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Role of gender in types and frequency of coronary artery aneurysm and ectasia

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Abstract

This study aimed to evaluate the role of gender in types and frequency of coronary artery aneurysm and ectasia.

We assessed retrospectively the angiography records of 6100 patients. At first, we mainly reviewed angiographic movies for the presence of coronary ectasia and/or aneurysm. Consequently, based on the number of the coronary artery involvement, the coronary ectasia and aneurysm were graded as mild if 1 coronary artery was involved and severe if 2 or more coronary arteries were involved. The location of ectasia and aneurysm was analyzed with respect to their isolated or combined location on various coronary arteries. The patients included in the present study were divided into 2 groups based on their gender as male and female. Then, we evaluated the impact of gender on severity and the location of the ectasia and aneurysm.

The incidence of the aneurysm and ectasia was 3.5%. Among the patients with aneurysm and ectasia, 6.9% were male and 4.5% were female. Aneurysm and ectasia were evaluated together; their frequency was significantly higher in the male than female patients ($P < 0.01$). However, when their incidence was evaluated separately, coronary artery ectasia was markedly greater in male patients with regard to female patients ($P < 0.01$). Incidence of CAE presence on the RCA was significantly greater in males than females (2.7% vs 1.9%, $P < 0.05$).

This study showed that incidence of CAE is more common in males than females. Particularly, frequency for the involvement of CAE on RCA and concurrently on 3 vessels is greater in male patients than female patients.

Abbreviations: CAA = coronary artery aneurysm, CAE = coronary artery ectasia, CX = circumflex artery, LAD = left coronary artery, LMCA = left main coronary artery, RCA = right coronary artery, SD = standard deviation.

Keywords: coronary artery aneurysm, coronary artery ectasia, gender

1. Introduction

Coronary artery ectasia (CAE) is an uncommon coronary artery disease characterized with the abnormal diffuse dilatation of 1 segment or >1 segment of coronary artery to 1.5 times or more the size of adjacent normal segment of the artery.[1–4] The dilatation may diffuse and involve the majority of the artery, so it is more appropriate to describe the lesion as ecstatic rather than aneurismal.[5] The incidence of coronary artery ectasia has been reported to be 0.3% to 5.3% of patients undergoing coronary angiography.[1–4,6,7] The right coronary artery (RCA) is the most affected coronary artery.[8] CAE is regarded to be the most common cause for the development of atherosclerosis and its presence is shown to be central underlying factor in >50% of the cases. Studies indicate that 20% to 30% of CAE cases in origin are congenital, 10% to 20% are inflammatory (syphilis and bacterial infections), and the remaining percentage is due to connective tissue impairments such as Ehlers–Danlos syndrome, Kawasaki disease, and scleroderma.[9,10,11]

Coronary artery aneurysm (CAA) is an infrequent clinical finding and it is defined as a diffuse dilatation of coronary arteries with a diameter of 2 or more times larger than that of its normal contiguous segment.[7] Compared to CAE, CAAs involves a shorter segment of the coronary artery, their beginning and end points are sharper, and they are generally encountered pathologies with larger diameters.[8,9,12,13,14] The incidence of CAA is reported to vary between 1.5% and 4.9% and the RCA is the most effected coronary artery.[15,16] The most common etiology of CAA is discovered to be the atherosclerosis (%50). Other etiologies for CAA include congenital impairments (20%–30%), inflammatory or vasculitis (10%–20%), and connective tissue disorders (5%–10%).[8]

Underlying etiological factors for the development of both CAA and CAE are shown to be similar. Development of CAA and CAE is illustrated to be closely associated with gender, presence of connective tissue diseases, atherosclerosis, and incidence of systemic diseases.[17] However, the studies indicating the relationship between gender and the presence of CAA & CAE in the literature are limited; therefore, we aimed to evaluate the role of the gender in types and frequency of CAA and CAE in the current study.

2. Materials and methods

We assessed retrospectively the angiography records of 6100 patients who had undergone coronary angiography at the Department of Cardiology, Medical School of Eskisehir

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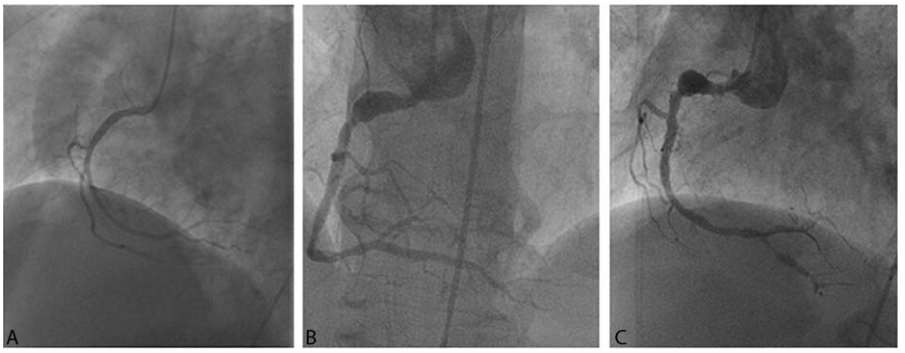

Figure 1. (A) Normal coronary artery, (B) coronary artery ectasia, (C) coronary artery aneurysm.

