

Evaluation of Children and Adolescents Admitted to the Emergency Department with Complaints of Chest Pain

Acil Servise Göğüs Ağrısı Şikayeti ile Başvuran Çocuk ve Adölesanların Değerlendirilmesi

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Abstract

Introduction: Chest pain (CP) is a common reason for pediatric emergency department presentation. The possibility of heart originated pain frightens the family. There is no pathology in most of the cases. Here, we aimed to evaluate the etiological causes of children and adolescents who admitted to the pediatric emergency service with complaint of CP.

Materials and Methods: Two hundred ninety eight cases aged between 8 and 18 years who admitted to the emergency service with GA complaints between February 2018 and 2019 were included in the study. Demographic characteristics, physical examinations, laboratory findings and diagnoses of the patients were analyzed retrospectively.

Results: The most common causes of CP were determined as idiopathic (50.3%), musculoskeletal system (24.1%) and psychogenic (10.2%). Most of the patients were over 12 years old (n=169, 58.7%) and female (n=155, 53.8%). There was no significant difference in terms of age and gender (p=0.06, p=0.07). The cardiac causes was found to be 4.5% of the all causes. The most common cardiac causes were mitral valve prolapse and mitral insufficiency. Psychogenic causes were higher in females, and psychogenic causes were anxiety, panic attack and depression, respectively.

Conclusion: Most of CP in children is due to non-cardiac causes. Although the most common cause of GA is idiopathic, the incidence of psychogenic causes in CP etiology is gradually increasing in adolescents. As a result of detailed history, physical examination and laboratory tests, families should be informed and felt comforted about the diagnosis of the patients.

Öz

Giriş: Göğüs ağrısı (GA), çocuk acil servisine başvurunun yaygın bir nedenidir. Ağrının kalp kökenli olma ihtimali aileyi telaşlandırmaktadır. Olguların çoğunda herhangi bir patoloji saptanmamaktadır. Çalışmamızda çocuk acil servisine başvuran çocuk ve adölesanların GA nedenlerini değerlendirmeyi amaçladık.

Gereç ve Yöntem: Şubat 2018-2019 tarihleri arasında GA şikayeti ile acil servise başvuran 8-18 yaş arası 298 olgu çalışmaya dahil edildi. Hastaların demografik özellikleri, fizik muayeneleri, laboratuvar bulguları ve tanıları retrospektif olarak incelendi.

Bulgular: GA'nın en sık nedenleri idiyopatik (%50,3), kas-iskelet sistemi (%24,1) ve psikojenik (%10,2) olarak belirlendi. Hastaların çoğu 12 yaşın üzerinde (n=169,

Keywords

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Anahtar kelimeler

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%58,7) ve kızdı (n=155, %53,8). Hastalar arasında yaş ve cinsiyet açısından anlamlı bir farklılık yoktu ($p=0,06$, $p=0,07$). Kardiyak nedenler tüm nedenlerin %4,5'iydi. En sık kardiyak nedenler mitral kapak prolapsusu ve mitral yetmezliktir. Kızlarda psikojenik nedenler daha fazlaydı, psikojenik nedenler sırasıyla anksiyete, panik atak ve depresyondur.

Sonuç: Çocuklarda GA'nın büyük çoğunluğu kalp dışı nedenlerden kaynaklanmaktadır. GA'nın en sık nedeni idiyopatik olmakla birlikte, psikojenik nedenlerin insidansı adolesan yaş grubunda giderek artmaktadır. Ayrıntılı anamnez, fizik muayene ve laboratuvar tetkikleri sonucunda hastaların tanıları konusunda ailelerin bilgilendirilmesi ve kendilerini rahat hissetmeleri sağlanmalıdır.

Introduction

Chest pain (CP) is one of the most common reasons for admission to the emergency department in children and especially in the adolescent age group. The most common causes of CP in children are idiopathic, musculoskeletal system, respiratory system and gastrointestinal system (GIS) pathologies, respectively. Cardiac causes are extremely rare and their frequency is usually around 5% (1). In adults CP is often associated with heart disease and sudden death. Although cardiac causes are rare, anxious parents who associate CP with heart disease often present to the pediatric emergency department (2). Many families perceive CP as heart disease, and the most frightening of the family is the possibility of children dying suddenly. After a detailed physical examination and anamnesis, most of the patients can be diagnosed without the need for further examinations. However, further investigations such as echocardiography, ECG, cardiac catheterization and angiography may be required in patients who are suspected of having CP due to cardiac causes, where organic causes cannot be excluded. Therefore, clinicians should know the possible causes and the symptoms indicating these reasons in children presenting with CP (3-5). In this study, we aimed to evaluate the adolescent children who presented to the pediatric emergency department with the complaint of CP in terms of diagnosis and to investigate the causes of pain.

