Research Letter

Fewer Operations for Cancer in Germany During the First Wave of COVID-19 in 2020

A Cohort Study and Time-Series Analysis

Since early 2020 the COVID-19 pandemic has affected all areas of healthcare services (1). Especially people with tumor disease can experience secondary effects as a result of reduced screening examinations, diagnostic delays, and reduced operative capacity. In this study we analyzed billing data from the BARMER Ersatzkasse (one of Germany's leading providers of statutory health insurance) as regards tumor surgery from April to October 2020 in comparison with the preceding year.

Methods

We analyzed data from 9 million insurance scheme members from January 2017 through October 2020. We included ICD-codes C15–C16, C18–C20, C25, C34, C50, C61, C64, and an associated procedural code for tumor surgery (5423–26, 542411–12, 5435–38, 5455–56, 5484–5485, 5524–25, 5323–25, 5527–28, 5870, 5872, 5874, 5877, 5604, 5554 [except 5554.9]). We calculated the relative frequency of a tumor operation per 10,000 insured patients per month and compared the time periods April through October 2017/18/19 with 2020.

Results

From April 2017 to October 2019 an average of $2.24 \pm 0.14/10\ 000$ insurance scheme members were operated on per

month; in the same period in 2020 the number was $2.06 \pm 0.18/10\ 000$ insurance scheme members (-8%; $P < 0.05$).

When we considered the lockdown period from April to June 2020 separately, 14.3% fewer operations took place than in the comparison period 2017–19 (2.24 ± 0.14 versus $1.92 \pm 0.17/10\ 000$ insurance scheme members/month, $p = 0.009$). The fall was significant for operations for colon (-20%), breast (-17.9%), rectal (-17.6%) and lung (-14.3%) cancer. A non-significant fall was observed for operations for esophageal cancer (11.5%), gastric cancer (-10.2%), pancreatic cancer (-5.4%), and renal cell cancer (-11.8%). For prostate cancer a significant increase occurred, from 0.24 ± 0.03 to $0.26 \pm 0.02/10\ 000$. For this time period, infection with SARS-CoV-2 was coded in 113 of the operated patients (2.2%) (Table). In the period from July through October 2020, the rate of tumor surgery had fallen by 4% (2.25 ± 0.15 versus $2.16 \pm 0.11/10\ 000$). For the individual entities, a non-significant rise in numbers of operations was observed for esophageal (+10.5%), pancreatic (+10.1%), and lung (+5.6%) cancers. Rates of operations for colon cancers were 9.8% lower than in the equivalent periods in the preceding years. Rates of resections for rectal cancer (-23.5%) and gastric cancer (-25.8%) were significantly lower than in the preceding years.

TABLE

Cancer resections before, during, and after the lockdown for the time period from April to October 2020

	Apr. – Jun. 2017–19	Apr. – Jun. 2020	Δ %	P * ¹	Jul. – Oct. 2017–19	Jul. – Oct. 2020	Δ %	P * ¹	Non-diagn. patients* ²	
									Apr. – Jul. 2020	Apr. – Oct. 2020
Operations (per 10 000 insurance scheme members)										
Total	2.24 (± 0.14)	1.92 (± 0.17)	- 14.3	0.009	2.25 (± 0.15)	2.16 (± 0.11)	- 4.0	ns	2656	1517
Age 50–69 years	2.78 (± 0.20)	2.44 (± 0.22)	- 12.2	0.03	2.74	2.70 (± 0.21)	-1.5 (± 0.07)	ns		
Age > 70 years	3.44 (± 0.31)	2.81 (± 0.31)	- 18.3	0.003	3.42	3.30 (± 0.25)	-3.5 (± 0.17)	ns		
COVID-19 diagnosis (number and %)	n/a	113 (2.2)	n/a	n/a	n/a	68 (0.9)	n/a	n/a	n/a	n/a
Cancer site (mean/10 000 insurance scheme members/month)										
Lung (± SD)	0.14 (± 0.01)	0.12 (± 0.02)	- 14.3	0.0374	0.143 (± 0.02)	0.151 (± 0.01)	+ 5.6	ns	166	32
Breast (± SD)	1.06 (± 0.07)	0.87 (± 0.04)	- 17.9	0.006	1.049 (± 0.1)	1.058 (± 0.04)	+ 0.9	ns	1577	635
Esophagus (± SD)	0.026 (± 0.01)	0.023 (± 0.01)	- 11.5	ns	0.019 (± 0.003)	0.021 (± 0.01)	+ 10.5	ns	25	3
Stomach (± SD)	0.059 (± 0.01)	0.053 (± 0.01)	- 10.2	ns	0.062 (± 0.01)	0.046 (± 0.01)	- 25.8	0.014	50	96
Pancreas (± SD)	0.074 (± 0.01)	0.070 (± 0.01)	- 5.4	ns	0.069 (± 0.01)	0.076 (± 0.02)	+ 10.1	ns	33	-21
Colon (± SD)	0.40 (± 0.03)	0.32 (± 0.04)	- 20.0	0.008	0.41 (± 0.03)	0.37 (± 0.05)	- 9.8	ns	664	460
Rectum (± SD)	0.17 (± 0.02)	0.14 (± 0.01)	- 17.6	0.026	0.17 (± 0.02)	0.13 (± 0.02)	- 23.5	0.003	249	294
Kidney (± SD)	0.068 (± 0.01)	0.060 (± 0.01)	- 11.8	ns	0.069 (± 0.01)	0.073 (± 0.005)	+ 5.8	ns	66	8
Prostate (± SD)	0.24 (± 0.03)	0.26 (± 0.02)	+ 8.3	ns	0.253 (± 0.02)	0.236 (± 0.03)	- 6.7	0.052	- 166	9