Osmangazi University, Eskisehir, Turkey, between February 2008 and April 2010. The angiographic movies were carefully reviewed by an expert cardiologist. Angiographic movies of the patients who had received earlier coronary artery bypass surgery and digital angiography records showing poor quality to review were excluded from the present study. Coronary artery ectasia is defined as a diffuse dilatation of coronary arteries with a diameter of 1.5 times larger than of its normal (Fig. 1A) contiguous segment[7] (Fig. 1B). Coronary artery aneurysm on the other hand is defined as localized coronary artery dilatation that exceeds >2 times the diameter of normal adjacent segments[7] (Fig. 1C). Of the 6100 patients evaluated, 369 patients showed coronary ectasia or coronary aneurysm. At first, we mainly reviewed angiographic movies for the presence of coronary ectasia and/or aneurysm. Consequently, based on the number of the coronary artery involvement, the coronary ectasia and aneurysm were graded as mild if 1 coronary artery was involved and severe if 2 or more coronary arteries were involved. The location of ectasia and aneurysm was analyzed with respect to their isolated or combined location on various coronary arteries including left main coronary artery (LMCA), left anterior descending artery (LAD), circumflex artery (Cx) and RCA.

The patients included in the present study were divided into 2 groups based on their gender as male and female. Then, we evaluated the impact of gender on severity and the location of the ectasia and aneurysm.

Our study was based on observational and retrospective records of angiography; therefore, we did not ask for ethic committee's approval and patient consent. We do not think that it is necessary to have ethic committee's approval for this study/work.

2.1. Statistical analysis

Continuous variables were expressed as mean ± standard deviation (SD); categorical variables were defined as percentages. To compare continuous variables, we used Student's *t* test or Mann–Whitney *U* test, where appropriate. Categorical variables were compared via the chi-square test. For all the tests, a value of $P < 0.05$ was considered to be statistically significant. The SPSS statistical software package (SPSS, version 16.0 for Windows; SPSS Inc., Chicago, IL) was used to perform all the statistical calculations.

3. Results

The review of the digital angiography records of 6100 patients (3973 males and 2127 females) showed that the mean age of the patients was 59 ± 10 years (range: 18–99). With respect to the gender of the patients, 65.1% were male and 34.9 % were female. Overall, the incidence of the aneurysm and ectasia was 369/6100 (3.5%). Among the patients with aneurysm and ectasia, 273 (6.9 %) were male and 96 (4.5%) were female.

When aneurysm and ectasia were evaluated together, their frequency was significantly higher in the male than female patients ($P < 0.01$). However, when their incidence was evaluated separately, coronary artery ectasia was markedly greater in male patients with regard to female patients ($P < 0.01$). Although the frequency of coronary artery aneurysm was slightly higher in the male than female patients, the difference between them was not statistically meaningful ($P = 0.09$). Frequency for coronary artery ectasia and aneurysms based on gender status of the patients are summarized in Table 1.

Moreover, involvement of aneurysms and ectasia for single coronary artery was defined as slight but their involvement for 2 or more coronary arteries were defined as severe. Frequency of single coronary artery involvement for aneurysms and ectasia was higher than that of 2 or more coronary arteries. When the distribution of the CAA was examined among the present study population, 0.5% CAA was spotted on the single coronary artery and 0.4% was found on the 2 or more coronary arteries. Similarly, when the distribution of the CAE was studied, 3.6% CAE was observed on the single coronary artery and 1.8% was noted on the 2 or more coronary arteries.

The severity of coronary artery involvement for CAA was similar among male and female patients ($P > 0.05$). Although involvement of single coronary vessel for CAE was found to be considerably higher in male than female patients (4.1% vs 2.8%, $P = 0.008$), there was no significant difference between the groups for the involvement of 2 or more vessels for CAE ($P > 0.05$). Results of coronary artery involvement for the present study population are summarized in Table 2.

