



Impact of the COVID-19 pandemic on a visceral surgical department in western Austria

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Summary

Background The COVID-19 pandemic caused by the SARS-CoV-2 virus has strongly affected the visceral and thoracic surgery department in southern Vorarlberg in Austria, which comprises two locations: the focus hospital in Feldkirch and the regional hospital in Bludenz.

Methods The complete lockdown lasted 6 weeks (from March 16 to April 26, 2020), after which the hospital in Bludenz started day surgery again and in Feldkirch the capacity was slowly increased. We compared how oncological and acute operations differed during those 6 weeks to the 6 weeks before lockdown.

Results Our findings show a clear increase in emergency operations for acute cholecystitis (+133%) and acute appendicitis (+157%). While the acute operations increased, some oncological operations decreased, which was especially apparent for oncological colorectal resections (−66%) and oncological lung resections (−43%).

Conclusion This survey shows that due to the increased catchment area, more acute operations were performed and also demonstrated that we were confronted with more advanced stages of those diseases. Furthermore, cancer operations which rely on short-term peripheral diagnostics decreased considerably.

Keywords General surgery · Pandemic · Coronavirus · Lockdown · Impact of COVID-19 lockdown

Availability of data and materials All data and materials are available.

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Introduction and background

In Vorarlberg, the western-most county of Austria with 400,000 inhabitants, there are four main and two specialized hospitals. The focus hospital is the Landeskrankenhaus (LKH) Feldkirch (a teaching hospital of the medical university of Innsbruck), located in the southern part of Vorarlberg. Together with the LKH Bludenz, it provides basic and specialized medical care for around 172,000 people and also specialized care for the entire county. The department of general, visceral, and thoracic surgery in Feldkirch therefore offers all operations apart from transplantation and heart surgery. Since 2018, the surgical departments in Feldkirch and Bludenz have been merged, sharing a single head of department whilst keeping the two locations.

With the beginning of the COVID-19 pandemic, the government and the hospital authorities prepared for a predicted escalation of the situation and, therefore, many drastic measures were taken beginning on March 16, 2020 [1]. Starting that day, the surgical capacity was reduced by 30% for 1 week and then by 50% in Feldkirch. The hospital in Bludenz was entirely reserved for the treatment of COVID-19 patients. In addition, only patients with emergency indications or with cancer were allowed to undergo surgery, in order to save resources. At the same time, a general public lockdown was imposed on Austria.

The number of actively COVID-19 positive patients in Vorarlberg peaked at the end of March [2]. After a slow reopening for the public without an increase in COVID-19 cases, the surgical capacity in Feldkirch was increased to 70% of its original capacity on April 27, also starting day surgery in Bludenz again [3].

By comparing selected operations from the 6 weeks of lockdown to the 6 weeks directly before the lockdown, we wanted to discover whether the lockdown

had an effect on the treatment of non-COVID-19 patients. Many surveys suggested a poorer medical care for non-COVID-19 patients, as they seek medical help later and many routine diagnostics are not available [4].

Concerning our surgical department, we mainly suspected an increase in acute operations in Feldkirch due to the larger catchment area. In some oncological operations, especially those which rely on routine checks like endoscopies or different departments and don't require neoadjuvant therapy, we suspected a decrease. In our department, this would mainly affect colon and lung cancer. Therefore, our focus in this survey lay on oncological operations and typical emergency operations. While in most cases delayed treatment could only be suspected by anamnesis, we thought it might become evident in an increased number of advanced stages of acute appendicitis that would be freely perforated at the time of operation. For the oncological patients we suspected a decrease in cases, since most routine checks were halted and many patients with typical symptoms of cancer would not seek immediate medical help due to a reduced outpatient department service and in fear of COVID-19 infection [4].

Our goal was to find and discuss relevant differences for those cases, even though we did not expect them to be statistically significant due to the limited investigation period and therefore limited number of cases.

Materials and methods

After the complete lockdown was ended on April 26, thus lasting 6 weeks, we compared selected operations performed at our department in Feldkirch to the 6 weeks directly before the lockdown.

