version:

https://daneshyari.com/en/article/2898596

Download Persian Version:

https://daneshyari.com/article/2898596

Daneshyari.com