

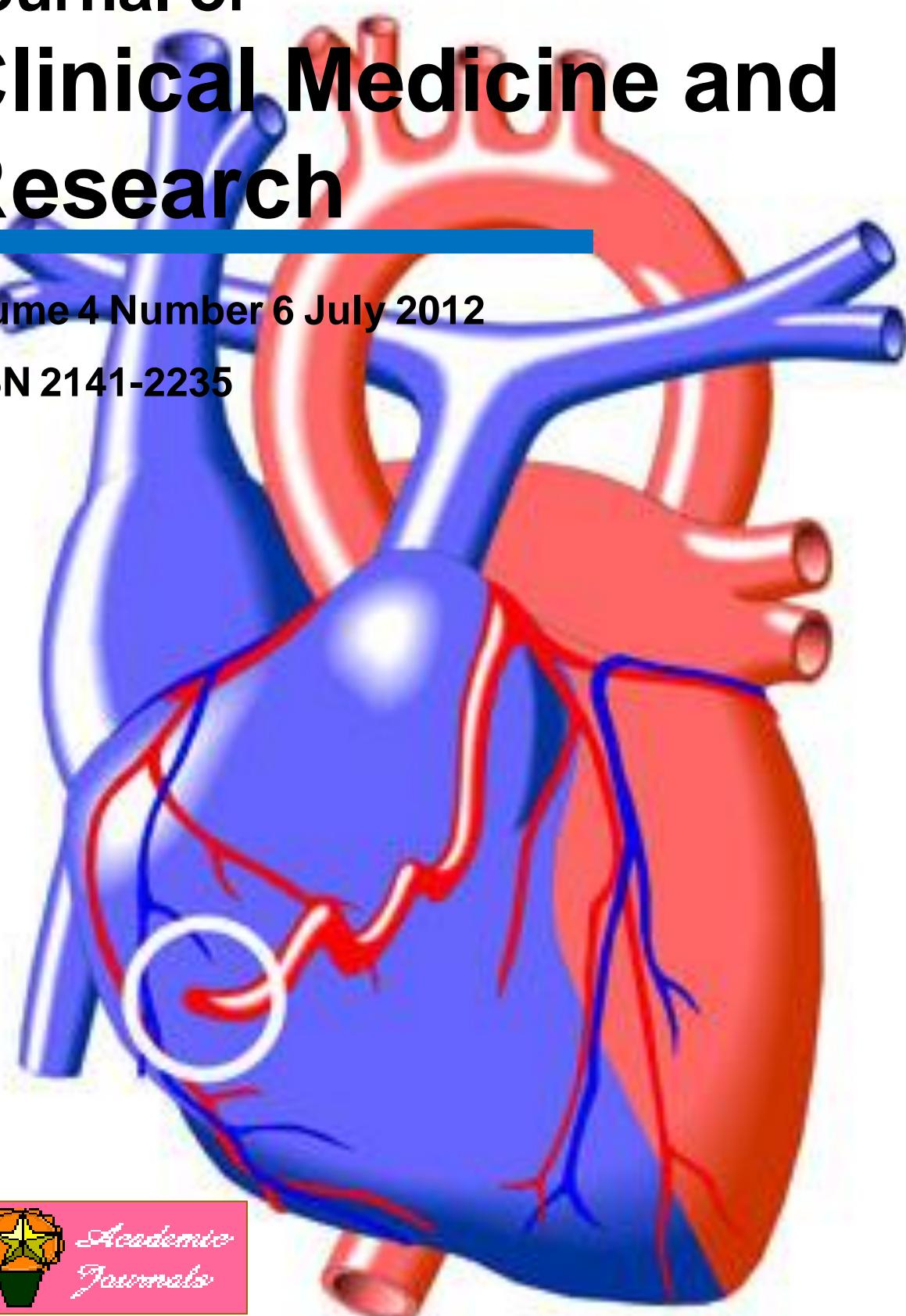
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Mussel RL, De Sa Silva E, Costa AM, Mandarim-De-Lacerda CA (2003). Mast cells in tissue response to dentistry materials: an adhesive resin, a calcium hydroxide and a glass ionomer cement. J. Cell. Mol. Med. 7:171-178.

Booth M, Bundy DA, Albonico P, Chwya M, Alawi K (1998). Associations among multiple geohelminth infections in school children from Pemba Island. Parasitol. 116: 85-93.0.

Fransiscus RG, Long JC, (1991). Variation in human nasal height and breath, Am. J. Phys. Anthropol. 85(4):419-427.

Stanislawski L, Lefevre M, Bourd K, Soheili-Majd E, Goldberg M, Perianin A (2003). TEGDMA-induced toxicity in human fibroblasts is associated with early and drastic glutathione depletion with subsequent production of oxygen reactive species. J. Biomed. Res. 66:476-82.

