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Surgical approach of bronchogenic cancer in correlation with tumor type and risk factors

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Original Article

Abstract

BACKGROUND: This study is conducted with the aim to analyse the epidemiological pattern of bronchogenic carcinoma in Erbil City, Iraq, with identification of any underlying causative factor, gender variations, as well as surgical approach.

METHODS: Patients with bronchogenic carcinoma who underwent an operatio were from Shar and PAR hospitals (n = 30) and their individual characteristics, such as age, gender male-to-female (M:F) ratios, weight loss, smoking status, histological types, and operative procedure in relation to the tumor subtype were obtained for each patient.

RESULTS: The incidence of bronchogenic carcinoma increased with age proportionally. The male patients with an operation for bronchogenic carcinoma were more than females. 25 out of 30 patients experienced weight loss and 5 patients had no weight loss at the time of operation. Among all patients undergoing the operation, 96.67% were smokers and only 3.33% were non-smokers, in addition, the majority of the smoker patients were active smokers. Adenocarcinoma was commonest among operable adenocarcinoma with different histological subtypes in bronchogenic carcinoma, moreover, large cell carcinoma had the lowest rate. The dominant procedure performed for bronchogenic carcinoma was lobectomy, which was used more frequently than pneumonectomy.

CONCLUSION: An apparent increase in bronchogenic carcinoma incidence was observed in Erbil that might indicate some local environmental risk factors, in addition to changing smoking habits. The study findings do not support the hypothesis that females in general are at higher risk for bronchogenic carcinoma development, but tobacco and histologic-specific susceptibility cannot be ruled out.

KEYWORDS: Bronchogenic Carcinoma; Weight Loss; Lobectomy; Pneumonectomy; Risk Factors; Lung

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Introduction

Bronchogenic carcinoma has a great morbidity, poor prognosis, and high mortality rate.[1,2] It is considered as the most common cause of cancer-related death in both genders in the United States.[3] The incidence of bronchogenic carcinoma is increasing over time.[4] Bronchogenic carcinoma is responsible for more deaths than the combined 5 largest causes of cancer mortality including breast, prostate, colon, ovarian, and pancreatic cancer,[1] because it is usually diagnosed in the advanced stage and is usually surgically unresectable.[5,6] Bronchogenic carcinoma has a dismal prognosis with a five-year survival rate of only 5%.[7]

The exact pathology of this complication is unknown, however, previous studies reported that smoking (both active and passive smoking), alcohol consumption, dietary, life style, family history, air pollution, occupation,

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and asbestos exposure have been proposed as possible causative factors.[8]

Some of the risk factors are preventable such as smoking and this results in a significant decrease in cancer development. A meta-analysis of cohort studies reported that individuals who started smoking in an early age had greater risk of malignancy in both males and females,[9] thus awareness or cessation of smoking could be a protective factor against bronchogenic carcinoma development. Lung carcinomas are classified according to the microscopic cell size into non-small-cell lung carcinoma (NSCLC) and small-cell lung carcinoma (SCLC) as well as mixed adenosquamous and carcinoid tumors, bronchial gland carcinomas, and sarcomatoid carcinomas.[10-13] Furthermore, NSCLCs are divided into adenocarcinoma, squamous cell carcinomas (SCCs), and large-cell carcinoma. It is of therapeutic value to recognize the histopathological sub-types of bronchogenic carcinoma because the management strategy will change based on each sub-type. The bronchogenic carcinoma is managed as surgery, if the mass is surgically operable, as chemotherapy, and/or as radiotherapy.[14,15] Sometimes surgical resection is preceded by radiotherapy to optimize the resection.[16] The surgical resection of bronchogenic carcinoma is greatly related to the stage of the tumor, tumor size, location of the tumor, mediastinal lymph node involvement, and adhesion to the surrounding tissues.[17] The procedures performed to remove the tumor surgically could be either wedge resection, segmentectomy, lobectomy, or pneumonectomy.[18] The aim in this study is to investigate the specific surgical approach applicable for each patient and its relation to causative factors of bronchogenic carcinoma, in addition to establishing a relationship between risk factors and the development of bronchogenic carcinoma in order to establish a specific criteria and guidelines to minimize the prevalence of bronchogenic carcinoma.