Materials and Methods

In this study, the data of 298 adolescent patients who were admitted to pediatric emergency service between 01.02.2018 and 2019 with CP complaints were retrospectively evaluated. The age range of the patients was 8-18 years. Patients' age, gender, time of onset of pain, season, time of admission to hospital, consultations, laboratory and radiological evaluations were evaluated. The patients were divided into two groups as <12 and >12 years old. The cases considered

psychogenic were consulted with the child psychiatrist, and the cases considered cardiological were consulted with the child cardiology. Physical examination, vital signs, 12-channel electrocardiography (ECG), and cardiac markers [troponin, creatine kinase (CK), and CK-MB] were evaluated in all patients. Patients with suspected pneumonia had bilateral chest radiographs. Before the study, Erciyes University Faculty of Medicine, Non-invasive Clinical Research Ethics Committee approval was obtained (approval number: 2018/222, date: 18.04.2018).

Statistical Analysis

SPSS for Windows 20 program was used to evaluate the data in the study. All data were calculated as mean and percentage (%) values. The difference between categorical variables was evaluated using the chi-square test. A p-value of <0.05 was considered statistically significant.

Results

In our study, 155 (53.8%) of the patients were female and 133 (46.2%) were male. The age range of the patients was 8-18 years. 58.6% of the patients were over 12 years old and in the adolescent age group. There was no significant difference between patients in terms of age and gender ($p=0,06$, $p=0,07$). The duration of the patients' onset of CP and their presentation to the emergency department ranged from one to 30 days. Most of the patients (79.1%) admitted within the first 24 hours. The patients admitted to the emergency department in the spring, summer, autumn and winter seasons, respectively (Table 1).

Only one patient had a high troponin value and was diagnosed with myocarditis. Sixty-six patients had chest radiography and 7 patients were diagnosed with pneumonia. The most common causes of CP were idiopathic, musculoskeletal, psychogenic, respiratory, cardiac, and GIS pathologies, respectively

(Table 2). Forty-four patients were consulted to child psychiatrists and 162 patients to child cardiology.

Psychogenic pathologies were detected in 29 patients, and they were anxiety (44.8%), panic attack (34.4%) and depression (20.8%), respectively. Cardiac pathology was detected in 14 patients as a result of the evaluation of the pediatric cardiology. These pathologies were mitral valve prolapse (MVP), mitral insufficiency, atrial septal defect (ASD), Wolff parkinson white (WPW), supraventricular tachycardia (SVT) and myocarditis, respectively (Table 3).

ECG evaluation revealed abnormal findings in five patients: SVT in two patients, delta wave in two patients and ST elevation in one patient. Musculoskeletal pathologies were myalgia 18.2%, costochondritis 5.9%, respiratory system pathologies pneumonia 2.4%, asthma 2.9%, GIS pathologies were 3.4% gastroesophageal reflux.

Discussion

In each child presenting with CP, a detailed history should be obtained and not only cardiovascular

Table 1. General characteristics of the patients with chest pain

	n	%
Age (year)		
<12	119	41.4
>12	169	58.6
Gender		
Female	155	53.8
Male	133	46.2
Starting time		
0-1 day	228	79.1
1-7 day	48	14.5
7-30 day	12	6.4
Beginning		
With effort	44	15.3
Rest	179	62.1
Both	65	22.6
Season		
Autumn	57	19.8
Winter	60	20.8
Spring	92	31.9
Summer	79	27.5

system examination but also comprehensive systemic examination should have to be performed. In studies on children, CP accounts for 0.7-5.2% of visits to pediatric emergency department (6). In our study, patients presented with CP comprised 0.9% of all presentations in agreement with literature. In pediatric population, CP is most commonly encountered at adolescent period and at ages of 12-14 years. In addition, it was reported that CP was more common at adolescent period and girls (7,8). In our study, CP was more common in adolescents and girls but the difference did not reach statistical significance.

