ÖZGÜN ARAŞTIRMA ORIGINAL RESEARCH

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EVALUATION OF PELVIC VENOUS DILATATION WITH COMPUTED TOMOGRAPHY IN PATIENTS WITH CELIAC DISEASE

ÇÖLYAK HASTALARINDA PELVİK VENÖZ DİLATASYONUNUN BİLGİSAYARLI TOMOGRAFİ İLE DEĞERLENDİRİLMESİ

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Öz

Amaç
Çölyak hastalığı (ÇH), genetik olarak glutene duyarlı bireylerde, ince bağırsağın enflamatuar hasarına yol açan bir immün yanıt ile karakterizedir. Pelvik venöz dilatasyonun (PVD) radyolojik olarak tanımlanması, pelvik ve sistemik hastalıkların farklı spektrumlarının teşhisine katkıda bulunabileceğinden önemlidir. Çalışmamızda ÇH olanlarda PVD prevalansını belirlemeyi ve bulgularımızı literatür eşliğinde sunmayı amaçladık.

Gereç ve Yöntem
Bu retrospektif gözlemsel çalışma, kurumumuzdaki etik kurulu tarafından onaylandı. ÇH tanısı alan tüm hastalar, klinik değerlendirme, serolojik veriler ve bağırsak biyopsisi olan ve Ekim 2011-Mart 2020 tarihleri arasında tıp merkezimizde Bilgisayarlı Tomografisi (BT) çekilen hastalardı. Kontrastlı BT yapılan ÇH olanlar (n=149) ve kontrol grubu (n=250) PVD açısından değerlendirildi. Hasta ve kontrol grubundaki tüm hastalarda PVD prevalansı incelendi. Pelvik damarların çapı ölçüldü ve not edildi. Hastaların şikayetleri hastane kayıtlarından not edildi.

Bulgular
Histopatolojik olarak kanıtlanmış toplam 149 hasta grubunda, yaş ortalaması sırasıyla 35,11 ± 13,03 ve 36,23 ± 15,06 yıl olan 93 kadın ve 56 erkek hasta vardı. Toplam 250 kontrol grubu arasından; yaş ortalaması sırasıyla 38,65 ± 15,38 ve 37,25 ± 13,56 yıl olan 145 kadın ve 105 erkek vardı. Kadın ve erkekte PVD prevalansı ÇH'larında sırasıyla %60,22 (n=56) ve %41,07 (n=23) idi. ÇH'nın %46,75'inde (n=36) karın ağrısı vardı ve PVD ile korele idi ($p < 0.05$). Mezenterik engorjman ve ince bağırsak kıvrım anormallikleri PVD ile korele idi ($p < 0,05$).

Sonuç
Pelvik konjesyon sendromu, kadınlarda çok yaygın olan ve potansiyel olarak önemli sakatlıklara yol açabilen PVD'nin neden olduğu düşünülen kronik pelvik ağrının nedenlerinden biridir. Karın ağrısı, ÇH'de görüntüleme yöntemlerinin uygulanmasının önemli bir nedenidir. Çalışmamızda ÇH hastalarında karın ağrısı PVD ile korele idi. Ayrıca, PVD prevalansı oldukça yüksekti. Dolayısıyla, ÇH olanlarda kontrastlı BT'de görülen artmış PVD prevalansı pelvik şikayetlerin bir bileşeni olabilir.

Anahtar Kelimeler: Pelvik venöz dilatasyon, çölyak hastalığı, bilgisayarlı tomografi

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Abstract

Objective
Celiac disease (CD) is characterized by an immune response in genetically gluten-sensitive individuals resulting in inflammatory damage of the small intestine. The radiological identification of pelvic venous dilatation (PVD) is important as it can contribute to the diagnosis of different spectrums of pelvic and systemic diseases. In our study, we aimed to determine the prevalence of PVD in CD patients and to present our findings with the literature.

Materials and Methods
This retrospective observational study was approved by the institutional review board in our institution. All patients were patients diagnosed with CD by clinical evaluation, serological data, and intestinal biopsy, and who underwent CT between October 2011 and March 2020 in our medical center. CD patients (n=149) and control group (n=250) who had contrast-enhanced CT were evaluated for PVD. In all patients, PVD prevalence was examined in the patient and the control group. The diameter of the pelvic veins was measured and noted. Complaints of the patients were noted from the hospital records.