Materials and Methods

The samples were collected from outpatient department of thoracic surgery and patients visiting fibro-optic bronchoscopy unit, as well as from patients undergoing an operation at Shar and PAR private hospitals located in Erbil.

The patients who were undiagnosed were thoroughly examined and sent for chest x-ray, and in case of any suspicion, the patient was sent for computed tomography (CT) scanning of the chest. The patients who were already diagnosed were included in the study.

The questionnaire form designed was filled in by each patient in a way that all the risk factors were included. The questionnaire form included the name, sex, smoking habit, weight loss up to the onset of symptoms, and occupational exposures. The surgical approach was left for later filling after the surgery was performed. The comparison was carried out in a random manner and included sex, age, smoking, weight loss up to the onset of symptoms and occupational exposures, concomitant medical condition, and length of history.

Bronchoscopy findings were collected, as well as the histopathology results obtained from biopsy samples obtained after operation (excisional biopsy) if the patient was operable upon the diagnosis.

A comparison and statistical analysis were performed among the types of bronchogenic carcinoma with a specific focus on SCC and adenocarcinomas. Subtypes of tumor were compared for each causative factor. The surgical procedure performed for each patient correlated to the sub-types of bronchogenic carcinoma as well as the risk factors.

The patients who were operable at the time of diagnosis were included in the study and patients with bronchogenic carcinoma who were beyond the operative stage were excluded from the study.

Data were presented as mean ± standard

errors of the means (SEM). Statistical evaluations were performed using non-parametrical tests (Mann-Whitney) or parametric tests (t-test). P < 0.05 was considered significant and *n* represented the number of patients.

Results

Age in bronchogenic carcinoma

The patients operated on were divided into five age groups (< 40, 40-50, 50-60, 60-70, and > 70). The patients operated on for bronchogenic carcinoma were predominantly among 50-70 years old. The least age-group operated was younger age group (< 40) as shown in figure 1, however, the second least group was > 70 years. The latest rate does not indicate that bronchogenic carcinoma will decrease after the seventh decade of life, rather it could be due to the fact that the patients with such age are associated with other comorbidities that do not allow for operation (Figure 1).

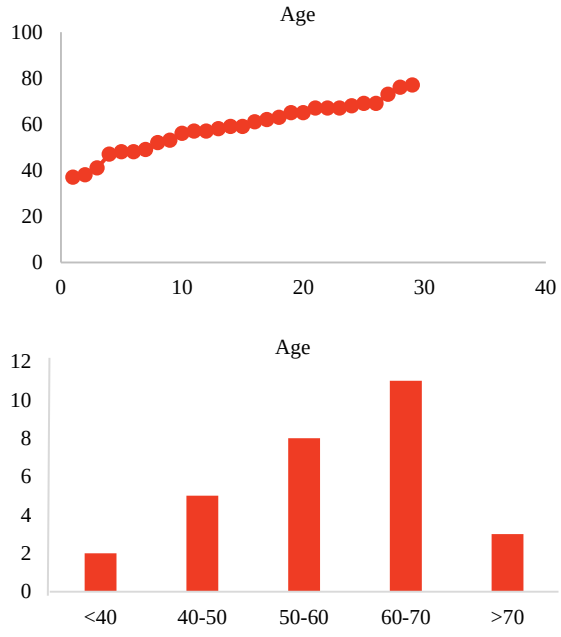

Figure 1. Age distribution in patients operated on for bronchogenic carcinoma. The peak age was between 60-70 years old. The lowest age group was the group younger than 40 years. A total of 30 patients were included in the study

Sex distribution in bronchogenic carcinoma

Among 30 patients who were operated on for bronchogenic carcinoma, 21 and 9 were males and females, respectively. There was a statistical difference (P < 0.50) between these two groups, implying that patients affected by bronchogenic carcinoma are predominantly males in Erbil city. This could be due to the fact that males are more active smokers than females in this area (Figure 2).

