



Original Article

Costochondritis After Coronary Artery Bypass Grafting

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ARTICLE INFO

Key Words:

Costochondritis after Coronary Artery Bypass Grafting

How to Cite:
 Nauman Jamal, M. ., Anees Sarwar, M. ., Fatima, I. ., Shabbir, S. ., & Hayat, R. . (2022). Costochondritis After Coronary Artery Bypass Grafting: Costochondritis after Coronary Artery Bypass Grafting. *Pakistan Journal of Health Sciences*, 3(04). <https://doi.org/10.54393/pjhs.v3i04.116>
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Received Date: 13th September, 2022Acceptance Date: 22nd September, 2022Published Date: 30th September, 2022

ABSTRACT

Costochondritis is painful inflammatory condition of costochondral junctions, which can be reproduced by palpating the affected joints. After CABG, musculoskeletal problems are major cause of chest pain due to median sternotomy. Prevalence of costochondritis in emergency department is 14% but its frequency in patients after coronary artery bypass grafting is not well established. **Objective:** To identify costochondritis as complication of sternotomy in post-operative CABG patients. **Methods:** This was a descriptive case series study in which 43 patients were included in study according to inclusion and exclusion criteria. 28 males and 15 females were included in the study with same baseline characteristics. Each patient was assessed using diagnostic criteria based on clinical history and physical examination, after 3 weeks of coronary artery bypass grafting, under supervision of cardiologist. **Results:** Mean age of patients was 51.14, with range minimum 30 years to maximum 70 years. 15 patients (34.9%) had costochondritis after CABG and 28 patients (65.1%) had other musculoskeletal causes of chest pain. **Conclusions:** Costochondritis after CABG is one major complication of sternotomy which causes severe chest pain, affecting 34.9% patients. It affects females twice as compare to males.

INTRODUCTION

In general, 25% of the population experiencing the chest pain in the world, from which more than half of the patients have cardiac origin of chest pain due to myocardial infarction, heart failure, angina, etc. Other have non-cardiac origin of chest pain e.g. from a musculoskeletal or visceral causes. Prevalence of this non-cardiac chest pain is 23-33% [1, 2]. Musculoskeletal accounts 31% of non-cardiac chest pains. Most commonly occurring musculoskeletal conditions are costochondritis 14%, chest wall syndrome 13%, ribcage anomalies 2% and skeletal trauma 2% [3]. Costochondritis(CC) is self-limiting inflammatory condition of the costosternal joints at multiple levels usually 2nd to 5th costochondral junctions without any swelling [4]. Coronary artery bypass grafting

(CABG) is open heart surgical procedure in which part of the aorta is grafted to the coronary artery to bypass the blocked section and improve the blood supply of the heart [5]. CABG is long lasting treatment of ischemic heart diseases, that's why every year, almost 400,000 CABG surgeries are performed in the United States [6]. Following recent CABG surgery, the most common cause of chest pain is musculoskeletal. Others are myocardial ischemia (occlusion & graft stenosis), aortic dissection, pericarditis (e.g. Dressler's syndrome), sternal wound infections or non-union, pulmonary embolism, pneumonia and gastritis [7]. Costochondritis accounts for 10-30% of all chest pain [8]. It mostly affects individuals older than 40 years, 69% females and 31% males [9]. Mostly it is idiopathic but some known

causes and risk factors are repetitive minor trauma to the chest and infections [10]. Patients with open chest wall injuries and who had undergone median sternotomies have increasing cases of fungal costochondritis from last 50 years [11]. Frequency of costochondritis in patients after coronary artery bypass grafting is not well established. A case of CC is reported in a male patient after off pump CABG caused by *Aspergillus flavus* [12]. Costochondritis is diagnosed on the basis of history and examination. There is sharp, pressure like, aching pain, exacerbated by deep breathing, upper body movements and exertion activities. Pain reproduced by palpation without any swelling or edema [8, 13]. Costochondritis is differentiated from shoulder, sternoclavicular and sternomanubrial arthritis, costal cartilages neoplasm, chest gastritis, fibromyalgia, herpes zoster of thorax, painful xiphoid syndrome, tietze syndrome, slipping rib syndrome, traumatic muscle pain, myocardial infarction (MI), inflammation of pericardium or pericarditis, pulmonary embolism, aortic dissection, Sternal wound infection or non-union, pneumonia and chest infections [1, 8]. Number of chest pain evaluations and admissions are decreasing significantly with diagnosis of costochondritis in adults. Study showed that number of several outcome measures decreases significantly before and after diagnosis of costochondritis [14, 15]. Like chest pain admissions were 39 before diagnosis of costochondritis and were 6 after diagnosis of costochondritis. Similarly minor investigations decrease from 169 to 17, major investigations from 30 to 0, Inpatient days from 137 to 5 respectively [16, 17].

