



COV-BT Ire study: safety and efficacy of the BNT162b2 mRNA COVID-19 vaccine in patients with brain tumors

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Abstract

Background The BNT162b2 vaccine conferred 95% protection against COVID-19 in people aged 16 years or older.

Objective The aim of this observational study was to evaluate safety and efficacy of vaccine in patients affected by primary brain tumor (PBT).

Methods We proposed COVID-19 vaccine to all patients affected by PBT followed by Neurooncology Unit of National Cancer Institute Regina Elena.

Results 102 patients received the first dose, 100 the second, and 73 patients received the booster dose. After first dose, we observed one patient with fever and severe fatigue, while after the second one, we recorded adverse events in ten patients. No correlation was observed between adverse events and comorbidities.

Conclusions The COVID-19 vaccine is safe and well tolerated in PBT patients.

Keywords COVID-19 · Vaccine · Efficacy · Safety · Brain tumors

Introduction

The 2019 Coronavirus (COVID-19) has affected tens of millions of people globally since it was declared a pandemic by the World Health Organization in March 2020. Patients with solid tumors appear to be at increased risk, particularly in the first year after diagnosis which drops to baseline if diagnosis is > 5 years [1]. For any type of malignancy, active disease confers a significantly increased risk of severe COVID-19 [2, 3]. However, the higher incidence and severity of COVID-19 in cancer patients, as opposed to people without cancer, are observations based on non-comparative and retrospective studies. Severity and mortality rates from the COVID-19 and Cancer Consortium (CCC19) registry and other cohorts range from 5 to 61% (meta-analysis

showed 26%), much higher than in the overall population (~2–3%). Nevertheless, there are doubts of unadjusted rates because cancer population is older, with more comorbidities, poorer performance status, and has many unmeasured and confounding selection biases [3].

Recent studies report that following the SARS-CoV-2 infection, some patients with cancer, particularly those with B-cell malignancies, showed delayed or negligible seroconversion, prolonged virus shedding, and sustained immunodysregulation, compared to individuals without cancer [4, 5].

According to the Italian National Plan, since March 2021, the administration of the BNT162b2 vaccine started at our institute for cancer patients undergoing active treatments. In literature, few studies on cancer patients [6, 7] have been reported, but there are no studies on primary brain tumor patients (PBT).

The aim of this study was to evaluate the safety and efficacy of the COVID-19 vaccine in patients affected by PBT on an active treatment regimen.

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Methods

Study design and participants

Between March and May 2021, we proposed to administer the COVID-19 vaccine to all patients affected by PBT under the care of the Neuro-oncology Unit of Regina Elena National Cancer Institute. Since October 2021, we have offered the booster dose. We considered all patients on active chemotherapy or biological treatments. For all patients, we collected clinical and demographic characteristics. Local and systemic side effects were recorded after the first, second, and booster dose.

Results

Patient population

We proposed to administer the COVID-19 vaccine to 112 patients with PBT under the care of our Neuro-oncology Unit.

Of them, 8 patients refused to get vaccinated and two showed clinical deterioration due to disease progression.

In Table 1, clinical and demographic characteristics are reported. 102 patients received the first dose of the COVID-19 vaccine, and 100 received the second one (time interval after the last chemotherapy: 1–28 days). Two patients did not receive the second dose. One patient died due to disease progression, and another one refused second dose. Only 73 patients received the booster dose because 23 patients died before receiving it, 1 refused, and 3 patients were missing at follow-up.

The cause of death is not related to the vaccine but to disease progression.

Safety

No events of anaphylaxis or life-threatening responses occurred after either the first or second vaccine doses. After the first dose, we observed only one patient with fever and severe fatigue, while adverse events were recorded in ten patients after the second dose.

We documented 2 cases experiencing fatigue, 3 cases with fever, 1 with urticaria, and 1 case with bronchitis. Moreover, three patients experienced pain in the site of injection. Overall, these adverse events were temporary and resolved within a few days after onset (see Table 1).

