AL MUTHANNA INTERNATIONAL TRAUMA CONFERENCE
MAY 9 – 11, 2020
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La Prensa Medica Argentina

Research Article

DOI: https://doi.org/10.47275/0032-745X-S1-002
S1-002

New Risk Factor for Bronchogenic Carcinoma

Al Amran FG* and Razzaq BA

Abstract

Introduction: Smoking causes 90% of cases of lung cancer in men and 70-80% of cases in women. Individuals without smoking history have other risk factors e.g. genetic, infectious, air pollution, cooking and heating fumes or radiation. In those patients the most common histology is adenocarcinoma. Complex coronary intervention is associated with significantly higher dose of radiation exposure than diagnostic procedure.

Objective: We aim in this study to show the relationship between X-ray exposure in complex coronary intervention and increase incidence of bronchogenic carcinoma.

Methods: A case control observational study. We recruited 60 cases of bronchogenic carcinoma presented to our facility from March 2012 to march 2019. Some had history of radiation exposure due to complex coronary intervention, compared with randomly selected 60 healthy relatives matched for age, sex and smoking index. Associations between radiation exposure and lung cancer risk were estimated by use of odds ratios. Reported P values are two-sided.

Results: 15 patients with bronchogenic carcinoma had history of radiation exposure due to complex coronary intervention while only 5 patients of controls had been exposed to this form of radiation.

Odd ratio = 3.67, p-value = 0.0257

Conclusion: Complex coronary intervention is associated with significant radiation exposure and increase incidence of bronchogenic carcinoma

Keywords: Bronchogenic Carcinoma; Complex Coronary Intervention; Smoking

Correspondence to: Al Amran FG

Citation: Al Amran FG, Razzaq BA (2020) New Risk Factor for Bronchogenic Carcinoma. Prensa Med Argent, S1-002. DOI: https://doi.org/10.47275/0032-745X-S1-002.

Received: May 09, 2020; **Accepted:** May 18, 2020; **Published:** May 20, 2020

Introduction

Bronchogenic carcinoma is very common disease and in year 2002 alone more than one million case of bronchogenic cancer had been diagnosed all over the world. Bronchogenic cancer is highly fatal and kills people more than all other cancers together. It's highly linked to smoking and its incidence increase in parallel with more adoption of smoking habit in the population yet there still a large proportion of cases that are not attributed to smoking particularly in women [1].

Other risk factors for bronchogenic carcinoma include [2]:

Positive family history and genetic susceptibility: A locus to chromosome 6q23–25 is found in high risk families [3]. Tumor-suppressor gene p53 mutation in Li-Fraumeni syndrome is also a risk factor for bronchogenic carcinoma [4].

Food and Alcohol: Vegetables and fruits rich food is protective [5]. Nitrosamines formed during cooking of red meat is implicated in pathogenesis of bronchogenic cancer [6]. Alcohol consumption is associated with higher incidence of bronchogenic cancer after adjusting it to smoking [7].

Respiratory Disease: Chronic obstructive pulmonary disease increased the risk for bronchogenic cancer independently from smoking [8]. Pulmonary tuberculosis is also a risk factor [9].

Radiation: Ionizing radiation exposure is known risk factor of bronchogenic cancer [10]. This had been observed atomic bomb survivors and in patients who treated with radiotherapy [11]. A-particles emitted from decay of radioactive radon in miners are as well incriminated [12]. Smoking and radon act in synergetic manner [13].

Occupational Exposures: Asbestos, silica, radon, heavy metals and polycyclic aromatic hydrocarbons all are associated with increased risk [14].

Diesel Exhaust: although not high but consistent is the association between diesel exhaust exposure and bronchogenic cancer [15].

Air Pollution: Coal, wood and other solid fuels burning in door and fumes arising from cooking using unrefined vegetable oils such as rapeseed oil especially at high temperature are risk particularly in non-smoker Asian women [16].

Nowadays percutaneous coronary intervention become complex more and more and this increase the risk of malignancy to the patient and the staff on long term run [17]. Complex coronary interventions are associated with higher fluoroscopy time and radiation dose than diagnostic procedure and this had been proven [18].

Objective

Radiation is well-known as risk factor for bronchogenic cancer but not in form of complex coronary intervention. We aim in this study to show the relationship between X-ray exposure in complex coronary intervention and increase incidence of bronchogenic carcinoma.

