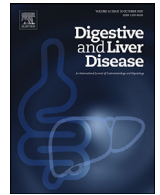




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## Correspondence

### Covid-19 post-lockdown: A transparent box, used as protective equipment in gastroscopy. A test of feasibility and efficacy



Dear editor,

SARS-CoV-2 pandemic has revolutionized and reshaped the way of thinking in the worldwide gastroenterology community regarding improving our personal protective equipment (PPE). This is especially important to reduce the risk of nosocomial COVID-19 transmission during the performance of elective and urgent endoscopies<sup>1,2</sup> and to reduce the psychological stress which endoscopy personnel experience.<sup>3,4</sup> During the lockdown phase, deferred routine gastrointestinal endoscopies have resulted in decreased gastric and colorectal cancer diagnosis, presumably causing the upshifting of cancer stage by 6 months.<sup>5</sup> Hence, most of us have come out to a simple conclusion: SARS-CoV-2 infection might be our perennial unwanted risky “companion” for the next years. Ethically, we cannot afford to keep rejecting the performance of ordinary endoscopic procedures. Accordingly, our group, as others<sup>6,7</sup> have been working on the design of a special “droplets containing box”, aiming to reduce drastically the gastroenterologist’s exposure to nasopharyngeal droplets generated during gastroscopy. For this purpose, herein, we summarize our experience with a simple dedicated gastroscopy box.

The box was made of a transparent Perspex and can be reused, following official guidelines<sup>8</sup> for cleaning and disinfection. It was tested on a simulator (GI-BRONCH Mentor™ 3D systems, formerly Symbionix). Due to the physical structure of the simulator, the gastroscopy-box was positioned with its opening un-evenly placed regarding the simulator’s mannequin mouth as shown in Fig. 1.

The simulator’s various modules were used to test the feasibility of performing gastroscopy with or without the box:

Upper GI endoscopy Cases 1–5 were carried out with the box and then without it.

EndoBubble module: this module consists of a tunnel (lumen) in which the endoscopist should navigate the scope and pop balloons. After two warm-up runs without the box, three consecutive runs were carried out without and with the box on level 1, and then three consecutive runs with and without the box on level 2 of the module.

EndoBasket module: this module consists of a tunnel (lumen) in which the endoscopist navigate through this lumen, catches balls and puts them in a basket. After a warm-up run, three consecutive runs on level 1 were performed without the box, followed by three runs with the box.

The metrics of gastroscopy simulations are summarized in Tables 1, 2a, 2b, 3. While these metrics are not validated as quality measures for gastroscopy and lack the specific ability for calculating any statistical differences, we think that our study clearly demonstrates gastroscopy through the gastroscopy-box is completely feasible.

Testing of the efficacy of shielding from droplets was tested on a mannequin (Laerdal airway management trainer). A fluorescent dye (Glo Germ gel) detected by ultra-violet (UV) light simulated a patient’s droplets. Five milliliters of fluorescent material diluted in ten milliliters of tap water was sprayed through the mannequin mouth. The endoscopist was positioned as for performing a gastroscopy and the mannequin was turned on its left side. The fluorescent color droplets were detected by UV light. Three positions were tested: With the box, the mannequin mouth is below the level of the box opening; With the box, the mannequin mouth is in the same level of the box opening and Without the box. When the gastroscopy-box opening was placed unevenly in regard to the simulator’s mannequin mouth, the droplets were noted to be glowing inside the gastroscopy-box and on the scope. Only a few drops were detected on the hand holding the scope (shown in Fig. 2a). On the contrary, placing the opening of the gastroscopy-box evenly with the mannequin mouth resulted in droplet’s contamination of the scope, the holding hand and the gown (shown in Fig. 2b). As

**Table 1**  
Box Vs Un-box gastroscopy simulations.

Box EGD				Un-Box EGD			
Run no.	total time (sec)	EOS* (%)	EOS*/sec ratio	Run no.	total time (sec)	efficiency of screening (EOS) (%)	EOS/sec ratio
1	168	89	0.52	1	149	96	0.64
2	219	76	0.34	2	203	73	0.35
3	303	91	0.30	3	273	89	0.32
4	252	91	0.36	4	212	78	0.36
5	274	96	0.35	5	261	96	0.36

\* EOS: efficiency of screening.