Frequency of CAE and CAA according to the coronary artery involvement was evaluated for each coronary artery. CAA

Table 1

Frequencies of coronary artery aneurysm and ectasia according to gender.

	Total (n = 6100)	Female (n = 2127)	Male (n = 3973)	*P*
Aneurysm (n, %)	36 (0.59)	10 (0.5)	26 (0.7)	0.09
Ectasia (n, %)	333 (5.46)	86 (4)	247 (6.2)	<0.01
Aneurysm and ectasia (n, %)	369 (6.05)	96 (4.5)	273 (6.9)	<0.01

Table 2

The role of gender on diffusiveness of coronary artery aneurysm and ectasia.

	Total (n = 6100)	Female (n = 2127)	Male (n = 3973)	P
Aneurysm				
1 vessel (n, %)	33 (0.5)	9 (0.4)	24 (0.6)	0.1
≥2 vessel	30 (0.4)	1 (0.04)	2 (0.1)	0.6
Ectasia				
1 vessel (n, %)	222 (3.6)	60 (2.8)	162 (4.1)	0.008
≥2 vessel	111 (1.8)	26 (0.42)	85 (1.39)	0.18

involvement was observed most commonly on the LAD artery, then on the RCA, and least on the Cx artery. Frequency of CAA according to the coronary artery involvement was comparable in both sexes ($P > 0.05$). Furthermore, CAE involvement was noted most frequently on the RCA, then on the Cx, and least often on the LAD. Incidence of CAE presence on the RCA was significantly greater in males than females (2.7% vs 1.9%, $P < 0.05$) and involvement of CAE on >3 vessel were also similarly higher in males with respect to the female patients (1.1% vs 0.4%, $P < 0.01$). Moreover, frequency of CAE presence on the Cx was slightly higher in males compared to the female patients but the difference was not statistically significant (1.1% vs 0.7%, $P = 0.06$). The results pertaining to the frequency of CAA and CAE according to the coronary artery involvement for each coronary artery are shown in Table 3.

Table 3

Frequencies of coronary artery aneurysm and ectasia spotted on each coronary artery or on its branches.

	Total (n = 6100)	Female (n = 2127)	Male (n = 3973)	P
Aneurysm				
LAD (n, %)	13 (0.2)	6 (0.2)	7 (0.2)	0.57
CX (n, %)	7 (0.1)	2 (0.1)	5 (0.1)	0.53
RCA (n, %)	10 (0.2)	1 (0.01)	9 (0.2)	0.08
LAD-CX (n, %)	0	0	0	0
LAD-RCA (n, %)	0	0	0	0
CX-RCA (n, %)	0	0	0	0
LAD-CX-RCA (n, %)	3 (0.01)	1 (0.01)	2 (0.1)	0.72
LMCA (n, %)	3 (0.1)	0	3 (0.1)	0.18
Ectasia				
LAD (n, %)	10 (0.2)	4 (0.2)	6 (0.2)	0.48
CX (n, %)	60 (1.0)	15 (0.7)	45 (1.1)	0.06
RCA (n, %)	150 (2.4)	39 (1.9)	111 (2.7)	<0.05
LAD-CX (n, %)	17 (0.3)	8 (0.3)	9 (0.3)	0.3
LAD-RCA (n, %)	25 (0.4)	6 (0.3)	19 (0.5)	0.17
CX-RCA (n, %)	16 (0.3)	5 (0.2)	11 (0.3)	0.49
LAD-CX-RCA (n, %)	52 (0.9)	8 (0.4)	44 (1.1)	<0.01
LMCA (n, %)	3 (0.01)	1 (0.01)	2 (0.1)	0.72

CAA = coronary artery aneurysm, CAA = coronary artery ectasia, CAE = coronary artery ectasia, CX = circumflex artery, LAD = left coronary artery, LMCA = left main coronary artery, RCA = right coronary artery.

4. Discussion

In the present study, the overall frequency of CAA and CAE was 0.3% and 3.1%, respectively. Total frequency of CAA and CAE was higher in the males than the females. When incidence of CAA and CAE were separately tracked, although the frequency of CAA and CAE was comparable in the male and female patients, CAE was detected more frequently in the males than the females.