Results
Among a total of 149 histopathologically proven patient groups, there were 93 female and 56 male patients with a mean age of 35.11±13.03 and 36.23±15.06 years, respectively. Among a total of 250 control groups; there were 145 females and 105 males with a mean age of 38.65±15.38 and 37.25±13.56 years, respectively. PVD prevalence in the female and male were 60.22% (n=56) and 41.07% (n=23) in CD patients, respectively. 46.75% (n=36) CD patients had abdominal pain and were correlated with PVD ($p<0.05$). Mesenteric engorgement and small bowel fold abnormalities were correlated with PVD ($p<0.05$).

Conclusions
Pelvic congestion syndrome is one of the causes of chronic pelvic pain thought to be caused by PVD, which is very common in women and can potentially lead to significant disability. Abdominal pain is an important reason for the application of imaging methods in CD. In our study, abdominal pain with CD patients was correlated with PVD. Also, the prevalence of PVD was considerably high. Therefore the increased prevalence of PVD seen on contrast-enhanced CT in CD patients may be a component of pelvic complaints.

Keywords: Pelvic venous dilatation, coeliac disease, computed tomography

Introduction

Celiac disease (CD) is characterized by an immune response in genetically gluten-sensitive individuals carrying the HLA-DQ-2 and/or HLA-DQ-8 haplotypes, resulting in T-cell mediated inflammatory damage of the small intestine (1). The worldwide known prevalence of this disease is between 0.6% and 1%, and the only known treatment is to follow a strict gluten-free diet (2, 3). In women with CD, as well as hypogonadal findings such as late menarche, early menopause, secondary amenorrhea, it can cause sexual dysfunction with recurrent miscarriages, fertility problems such as infertility, preterm birth and low birth weight (1, 4). In addition to the abnormal sperm motility and morphology seen in men, increased androgen resistance are blamed for infertility, while decreased libido associated with low levels of testosterone has been associated with sexual dysfunction (5,6).

Focal or diffuse dilation of pelvic vascular structures is rarely seen on magnetic resonance imaging (MRI) or computed tomography (CT). Pelvic venous dilatation (PVD) has been defined by two mechanisms. The first mechanism is the development of collateral vessels as a result of venous stenosis or occlusion. Findings associated with vascular enlargement vary according to the level of obstruction. Increased blood flow from collateral vessels associated with a neoplasm or a vascular lesion constitutes the second major mechanism for PVD (7). The radiological identification of abnormal pelvic vascularity and hemodynamics is important as it can contribute to the diagnosis of different spectrums of pelvic and systemic diseases. In the literature review, we did not find any study on the association of PVD and its prevalence in CD patients.

Our aim in this study is to determine the prevalence of PVD in CD patients and to present our findings with the literature.

Material and Methods

Study Design
This single-center retrospective observational study was initiated after the approval of Van Yüzüncü Yıl University Non-Interventional Clinical Research

Ethics Committee with the approval number 2020/10-07 dated 11/12/2020 and continued in accordance with ethical principles. Written informed consent could not be obtained from the cases due to its retrospective nature of our study.

Patient Population

All patients were diagnosed with CD based on intestinal biopsy, serological values and clinical evaluation, and underwent CT between October 2011 and March 2020 in our medical center. CD patients (n=149) and control group (n=250) were evaluated for PVD. Patients who had positive serological values and clinical symptoms at the first pathological diagnosis and had contrast-enhanced CT for other abdominal complaints were considered as the first patient group. Individuals who underwent contrast-enhanced CT due to non-specific abdominal complaints and who did not have any other comorbid disease were considered as the control group. Patients with abdominal vascular compression syndrome that may cause increased pelvic vascularity, such as May-Thurner Syndrome, Nutcracker Syndrome, and retro-aortic left renal vein, were excluded from the study. Patients with and inflammatory bowel disease, abdominal malignancy, cirrhosis, portal hypertension, radiation therapy, chemotherapy, abdominal and pelvic surgery, non-contrast abdominal CT, pregnancy were excluded from the study. Complaints of the patients (abdominal/pelvic pain and infertility) were noted from the hospital records.

CT Technique

All CT examinations have been performed with intravenous (IV) contrast agents in all patients in our center. The routine CT scan protocols in our center were as follows; CT scans were acquired using the multislice CT device with 16 detectors (Somatom Emotion 16-slice; CT 2012 Siemens AG Berlin and Munchen-Germany). IV contrast agent was applied to all patients and all normal subjects. A 100-150 ml non-ionic contrast agent (Omnipaque Nycomed) was applied with an injection rate of 1,5-2 ml/s by adjusting the contrast dose and injection rate according to the body weight of each patient. CT scans were started 70-90 second after the intravenous contrast administration and the slice thickness was chosen as 3-5 mm in all cases.