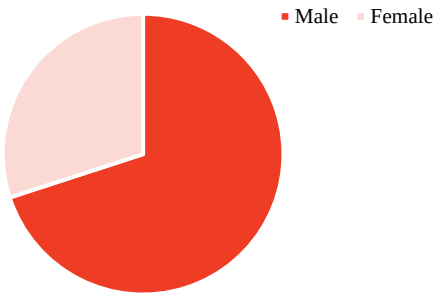

Figure 2. Male to female ratio in patients operated on for bronchogenic carcinoma. Among patients operated on for bronchogenic carcinoma, 21 were males and 9 were females. There was statistical difference between these two groups (P < 0.05) (n = 30)

Weight loss at the time of operation

Among the total of 30 patients who were operated on for bronchogenic carcinoma, 25 suffered from weight loss, and there was a statistical difference between the two groups (P < 0.05) (Figure 3).

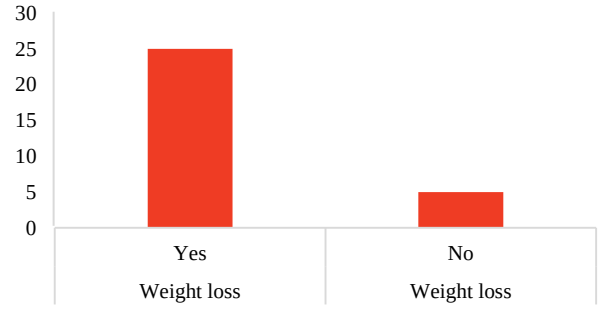

Figure 3. Weight loss in patients operated on for bronchogenic carcinoma. Out of 30 patients operated on for bronchogenic carcinoma, 5 experienced weight loss (*P < 0.05), (n = 30)

Smoking and bronchogenic carcinoma

Smoking plays a great role in the development of bronchogenic carcinoma. Among total 30 patients operated on for bronchogenic carcinoma, 96.67% were smokers and only 3.33% were non-smokers. Among those who were smokers, 96% were at least passive smokers, however, 90% were active smokers and 10% had a history of occupational carcinogen exposure (Figure 4).

