

RESEARCH ARTICLE

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The Effect of Pandemic on Lung Cancer Waiting Time - Tertiary Center Experience

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Abstract

Background: Early diagnosis and treatment of lung cancer are crucial to improve the survival and the outcomes in patients who are diagnosed with lung cancer. Many factors can affect the waiting time for lung cancer treatment, however, the corona virus disease 2019 (COVID-19) was one of the major factors that universally slowed down clinical activities in the last three years. We are aiming with this study to demonstrate how this pandemic and other factors affected the lung cancer waiting times for diagnosis and treatment. **Methods:** This is a retrospective study including 670 patients who were diagnosed with lung cancer within the NHS Lothian region of Edinburgh - Scotland between March 2019 and November 2023. One hundred patients underwent curative lung resection. Patients were categorised into three groups for sub analysis. The first group included patients diagnosed before the COVID-19 pandemic, the second group included patients diagnosed during the pandemic in 2020, and the third group represents those diagnosed after the mass vaccination program was established and until November 2023. **Results:** The average waiting time between the referral from the GP to the date of surgery in the three groups was 88.5 days, 81 days, and 83.5 days, respectively. On the other hand, the waiting times elapsing between the first surgical clinic appointment and the date of the surgery itself were 17.6 days, 18.6 days, and 21.5 days, respectively. **Conclusion:** Unexpectedly waiting times elapsing between the referral to surgery and the date of surgery amongst lung cancer patients showed improvement during the COVID-19 pandemic. This is likely due to prioritizing cancer patients. Nevertheless, actions should be considered to decrease the waiting times in general.

Keywords: COVID-19- Lung cancer- Delay treatment- Decrease waiting times

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Introduction

Lung cancer is an aggressive type of cancer and carries a high mortality rate. It is very important to diagnose and treat lung cancer in the early stages [1]. There are many factors that can set back Lung Cancer diagnosis and treatment, such as delay or repeated investigations (images or biopsies for example), logistical factors in the hospital, and in the last three years, there was an extraordinary factor which was the COVID-19 pandemic [2]. Many studies were carried out to identify the factors that may cause a fall back in the treatment of lung cancer and try to find solutions to these causes [1, 2].

The coronavirus disease of 2019 (COVID-19) had a global effect over the last three years, especially in the first year prior to the development and roll-out of the vaccine programme. The global effects included initial increasing admissions of patients suffering from COVID-19, decreasing the number of available beds for other patients, as well as a shortage of health care staff. Therefore, there

was a direct effect on patients with malignant diseases, and each health care system has attempted to address this and minimize the negative effect of the pandemic on this group of patients [3, 4]. One of the main issues to address is how the pandemic affected the waiting times in lung cancer patients.

The delay in lung cancer treatment carries negative impact on patients which increase the psychological stress and may lead to the disease progression [5, 6]. Some studies investigated the effect of the delay between diagnosis and treatment of lung cancer and it showed a survival improvement in patients without metastatic disease when the time between diagnosis and treatment was 35 days or less [7]. In England, Scotland and Northern Ireland, the current targets of cancer waiting times are no more than 2 months (62 days) wait between the date the hospital receives an urgent referral for suspected cancer and the start of treatment. Furthermore, there should be no more than 31 days' wait between the meeting at which both the patient and the doctor had agreed with the treatment

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plan and starting it [8, 9].

In our study, we will discuss how different factors affected cancer waiting times in lung cancer patients and suggest some solutions to decrease waiting times overall.

Materials and Methods

This is a retrospective study including 670 patients who were diagnosed with lung cancer in the Lothian region of Edinburgh - Scotland from March 2019 to November 2023. The population in the Lothian region is approximately 916,310 in 2021 [10]. It is worth mentioning that the Royal Infirmary of Edinburgh also receives referrals from the east of Scotland. We chose this sample of patients due to easy access to the required data. And this number of patients (670) is a randomly selected sample from the whole referred number from the Lothian region.

Out of 670 patients, only 100 patients (~15%) were suitable for curative surgery. Patients were divided into three groups for sub-analysis. The first group is the pre-COVID group included 26 patients from March 2019 to February 2020, while the second group (COVID group) included 26 patients from March 2020 to February 2021 and the third group is (post-COVID group) included 48 patients from March 2021 to November 2023. Data were collected from patients' files.

Results

Between March 2019 and November 2023, 100 patients underwent different type of thoracic surgical procedures with curative intent for primary lung cancer. Of these, 41 (41%) were male patients with mean age 69 years old and 59 (59%) were female patients with mean age 68 years old. Adenocarcinoma was the most frequent type of tumour encountered in this study population with 68 patients (68%) presenting with this final histology, whereas squamous cell carcinoma was found in 23 patients (23%). 34 patients (48.5%) were diagnosed with Stage I Lung Cancer. It is valid to mention that only 35 patients (35%) underwent open surgery whilst the remaining population underwent minimally invasive procedures such as video or robotic -assisted surgery (VATS/RATS). Patient characteristics, type of resection and the lung cancer histology diagnosed are summarized in Table 1.