Data available in the literature regarding the frequency of CAA in human population are collected and reported on the patients who underwent coronary angiography owing to suspected coronary artery disease. Previous studies indicate that frequency of CAA is between 0.3% and 5%).[5,8,14,16,18–20] In the current study, incidence of CAA was slightly below the literature. We think that a number of factors may explain our finding on slightly lower frequency of CAA. The most important factor might be the definition of the CAA. In the present study, we described CAA as a local-diffuse dilatation of coronary arteries with a diameter of at least 2 or more times larger than of its normal contiguous segment; however, other studies describe CAA as local-diffuse expansion of coronary arteries with a diameter of at 1.5 or more times larger than of its normal contiguous segment.[8,9,17] In addition, these previous studies provide even no distinction concerning the definition of CAA and CAE.[8,15,21] Our present definition on CAA might explain the lower incidence we obtained for CAA compared to the literature. Another reason for the relatively lower frequency of CAA may be associated with differences in the patient population used in the present and previous studies. Remember that data regarding CAA in different countries are generally obtained during coronary angiography performed on the patients with suspected coronary artery disease. When the effect of genetic differences and the presence of atherosclerosis are considered on the development of CAA, it is not unexpected to obtain different frequencies of CAA in different regions of the world.

In the current study, we found that the frequency of CAA was higher in the males than the females but the difference was not statistically significant. When we evaluated CAA and CAE together, their incidences were meaningfully higher in the males than the females but when CAAs were assessed separately there was no considerable difference between the genders. We think that relatively lower number of patients with CAA included in the present study might be responsible for getting this result. A number of studies in the literature indicate that the frequency of CAA is higher in females than males.[8,16] In the present study, we detected that CAA involvement was observed most commonly on the LAD artery, then on the RCA, and least on the Cx artery. Ordering of CAA localization according to the coronary artery involvement was comparable in both sexes ($P > 0.05$). Other studies indicate that most common placement of CAA is on RCA.[8,16,22] Contradiction on frequency of location of CAA between the present study and previous studies might arise from the inadequate number of patients (total of 36) evaluated in the present study and therefore this number of patients may not have sufficient power to demonstrate frequency of CAA involvement on the coronary arteries.

Earlier studies report that the prevalence of CAE is between 0.3% and 5.3%.[1–4,23] There is no sufficient amount of information in the literature regarding the frequency of CAE between the genders. Although some studies on CAE frequency show that its incidence is higher in males than the females,[16] some other studies state that there is no difference between the genders.[24] Furthermore, in their study, Aboeata et al[25] report that the frequency of CAE in males is 3-folds higher than females. Overall, when limited amount of available reports on the CAE are assessed, it is evident that frequency of CAE is greater in males than females. In the present study, we observed that the frequency of CAE in the males was 1.5-folds higher than the females. The most important factor underlying the CAE etiology is the

coronary artery disease.[9,11,21,26] Consequently, higher incidences of coronary artery diseases in males might explain increased frequencies of CAE in males with respect to females.[27]

Our literature review showed no report regarding association between genders and the numbers of coronary arteries with CAE. The present results revealed that involvement of aneurysms and ectasia on single coronary artery, which was defined herein as mild involvement, developed nearly 2-folds more in the males than the females. On the other hand, involvement of CAA and CAE on 2 or more coronary arteries, which was graded herein as severe, was comparable between the genders. Increased mild CAE involvement in the males and comparable severe CAE involvement in between males and females might increase the rate of risk for undesired clinical outcomes in males with respect to the females. However, the present study was not aimed to investigate the relationship between the prevalence of CAE and undesired clinical events. In the current study, CAE involvement was observed most often on the RCA, then on the Cx, and least often on the LAD. Moreover, frequency of CAE presence on the RCA and involvement of CAE on >3 vessels were higher in males than females. Present results about the localization of CAE on coronary arteries were consistent with the literature.[15,28,29]

In conclusion, detection of CAA and CAE during coronary angiography is critical for their proper treatment and clinical follow-up. The present study showed that incidence of CAE is more common in males than females. Particularly, frequency for the involvement of CAE on RCA and concurrently on 3 vessels is greater in male patients than female patients.

References

[1] Rukhsan S, Nuzhat S, Ishaq M, et al. The prevalence and clinical profile of angiographic coronary ectasia. J Pakistan Med Assoc 2011;61:372–5.

[2] Tolga A, Belma U, Mine DK, et al. Coronary artery ectasia: its frequency and relationship with atherosclerotic risk factors in patients undergoing cardiac catheterisation. Anatolian J Cardiol 2011;11:280–4.

[3] Eduardo PB, Ramón LP, Iñigo LM-L, et al. Coronary ectasia: prevalence, and clinical and angiographic characteristics. Revista Española de Cardiologia 2003;56:473–9.

[4] Harikrishnan S, Nair Krishnakumar , Tharakan J. Coronary artery ectasia—is it time for reappraisal? Clin Cardiol 2007;30:536.