Imaging Analysis

15 and 7 years of experienced two radiologists made evaluations, reaching the same consensus, without prior knowledge of patient data. PVD prevalence was examined in the patient and the control group. PVD correlation was determined with the equal or increased superior mesenteric vein (SMV)/Aortic diameter rate, venous engorgement, and small intestinal fold abnormalities defined for CD (Figure 1). As a diagnostic criteria for PVD, a tortuous periuterine and periprostatic vein diameter was accepted to be more than 4 mm (8-11). The diameter of the pelvic veins was measured and noted (Figure 2).

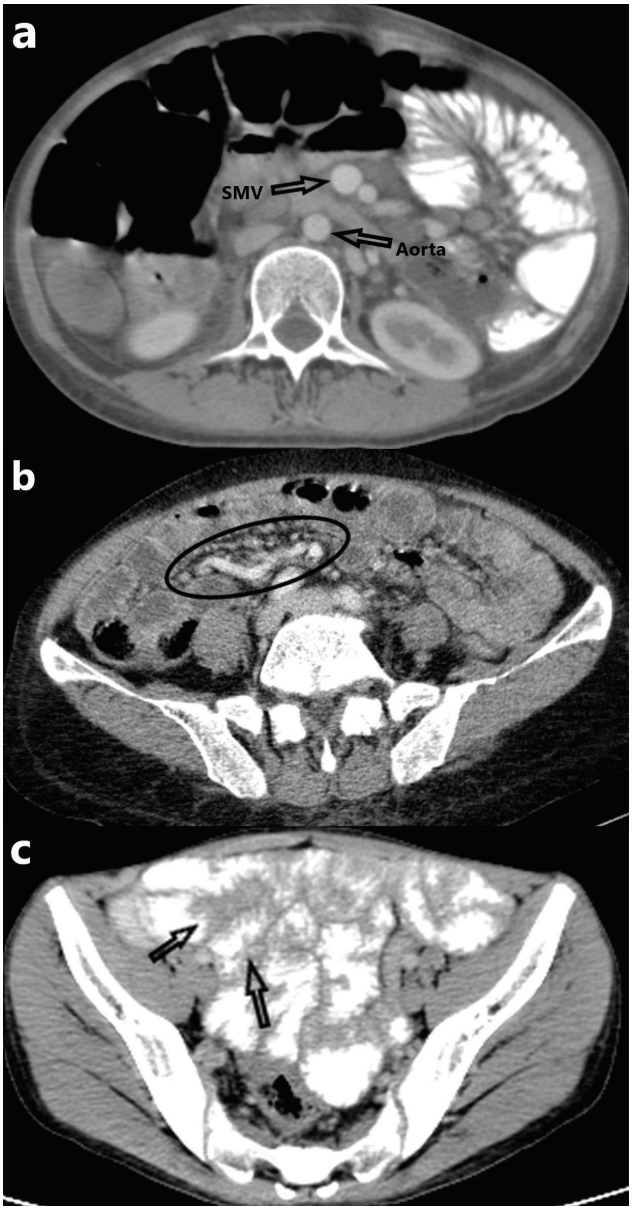

Figure 1:
Axial contrast-enhanced CT images demonstrate; a. Increased SMV/aortic ratio in a 37 year old untreated female celiac patient. b. High vascular flow (black oval) through the small bowel showing mesenteric engorgement in a untreated female celiac patient. c. Reversed jejunoileal fold pattern consisting of greater number of ileal folds (arrows) showing ileal jejunation in 41 years old untreated female celiac patient.