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Review

Interesting case of coronary artery fistula and coronary anomaly resulting in coronary steal with literature review

Jayanth Koneru*, Nishant Gupta, Yazan Al-Khoury, Aman Hamdan, Fayeza E. Shamoon and Mahesh Bikkina

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Coronary artery fistulae are rare and abnormal communications between a coronary artery and a great vessel, which may shunt blood flow away from the myocardial capillary network causing steal phenomenon. We present a 47-year-old man with a unique arteriovenous fistula originating from the proximal portion of the left main coronary artery and entire left anterior descending artery, which then reconstitutes to form a branch of the left pulmonary artery.

Key words: Coronary artery fistula, coronary steal phenomenon, coronary artery anomaly, A-V fistula.

INTRODUCTION

Coronary steal is defined as alteration in blood flow patterns leading to a reduction in the blood directed to the coronary vasculature (Gould, 1989). There are several reasons for this phenomenon and one of the uncommon causes is coronary artery fistula (CAF). Our case is extremely unusual and interesting as it combines CAF and anomalous origin of coronary artery (AOCA). Congenital coronary artery fistula is a rare, isolated anomaly of the coronary artery system that is defined as a direct communication between a coronary artery and another vascular structure. Incidence of CAF in the general population is about 0.002% and the incidence of coronary pulmonary fistulae was similarly reported only to be 0.1% in a study of 11,000 patients undergoing cardiac catheterization (Said and Landman, 1990). Coronary artery anomalies are congenital and the incidence of coronary anomalies varies between 0.6 and 1.5% of patients undergoing invasive cardiovascular imaging (Kardos et al., 1997; Malouf et al., 2004). By definition, these abnormalities are variants of coronary anatomy.

Most of the coronary fistulae and anomalies are found incidentally during angiographic evaluation for coronary vascular disorder.

CASE REPORT

A 47-year-old man with a past medical history of hypertension, dyslipidemia, diabetes mellitus, and a 20 pack years smoking history presented to the emergency room (ER) with a two day history of recurring chest pain. Pain was described as 7/10 pressure like, non-radiating, substernal chest pain which progressively worsened with no significant aggravating or relieving factors. He had occasional shortness of breath and lightheadedness associated with the chest pain. No other symptoms were reported. Negative family history was reported as per the patient. The patient had similar symptoms for the past 5 months, but ignored the symptoms as he thought it was heart burn. Electrocardiogram (ECG) at the time of admission did not reveal any signs of acute ischemia, and cardiac enzymes were negative. Nuclear scan was performed which was equivocal.

Patient underwent cardiac catheterization the following day for unstable angina. AOCA was noted on the right

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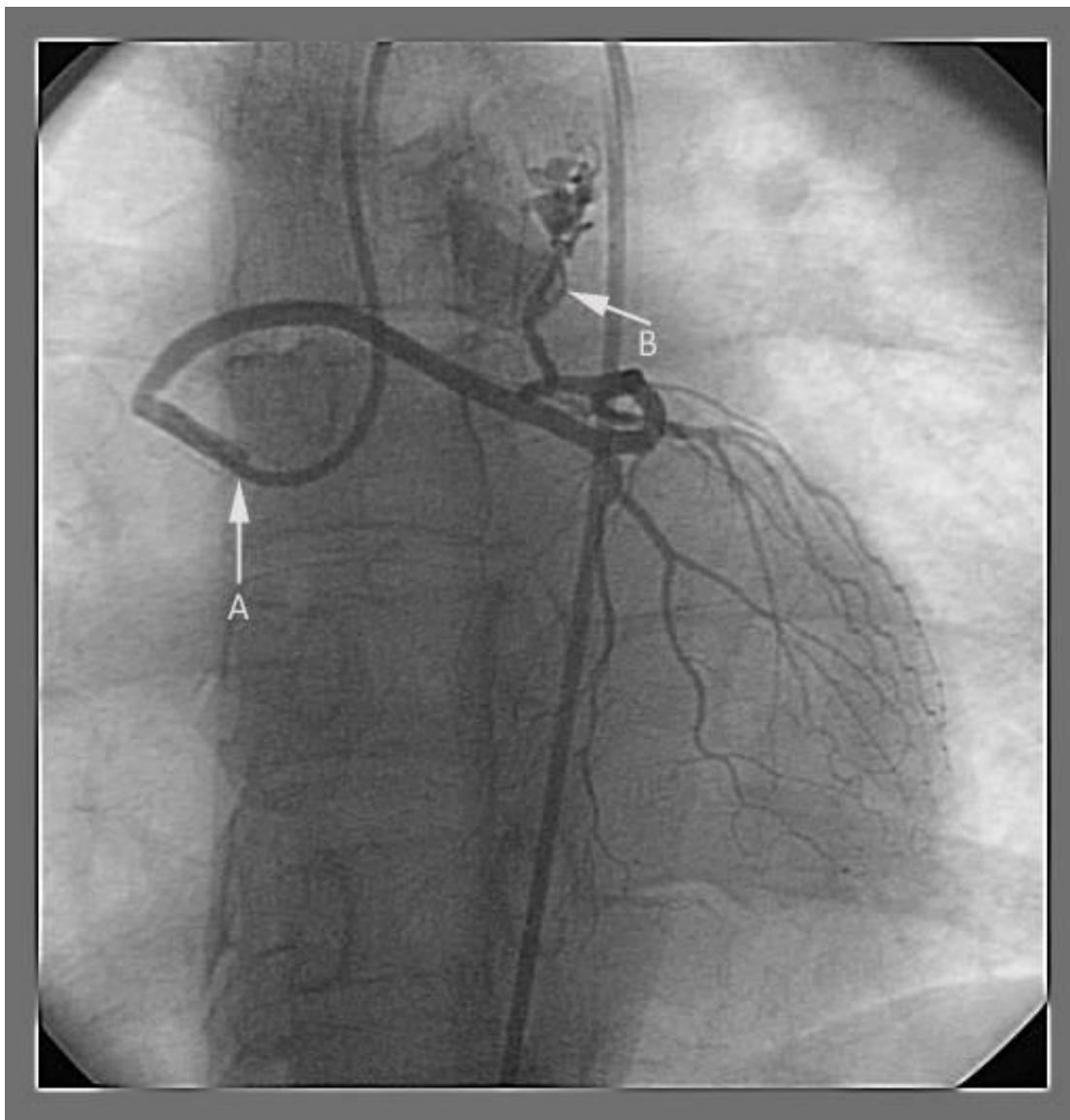


