

Digit Ratio and the Age of Occurrence of Myocardial Infarction

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Abstract

Digit ratio shows sexual dimorphism and is influenced by oestrogen and testosterone while in womb. This digit ratio can be used as biomarker to know about the age of occurrence of MI. We conducted digit ratio study on 25 men and 25 women both in case and control. In the normal healthy men the average 2D:4D ratio was 0.94 and in women it was 0.95. While in cases we found that 2D:4D ratio in men with MI was 0.98 and that in women it was 0.97. The average age of occurrence of MI was 58 in men and 53 in women. Hence, we are of opinion that digit ratio can be used as a non-invasive and inexpensive biometric screening procedure for early detection of MI.

Keywords: Digit Ratio; Age; Myocardial Infarction.

Introduction

Many studies have been done which support the connection between 2D: 4D ratio and prenatal exposure to testosterone and oestrogen. Further this ratio shows relation with aggression, dominance, sporting and musical ability, fertility and health status. People who are at risk of MI early in their adult lives can be identified simply by measuring their fingers and can change diet and exercise to reduce the risk. Finger ratio is biological and medical dream which is easily and non-invasively measured as a screening tool for MI.

Digit ratio is the ratio of length of index and ring fingers typically measured from the bottom crease where fingers join the hand, to the tip of the fingers which is said to be affected by the exposure to androgens while in the uterus. The relation between testosterone and heart disease is surprising and counter intuitive, because it protects against heart attacks in men. Thus fingers may therefore provide a window into the important process of sexual differentiation in the womb.

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Method

Using the digital Vernier's Caliper, we measured the length of index finger and ring finger of right hand in 25 male and 25 female MI patients aging 30 years onwards which was compared with 25 male and 25 female controls. The right hand was chosen for stronger relation with 2D:4D ratio. The cases were collected from S.Nijalingappa Medical College and HSK Hospital, Bagalkot.

To measure the digit ratio, the proximal most crease near to the palm of the index and ring finger were selected and a mid-point of the crease was taken till the tip of the respective fingers using digital Vernier's Calipers. Then the length of the index finger was divided by ring finger to get the digit ratio. If the 2D / 4D value is less than 1, it implies that the ring finger is longer than the index finger. This type is called Casanova pattern which is usually seen in males. If the value is equal to 1, then the fingers are equal in length and are usually seen in females. If the 2D / 4D ratio is greater than 1, it implies that the index finger is longer than the ring finger. This is known as Meng's pattern[1].

In the present study, we have compared the digit ratio and its relation to the age of occurrence of MI on 50 cases and 50 controls.

Results

In our present study, we took 25 men and 25

women as control group and 25 men and 25 women in case study. We took into consideration of the entire person above the age of 30 years. We excluded deformed hands. Medical ethical clearance was taken along with consent of cases and controls.

In the normal healthy men the average 2D:4D ratio was 0.94 and in women it was 0.95. This agrees with the sexual dimorphism and lower 2D: 4D ratio in men when compared to women.

While in cases we found that 2D:4D ratio in men with MI was 0.98 and that in women it was 0.97. The average age of occurrence of MI in men was 58 and in women it was 53.

As proved by Manning, men with shorter ring finger tend to be at greater risk than the men with longer ring finger. This necessarily does not mean that all men with shorter ring finger should have MI, but they can be alerted. They can then be advised to eat low fat, reduced salt intake, avoid smoking, regular exercise etc.

When it comes to women, they are little lucky, to be protected by the oestrogen. Hence early MI are very uncommon during premenopausal age.

Discussion

Myocardial Infarction has been one of the biggest killer of this generation. Considering the vast amount of money that goes into developing and marketing products for screening and diagnosis of MI, it is provocative to think that our own external features may afford us a technology and money free way of finding it out. The relative length of index and ring fingers may contain information related to our health. According to Manning, when the foetus is in the womb it has a profound programming effect on its biology. Foetal physiology and biochemistry are very difficult to measure directly. There are many ethical and methodological problems associated with determining hormone concentrations in human foetal blood. Difficulties in measuring the foetus often lead us to measure children and adults instead. For example the important problem of coronary heart diseases a major chronic disease affecting adults. It has been found that some human populations have a higher incidence of heart disease than others, and that these populations also have high incidences of smoking, obesity, high cholesterol and high blood pressure. To combat this in 1960s and 1970s many people took to dieting, jogging and aerobic exercise with a consequent reduction in the heart attack rates. However, by the mid-1980s it was apparent that many

lean and hungry non-smokers were still dying of premature heart attacks. Infact lifestyle factors account for only about 25% of adult death from coronary heart diseases. Evidence is mounting that biological programming at the foetal stage is an important factor in the remainder.