In our study, no underlying pathology was identified in 48.1% of patients presented with CP; such patients were considered as idiopathic CP. Idiopathic CP is most common cause of CP children with incidence ranging from 12% to 85% in several studies (7,9). Before making diagnosis of idiopathic CP, the patient should be evaluated with detailed anamnesis and physical examination; studies such as

Table 2. The causes of chest pain

Reasons	%	n
Idiopathic	50.3	145
Musculoskeletal system	24.1	69
Psychogenic	10.2	29
Respiratory system	5.3	16
Cardiac system	4.8	14
Gastrointestinal system	3.4	10
Others (trauma, tonsillitis)	1.9	5
Total	100	288

Table 3. Psychogenic and cardiac causes of chest pain

	%	n
Psychogenic reasons		
Anxiety	13	44.8
Panic attack	10	34.4
Depression	6	20.8
Cardiac causes		
Mitral valve prolapse	4	28.5
Mitral regurgitation	3	21.4
Atrial septal defect	2	14.3
Wolff parkinson white	2	14.3
Supraventricular tachycardi	2	14.3
Myocarditis	1	7.2

ECG and echocardiography should be performed when needed; and organic and psychogenic causes that may play role in the etiology should be ruled out (1,7). In a study on 3,700 patients with CP, idiopathic causes were detected in 52% of children (10). This group of patients is generally adolescents and describes a sudden pain lasting for a few seconds or minutes. The children limit their activities during attacks. The attacks can recur and physical examination is always normal. The causes are mostly normal and self-limiting. No treatment is required (11). In such cases, the patient and patient should be assured that the pain is not associated with heart.

Among chest with an identifiable cause, musculoskeletal pathologies are most common. Of children presented to emergency department with CP, musculoskeletal system pathology was detected in 28% (1). In a series including 3,700 children, it was found as 37% (10). In the study by Çiçek et al. (12) it was found that musculoskeletal conditions were second most common causes of CP following idiopathic causes. In our study, musculoskeletal pathologies were the most common cause of CP in agreement with literature. The factors which are helpful in diagnosis include worsening pain with breathing or activity, relief of pain with removal of triggering event and lack of abnormal finding in the physical examination (13-15). Costochondritis, exercise, overuse of chest muscles by cough, trauma, slipping rib syndrome, herpes zoster, pleurodynia, Tietze's syndrome and chest wall and vertebral anomalies can cause CP (10,16). CP secondary to costochondritis is a common condition in children. It is more common in adolescents and girls. In general, costochondral and costosternal joints over ribs 2-5 are tender and painful at palpation in unilateral manner. The pain is exacerbated by deep breath and exercise. In general, it is recurrent and lasts over a few seconds and minutes. It is typically self-limiting condition; thus, symptomatic treatment is employed and non-steroidal anti-inflammatory agents are given during acute period (17). In our patients, myalgia and costochondritis were most commonly detected musculoskeletal system pathologies and non-steroidal anti-inflammatory drugs were prescribed in these patients. GIS disorders can manifest as CP. Many causes such as gastroesophageal reflux disease (GERD), gastritis, peptic ulcer, esophagitis and foreign body in esophagus can cause GIS-related CP.

Among these, GERD is common and can present as heartburn. It is seen that the pain is associated with meal while it is exacerbated when the patient lie down and it is generally localized at epigastric region. In a case series including 441 patients, Güvenç et al. (8) found GIS-related CP incidence as 1.4%. In our study, GIS-related CP incidence was 3.4% as GERD being most common cause.

Respiratory disorders such asthma, pneumonia, pleural effusion, pulmonary embolism and pneumothorax can cause CP (9,18). The presence of complaints such as cough and fever, pain worsening with breathing and pathological lung sound at physical examination suggests respiratory system disorders. The diagnosis can be made directed studies such as chest radiograph and appropriate treatment is prescribed. Asthma is most common respiratory CP in children. CP following exercise, wheezing and respiratory distress may be present (19,20). In a study by Sert et al. (3) it was reported that respiratory CP incidence was 6.6% among children, 28% of which were asthma. Öztürk et al. (13) reported that 5.1% of all CP cases originated from respiratory system, 58% of which were diagnosed as asthma. In our study, respiratory CP comprised 5.3% of all cases with CP; of these, 56.3% were asthma and 43.7% were pneumonia. In pneumonia, overuse of accessory breathing muscles due to cough and pleural or diaphragmatic irritation can result in CP. Again, pleural inflammation secondary to effusion may cause pain which exacerbates with deep inspiration (17,21).