Figure 1. Patient cardiac catheterization: (A) AOCA was found on the right side where there was left anterior descending arising from the right coronary sinus and (B) significant fistulous formation arising from the left anterior descending artery which then reconstitutes to form a branch of the left pulmonary artery.

side, where there was left anterior descending arising from the right coronary sinus (Figure 1A). The catheterization also revealed a significant fistulous formation arising from the left anterior descending artery which then reconstitutes to form a branch of the left pulmonary artery (Figure 1B). Surgery was consulted and a ligation procedure along with correction of the anomaly was planned. Patient underwent corrective surgery for both anomalies and follows at a different center.

PATHOPHYSIOLOGY

Fistulae, most commonly drain into the right side of the

heart and seldom seen drain into the left atrium or the left ventricle. Occasionally, congestive cardiac failure occurs due to volume overload from redirected blood flow, and myocardial ischemia rarely occur in adults (Fernandes et al., 1992). The mechanisms that lead to myocardial ischemia in the patient who has AOCA from the opposite sinus that course between the pulmonary and aortic roots are unclear, but it was hypothesized that the inter arterial course places the anomalous coronary at risk of compression between the great arteries.

DISCUSSION

The first case of coronary artery fistula (CAF) was

described by Klause (1865). CAF is defined as any abnormal communication through which coronary artery blood is shunted into a cardiac chamber, great vessel, or other vascular structure without passing through the myocardial capillary bed (Sapin et al., 1990). Bjork and Craoord (1947) reported the first successfully corrected coronary artery fistula. The first successful transcatheter closure of a coronary artery fistula was reported by Reidy et al. (1983). Fistulae more frequently involve the right coronary artery and usually drain into one of the right heart chambers (Lowe et al., 1981). Symptoms and signs are dependent on the size of the fistulous connection; rarely, large fistulae can have a significant left-to-right shunt with resultant congestive heart failure and cardiomegaly in infancy (Hsieh et al., 2002). In a review of all patients who underwent coronary arteriography from 1971 to 1981 at the Cleveland Clinic Foundation, a total of 122 fistulae were identified. Of these, 17% was drained into the left ventricle and 6% was drained into the left atrium (Hobbs et al., 1982).

Looking into the embryological development, coronary artery to pulmonary artery fistulae are remnants of a vascular communication that was probably normal in the mediastinal mesoderm (Rittenhouse et al., 1975). These structures represent an anomalous origin of a supernumerary coronary artery arising from a coronary bud in the posterior pulmonary portion of the truncus arteriosus (Demirkilic et al., 1004). In the fetus, pulmonary artery pressure exceeds aortic pressure, and hence, perfusion through such connections is antegrade. The smaller structures usually disappear when the pulmonary artery pressure falls below the systemic pressure at birth, when flow reverses. Persistence of arterial and venous embryologic communications into adulthood results in a fistula. Maintenance of such connections in the adult requires the presence of a large hemodynamic gradient and limited distal resistance. Rarely do these connections attain sufficient size to require surgical ligation or intervention in adults (Lloyd and Klein, 2008).

