Abstract

Background: Smoking is a risk factor for postoperative pulmonary complications following lung resection surgery in cancer patients. The respiratory system might take 6 weeks to return to normal function after general anesthesia for major surgery. Induction of general anesthesia can cause changes and reductions of the respiratory parameters e.g. reduction of lung volume. A recent study by Kozub found that the duration of smoking cessation had no significant influence on the frequency of post-operative pulmonary complications, and that the optimal timing for preoperative smoking cessation has not been identified.

Purpose and Aim: To evaluate the effect of the duration of smoking cessation pre-operatively and the incidence of post-operative pulmonary complications after general anesthesia in patients with lung cancer coming for lung resection.

Design and Methodology: A retrospective observational design using patient records as a data collection tool. The population was adult smoker patients who were coming for elective lung resection surgery under general anesthesia in King Fahad Specialist Hospital in Dammam Saudi Arabia. A sample of 30 patients was determined based on the available number of patients who met the study inclusion criteria. A chi-square test was performed to examine the association between smoker patients who stopped smoking for 6 weeks and other smoker patients who stopped smoking for less than 6 weeks prior to surgery.

Results and Findings: The findings revealed that there was not statistical difference in the incidence of post-operative pulmonary complications after lung resection surgery under general anesthesia between smoker patients who stopped smoking for more than six weeks and smoker patients who stopped smoking for less than six weeks. The Chi-square was 3.33 with a P-value of 0.07; showing no statistical significance between variables from the two groups. 100% of the smoker patients who stopped smoking for more than 6 weeks (15 patients of the study sample) had no post-operative pulmonary complications, and 20% of smoker patients who stopped smoking for less than 6 weeks (15 patients of the study sample) had a few post-operative pulmonary complications. However, this finding was not statically significant. Another chi-square test performed to find out the type of post-operative pulmonary complications occurred. The types of complications found were cough, bronchitis, bronchospasm and pneumonia. The onset of post-operative pulmonary complications was also evaluated which occurred either after 48, 50 or 72 hours in the post-operative period.

Conclusion: The No association between smoker patients who stopped smoking for 6 weeks and other smoker patients who stopped smoking for less than 6 weeks on the incidence, severity, and onset of post-operative pulmonary complications. It would seem unnecessary to postpone surgery in order to allow an optimal smoking cessation period for patient coming for lung resection surgery under GA. Smoking cessation is however still strongly recommended when treating patients with lung cancer, but it would seem unnecessary to delay surgery in order to ensure an optimal cessation of smoking period. Moreover, literature is inconsistent about the optimal time for smoking cessation before surgery. Focus on preoperative patient management, anesthesia, postoperative pain management and surgical techniques is more effective to improve pulmonary function and reduce post-operative pulmonary complications.

Keywords: Smoking; Cancer; Lung
Introduction
The most common PO pulmonary complications are: Lung Infections: Incidence is 20%. Predisposing causes include prolonged operations and prolonged antibiotic treatment. Lung Collapse: Arcus of lung tissue are prone to collapse, because of the anesthetic and surgical processes. Pulmonary edema: Excessive fluid in the lung due to fluid overload, or heart dysfunction or as a complication of airway obstruction.8

Aspiration pneumonia: Pulmonary inflammation caused by aspiration of stomach or other secretions (blood, vomit, food) into the lung. The lung inflammation is usually more severe if the stomach contents are acidic. Exacerbation of Asthma or Bronchitis. It is not uncommon for asthma or chronic bronchitic patients to suffer an attack of PO pulmonary complications. Pulmonary Embolism: Usually presents with shortness of breath, but sometimes there may be no symptoms. With larger emboli there is also chest pain, wheezing and lung collapse. The respiratory system may take 6 weeks to return to its preoperative state after general anesthesia for major surgery. Risk factors for postoperative pulmonary complications development are many e.g. smoking, and anemia.1,2 We target is to determine the duration of smoking cessation for 6 weeks preoperative is not necessary. However, if there is a large difference between the percentages of pulmonary complications in both groups, then it is important to take some precaution requirements in urgent cases to decrease the postoperative pulmonary complications. Patients 18 years old who are coming for mandatory urgent surgery (bronchogenic carcinoma). We completed the patients’ variables and complications in the data sheet. Data sheets coded and we had a code sheet with a code and medical record number to secure patient’s confidentiality. We did not mention any personal information (name, ID number). We replaced all names by code (patient1, patient2 ... etc). Respiratory complications identified as Pneumonia, bronchospasm, emphysema, pulmonary embolism, atelectasis, bronchitis and cough. Lung cancer causes the growth of tumors that reduce a person’s ability to breathe. We completed the patients’ variables and complications in the data sheet. Data sheets coded and we had a code sheet with a code and medical record number to secure patient’s confidentiality. We did not mention any personal information (name, ID number). We replaced all names by code (patient1, patient2 ... etc). Pressure controlled ventilation with PEEP was used to avoid lung injury. Fluids were managed using CVP to avoid volume overload and pulmonary edema. Postoperative pain was controlled using thoracic epidural analgesia.