In recent years, psychogenic CP with increasing incidence is another cause of CP in children. Age is an important factor in the etiology of CP in children. It is more common in adolescent girls (22). While psychogenic or stress-related CP is more common among adolescents while cardiorespiratory CP resulting from asthma, pneumonia or cardiac disorders is more common in younger children. In Turkey, psychogenic factors are reported in 3-10% of children presented with CP (3,13,23). In our study, CP frequency was 10.2% and was more common among adolescent girls. CP following stressful events, presence of multiple complaints such as headache and abdominal pain, sleep disorder, prolonged complaints, recurrent complaints, healthy appearance, normal physical examination and problems in school and at home should suggest psychogenic CP. Divorce, breaking up friends, loss of a beloved individuals,

disapproval by friends and academic failure are common conditions (1,22,24). In recent years, some studies emphasized that psychogenic causes are more common than organic causes of CP and anxiety, depression and suicidal thoughts were higher in adolescents when compared to controls (25,26). In our study, psychogenic CP was second most common cause of CP with identifiable cause and there was anxiety, panic disorder and depression in the patient. Thus, it will be appropriate to perform as psychogenic assessment when all evaluations for CP were normal in adolescent girls.

Although cardiac CP is rare in children, it can be an important, fatal condition. Thus, families are concerned due to likelihood of cardiac origin when they faced CP. In previous studies, cardiac CP frequency ranges from 0% to 6% (1,17,24). Çiçek et al. (12) reported cardiac CP frequency as 6.7%. In our study, rate of cardiac CP was found as 4.5% in agreement with literature. It is difficult to rule out cardiac disease definitely since children could not fully describe or localize pain (18,27,28). The patient should be evaluated for cardiac disorders in detail and must be assessed by a pediatric cardiologist if there is sudden onset, exercise-induced CP; if there is accompanying respiratory distress, palpitation, nausea, sweating, pallor, pre-syncope or syncope and if there is history of previous cardiovascular surgery and family history of premature death. Initial evaluation includes ECG and cardiac enzyme assays (troponin, CK). MVP, arrhythmias, aortic stenosis, pulmonary stenosis, cardiomyopathy, cardiac tumors, myocarditis, pericarditis and infective endocarditis can lead CP (3,8,21,29). The MVP is a common condition in general population, which generally has a benign course. Its prevalence is 2-5% at childhood, which increased by advancing age. In a last study the prevalence of MVP in 7,550 Turkish school children was found 1.2-1.6% (30). It is particularly seen in adolescent girls. In general, there is positive family history. It may cause a vague pain due to stretching of papillary muscle at apex. Although definitive cause of pain is unknown, it has been proposed that pain may be due to ischemia in papillary muscles, abnormal stretching or arrhythmias (22,31). The MVP was reported as most common cardiac pathology underlying CP (12). In our study, the most common cardiac cause of CP was MVP (28.5%); followed by mitral regurgitation (21.4%),

ASD (14.3%), WPW (14.3%), SVT (14.3%) and myocarditis (7.2%). ASD and mitral regurgitation are rare causes of CP in children, and we think that these findings are coincidental. In children, CP can occur due to arrhythmias such as ventricular extra-systole, SVT or ventricular tachycardia. It is more commonly seen in prolonged tachycardia resulting in decreased cardiac output and diastolic blood flow, and myocardial ischemia. There may be concomitant palpitation, dizziness, pre-syncope or syncope. Hypertrophic or dilated cardiomyopathy can cause CP at rest or during exercise due to ischemia and dysrhythmia. Family history, pathological murmur or findings of congestive heart failure as well as electrocardiographic and telecardiographic abnormalities are supportive for diagnosis. Sharp, long-lasting pain which is exacerbated by supine position and relieved by sitting or anterior bending can be seen in patients with pericarditis (1,21,24).

Study Limitations

Our study had some limitations. The fact that the study was not multicenter was one of the limiting features. Other limiting factors were the retrospective planning of our study and the small number of cases.

Conclusion

Cardiac CP which leads panic and fear in the family is extremely rare in children. The further evaluations should be performed in patients suspected to have cardiac pathology and a consultation with pediatric cardiologist should be ordered. As there is a non-cardiac cause in majority of patients, informing and assuring family is the most important part of management in emergency department. The psychogenic CP with increasing incidence should be kept in mind in adolescents.

Ethics

Ethics Committee Approval: Ethical approval was obtained for this study from the Erciyes University Clinical Research Ethics Committee (approval number: 2018/222, date: 18.04.2018).

Conflict of Interest: The authors have no conflict of interest to declare.

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