CAF was present in different ways clinically. In a review of 174 patients, fistula-related complications such as congestive heart failure (12%), myocardial infarction (4%), bacterial endocarditis (3%), and death (6%) occurred, with an overall complication incidence of 21% (Liberthson et al., 1979). Other complications including giant aneurysmal dilatation of fistula (Katoh et al., 1999), fistula dissection and rupture with cardiac tamponade (Bauer et al., 1996), embolization of mural thrombi to the distal coronary bed with subsequent myocardial infarction (Shirai et al., 1994), and sustained ventricular tachycardia (Moro-Serrano et al., 1992) were also reported. These complications may lead to the development of premature atherosclerosis or become life threatening.

Various cardiac imaging modalities are utilized for diagnosis and for planning before surgical or percutaneous interventions if closure of the coronary fistula is indicated.

A significantly enlarged coronary artery can usually be detected by two-dimensional echocardiography. Continuous turbulent systolic and diastolic flow pattern characterizes the shunt entry site (Lin et al., 1995; Cox et al., 1996). Use of contrast microbubbles to enhance the color Doppler signal assists to define the location and extent of coronary artery fistulae (Goswami and Zabalgoitia, 2002). When a coronary artery fistula is present, a dilated feeder vessel with an abnormal flow pattern can be readily identified. Multiplane transesophageal echocardiography can accurately define and provide a high quality panoramic view of the origin, course, and drainage site of coronary artery fistulae.

Coronary catheterization remains the gold standard for the evaluation of coronary artery fistula. It can be used to reliably identify the size and anatomical features of the fistulous tract (Frommelt et al., 2001), but the relation of coronary artery fistula to other structures, their origin, and course may not be apparent and it may be difficult to measure abnormal tortuous blood vessels in one section. Magnetic resonance imaging (MRI) and multidetector computed tomography (CT) have also become alternative methods to evaluate the anatomy, flow, and function of CAF.

AOCA from the opposite sinus of Valsalva was associated with myocardial ischemia, ventricular arrhythmias, and sudden death, particularly, when the anomalous coronary courses are between the great arteries (Frommelt et al., 2001; Liberthson et al., 1979; Roberts, 1986; Frescura et al., 1998; Taylor et al., 1992). Although, AOCA from the noncoronary or posterior sinus of Valsalva has been described; it is rare and is not associated with myocardial ischemia or sudden death (Frommelt and Frommelt, 2004). Similarly, AOCA can occur from the opposite sinus of Valsalva (either the right coronary artery arising from the left sinus or the left coronary arising from the right sinus of Valsalva), but is not associated with myocardial ischemia unless the anomalous coronary courses are between the great arteries (Frommelt and Frommelt, 2004; Roberts and Shirani, 1992).

The ischemia from interarterial course is more likely due to the deformation of the anomalous coronary within the aortic wall during the periods of systemic hypertension, particularly, in patients who have an intramural course (Berdoft et al., 1986).

The aorta will exhibit greater wall tension than the intramural coronary within the aortic wall which results in deformation of the coronary and diminished cross-sectional area, because wall tension is determined by the radius of a vessel. As aortic wall tension increases with increasing aortic pressure during exercise, the anomalous coronary becomes flattened and coronary reserve is reduced to a point where myocardial oxygen requirements are not met. Coronary catheterization also remains the gold standard for evaluation of coronary anomalies.

Management

The management is controversial and recommendations are based on anecdotal cases or small retrospective series due to variable natural history of coronary artery fistulae (Umana et al., 2002). The main indications for closure are clinical symptoms especially of heart failure and myocardial ischemia and in asymptomatic patients with high-flow shunting, to prevent the occurrence of symptoms or complications, especially in pediatric population (Balanescu et al., 2001). Surgery and direct epicardial or endocardial ligations were traditionally viewed as the main therapeutic method for the closure of coronary artery fistulae (Balanescu et al., 2001). Surgical correction is safe and effective, with good results (Balanescu et al., 2001; Wang et al., 2001). Catheter-based closure of the fistulous connection is the non-surgical treatment option for closure of coronary fistulae, with good success reported (Qureshi and Tynan, 2001; Alekyan et al., 2002; Armsby et al., 2002). Catheter closure can be performed with a variety of techniques, including detachable balloons, stainless steel coils, controlled-release coils, controlled-release patent ductus arteriosus coils, patent ductus arteriosus plug, regular and covered stents, and various chemicals (Mullasari et al., 2002; Sreedharan et al., 2004; Pettersen et al., 2001). Repair of AOCA is primarily by surgery and techniques of the repair are beyond the scope of this paper.

Treatment of adult asymptomatic patients with non-significant shunting is still a matter of debate. Results from the transcatheter and surgical literature show that both approaches have similar early effectiveness, morbidity, and mortality (Armsby et al., 2002). The safe and effective results of both approaches support the option for elective closure of clinically significant coronary artery fistulae in childhood (Armsby et al., 2002). Antiplatelet therapy is recommended, especially in patients with distal coronary artery fistulae and abnormally dilated coronary arteries (Umana et al., 2002). Prophylactic measures for subacute bacterial endocarditis are recommended, as bacterial endocarditis is a known complication.