[5] Markis JE, Joffe CD, Cohn PF, et al. Clinical significance of coronary arterial ectasia. Am J Cardiol 1976;37:217–22.

[6] Oliveros RA, Falsetti HL, Carroll RJ, et al. Atherosclerotic coronary artery aneurysm report of five cases and a review of the literature. Arch Intern Med 1974;134:1072–6.

[7] Demopoulos VP, Olympios CD, Fakiolas CN, et al. The natural history of aneurysmal coronary artery disease. Heart 1997;78:136–41.

[8] Swaye PS, Fisher LD, Litwin P, et al. Aneurysmal coronary artery disease. Circulation 1983;67:134–8.

[9] Swanton RH, Thomas ML, Coltart DJ, et al. Coronary artery ectasia—a variant of occlusive coronary arteriosclerosis. Br Heart J 1978;40: 393–400.

[10] Hale Y, Nurten S, Mehmet YDr, et al. Coronary artery ectasia: clinical and angiographical evaluation. Türk Kardiyol Dern Arş—Arch Turk Soc Cardiol 2009;36:530–5.

[11] Hasahya T, Kai M, Bangwei W, et al. Among ectasia patients with coexisting coronary artery disease, TIMI frame count correlates with ectasia size and markis type IV is the commonest. Cardiol Res Pract 2015;2015:5.

[12] Befeler B, Aranda MJ, Embi A, et al. Coronary artery aneurysms: study of the etiology, clinical course and effect on left ventricular function and prognosis. Am J Med 1977;62:597–607.

[13] Tunick PA, Slater J, Kronzon I, et al. Discrete atherosclerotic coronary arteryaneurysms: a study of 20 patients. J Am CollCardiol 1990;15: 279–82.

[14] Munker TM, Peterson O, Vesterdal J. Congenital aneurysm of the coronary artery with an arteriovenous fistula. Acta Radiol 1958;150: 333–6.

[15] Mushabbar S, Michael L. Coronary artery aneurysm: a review. Prog Cardiovasc Dis 1997;40:77–84.

[16] George H, Barbara P, Pridie RB. Coronary artery ectasia. Its prevalence and clinical significance in 4993 patients. Br Heart J 1985;54:392–5.

[17] Ali Dahhan. Coronary artery ectasia in atherosclerotic coronary artery disease, inflammatory disorders, and sickle cell disease. Cardiovasc Ther 2015;33:79–88.

[18] Şaşmaz H, Duru E, Kocakavak C, et al. Koroner arter anevrizmalarının ateroskleroz risk faktörleri ile ilişkisi ve klasifikas yonu. Turkısh KL Kard 1990;3:148.

[19] Daoud AS, Parkins D, Tulgan H, et al. Aneurysms of the coronery artery: report of ten cases and review of literature. Am J Cardiol 1963;11:228.

[20] Crawley PD, Mahlow WJ, Huntsinger DR, et al. Giant coronary artery aneurysms: review and update. Tex Heart Inst J 2014;41:603–8.

[21] Nathan B, Rajesh G, Alex S, et al. Coronary artery aneurysms in acute coronary syndrome: case series, review, and proposed management strategy. J Invasive Cardiol 2014;26:283–90.

[22] David WB, Joceline AB, Jonathan JM. Atheromatous coronary artery ectasia. Aust N Z J Med 1979;9:44.

[23] Rene AO, Herman LF, Robyn JC, et al. Atherosclerotic coronary artery aneurysm. Report of five cases and review of literature. Arch Intern Med 1974;134:1072–6.

[24] Vassilios P, Christopher DO, Constantine NF, et al. The natural history of aneurysmal coronary artery disease. Heart 1997;78:136–41.

[25] Aboeata A, Siva P, Venkata S, et al. Coronary artery ectasia: current concepts and interventions. Front Biosci (Elite Ed) 2012;4:300–10.

[26] Falsetti HL, Carrol RJ. Coronary artery aneurysm. A review of the literature with a report of 11 new cases. Chest 1976;69:630–6.

[27] Anders Hvelplund, S∅ren Galatius, Mette Madsen, et al. Women with acute coronary syndrome are less invasively examined and subsequentlyless treated than men. Eur Heart J 2010;31:684–90.

[28] Hon-K Y, Mien-C C, Chiung-J W, et al. Clinical features and outcome of coronary artery aneurysm in patients with acute myocardial infarction undergoing a primary percutaneous coronary intervention. Cardiology 2002;98:132–40.

[29] Ole-Gunnar A, Lars A, Odd Geiran, et al. Coronary artery aneurysms mimicking cardiactumor. Eur J Echocardiogr 2004;5:308–12.