Patient and Method

A case control observational study. We recruited 60 cases of bronchogenic carcinoma presented to Al-Sadir medical city in Najaf governorate which is a tertiary referral center receive patients from all middle Euphrates region, the study span over 7 years from march 2012 to march 2019. Cases diagnosed in our institution by different cardiothoracic surgeons either by bronchoscope biopsy, transthoracic true cut biopsy or excisional biopsy during thoracotomy. Some cases had history of radiation exposure in form of complex coronary intervention and repeated session done mainly in Al-Najaf cardiac center located in the same medical city where this form of intervention is very common. Because many patients with high Syntax score who are candidate for coronary artery bypass grafting are offered repeated and complex percutaneous intervention. We selected 60 healthy relatives matched for age, sex and smoking index as a control group. Patient or control that had simple coronary intervention or diagnostic coronary angiography was assigned as not exposed. Smoking index was used to classify the degree of smoking and calculated by multiplying the number of cigarettes smoked per days by numbers of years the patient smoked. The patient classified into: Never smoked, light/moderate smoker (smoking index =1-300) and heavy smoker (smoking index > 300) [19]. Associations between this form of radiation exposure and lung cancer risk were estimated by use of odds ratios. Reported *P* values are two-sided. Statistical calculation made using online calculator.

Results

The mean age of patients was 56.1± 1.98. 40 % of them were female. 65% were never smoked, 35% light/moderate smoker and 15% were heavy smoker. The histological type of bronchogenic carcinoma is shown in Figure 1.

15 patients had history of radiation in form of complex coronary intervention while only 5 of the control group had this form of exposure. The mean number of total coronary angiographic session each patient and control had undergone is 3.8 ± 0.83 and the average number of interventions was 1.8 ± 0.83. The average times where all the exposure happened was 15.8 ± 4.7 months.

Table 1 show the incidence of exposure to radiation in patients group and control group.

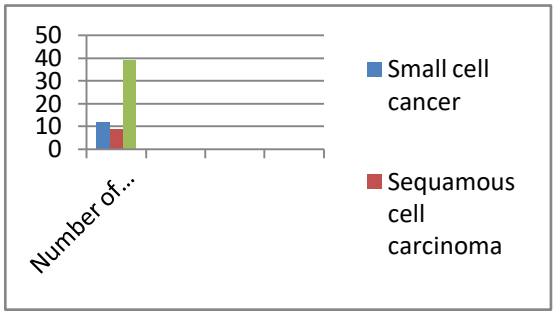

Figure 1: Histological types of bronchogenic carcinoma in our patients.

Table 1: 2×2 tables for radiation exposure in form of complex coronary intervention.

Control	Bronchogenic carcinoma	
5	15	Exposed to radiation
55	45	Not exposed

Odd ratio = 3.67 Estimated 95% CI (1.238 to 10.863)

p- Value = 0.0257

Discussion

X-rays causes ionization and form free radicals within cells, which can induce chromosomal damage that may lead to cancer [20], radiation effect on tissue, are classified into two types: deterministic and stochastic. Deterministic effects like skin erythema, radiation-induced cataract formation, and sterility Occur when threshold of exposure has been surpassed. Stochastic effects lead to malignancy and have no threshold but risk increase with increasing exposure and need time to manifest [21]. Endovascular procedures radiation hazard depends on certain parameters: BMI, field of view, fluoroscopy pulse rate, acquisition frame rate, variable beam filtration, total fluoroscopy time, and total acquisition time [22-25]. The dose of radiation that the patient receives in complex coronary intervention is significantly more than in diagnostic and simple intervention [18]. In our series of patients the most common histological type is adenocarcinoma which correlates well with predominant of non-smoker in the group. María Torres-Duránet M, et al. (2014) found similar predominant of this histological type in never smoker [23], the heavy smoker patients are relatively younger than other patients which may be explained by synergistic effect of this form of radiation and smoking. This need further studies to prove it also it had been proven for radiation from radon [13]. Repeated and lengthy coronary interventions were common in our patients and the control group which reflect predominance of coronary artery disease and the way we treat this disease.

Limitations

Although we had statistically significant results, the sample size is small and we need more power. Also, we need to be more accurate by calculating the radiation dose each patients or control had exposed to.

Conclusion

Complex and repeated coronary intervention is associated with significant radiation exposure and increase incidence of bronchogenic carcinoma and this need to be kept in mind in making decision before treating patient with coronary artery disease which is very common disease.

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