Further work has shown that high cholesterol and elevated levels of clotting factors may also be associated with reduced foetal growth. This then is the biological programming model of heart disease. It suggests that many of the characteristic and function of our cardiovascular system are determined before birth. However, the essence of this model is that prenatal influences, often during the early stages of foetal growth may trigger major diseases in adult life. To an evolutionary biologist with an interest in sex differences the most striking pattern associated with coronary heart disease is the excess of male victims. Heart attacks are uncommon among pre-menopausal women, and so mortality rates from coronary heart diseases are 2 to 3 times higher in men compared to women. Many diseases show sex differences in their expression and progression. These sex differences are indicators of prenatal effects of sex hormones such as testosterone and estrogen. The finger ratio also shows evidence of sex differences and is prenatal in origin [2].

There is also evidence that Hox genes are responsible for digit development. Direct effects of sex hormones on bone growth might be responsible either by regulation of Hox genes in digit development or independently of such genes [3].

An examination of 56 human embryos and foetuses at various stages of development has shown that the relative lengths of fingers are established remarkably early in development. By the seventh week of intra uterine life the foetus has established near adult proportions of fingers relative to each other and to the length of the bones making up the hand. There is then a relative elongation of the bones at the ends of the fingers followed by a return to adult proportions. The result is that by the thirteenth week of pregnancy adult proportions are reached in the hand [4]. During this period, if the foetus is exposed to androgens the exact level of which is thought to be sexually dimorphic, the growth rate of fourth digit is increased. This is analysed by 2D/4D ratio of opposite sex dizygotic twins where the female twin is exposed to excess androgens from her brother in utero and thus has a significantly lower 2D/4D ratio [5].

There is evidence that testosterone enhances the efficiency of Cardio Vascular System in men. Oestrogen on the other hand is seen as a protective against heart disease because premenopausal

women rarely have heart attacks. Men who have had heart attacks tend to have lower levels of Testosterone than healthy men who are of similar age and body weight. Testosterone may enlarge the blood vessels resulting in less resistance to blood flow and may also protect against thickening of arteries. In contrast, high oestrogen levels may be related to the increased heart attacks in young men [6,7].

It is found in the latest studies that female type finger ratio in men are related to high levels of fibrinogen. This is large molecule which is present in large amounts than required for maintaining the integrity of vascular system. The result is that the heart of men with high fibrinogen levels must labour to pump their viscous blood around their body. While men with Casanova type ratio have low fibrinogen and low viscosity blood which slips easily through narrow capillaries [8]. High blood viscosity may result in continually high resistance to the action of the heart, which could wear it down. This long process of attrition may then accelerate the age related process of vascular decline. Again lifestyle factor would be relevant. For example weight gain; increases in stress, smoking and ageing have all been linked to increase in Fibrinogen concentration. We cannot only consider Fibrinogen as the only variable in the decline of our heart and blood vessels. High cholesterol in our blood stream especially LDL is an established indicator of risk for serious heart disease.

It is proved that high levels of TSH stimulate thyroid gland to produce T4 which increases metabolic and heart rates. If metabolic control is set so that TSH is consistently produced in high amounts, this would lead to an elevated heart rate, arrhythmias and even heart attacks. A study done in China on 140 children, it was found that children with high TSH levels and having female type finger ratio are more prone for Heart attacks [9].

According to Manning, men with a Casanova type finger ratio tend to have their first MI late in life while those with female type finger ratio tend to experience it early [10].

In a study done on Greek men and women found 2D:4D ratio significantly higher in men with MI than the respective ratio in healthy men. But no significant differences were observed in the ratios between women with MI and healthy women. Sexual dimorphism of digit ratios was present in both groups [11].

In a study done on Chinese population showed an association between High 2D:4D ratio and Coronary artery disease in both hands in men. There were no significant differences in mean 2D:4D between women with coronary artery disease and controls [12].

Conclusion

In our study, we found that the average age of occurrence of MI was 58 in men and 53 in women. Finger ratio can function as a very early warning sign of poorly formed vascular system. Further, sex hormones also play a major role in the occurrence of MI. Thus, the digit ratio can be used as a non-invasive and non-expensive biometric screening procedure for the early detection of MI. However we also feel many more studies are required to test the sound knowledge of 2D:4D ratio and its relation with MI.

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