CONCLUSION

Congenital coronary artery abnormalities are rare isolated anomalies that are important to recognize symptomatic patients. Usually, isolated coronary anomalies are asymptomatic; however, certain forms are associated with myocardial ischemia, congestive heart failure, and sudden cardiac death. Recognition of signs and symptoms that may indicate a congenital coronary artery anomaly should lead to additional testing, and a thorough evaluation of coronary artery anatomy using cardiac CT, MRI, and other imaging modalities are necessary.

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Full Length Research Paper

Corneal biomechanical characteristics, intraocular pressure and central corneal thickness in patients with type 2 diabetes mellitus

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To evaluate corneal biomechanical properties, intraocular pressure and central corneal thickness in type 2 diabetic patients by Ocular Response Analyzer (ORA), ORA measurements were performed on the 80 eyes of 40 diabetic patients (group I) and 80 eyes of 40 healthy people who served as the control group (group II). Corneal hysteresis (CH), corneal resistance factor (CRF), intraocular pressure (Goldmann correlated [IOPg]), corneal compensated [IOPcc]) and central corneal thickness (CCT) values were determined by ORA. Mean age of patients with diabetic melitus (DM) and control groups were 51.8 ± 5.8 and 51.2 ± 7.1 years, respectively. Mean CH and CRF were 9.44 ± 0.62 versus 9.41 ± 0.50 ($p=0.738$) and 11.58 ± 0.60 versus 10.56 ± 0.50 ($p<0.001$), in groups I and II, respectively. Mean IOPg and IOPcc were 19.90 ± 3.35 mmHg versus 18.90 ± 2.56 mmHg ($p=0.036$) and 17.41 ± 2.57 mmHg versus 17.22 ± 2.66 mmHg ($p=0.651$) in groups I and II, respectively. Mean CCT's were 548.02 ± 23.16 versus 521.92 ± 31.60 ($p<0.001$) in groups I and II, respectively. Statistical analysis revealed significant differences for CRF, IOPg and CCT values between groups. CRF, IOPg and CCT values were altered in diabetics and these changes can be detected by ORA. Further studies are required to establish the effects of type 2 diabetes on corneal biomechanical properties.

Key words: Type 2 diabetes mellitus, ocular response analyzer, corneal biomechanical characteristics, central corneal thickness

INTRODUCTION

Ocular response analyzer (ORA, Reichert; USA) is a non-contact tonometer being developed to measure biomechanical features of cornea through monitoring and analyzing corneal response during air impulse (Kotecha, 2007). Two applanation values (P1, P2) are obtained by electro-optic system; one while the cornea undergoes deformation after a rapid air impulse applied to a 3 mm

central corneal area and the other as the cornea begins to return to previous form. The difference between these two pressure values is called 'corneal hysteresis' (CH). CH is a valuable indicator of the biomechanical properties (particularly viscous properties) of the cornea. The average of two applanation pressures is determined as Goldmann-correlated IOP (IOPg). The instrument also determines a second IOP value (IOPcc) considering CH, which is compensated with the biomechanical properties of the cornea. Another important parameter of the instrument is the corneal resistance factor (CRF). It is strongly associated with central corneal thickness particularly and

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Table 1. Mean CH, CRF, IOPg, IOPcc, CCT values of the groups.

	CH (mean ± SD) (range)	CRF (mean ± SD) (range)	IOPg (mean ± SD) (range)	IOPcc (mean ± SD) (range)	CCT (mean ± SD) (range)
Group 1	9.44 ± 0.62 (8.30 to 10.90)	11.58 ± 0.60 (10.10 to 12.90)	19.90 ± 3.35 (12.0 to 26.6)	17.41 ± 2.57 (11.0 to 23.4)	548.02 ± 23.16 (500 to 601)
Group 2	9.41 ± 0.50 (7.90 to 10.40)	10.56 ± 0.50 (9.70 to 12.40)	18.90 ± 2.56 (12.70 to 24.50)	17.22 ± 2.66 (11.20 to 21.10)	521.92 ± 31.60 (470 to 591)
p value	0.738	<0.001	0.036	0.651	<0.001

CH, Corneal hysteresis; **CRF**, corneal resistance factor; **IOPg**, Goldmann correlated intraocular pressure; **IOPcc**, corneal compensated intraocular pressure; **CCT**, central corneal thickness; **SD**, standart deviation.

is a good indicator of elastic properties of the cornea (Shah et al., 2006; Saricaoğlu, 2010).

Diabetes is a common disease with high risks of morbidity and early mortality, which leads to acute metabolic complications as well as vascular, renal, retinal or neuropathic disorders in the long-term. The incidence of the Type 2 diabetes (insulin-independent diabetes) that represents 80% of all diabetes cases is estimated to be 2% to 5% in the population. The incidence and prevalence of the Type 2 diabetes is gradually increasing especially in the industrialized countries in which the life style has become largely changed (Halifeoglu et al., 2005).