Both local and systemic events were reported more often by older patients (more than 65 years of age) than the younger ones (18–65 years of age), and were more frequent

Table 1 Clinical, demographic characteristics, and adverse events

Demographic and clinical features at baseline		
	<i>N</i>	%
Sex		
Male	61	59.8
Female	41	40.2
Age group		
< 65	76	74.5
> 65	26	25.5
Disease status		
Diagnosis	25	24.5
Disease progression	24	23.5
Control of disease	53	52
Disease type		
Glioblastoma	45	44.1
Other malignant gliomas	54	53
Meningioma	3	2.9
Karnofsky performance status		
≥ 90	60	58.8
< 90	42	41.2
No. of comorbidities		
0	63	61.8
1	23	22.5
≥ 2	16	15.7
Type of comorbidities		
Cardiac	3	
Hypertension	17	
Vascular	4	
Respiratory system	1	
Eye, ear, nose, throat, and larynx	3	
Upper gastro-intestinal	1	
Lower gastro-intestinal	1	
Liver, pancreas, and biliary	3	
Renal	1	
Neurologic	2	
Endocrine	15	
Psychiatric illness	4	
Ongoing treatment		
Yes	68	59.8
Interrupted (within 6 months)	34	33.3
Type of treatment		
Temozolomide	38	55.9
Concomitant radiotherapy	7	10.3
Nitrosurea	10	14.8
Regorafenib	7	10.3
Carboplatin	2	2.9
Everolimus + Bevacizumab	2	2.9
RAC-TAC trial (Temozolomide + Clorpromazina)	2	2.9
Antiepileptic treatment		
Yes	81	79.5

Table 1 (continued)

No	21	20.5	
Steroid treatment			
Yes	31	30.4	
No	71	69.6	
No. of adverse events			
	1st dose	2nd dose	Booster dose
Fever	1	3	-
Fatigue	1	2	-
Urticaria	-	1	-
Bronchitis	-	1	-
Side of injection pain	-	3	-

after dose 2 than after dose 1. We did not observe any correlation between adverse events and comorbidities. Moreover, no correlation was found with disease course or disability.

No patients reported adverse events after the booster dose.

We did not observe any correlation between vaccine administration and changes in disease status.

SARS CoV-2 infection

Between the first, second, and booster vaccination doses, only 4 patients were infected by the SARS-CoV-2 without symptoms, suggesting a high vaccine efficacy. Of the six patients that refused the vaccine, 3 were infected. Of them, 2 young patients without other comorbidities reported fever resolved without sequelae and 1 patient with comorbidities (obesity and diabetes) died from pneumonia COVID-19 related.

Discussion

In this study, we investigated whether the COVID-19 vaccination is associated with increased risk of adverse events and whether it influences disease trajectory in PBT patients. The low rate of adverse events leads us to the conclusion that PBT patients do not show higher risk for vaccine-induced serious side effects.

Side effects following the second dose were more common than after the first and the booster dose.

In our PBT sample, fever has been found in less than 1% of patients after the first dose. At the second dose, we reported fever in 3% of cases. Two cases of local adverse events have been found after the first dose and three cases after the second one.

In this sample, we report four cases of COVID-19 infection in patients who were administered the vaccine, while 50% of patients who refused to be vaccinated resulted infected. These

data suggest the importance of protection in frail people, particularly during chemotherapy treatment.

Grinshpun et al. [8] confirm an overall excellent immunogenicity as manifested by antibody response to the BTN162b2 mRNA COVID-19 vaccination or COVID-19 infection, with approximately 90% seroconversion in actively treated patients with solid tumors. They also identified patients undergoing chemotherapy as significantly less responsive, and with lower antibody levels.

This is the first study on safety and efficacy of vaccine COVID-19 in primary brain tumors. Even though one of the main limitations of this report is the involvement of a mono-institutional population, we demonstrated that the COVID-19 vaccine is safe in a long period after vaccination (March–December 2021) and that it is also effective for protection against disease.

Conclusion

Our findings support the recommendation to promote, instead of postponing, vaccination during the ongoing SARS-CoV-2 pandemic in patients affected with primary brain tumors and especially during chemotherapy treatment.

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Author contribution Antonio Tanzilli and Veronica Villani contributed to the study conception and design. Material preparation, data collection, and analysis were performed by Dario Benincasa, Edvina Galiè, Antonia La Malfa, Andrea Pace, Valentina Bonomo, and Annamaria Biscu. The first draft of the manuscript was written by Veronica Villani and Antonio Tanzilli, and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

Data availability The data that support the findings of this study are available on request from the corresponding author [A.T.]. The data are not publicly available due to their containing information that could compromise the privacy of research participants.

Code availability Not applicable.

Declarations

Ethical approval and Informed consent All data were gathered after obtaining an informed consent from each participant, and after notification to our institutional ethical committee board that provided exemption of approval for non-interventional retrospective studies. In no way, this study did interfere in the care received by patients.

Conflict of interest The authors declare no competing interests.

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