Objective of the Study
The purpose of this study was to evaluate the duration of smoking cessation on the pulmonary state after general anesthesia and surgical procedure. Hypothesis: Is it mandatory to stop smoking pre-operative for duration of 6 weeks? Methodology
This study used retrospective observation; cross-sectional observational study will include the following variables: adult smoker patients age ≥ 18 years old who are coming for elective surgery under general anesthesia in King Fahad Specialist Hospital in Dammam Saudi Arabia in comparison with adult smoker patients age ≥ 18 years old who are coming for mandatory urgent surgery (bronchogenic carcinoma).

Data Analysis
From the data collection sheet, we applied Chi-square test in testing the association between the variables. The findings from the data collection sheet divided in the complications table. The table contains the smoker patients who got post-operative pulmonary complications and other who did not (Complications Table). We answered the concerns or question of our research according to the data collection sheet findings.


Short title: Smoking Cessation Duration Affect Postoperative Pulmonary Complications

Table 1:Complications * Group Crosstabulation

<table>
<thead>
<tr>
<th>Complications</th>
<th>Group</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Six weeks</td>
<td>3</td>
<td>15</td>
</tr>
<tr>
<td>Less than six</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>weeks</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Ethical Consideration:
The study approved by the ethics committee of Prince Sultan Military College of Health Sciences (PSMCHS), the ministry of health, hospitals, and department of anesthesia. In addition, all participants were assured that all personal information concerning their health status would be kept confidential. We completed the patients’ variables and complications in the data sheet. Data sheets coded and we had a code sheet with a code and medical record number to secure patient’s confidentiality. We did not mention any personal information (name, ID number). We replaced all names by code (patient1, patient2 ... etc).

Results
A total of 30 smoker patients met our study inclusion criteria. Out of all, 15 smoker patients stopped smoking for 6 weeks or more. While the other 15 smoker patients stopped smoking for less than 6 weeks. A Chi-square test performed to examine the association between the smoker patients who stopped smoking for 6 weeks and other smoker patients who stopped smoking for less than 6 weeks on getting post-operative pulmonary complications. The Chi square was 3.33. The P-value was 0.07. The relation between these variables showed an insignificant difference at P-value < 0.05. A 55.6% of the smoker patients (100% of the smoker patients stopped smoking for 6 weeks) had no post-operative pulmonary complications, and 44.4% of the smoker patients (20% of smoker patients stopped smoking for less than 6 weeks) had post-operative pulmonary complications in Figure 1.

Short title: Smoking Cessation Duration Affect Postoperative Pulmonary Complications

Table 3: Onset of complications * Group Crosstabulation

<table>
<thead>
<tr>
<th>Group</th>
<th>Total</th>
<th>6 weeks</th>
<th>Less than 6 weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>onset of complications</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>after 48 hr</td>
<td>15</td>
<td>12</td>
<td>3</td>
</tr>
<tr>
<td>after 50 hr</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>after 72 hr</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
<td>12</td>
<td>3</td>
</tr>
<tr>
<td>percent</td>
<td>55.6%</td>
<td>44.4%</td>
<td>100.0%</td>
</tr>
<tr>
<td>P-value</td>
<td>0.05</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Similarly, Groth et al. (2009) found that smoking cessation before surgery did not have a significant impact on PPCs and therefore should not be a reason to delay surgery. However, the study might have been limited by reliance on self-report of patients to document the amount of tobacco they have used. Furthermore, Matsuoka et al. (2019) revealed that there was no relationship between the lengths of the preoperative smoking cessation period and the frequency of PPCs. The study might have been empowered by the large sample size (1248 patients), which increases the validity of their findings. However, it must be noted that this was a single institution study and might not be generalizable to the entire population irrespective of the large sample size. A case-control study by Rodriguez et al. (2016) retrospectively reviewed database of 2139 patients who underwent anatomical lung resection. The authors stated that smoking was not recognized as a risk variable in this population of patients by risk criteria for PPCs at the moment of surgery. Therefore, it does not seem justified to postpone surgery until tobacco abstinence has been achieved.