Diabetes leads to complications in almost all ocular structures, including eyelids, conjunctiva, cornea, extra ocular muscles, iris, lens, and retina. The most important complication leading to the visual loss is diabetic retinopathy. Diabetes may also cause several corneal disorders. A decrease in epithelial adhesion and corneal sensitivity, increased fragility, recurrent epithelial erosions, epithelial edema, decreased corneal sensitivity, neurotrophic ulcers are among the corneal complications in diabetic patients (Totan et al., 2000; Weston et al., 1995; Su et al., 2008). These changes may affect the measurement of IOP in an unexpected manner, such as an overestimation of the "true" IOP. Although the current gold standard to measure IOP is Goldmann applanation tonometry (GAT), it has been clearly documented that GAT measurements can be affected by several ocular factors such as corneal curvature, axial length, and central corneal thickness (CCT). So it is clear that accurate IOP measurements can be determined independently by ORA.

The aim of our study was to investigate whether corneal biomechanical properties, CCT and intraocular pressures of the patients with type 2 diabetes differ from that of control group.

MATERIALS AND METHODS

The study included 40 type 2 diabetic patients and 40 healthy individuals who served as control. All diabetic patients were

recruited from the Department of Endocrinology, and all healthy patients were recruited from the General Ophthalmology Clinic.

Exclusion criteria include patients with at least one of the following conditions; topical or systemic treatment for a systemic disorder other than diabetic miletus (DM), previous ocular surgery, previous laser or anti-VEGF (Vascular endothelial growth factor) therapy, ophthalmic trauma history, corneal and lens pathologies preventing ocular fundus examination, uveitis and other posterior segment pathologies. The patients who had proliferative stage diabetic retinopathy were not included in the study because of potential anterior segment complications (for example, iris neovascularization, neovascular glaucoma). All patients gave informed consent to be enrolled in the study. All procedures were performed in accordance with the Declaration of Helsinki.

CH, CRF measurements, IOPg, IOPcc and CCT values were measured by ORA after ophthalmologic examination including visual acuity with and without correction, anterior segment examination, and fundus examination after pupil dilation of the patients. Measurements were performed by the same operator and the average of 5 values obtained from one measurement for each eye was used for analysis.

For statistical assessment, SPSS 11.0 was used. Results are reported as mean ± SD. P value less than 0.05 was considered as statistically significant. Differences between groups were analyzed by Independent T test (parametric). To assess the correlation of the data with normal distribution, Kolmogorov-Smirnov test was used.

RESULTS

The mean age of the patients in the group 1 was 51.8 ± 5.8 years (range, 39 to 66) and 51.2 ± 7.1 (range, 39 to 66) in group 2. No significant difference was found between the groups regarding age and gender ($p = 0.56$).

Table 1 shows the results of mean CH, CRF, IOPg, IOPcc and CCT values of the patients in the group 1 and group 2.

CRF ($p<0.001$), IOPg ($p=0.036$) and CCT ($p<0.001$) values were statistically different between groups. There were no statistically significant differences regarding CH ($p=0.738$) and IOPcc ($p=0.651$) (Figures 1 and 2).

The correlation analyses for CH and CRF in the diabetic patients and the control groups are shown in Tables 2 and 3, respectively. CH and CRF showed a correlation with CCT and IOPg.

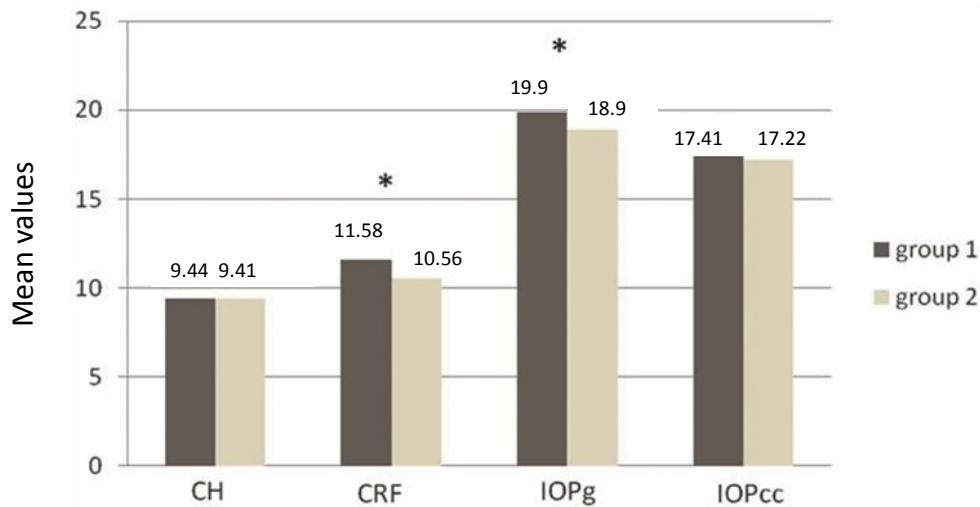


Figure 1. Comparison of the mean CH, CRF, IOPg, IOPcc values. **CH**, Corneal hysteresis; **CRF**, corneal resistance factor; **IOPg**, Goldmann correlated intraocular pressure; **IOPcc**, corneal compensated intraocular pressure; *, statistical significance.