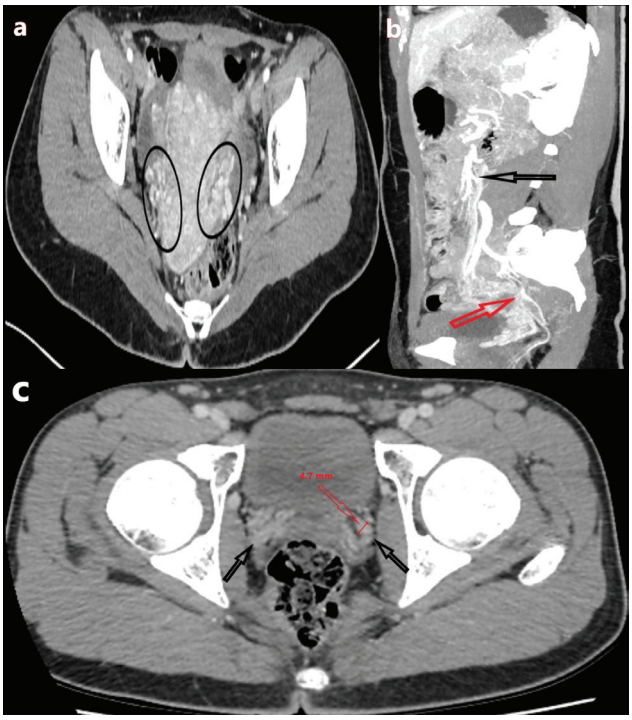

Figure 2:
Contrast-enhanced CT images demonstrate; a. Dilated paraovarian (utero and salpingo ovarian) veins (black ovals) in axial section. b. Increased mesenteric vascularity (black arrow) and collaterals (red arrow) in a 40-year-old untreated female patient in sagittal section. c. Bilateral periprostatic enlarged veins (arrows) in a 42 years old untreated male celiac patient in axial section and measurement of dilated vein on the left side (red arrow).

Statistical analysis

Descriptive statistics for studied variables (characteristics) were presented as mean, standard deviation, minimum and maximum values. Student t-test was used to compare Control and Patient group means for the studied variables. For determination linear relations among the variables, Pearson correlation analysis was carried out. Statistical significance levels were considered as 5% and SPSS (Ver: 20) statistical program was used.

Results

In this retrospective study, among a total of 149 histopathologically proven patient groups, there were 93 female patients with a mean age of 35.11 ± 13.03 years (18-80 years) and 56 male patients with a mean age of 36.23 ± 15.06 years (18-75 years). Among a total of 250 control groups; there were 145 females with a mean age of 38.65 ± 15.38 years (18-72 years) and 105 males with a mean age of 37.25 ± 13.56 years (18-74 years) (Table 1).

PVD prevalence in the female and male were 60.22% (n=56) and 41.07% (n=23) in CD patients, respectively. In the control group, 25 female patients (17.24%) and 5 male patients (4.76%) had PVD (Table 2). The mean diameters of the pelvic veins in female patients with PVD were 5.65 ± 1.69 mm (4.2-9.8 mm) in CD patients, and 5.02 ± 1.78 mm (4.1-10 mm) in the control group. The mean diameter in male patients were 4.97 ± 1.22 mm (4.1-8.3 mm) in CD patients, and 4.67 ± 1.94 mm (4.2-8.4 mm) in the control group (Table 1).

In the patient group, 77 patients (51.68%) had abdominal pain. Among CD patients with abdominal pain, 46.75% (n=36) of the patients had PVD. Abdominal pain was correlated with PVD ($p < 0.05$). Infertility was present in %6.49 of the patients (n=5).

In 98 (65.77%) of the CD patients, SMV/aortic ratio was equal or higher. Mesenteric engorgement was observed in 116 patients (77.85%). Small bowel fold

Table 1 The characteristics of the patients between Celiac Disease and Control Group

Variables	Celiac Disease Patients (n=149)			Control Group (n=250)		
Age	**Mean**	**SD**	**Range**	**Mean**	**SD**	**Range**
Female	35.11	13.03	18-80	38.65	15.38	18-72
Male	36.23	15.06	18-75	37.25	13.56	18-74
The mean diameters of the pelvic veins (mm) with PVD	**Mean**	**SD**	**Range**	**Mean**	**SD**	**Range**
Female	5.65	1.69	4.2-9.8	5.02	1.78	4.1-10
Male	4.97	1.22	4.1-8.3	4.67	1.94	4.2-8.4

Table 2 The distribution of the patients between Celiac Disease and Control Group

Variables	Celiac Disease Patients		Control Group	
All patients	**n**	**%**	**n**	**%**
Female	93	62.42	145	58
Male	56	37.58	105	42
Total	149	100	250	100
Pelvic venous dilatation (PVD)	**n**	**Prevalence**	**n**	**Prevalence**
Female	56	60.22	25	17.24
Male	23	41.07	5	4.76
Total	79	53.02	30	12

Table 3 Distribution of SMV/aortic ratio, mesenteric engorgement and small bowel fold abnormalities, and their correlation with pelvic venous dilatation (PVD).

Variables	n	%	Correlation with PVD		
			R value	P value	Odds ratio
SMV/aortic ratio (equal or higher)	98	65.77	0.146	0.61	1.933
Mesenteric engorgement	116	77.85	0.326	<0.001	7.926
Small bowel fold abnormalities	125	83.89	0.160	0.043	2.043

abnormalities were observed in 125 (83.89%) CD patients. It was correlated with PVD for mesenteric engorgement (R value: 0.326 $p < 0.001$, odds ratio: 7.926,) and small intestinal fold abnormalities (R value: 0.160, p: 0.043, odds ratio: 2.043) from CT findings. For the SMV/aortic ratio, there was no significant correlation (R value: 0.146, p: 0.61 odds ratio: 1.933) (Table 3).