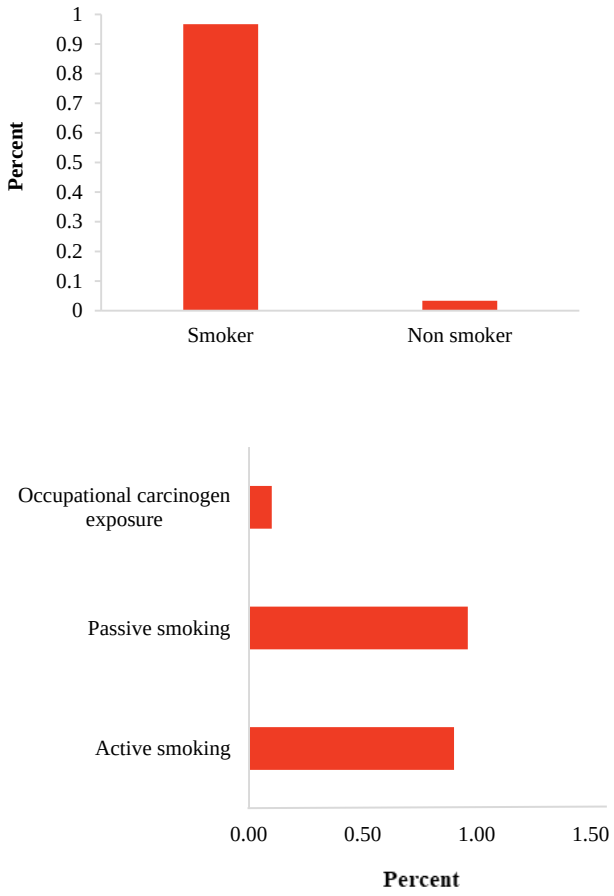

Figure 4. Smoking in bronchogenic carcinoma. The rate of patients operated on for bronchogenic carcinoma was significantly higher considering smoking. The patients operated on for bronchogenic carcinoma had at least passive exposure to smoking. 10% of patients operated on for bronchogenic carcinoma had a history of exposure to occupational bronchogenic carcinoma carcinogens

Histological types of operated patients

In the present study, of the histological results of all 30 patients who were operated on, 38.8%, 29.5%, 1.6%, and 10.6% were adenocarcinoma, SCC, large cell carcinoma, and mixed adenosquamous carcinoma, respectively, in addition to lymphoma accounting for 19.7% of the cases among the patients operated on for bronchogenic carcinoma (Figure 5).

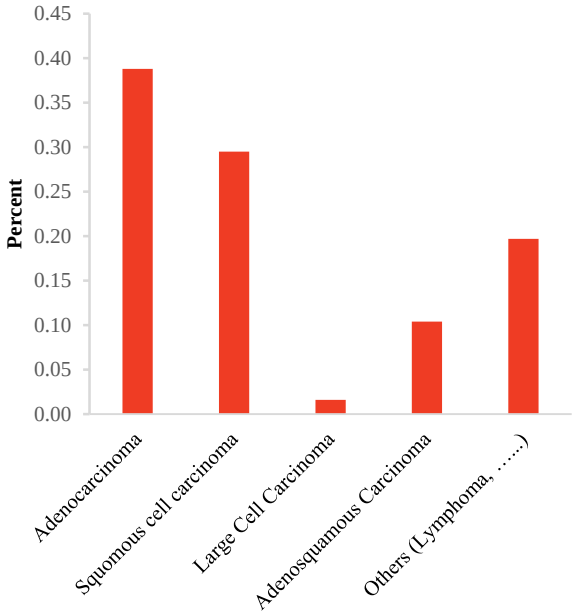

Figure 5. Histological types in patients operated on for bronchogenic carcinoma. The largest proportion of patients operated on for bronchogenic carcinoma were adenocarcinoma, followed by squamous cell carcinomas (SCCs). The lowest one was large cell carcinoma

Side and approach of operation

Unexplainably, the tumors of operated patients were more affecting the right side of lung, 19 were from right side and 11 patients from left side. The surgical approach was done by posterolateral thoracotomy, 21 patients were operated with lobectomy and 9 patients were treated with pneumonectomy (Figure 6).

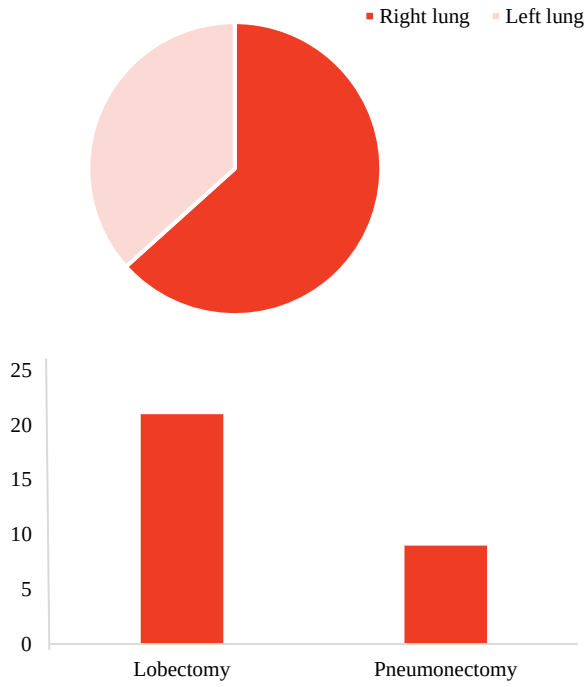

Figure 6. Surgical approach of operation in patients with bronchogenic carcinoma. The tumors operated on were mainly on the right side (21 operations on the right side vs 9 operations on the left side). The procedures performed were lobectomy and pneumonectomy in 21 and 9 patients, respectively