There is an area of disagreement with our findings and the literature regarding the impact of preoperative smoking cessation on PPCs. Mason et al. (2009) and Lugg et al. (2017) conducted observational studies to assess the effect of smoking cessation on PPCs. They showed that there was a greater frequency of PPCs in patients who continue to smoke until the date of curative-intent lung cancer surgery. Smoking increased the risk of PPCs among patients who stopped smoking in their studies and was slowly mitigated by preoperative cessation. However, the differences between groups in the study by Mason et al. (2009) were not statistically significant to recommend optimal timing for smoking cessation. One critique of this study is that the prevalence of PPCs was small (6.9% in smokers) since only significant respiratory complications were recorded, indicating minor yet more common PPCs might have been missed. Mason et al. (2009) and Lugg et al. (2017) were limited by the retrospective nature of data collection. Randomized controlled trials are needed to confirm efficacy of smoking cessation programs. Differences in the findings of other studies are difficult due to differences in study designs and differences in the definition of PPCs, which might include severe and/or less frequent complications such as pulmonary embolism in some studies[30]. There is a paucity of literature on identifying the optimal interval of smoking cessation before surgery.

Reducing postoperative respiratory complications after cessation of smoking is believed to be linked to improving ciliary function, macrophage activity, and reducing sputum production[31]. Because these changes may take weeks or months to appear it takes a significant quantity of time to become evident to the consequences of smoking cessation[32]. Some researchers believe that the impact of smoking on the development of PPCs has been reduced due to the increase in quality of pre and postoperative management and surgery procedures[33]. Accordingly, there appears to be no need to delay surgery in order to ensure a substantial length of cessation of smoking in patients with lung cancer. Long-term cessation of smoking creates unreliable health advantages[34], but researchers consider the effect of cessation on decreasing complication risk to be ambiguous[35]. Many studies addressing this issue are retrospective in nature with small sample sizes, therefore, randomized controlled trials are strongly recommended.

Some studies suggested that a few weeks of smoking cessation prior to lung surgery could lead to an unexpected high rate of PPCs[36]. Such an enhanced risk could be linked to nicotine withdrawal among those patients who quit their cigarette consumption near surgery.

Conclusion and Recommendations

We concluded that there is no association between smoker patients who stopped smoking for 6 weeks and other smoker patients who stopped smoking for less than 6 weeks on getting post-operative pulmonary complications. Taken together, our results in light of previous literature suggest that improvement in the preoperative care such as education and respiratory therapy could result in reduced PPCs. An implication of our study findings is that it seems unnecessary to postpone surgery to allow smoking cessation. Providing the standard respiratory care for the patients in the post-operative period will improve their condition and decrease the chance of getting post-operative pulmonary complications. Video-assisted thoracoscopic surgery techniques (VATS) are being applied more commonly which are expected to lower the overall costs of PPCs. A greater focus on preoperative patient management, anesthesia, and surgical techniques are required to improve pulmonary function. Smoking cessation education is therefore still suggested when treating patients with lung cancer. Long-term cessation of smoking creates unreliable health advantages[10], but researchers consider the effect of cessation on decreasing complication risk to be ambiguous[35]. Some researchers believe that the impact of smoking on the development of PPCs has been reduced due to the increase in quality of pre and postoperative management and surgery procedures[33]. Accordingly, there appears to be no need to delay surgery in order to ensure a substantial length of cessation of smoking in patients with lung cancer. Long-term cessation of smoking creates unreliable health advantages[34], but researchers consider the effect of cessation on decreasing complication risk to be ambiguous[35]. Many studies addressing this issue are retrospective in nature with small sample sizes, therefore, randomized controlled trials are strongly recommended.

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Previous studies strongly recommended smoking cessation more than six weeks. Our study aimed to determine the value of duration of preoperative smoking cessation on reducing postoperative pulmonary complications (PPCs). Our findings demonstrate that smoking cessation duration of more than six weeks before surgery has no significant value to avoid PPCs. There was an insignificant difference between smoker patients who stopped smoking for more than 6 weeks and smoker patients who stopped smoking for less than 6 weeks with a p-value of 0.05. There have been a number of studies which assessed the value of duration of smoking cessation in terms of postoperative pulmonary complications[29]. The most recent study was a prospective analysis by Kozub et al. (2019), which was undertaken from 2010 till 2015 to assess the impact of timing of smoking cessation on the incidence of postoperative pulmonary complications in patients undergoing surgery for non-small cell lung cancer. Similar to our findings, duration of smoking cessation had no significant influence on frequency and/or type of PPCs. However, it should be noted that the study included twelve never smoker patients out of 286 patients, which might have introduced selection bias into their study findings. Seok et al. (2013) have proceeded this with similar findings. Their analysis revealed that smoking was not a significant risk factor for the development of PPCs. However, both Seok et al. and Kozub et al. were limited by their study design as being only observational.

Comparing our findings with results of other studies is difficult due to differences in study designs and difference in the nature of data collection. Randomized controlled trials are needed to confirm efficacy of smoking cessation programs.

References


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