From March 2019 to February 2020 (Pre-COVID group) the average waiting time between referral from the GP/Emergency Department/other speciality to the date of surgery was 88.5 days. Just 11.5% achieved the 62 day target while 92.3% achieved the 31 day target, with average waiting time between the clinic and surgery of 17.6 days. From March 2020 to February 2021 (COVID year) the average waiting time between referral from the GP/Emergency Department/other speciality to the date of surgery was 81 days. Just 23% achieved the 62 day target while 88.4% achieved the 31 day target with average waiting time between the clinic and surgery of 18.6 days.

From March 2021 until November 2023 (Post-COVID group) the average waiting time between referral from the GP/Emergency Department/other speciality to the day of

Table 1. Patient Characteristics

Name	Value	Out of 100 patients
Sex	M	41 (41%)
	F	59 (59%)
Smoking	Yes	82 (82%)
	No	18 (18%)
Type of surgery	Open	35(35%)
	VATS	62(62%)
	RATS	3(3%)
Volume of resection	Segmentectomy	4 (4%)
	Lobectomy	86 (86%)
	Bilobectomy	6 (6%)
	Pneumonectomy	4 (4%)
Stage	I	55 (55%)
	II	30(30%)
	III	15(15%)
Cancer type	Adenocarcinoma	68 (68%)
	SCC	23 (23%)
	Large cell tumor	1 (1%)
	Small cell	2 (2%)
	Carcinoid	3 (3%)
	Spindle cell	1 (1%)
	pleomorphic carcinoma	1 (1%)
	lymphoepithelial carcinoma	1(1%)
	Mediastinoscopy	Yes
No	80(80%)	

surgery was 83.5 days. Just 16.6% achieved the 62 day target while 91.6% achieved the 31 day target with an average waiting time between the clinic and surgery of 21.5 days, Table 2, 3.

Further analysis was performed on patients who had COVID or were isolated because they were in contact with people who had COVID (from March 2020 until November 2023). For these patients, the 62 and 31 - days waiting times didn't differ from patients who didn't have COVID or were delayed for other reasons. The average time for this group of patients from meeting the GP/referral from another team to surgery was 85 days and the average time from meeting the surgeon to surgery was 20 days.

In regard to the length of stay (LOS), the average

Table 2. Average Waiting Time 62 and 31 Days

	Pre-COVID group	COVID group	Post-COVID group
62 days	88.5 days	81 days	83.5 days
31 days	17.6 days	18.6 days	21.5 days

Table 3. Achieved Waiting Time Target

	Pre-COVID	COVID	Post-COVID
62 days	11.50%	23%	16.60%
31 days	92.30%	88.40%	91.60%

Table 4. Most Common Causes of Delay

Cause	Times
Repeat investigations	34
Shielding/isolation	25
Patient's factors	16
Mediastinoscopy to surgery time	Average waiting time ~ 25 days

LOS in the first group was 8 days in comparison to 9 days in both other groups. The reason for the long LOS was that some patients in each group had post-operative complications such as respiratory failure, prolonged air leak, or chest infection which required them to spend more days in hospital. It is worth mentioning that in only one patient his discharge was delayed because he had COVID after the surgery. This shows that the pandemic didn't have a significant impact on the LOS in our department.

We compared tumor size in each group, in the pre-COVID group the average size was 4 cm, in the COVID group 4.2 cm, and in post-COVID group was 3.9 cm. On the other hand, in patients who were affected by COVID in 2020 and 2021, the average tumor size was 3.9 cm, and comparing these results to patients who didn't have any delay in getting the surgery where the average tumor size was the same at 4 cm. This result shows that the minimal delay in surgery didn't have a significant impact on tumor size in this sample of patients.

The causes of the delay varied between patient factors, such as refusal of admission or postponement of investigations and other factors, such as the need for repeated investigations such as staging imaging or pulmonary function tests (PFTs). It is worth mentioning that there were 20 patients (20%) who underwent diagnostic mediastinoscopy for mediastinal lymph node staging and the waiting time between the first procedure (mediastinoscopy) and definitive surgery was approximately 25 days. This can also be considered one of the causes of the delay. Moreover, due to the COVID-19 pandemic, many patients had to be isolated which led to postponing their investigations and, as a result, their treatment. Most common causes are shown in Table 4.

Discussion

In this retrospective study comparing the lung cancer waiting times for surgery before, during, and following the COVID-19 pandemic, we found that most patients breached the national target of 62 days. Importantly, however, we also noticed that during the pandemic unexpectedly there was slight improvement in the waiting times. This can be explained by focusing treatment and giving priority to patients with malignant diseases over benign conditions during the pandemic. Moreover, medical and radiological investigations continued to be prioritized on patients with lung cancer to minimize the effect of the pandemic. As a result, diagnosis and radiological staging times were improved during the pandemic.