METHODS

The data was taken from out-patient department (OPD) cardiac surgery of Punjab institute of cardiology Lahore. Almost 20 to 50 patients were evaluated through convenient sampling. Patients, who had CABG with median sternotomy with anterior wall chest pain after 3 weeks of surgery and age between 30-70 years, were encompassed in the study. Omission of patients were made by any positive history of anterior chest wall pain with cardiopulmonary sign and symptoms, patients with marked electrocardiography (ECG) changes, patients with anterior chest wall pain other than musculoskeletal causes e.g. sternal infection, sternal wound etc. Total 43 patients fulfilled the criteria and were contained within the study. All patients had same baseline characteristics. A self-constructed Questionnaire was used containing diagnostic criteria of costochondritis used in previous studies and demographics of patients. Validation of questionnaire was done according to 'content validation of questionnaire' criteria by University of Health Sciences (UHS). Informed consent was obtained from every single patient.

Permission from the ethical review committee of Lahore College of physical therapy LMDC was obtained in order to carry out the study. Copy of synopsis with signature of supervisor was submitted to evaluation board of ethical review committee of Punjab institute of cardiology (PIC) together with a request and permission letter from Lahore College of physical therapy LMDC for approval to carry out the study. Ethical review committee of Punjab institute of cardiology (PIC) allotted a provisional letter for data collection. Final letter was dispensed by Chairman ethical review committee Punjab institute of cardiology Prof. Dr. Nadeem Hayat Malik after completion of data by analyzing the results. Both provisional and final letters were attached in annexure as appendix IV and V. Informed consent was obtained from each patient in Urdu after describing the procedure. Female examination was 10 accommodated with the nurse. The cultural and religious considerations were duly taken at the time of collection of data.

RESULTS

Table 1 showed that mean \pm SD of the sample size (n=43) was 51.14 ± 11.72 and the range of the age was 30-70 years. Frequency of patients was almost equal in all age groups which showed that all groups had almost same percentage of patients. Group (61-70) had (12) maximum number of patients. Out of sample size of 43 patients, 28 (65.1%) patients were males and 15 (34.9%) patients were females.

Gender	N	Percentage
Males	28	65.1%
Females	15	34.9%
Age		
61-70	12	27.9%
51-60	10	23.3%
41-50	10	23.3%
30-40	11	25.6%

Table 1: Demographic variables

Figure 1 illustrates that there were 15 (34.9%) patients diagnosed with costochondritis and 28 (65.1%) had other musculoskeletal conditions e.g. hypertrophic scar, keloid, tietze syndrome, pectoralis major tightness. Out of 43 patients included in the study, 2 patients had costochondritis and 9 had other musculoskeletal conditions in the age group 30-40.

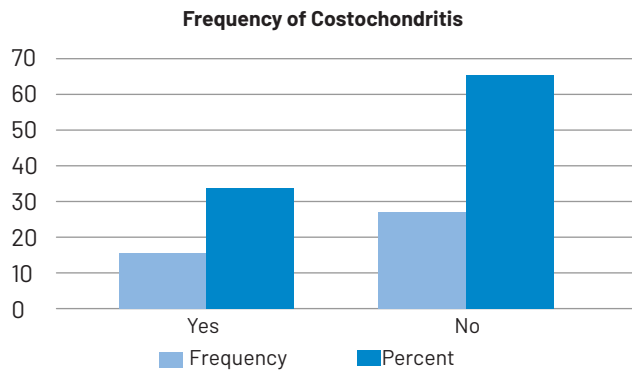


Figure 1: Frequency of Costochondritis

Figure 2 depicts that 6 patients were diagnosed with costochondritis in age group 41-50 and 4 had other musculoskeletal conditions. Correspondingly, 4 patients were suffering from costochondritis in age group 51-60 and 6 had other musculoskeletal conditions. 3 patients had costochondritis and 9 had other musculoskeletal conditions.

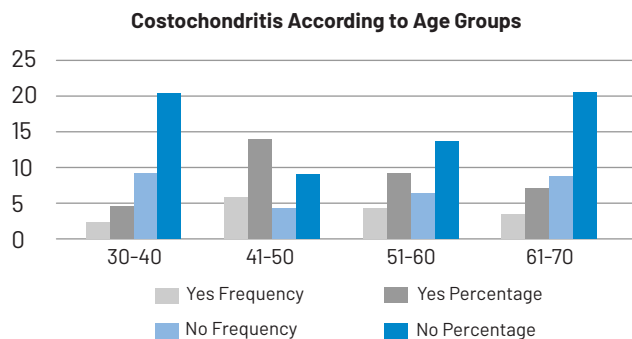


Figure 2: Frequency of Costochondritis according to age groups

Figure 3 showed that among 43 patients, 28 were males out of which 7 (25%) males had costochondritis and 21 (75%) males had other musculoskeletal origin of chest pain. Likewise, 15 were females, out of which 8 (53.3%) females had costochondritis and 7 (46.7%) females had other musculoskeletal conditions. So, according to results of study females had two times greater chances of postop CABG costochondritis as compare to males. Hence it is concluded that costochondritis after CABG is one major complication of sternotomy which causes severe chest pain, affecting 34.9% patients. It affects females twice as compare to males.