Discussion

CD or gluten-sensitive enteropathy is a proximal small intestine disease that develops in genetically susceptible individuals as a permanent intolerance to gluten-like grain proteins in wheat and cereals (1). CD has increased to include its impact on all body systems following recent findings related to the pelvic complaints. Infertility, late menarche, early menopause, pregnancy problems, and elevation of follicle-stimulating and luteinizing hormones have been reported in untreated female celiac patients (12-18). In addition, in male CD patients, elevated plasma testosterone, and free testosterone levels and androgen resistances have been reported (19). In CD, the findings of the small intestine malabsorption pattern (MABP), the colonic MABP, and other organs (small spleen, mesenteric lymph node prominence, etc.) are described in the literature (20). However, PVD on CD patients has not been described in the literature.

There are collateral vascular networks in the pelvic region. The superior rectal venous plexus drains into the portal vein via the inferior mesenteric vein, while the middle and inferior rectal venous plexuses drain into the inferior vena cava (IVC) via the internal iliac vein. Retroperitoneal plexiform venous networks, also known as Retzius veins, sometimes form a vascular network between the colic or mesenteric veins and the IVC or gonadal veins (21). Diameter increase in SMV and venous occlusion described on CT refer to vascular prominence in the portal system in celiac patients. In patients with CD, the mesentery is seen as hypervascular, especially in the active inflammatory phase. The diameter of the SMV may increase to equal the aorta. In our study, the SMV/aortic ratio was equal or higher in 98 patients. Mesenteric engorgement

was observed in 116 patients. The mesenteric hypervascularity in the small bowel may appear, particularly during the active inflammatory process. Although the SMV/aortic ratio was not correlated, it was found to be numerically high. The reason for the increase in diameter in the SMV in CD patients is related to the active disease process due to ingested gluten. In this study, we think that the mesenteric-portal system pressure and mesenteric vascularity increase in CD patients who have not been treated for a long time, create PVD with connections between IVC or gonadal veins such as Retzius.

Chronic pelvic pain (CPP) is a common health problem for most women worldwide. However, revealing the causes of these pains can be a difficult situation to handle. Approximately 40% of all women in gynecology clinics report CPP. 25% of all hysterectomies and one-third of laparoscopic exploration procedures are performed to investigate CPP (22). Pelvic congestion syndrome (PCS) is a cause of CPP that should be considered in many women after other pelvic pathologies have been excluded. Imaging modalities can aid diagnosis and imaging findings can facilitate pre-procedure planning for definitive diagnosis. Abdominal pain is an important reason for the application of imaging methods in celiac patients. In our study, 51.68% of patients had abdominal pain and were correlated with PVD cases. The prevalence of PVD has been reported in the literature as 10-15% (23). In our series, PVD prevalence in control group (12%) was compatible with the literature. However, in our study, the prevalence of PVD in CD patients was 53.02% (women 60.22%, men 41.07%), which was considerably higher than the literature. However, clinical evaluation for PCS could not be made due to a lack of data.

Prostatodynia is an unexplained presentation of chronic pelvic pain associated with nonspecific voiding symptoms and pain located in the groin, genitalia, or perineum (24). Among patients with CD, 15.44% of men had dilatation of the periprostatic veins.

Our study has its limitations. Because it was retrospective, it was the absence of hormonal data and venous insufficiency in the lower extremities and no records of scrotal varices. In addition, there was no evaluation in terms of pelvic insufficiency clinical findings in patient records.

Conclusion

PCS is one of the causes of chronic pelvic pain, a condition very common in women that can potentially lead to significant disability. The condition is thought to be due to the PVD. Abdominal pain is an important reason for the application of imaging methods in CD. In our study, most of the CD patients had abdominal pain and were correlated with PVD. Also, the prevalence of PVD in CD patients was considerably higher than in the literature. Therefore the increased prevalence of PVD seen on contrast-enhanced CT in CD patients may be a component of pelvic complaints.

Conflict of Interest Statement
The authors have no conflicts of interest to declare.

Ethical Approval
This single-center retrospective observational study was initiated after the approval of Van Yüzüncü Yıl University Non-Interventional Clinical Research Ethics Committee with the approval number 2020/10-07 dated 11/12/2020 and continued in accordance with ethical principles.

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