On the other hand, the waiting times between the

meeting at which patient and doctor agree the treatment plan and the start of treatment (for which the target is 31 days) was overall satisfactory in all groups and met the national guidelines, but similarly did not improve during the pandemic in comparison with other groups. This can be explained by the increase in admissions (patients suffering of COVID) during the pandemic, as well as reserving staff to solely serve COVID patients. As a result, there was overall decreased capacity within the operating list, even with a decreased number of benign conditions that needed to be operated. As the pandemic has had a global effect, it is reasonable to expect a diverse range of experiences amongst different sites and healthcare systems. Kasymjanova, [4] performed a retrospective review of COVID's impact on the diagnosis and treatment of lung cancer, and they found to have had a major impact in diagnose and treatment of Lung Cancer in their Center in Canada, with a drop of 34.7% on lung cancer diagnosis [4].

Having a look at the causes of long waiting time in the three groups, we notice that during the pandemic and after mass vaccination programme, many patients' investigations or treatment were postponed due to isolation and shielding. On the other hand, other reasons caused delay and increasing waiting times which can be controlled by the medical team and hospital. One of the significant causes is the requirement to repeat certain investigations before surgery, for instance if the initial images had been taken more than 6 weeks prior to surgery.

Nevertheless, the majority of our patients were diagnosed with early-stage lung cancer. Accordingly, repeating the images most probably would not affect or change the surgical decision. As a result, it is reasonable to suggest that patients with early-stage lung cancer (stage I) could be exempt from requiring up-to-date imaging before their operation, unless there is a new symptom or concern. Additionally, a seamless MDT process wherein the need for additional radiological investigations is identified and organized simultaneously would go some way to preventing the late realization of out-of-date images. Our results were similar to study performed by Maiga, [11] who investigated the causes of delay treatment in patients with lung cancer and they found that most common causes are cardiac evaluation before surgery (46%), staging (images and mediastiscopy) in 35% of cases and smoking cessation (29%) [11].

Other causes which can be controlled by the medical team include the two stage mediastinoscopy procedure. Mediastiscopy is a diagnostic procedure which used to evaluate the mediastinal lymph nodes and exclude N2 disease and consider an important part of staging when indicated [12]. Our results showed that there were 20 patients (20%) who had diagnostic mediastiscopy for mediastinal lymph node staging and the waiting time between the first procedure (mediastiscopy) and definitive surgery was approximately 25 days.

The current practice in the department is of a two-staged procedure, that is, mediastiscopy followed by definitive surgery. However, there is evidence to support the single-stage mediastiscopy, which involves an intraoperative frozen section and definitive surgery if the

pathology result is negative. Attaran, [13] did a systematic review included 5 articles from USA, France and Turkey where 809 patients were included in all studies [13].

These studies compared the efficacy and accuracy of frozen sections (FSs) from mediastinal lymph nodes for staging of patients with lung cancer to determine whether a combined procedure can be planned based on these results and to proceed to lung resection in cases of negative mediastinal nodes diagnosed by FS. These studies unanimously showed that FS of mediastinal nodes are as accurate as permanent section results. Indeed, definitive histology diagnoses showed a sensitivity of >94% and specificity of 100% with no false-positive results. They also confirmed that even in benign lung conditions and other malignancies of the mediastinum, the results of FS are comparable with the histology of the node [11]. As a result, this practice could be mirrored at our centre to help to decrease waiting times, as well as to decrease the associated costs.

Recently in November 2023, the United Kingdom Lung Cancer Coalition (UKLCC) published a report about the care of lung cancer patients in Scotland and they mentioned that over the last 10 years, more than a third of patients breached the 62 days waiting time which is agree with our results. They reported also that the 5-year survival in patients with lung cancer in Scotland is 16% only. They came up with new recommendations under the title of (Scottish Pathway Matter) aiming to improve the health care service and achieve the new target of lung cancer waiting time which is 42 days [8].

We believe that there is a window for improvement and following minor changes can lead to a significant decrease in the waiting time which will lead to early treatment and improve the prognosis. This study has a number of limitations. First, its retrospective nature introduces selection biases and restricts selection to a single institution. Additionally, the study population is relatively small and is not representative of the general population. Nevertheless, there is value in the ability to describe the experience of a single centre and creating evidence with which clinicians can compare and learn about the wider effects of COVID on lung cancer waiting times globally.

In conclusion, Waiting times between the referral to the date of surgery showed slight improvement during the height of COVID, but still didn't meet the national target. Actions should be considered to decrease the waiting times, in general.

Author Contribution Statement

Ghaith Qsous conducted the literature search, data extraction, and data analysis. The writing performed by Ghaith Qsous, George korelidis and Thabbta Vianna. Anthony Chambers, Malcolm Will and Vipin Zamvar provided critical feedback and guidance throughout the review process.

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Data Availability Statement

The data that support this study will be shared upon reasonable request to the corresponding author.

Ethical Approval

The research was conducted out with the approval of the department of cardiothoracic surgery in the Royal Infirmary Hospital of Edinburgh.

Conflict of Interest

The authors declare no conflicts of interest.

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