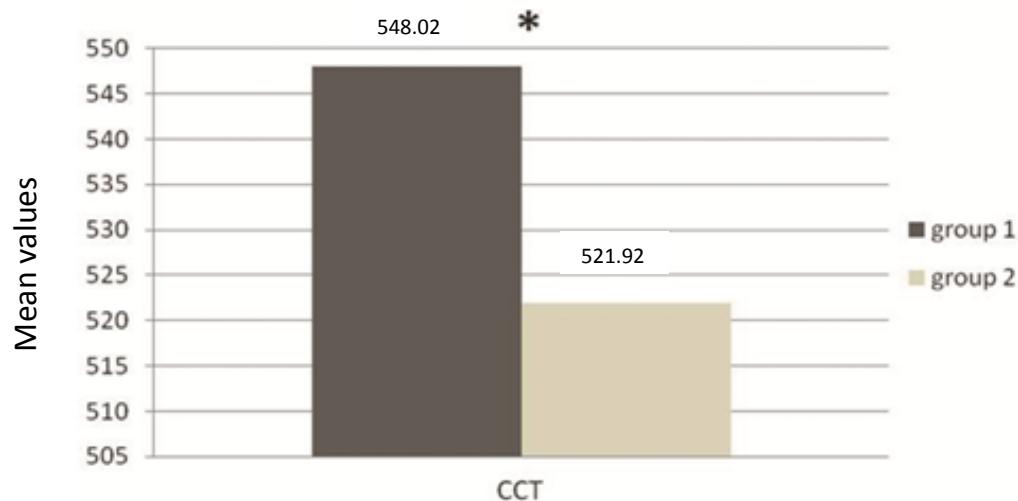


Figure 2. Comparison of the mean CCT values of the groups . **CCT**, central corneal thickness; *, statistical significance.

Table 2. Results of correlation analyses for CH and CRF in healthy control subjects.

Parameters	Age	CCT	IOPg
CRF			
r	0.20	0.72	0.73
p	0.04	0.0001	0.0001
CH			
r	0.18	0.56	0.61
p	0.13	0.0001	0.0001

Bold type shows statistical significance.

Table 3. Results of correlation analyses for CH and CRF in diabetic patients.

Parameters	Age	CCT	IOPg
CRF			
r	-0.11	0.78	0.61
p	0.27	0.0001	0.0001
CH			
r	-0.12	-0.24	-0.28
p	0.31	0.01	0.01

Bold type shows statistical significance.

DISCUSSION

The potential pathologies that may occur in the cornea of diabetic patients are epithelial edema, Descemet membrane folds, recurrent erosions, neurotrophic ulcers, delayed wound healing and decrease in corneal sensitivity (Keoleian et al., 1992). In some studies conducted with specular microscopy, it was shown that certain morphologic changes occurred in the cornea endothelium compared with the healthy individuals and it was argued that these changes might be due to chronic metabolic stress resulting from hyperglycemia (Schultz et al., 1984; McNamara et al., 1998).

McNamara et al. (1998) reported that in diabetic patients, hyperglycemia alters the corneal structure by impairing the hydration of the cornea. Sanchez-Thorin (1998), reported that diabetes impairs homeostasis in the corneal epithelium, epithelial basal membrane and basal membrane complex, corneal tissues such as stroma and endothelium, and consequently leads to structural changes in these tissues. In the light of that information, in our study, the structural changes that occurred in the cornea of diabetic patients were evaluated with ORA device that displays corneal biomechanical properties, one of the important issues, which the studies have recently focused on.

Although the Goldmann applanation tonometry is the most widely used method today in the clinical practice to measure intraocular pressure, it has been shown that this method is affected by many ocular parameters (for example, corneal thickness, refractive errors, corneal edema and corneal surface irregularities) (Saricaoglu, 2010). Clinical studies conducted with ORA have shown that this device is not affected or slightly affected by central corneal thickness (CCT) (Kotecha, 2007; Saricaoglu, 2010). There were no differences between groups regarding IOPcc in our study despite statistically higher IOPg in group 1 which is in favor of this situation. Studies show that eyes in patients with diabetes have a greater central corneal thickness (CCT) and that there is a positive association between CCT and the degree of

diabetic retinopathy. During the past decade, it has been proposed that CCT is one of several corneal biomechanical properties that affect IOP measurement. Those biomechanical properties include corneal viscosity, elasticity, hydration, connective tissue composition, and regional pachymetry (Chang and Stulting, 2005). In a recent study, it was shown that the level of corneal elasticity may influence the effect of CCT on IOP measurement. Recently, it has been shown that tonometry is affected by all corneal biomechanical characteristics other than CCT (Liu and Roberts, 2005).