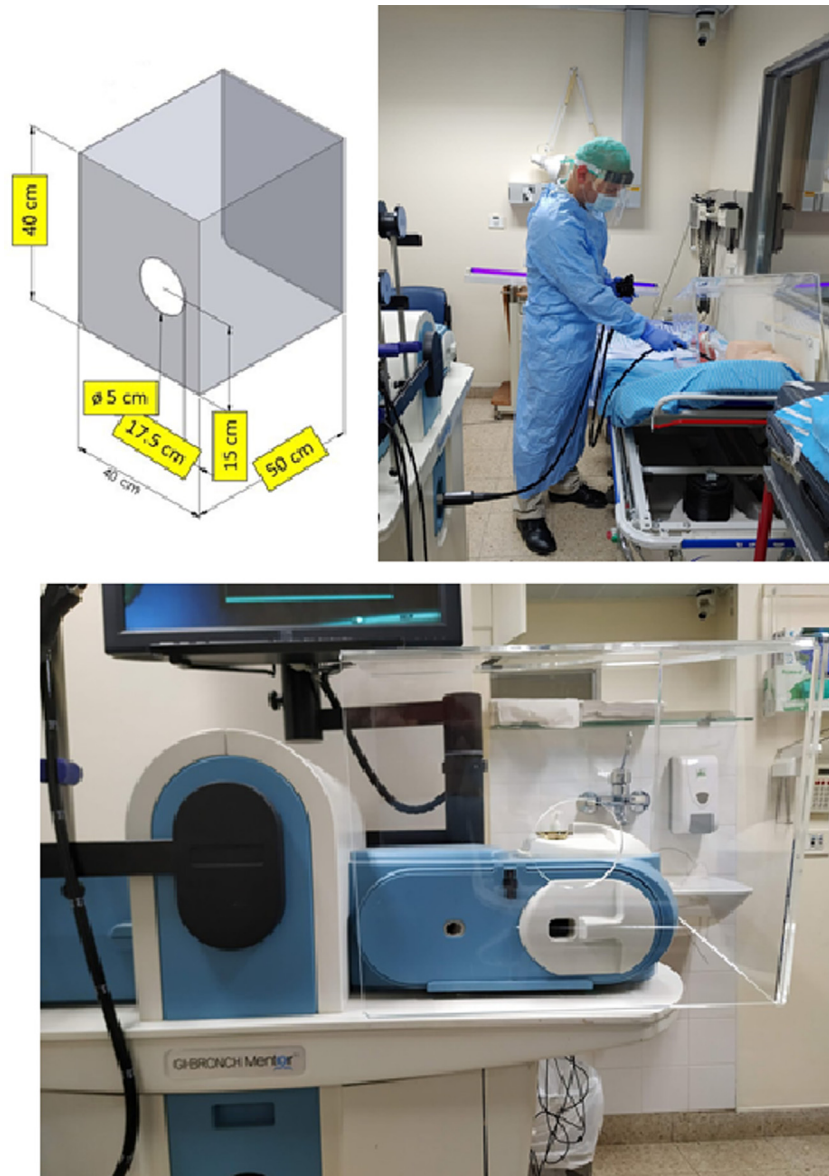


Fig. 1. Box dimensions and placement on the simulator, mannequin.

Table 2a

Box Vs Un-box EndoBubble module simulations.