n/a, not applicable; non-diagn., non-diagnosed; ns, non-significant; Δ, change

*¹ Student's t-test if not otherwise indicated;

*² Non-diagnosed patients: patients potentially not diagnosed nationwide (relative to 83 000 000 population)

In this time period, COVID-19 was coded additionally in 68 (0.9%) of operated patients.

To model the effect of the reduction in operations with the first lockdown, we undertook an interrupted time series analysis, with April 2020 as the assumed timing of the intervention (2). In this model, a stable surgery rate was seen in the comparison period with a significant reduction in cancer operations for the cumulative number of resections ($-0.34/10,000$ (95% confidence interval $[-0.456; 0.225]$, $p < 0.001$) as well as for individual resections of lung, breast, colon, and rectal cancers in 2020. Furthermore, the regression coefficient showed a significant positive trend from April for all entities, which indicates a potential catch-up effect ($(+0.039/10,000 [0.013; 0.065])$, $p = 0.004$). The exception was operations for rectal cancers, which underwent a further decline.

Discussion

This cohort study presents for the first time clear indications of a secondary effect of the COVID-19 pandemic on tumor surgery in Germany. It shows that the overall rate of cancer operations fell significantly. Most of these cases relate to cancers that are detectable in the setting of structured screening examinations and have a good prognosis if diagnosed at an early stage. Furthermore, the catch-up effect for these entities is limited. Also, the decrease is more pronounced in patients older than 70 than in those younger than 70.

Extrapolating the data of the members of the BARMER health insurance scheme to the total population of 83 million German citizens prompts the suspicion that from April to June 2020 2656 patients were probably not diagnosed or treated (3). The main proportion of these are breast cancers (about 1600 patients) and colorectal cancers (about 900 patients). When a possible catch-up effect is considered, the resulting number is about 1500 patients between April and October (about 600 breast cancer and 750 colorectal cancer operations).

Hypothetical calculations of the P effect of a six month delay to the treatment of colorectal cancers find at stage II after five years for patients aged 30–39 years at the time of diagnosis a survival rate that is 16.7% lower; in patients older than 80 it is 4.8% lower. Patients at stage III have a 30% reduced age independent five year survival rate (4). In the UK NHS, the assumption is of an increase rise on colorectal cancer related deaths between 15.3% and 16.6% over five years, which corresponds to about 1500 patients (5).

Limitation

Our study is subject to several limitations. The BARMER cohort represents only 10% of the total population. Biases owing to

socioeconomic factors are therefore possible. Secondly, no information was available regarding the tumor stage. Thirdly, in recent years a falling incidence has been observed for different tumor entities, such as colorectal cancer, but this decrease was much lower than the observed effect in 2020.

Conclusion

In sum, further to the direct effects of COVID-19 on the health of the population, we observed a concomitant fall in oncological operations. This affected in particular patients with tumor disease who are treated with surgery at an early stage and in whom after a delay to their treatment resection with a curative intent is not possible.

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Conflict of interest statement

The authors declare that no conflict of interest exists.

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References

1. Rommel A, von der Lippe E, Plass D, et al.: The COVID-19 disease burden in Germany in 2020—years of life lost to death and disease over the course of the pandemic. *Dtsch Arztebl Int* 2021; 118: 145–51.
2. Wagner AK, Soumerai SB, Zhang F, Ross-Degnan D: Segmented regression analysis of interrupted time series studies in medication use research. *J Clin Pharm Ther* 2002; 27: 299–309.
3. Baum P, Diers J, Lichthardt S, et al.: Mortality and complications following visceral surgery—a nationwide analysis based on the diagnostic categories used in German hospital invoicing data. *Dtsch Arztebl Int* 2019; 116: 739–46.
4. Sud A, Jones ME, Broggio J: Collateral damage: the impact on outcomes from cancer surgery of the COVID-19 pandemic. *Ann Oncol* 2020; 31: 1065–74.
5. Maringe C, et al.: The impact of the COVID-19 pandemic on cancer deaths due to delays in diagnosis in England, UK: a national, population-based, modelling study. *Lancet Oncol* 2020; 21: 1023–34.

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