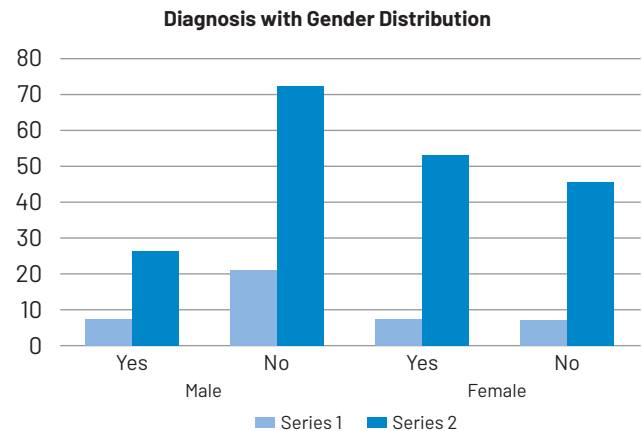


Figure 3: Frequency of Costochondritis with gender distribution

DISCUSSION

In the past there was a study conducted on 54 years old patient having renal failure, hypertension. He was a smoker and had undergone CABG in 2011. His medical records indicated that he had severe left anterior descending and right coronary artery blockage. The patient was directed to our department of Yazd cardiac surgery with fever and severe chest pain moderate discomfort around the previous sternal incision severely hurting in the shoulders and upper abdomen respectively. Necrotic costochondritis was the final condition they found after an earlier CABG. Similarly in our present study same results were found that costochondritis is commonly reported after CABG [12]. Previously there was a study conducted on 5 cases and in that study, it was seen either costochondritis or sternal osteomyelitis was the side effect of median sternotomy for open-heart surgery. The *Pseudomonas aeruginosa* pathogen was found in 4 out of 5 cases. These infections were slow-moving and challenging to identify. They needed protracted antibiotic treatment and thorough debridement for efficient management. Likewise results were found in our present study showing that costochondritis is common after cardiac surgery [18]. In the past there was a case reported in which 72-year-old man who underwent triple bypass surgery and diagnosed with persistent ischemia in February 2017 had multiple hospital admissions following the procedure because of dyspnea, fever, pleural effusion, unusual chest discomfort, and persistent elevation findings (erythrocyte sedimentation rate and C-reactive protein). Cultures of the pleural fluid and blood were unfavorable. The cause of infection was not revealed by a CT scan or thoracoscopy. The patient reported abnormal chest discomfort and atypical fever, PET/CT scans showed a severe bilateral hyper metabolism. *Aspergillus* species fungi subsequently developed in a blood culture, establishing this as the cause of costochondritis. Likewise it can be seen that after CABG,

Aspergillus could be the source of Costochondritis same as reported in our study showing its common incidence after cardiac surgery [19]. Prevalence of costochondritis in emergency department is 14% but its frequency in patients after coronary artery bypass grafting is not well established. In the past, a case of costochondritis is described in a male patient postoperative off-pump CABG caused by *Aspergillus flavus* presented with anterior wall chest pain [12]. I thus selected post-CABG patients with anterior chest wall pain and assessed them using diagnostic standards from earlier investigations [4, 8]. Results of this present study about frequency of costochondritis after CABG were 34.9% and frequency of males and females diagnosed with costochondritis after CABG were 25% and 53.3% respectively, likely as previous studies which defined the prevalence and frequencies of costochondritis (10-30%) in emergency departments and gender distribution affected with costochondritis, females (69%) and males (31%) [4, 8, 9]. Previously, studies with frequency and prevalence of costochondritis in emergency departments, defined costochondritis mostly affects individuals greater than 40 years [20]. According to results of this study age group 41-50 had greatest number of patients (6) diagnosed with costochondritis after postop CABG out of 15 patients. Other age groups 30-40 had six (2) patients, age group 61-70 had three (3) patients and age group 51-60 had four (4) patients. In a nutshell, costochondritis affects mostly individuals between age 41-60 years after coronary artery bypass grafting. Similarly, the results of this study were just contiguous with the previous studies.

CONCLUSION

On the word of results, frequency of costochondritis was 34.9% after coronary artery bypass grafting. Females had two times greater chances of costochondritis after CABG as compared to males. Correspondingly, costochondritis can arise in any age after coronary artery bypass grafting but it mostly affects individuals between ages 41-60 years after coronary artery bypass grafting. Thus, it is concluded that costochondritis was one of the major complications after coronary artery bypass grafting and median sternotomy.

Conflicts of Interest

The authors declare no conflict of interest.

Source of Funding

The author(s) received no financial support for the research, authorship and/or publication of this article

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