Diabetic eyes with the same CCT varied greatly in CH and CRF when compared to normal eyes. Several investigators have reported that CH and CRF are correlated with CCT, as we saw in our study. The cornea responds to a pressure first with deformation and then with relaxation. However, deformation and relaxation pathways differ from each other; energy loss described by these different responses defines corneal hysteresis (CH) represents the ability of the cornea to stretch against a force and then to revert to the previous status. CH is a good indicator of the biomechanical properties of the cornea (Kotecha et al., 2010). It is defined by the difference between two applanation pressures (Saricaoglu, 2010). In a study by Kotecha et al. (2010), it was shown that CH value of diabetic patients did not statistically and significantly differ in comparison with the control group. In other studies, (Goldich et al., 2009; Hager et al., 2009) denoted that CH value of diabetic patients did not statistically and significantly differ in comparison with normal control group, however, CH value of the patients with type 1 diabetes was significantly higher than that of type 2 diabetics. In contrast, in a study performed by Sahin et al. (2009), it was reported that CH value of diabetic patients was significantly lower compared to the control group. In our study, we did not find any statistically significant differences between two groups regarding CH values.

Another important parameter measured by ORA is corneal resistance factor (CRF). It is partly independent from IOP. It is highly correlated with particularly CCT.

This parameter reflects the elastic properties of the cornea better; whilst, CH is a good indicator of the viscous properties of the cornea (Krueger and Ramos-Esteban, 2007). In our study, CRF was statistically and significantly higher in the diabetic patients. In a study by Kotecha et al. (2010), this value was higher in diabetic patients. Similarly, Goldich et al. (2009) showed that CRF value of diabetic patients were higher than that of the control group. Also, several other studies reported higher central corneal thickness (CCT) in diabetic patients which is parallel to that increase in CRF value (Weston et al., 1995; Su et al., 2008). In our study, parallel to these results, we found that CCT values of diabetic patients were significantly higher compared to the control group.

Co-existence of diabetes and glaucoma has been reported in many studies. In diabetic patients, higher IOP values were found than the normal population (Bonovas et al., 2004). The Goldmann applanation tonometry sets the corneal thickness to be 520 μ . It misleads to high IOP measurements in thick corneas and low IOP measurements in thin corneas (Chihara, 2008). Pathologies causing alterations in the viscoelastic structure of the cornea may impede a correct IOP measurement. It is debated that these routine tonometry methods that we used may cause false IOP measurements when the rigidity of the cornea is affected (high IOP, keratoconus, corneal dystrophies, previous photorefractive surgeries). To minimize these errors, 2 distinct IOP values may be measured with ORA device. IOPg is an average of two applanation pressures; IOPcc is a second IOP value compensated with the biomechanical properties of the cornea considering CH value. That IOPg of the group 1 was statistically and significantly higher than that of the group 2 in our study and is parallel to the studies in the literature reporting that IOP increases in diabetic patients, however, that there was no statistical difference between two groups for IOPcc values suggests that certain alterations in the parameters affecting corneal thickness occur in diabetic patients.

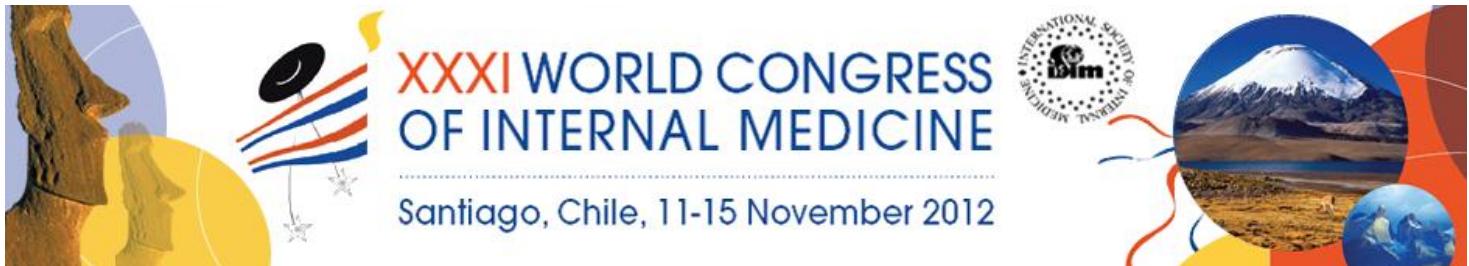
In conclusion, ORA device is able to detect the changes that may occur in corneal parameters of the patients with type 2 diabetes. Clinicians should take this finding into account in routine practice because clinically relevant IOP measurements errors may independent of CCT occur. To evaluate the effects of these changes occurring in the cornea on the corneal refractive power and IOP, further studies are needed.

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UPCOMING CONFERENCES

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