The operational procedures in question were acute appendicitis, acute cholecystitis, sigmoid diverticulitis, intestinal perforations, ileus, upper gastrointestinal (GI) cancer, lung cancer and other acute thoracic operations, colorectal carcinoma, and thyroid cancer (see Table 1). A peculiarity is acute appendicitis, which was divided into two groups depending on being freely perforated or not. Therefore, both the assessment of the surgeon (according to the surgery report) and the assessment of the pathologist (according to the histological report) were taken into consideration.

All results were collected and evaluated using Microsoft Excel© (Redmond, WA, USA). Statistical analyses were performed using the Fisher's exact test. Differences were regarded statistically significant at $p < 0.05$.

Results

During the observation period of the lockdown there was an increase in selected emergency operations to

Table 1 Operations performed

OP	Before lockdown (03.02.–15.03.2020)	During lockdown (16.03.–26.04.2020)	Difference (%)
<i>Appendicitis</i>	7	18	157
Perforated	0	5	–
Not perforated	7	13	86
<i>Cholecystitis</i>	3	7	133
<i>Acute sigmoid diverticulitis</i>	3	0	–100
<i>Perforated sigmoid diverticulitis</i>	2	3	50
<i>Perforated ulcer</i>	1	1	0
<i>Other intestinal perforations</i>	3	4	33
<i>Ileus</i>	6	3	–50
<i>Thoracic surgery</i>	23	19	–17
Oncological	7	4	–43
Not oncological	16	15	–6
<i>Liver cancer</i>	2	2	0
<i>Pancreatic cancer</i>	1	1	0
<i>Esophageal cancer</i>	0	1	–
<i>Stomach cancer</i>	1	1	0
<i>Colon cancer</i>	9	3	–67
<i>Rectum cancer</i>	1	1	0
<i>Thyroid cancer</i>	9	8	–11

the abdomen from 22 to 36 cases (+63%). This was especially due to the increase of acute cholecystitis, which rose from 3 to 7 (+133%), and acute appendicitis, which rose from 7 to 18 (+157%). There was also a slight increase in other perforations from 6 to 8 (+33%), whilst cases of ileus decreased from 6 to 3 (–50%). Especially noticeable is the large increase in advanced cases of appendicitis (5 vs. 0, $p = 0.27$; Table 2 and Fig. 1). While there were no freely perforated appendices in the 6 weeks before lockdown, 5 were found in the 6 weeks of lockdown (Table 1).

The selected oncological operations decreased from 30 to 21 (–30%). Particularly striking was the decrease from 9 to 3 in colon carcinoma (–67%; Fig. 2) as well as that in thoracic operations, which decreased from 7 to 4 (–43%; Fig. 3). There was no relevant difference for upper GI cancer (4 before and 5 during lockdown), rectal cancer (1 each), or thyroid cancer (9 before, 8 during; Table 1).

Discussion

The COVID-19 pandemic resulted in a lockdown in many countries. Most of them mainly focused on reducing numbers of severely ill patients needing hospitalization. In addition, nearly everywhere, the authorities tried to increase the capacity of their health care systems. This resulted in closing most routine outpatient departments and postponing all non-vital operations and interventions [5]. Whilst these drastic

Table 2 Perforated appendicitis

	Before lockdown	During lockdown	Difference	<i>p</i> -value
Appendicitis	7	18	157%	0.27
Perforated	0	5	–	
Not perforated	7	13	86%	

means, together with other changes, did sufficiently increase the number of free beds, an effect on non-COVID-19 patients could be at least suspected for two reasons:

On the one hand, vital routine diagnostics were performed less during lockdown, in our case particularly endoscopies. In addition, it was more difficult to simply contact your GP if feeling sick [6]. On the other hand, in fear of coming into contact with COVID-19, patients were very afraid to seek medical help if they had symptoms which would normally cause them to go to their GP or to the emergency room [4]. In the anamnesis of those patients who did show up in our emergency room, we found that the onset of symptoms was longer ago than usual. And whilst the posi-

tive effects of some of the boundaries to showing up in the emergency room during the time of lockdown cannot be denied and saved medical staff, those patients who did show up very often presented themselves in advanced stages of their illnesses. Especially those patients who came with suspected acute appendicitis more often showed signs of significant peritonitis and, in fact, our data showed that there was a huge difference, with many freely perforated appendices, which is normally quite rare as most patients seek medical help very early and early stages of appendicitis can be diagnosed easily with modern imaging [7]. Even though the number is not significant and could be coincidental, the anamnesis of those patients confirmed the suspicion that they sought medical help later due to the COVID-19 pandemic, which led to the advanced stage.