Discussion

The findings of this study demonstrate that bronchogenic carcinoma is proportionally increasing with increasing age and smoking plays a significant role in the pathogenesis of bronchogenic carcinoma. Moreover, the results show that in Erbil City, male patients are more affected with bronchogenic carcinoma compared to females. Furthermore, the findings reveal that most patients with bronchogenic carcinoma suffered from weight loss during the time of operation. Additionally, adenocarcinoma was commonest among histological subtypes and lobectomy was the more frequent procedure used in the present study. Bronchogenic carcinoma is the leading cause of cancer-related death all over the world. Since smoking habit has increased during the last few decades, there is an expected peak rise in the number of people affected with bronchogenic carcinoma.[19] In some countries such as China, smoking habit increased during the last 2 decades, so a peak in bronchogenic carcinoma incidence is expected.[20,21]

Age is considered as one of the major determinants of cancer risk. In the present investigation, the peak age of incidence was between 60-70 years; this is in line with a study performed in Poland.[22] In the current study, there was a decrease in the number of patients operated on for bronchogenic carcinoma after the age of 70 years, which could be due to the fact that older patients usually have other comorbidities which do not fit them for such major operation. In the global scale, females are more affected to bronchogenic carcinoma than males.[23-25] However, the proportion is reverse in the present study, i.e. male patients were more operated on for bronchogenic carcinoma in comparison to females. This could be due to the fact that smoking was more prevalent among males in the past decades, in contrast in the past few decades, smoking was scant among females. Even though, smoking increased among females in the recent years, which could result in the rise in the proportion of females affected with bronchogenic carcinoma in the next few decades. Smoking is associated with all types of bronchogenic carcinoma; the majority of patients in this study had a history of smoking, at least a history of passive smoking exposure which is adequate to stimulate the development of bronchogenic carcinoma if persistent for a long period.[26,27]

In the present study, weight loss was a profound feature in patients operated on for bronchogenic carcinoma, this is in line with previous studies describing weight loss as a feature in patients with bronchogenic carcinoma.[28-30] Weight loss in bronchogenic carcinoma is related to systemic inflammatory response to the disease.[31]

In most studies, SCC is more related to smoking, however, the relation of different tumor types with smoking was not examined in this study, but histopathology reports revealed that adenocarcinoma was commonest among operated patients followed by SCC. This is in line with some other studies which showed the histopathological distribution of bronchogenic carcinoma among population.[32,33]

The surgical approaches for bronchogenic carcinoma are wedge resection, segmentectomy, lobectomy, and pneumonectomy.[34,35] The selection of each approach is largely dependent on the tumor staging. In the current investigation, the patients were classified only for lobectomy and pneumonectomy because wedge resection and segmentectomy are merely used due to late presentation at the time of operation. Lobectomy was more used than pneumonectomy in the present study.

Conclusion

To conclude, the present novel findings demonstrate that patients operated on for bronchogenic carcinoma are mainly between 6th and 7th decade of life. Males are more operated for bronchogenic carcinoma compared to females. Smoking plays a crucial role in the development of bronchogenic carcinoma. Weight loss is a profound sign in patients operated on for bronchogenic carcinoma. Adenocarcinoma is the commonest among operated patients and lobectomy is more widely used surgical approach. This study was carried out among patients operated on in Erbil City.

Conflict of Interests

Authors have no conflict of interests.

Acknowledgments

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