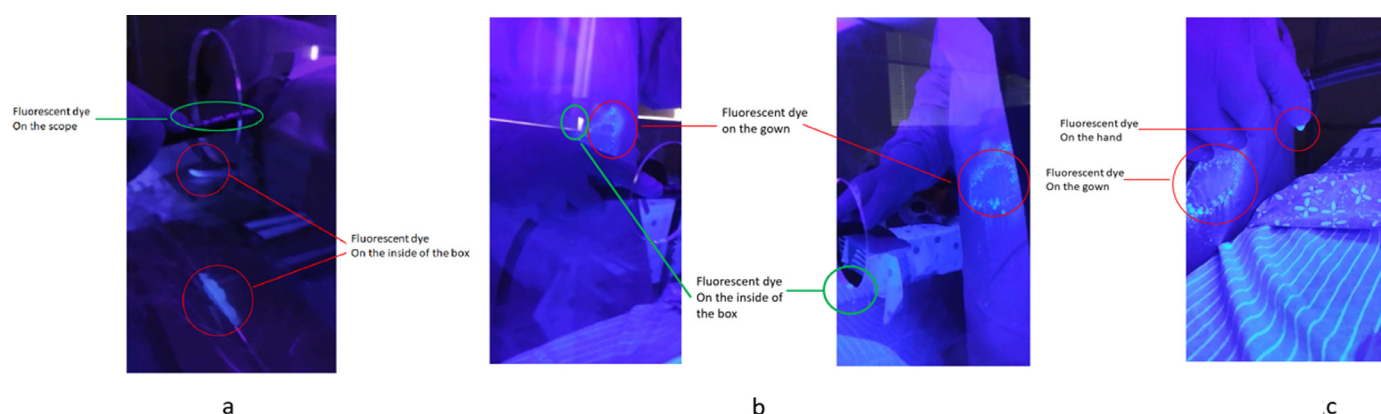
EndoBubble module, level 1- Box				EndoBubble module, level 1- No box			
Run no.	total time (sec)	number of wall hits	average time between balloon pops (sec)	Run no.	total time (sec)	number of wall hits	average time between balloon pops (sec)
1	62	1	2	1	68	2	3
2	48	0	2	2	52	0	2
3	56	0	2	3	48	1	2

Table 2b

EndoBubble module, level 2- Box					EndoBubble module, level 2- No Box				
Run no.	total time (sec)	number of wall hits	average time between balloon pops (sec)	Successful balloon pops ratio (%)	Run no.	total time (sec)	number of wall hits	average time between balloon pops (sec)	Successful balloon pops ratio (%)
1	89	1	3	72.5	1	99	2	3	65
2	81	0	2	80	2	96	0	3	77.5
3	91	0	2	85	3	91	0	2	77.5

**Table 3**  
Box Vs Un-box EndoBasket module simulations.

EndoBasket module, level 1- Box								
Run no.	total time (sec)	number of wall hits	1st ball was located after (sec)	1st ball was placed in its basket after (sec)	2nd ball was located after (sec)	2nd ball was placed in its basket after (sec)	3rd ball was located after (sec)	3rd ball was placed in its basket after (sec)
1	50	0	7	9	22	31	40	46
2	64	0	12	17	31	43	56	60
3	48	0	4	7	22	34	39	44
EndoBasket module, level 1- No Box								
Run no.	total time (sec)	number of wall hits	1st ball was located after (sec)	1st ball was placed in its basket after (sec)	2nd ball was located after (sec)	2nd ball was placed in its basket after (sec)	3rd ball was located after (sec)	3rd ball was placed in its basket after (sec)
1	49	0	6	9	23	35	41	46
2	45	0	4	7	21	31	37	41
3	56	0	4	7	22	37	47	51



**Fig. 2.** Testing the efficacy of shielding from droplets:  
a- The gastroscopy-box opening placed unevenly in regard to the mannequin mouth  
b- The gastroscopy-box opening placed evenly in regard to the mannequin mouth  
c- Without the box.

expected, gastroscopy without the dedicated gastroscopy-box resulted in massive droplets contamination of the scope, the holding hand, the gown, and the bed (shown in Fig. 2c).

To summarize, we believe that the gastroscopy-box might provide an additional layer of protection for endoscopy unit staff and its use should be further investigated.

#### Declaration of Competing Interest

The authors have no conflicts of interest to declare.

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#### Statement of Ethics

The ethics committee of Samson-Assuta University Hospital waived the need for approval and consent.

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