On the oncological side, we and all the other departments tried out best to treat cancer patients as accurately and mindfully as before. We did not have to postpone any oncological operations due to the lockdown and those patients who underwent neoadjuvant treatment were operated as scheduled. For many can-

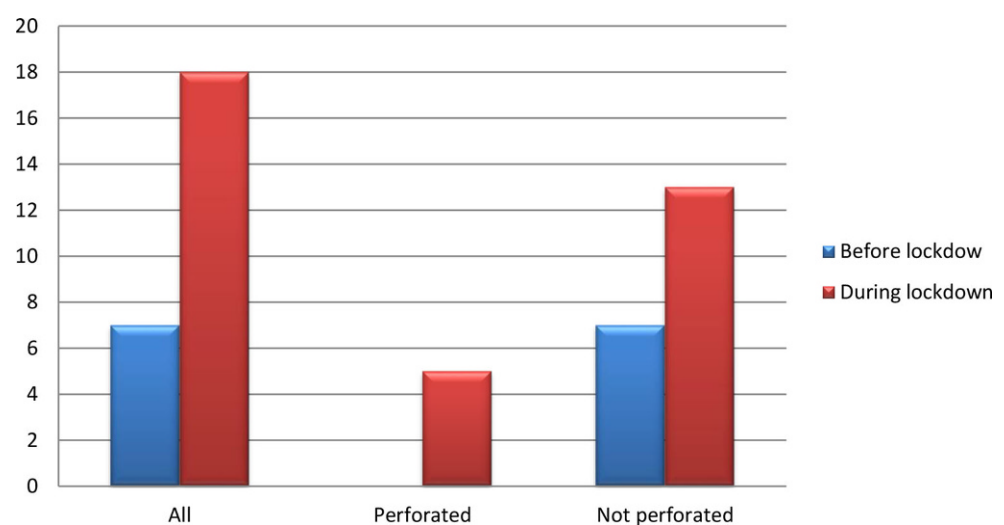
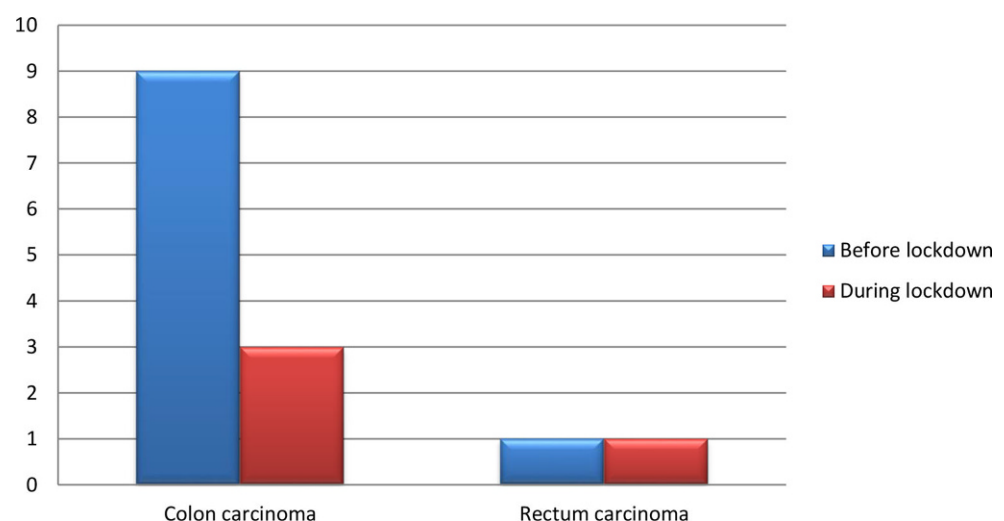
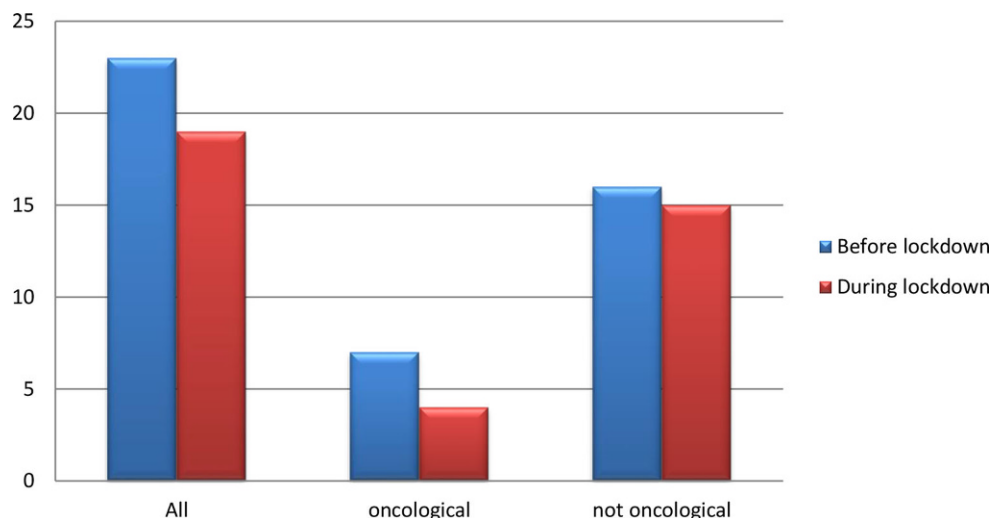
Fig. 1 Appendicitis in Feldkirch**Fig. 2** Colorectal cancer in Feldkirch

Fig. 3 Thoracic surgery in Feldkirch

cer entities, however, we rely on our referrers and of course on the patients themselves, which is especially true in colon and lung cancer as the time from diagnosis to operation is normally very short. Again, even though not significant, our data showed a noticeable decrease in those operations, as only very few symptomatic patients were presented to us. What long-term effect this delay may have and what may possibly happen as a result of paused oncological aftercare can only be speculated upon.

Luckily, the complete lockdown only lasted 6 weeks and no relevant negative outcome is known to us so far. However, the real effect on non-COVID-19 patients can only be seen in longer terms and should be investigated. This is because even our small sample shows a very noticeable effect on performed operations, which would most likely lead to a negative overall outcome if the situation lasted longer, both in oncological and in emergency patients. Whilst a delay in diagnosis and therefore operation in oncological cases which lead to a poorer outcome might not be relevant during a 6-week lockdown, any further delay would certainly lead to higher morbidity and mortality. In case of acute appendicitis, a perforated stage is also associated with a higher incidence of short- and long-term morbidity and a prolonged medical lockdown would sooner or later have an impact here as well [8]. Another interesting aspect that should be investigated further is the impact on patients' recovery caused by reduced physical therapy and also by the lack of comforting visitors.

In general it is very important in every exceptional medical situation to focus on all patients, because even though COVID-19 is very dangerous for a selected population and measures had to be taken to control the spread of the virus, "normal" patients should not be forgotten. And just like oncological patients or patients with surgical emergencies, there are of course still patients who suffer from heart attacks or strokes. It seems worthwhile to investigate whether

the lockdown had a negative impact on rapid treatment of patients with medical issues that are even more time sensitive.

Compliance with ethical guidelines

Conflict of interest D. Lechner, P. Tschann, P.C.N. Girotti, and I. Königsrainer declare that they have no competing interests.

Ethical standards For this article no studies with human participants or animals were performed by any of the authors. All studies performed were in accordance with the ethical standards.

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