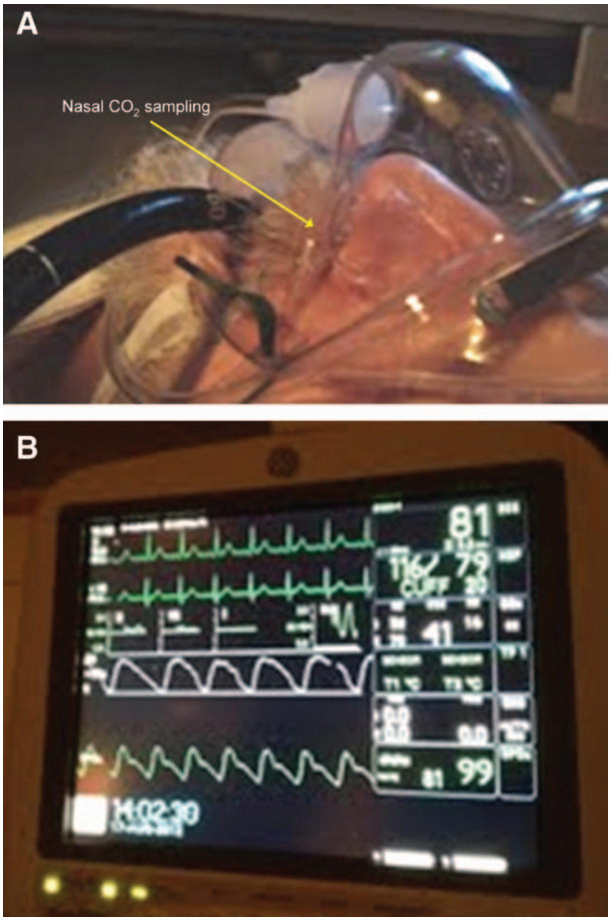

Fig. 1. Patient undergoing endoscopy. Supplementary oxygen was provided *via* the oxygen mask and expiratory carbon dioxide (CO_2) was sampled at the nostril by the nasal carbon dioxide sampling catheter device (*A*). Downstroke of capnograms reach zero base line suggesting no rebreathing of carbon dioxide (*B*).

not flow in blocks). For example, if malfunction of the inspiratory valve results in decreased resistance, it is conceivable that more than half of the expiratory gases might enter the inspiratory limb. This, in conjunction with the gas mixing between carbon dioxide–containing expiratory gases and carbon dioxide–free fresh gases may cause the final portion of the inspiratory tidal volume to contain certain amounts of carbon dioxide. Thus, the resulting downstroke of the capnogram (phase 0) will not reach the zero baseline. This was illustrated by me and my colleagues in a case report where we recorded capnograms during inspiratory valve malfunction and the subsequent inspiratory downstrokes did not reach the baseline.[2] However, it was also demonstrated by our group that capnograms can apparently appear normal despite substantial rebreathing resulting from inspiratory valve malfunction. However, when respiratory gas flows were superimposed on the capnograms, the significant rebreathing was obvious.[3]

Regarding capnogram 3A–D illustrated in the original article,[1] the morphology of capnograms depends, once again, on several factors. These include patient's respiratory rate, tidal volume, supplementary oxygen flow, gas leaks from the mask resulting in the carbon dioxide washout by the oxygen flow, and more importantly, the site of the carbon dioxide sampling. In capnograms 3A–D, the site of the sampling was adjacent to the inside wall of the mask *via* an adaptor, and not at the nostril. Therefore, the recorded carbon dioxide concentration does not represent the carbon dioxide concentration at the nostril. The morphology of the capnograms depends on the location of carbon dioxide sampling within the mask and on the washout of carbon dioxide by the supplementary oxygen flow. Unless carbon dioxide measurements are performed at the nostril, it may be difficult to ascertain whether there is rebreathing (although minimal). For example, figure 1A and B from this reply shows a patient undergoing upper gastroinstestinal endoscopy with supplementary oxygen provided *via* the mask, and end-tidal carbon dioxide monitoring was performed within the nostril using carbon dioxide sampling nasal cannula. The endoscope was inserted *via* a "U-shaped flap cut" in the mask. In this case, the carbon dioxide rebreathing was zero (fig. 1B) due to the carbon dioxide washout by supplementary oxygen at the nostril. Capnograms during sedation is a good subject for future discussion.

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The Airway Paradigm: What Really Changed?

To the Editor:

In their recent study on airway assessment, Langeron *et al.*[1] described the results of their computer-scored examination as "paradigm changing." Although I believe they are correct in producing a paradigm change in the airway examination, I believe that the change actually arises from their methods rather than their results, and that the change is more significant than they suspected.

A key piece of methodology in this study, as in every study on airway examinations since Mallampati's 1985 article,[2] was the definition of a "difficult intubation." One definition chosen by Langeron *et al.* was the use of either a gum bougie or a video laryngoscope following an unsuccessful attempt using a direct laryngoscope. Because this definition figured in about three quarters of the intubations counted as difficult, it had a considerable impact on their results and conclusions. However, the authors did not fully explore why the decision to use familiar and readily available instruments should define an intubation as difficult.

One reason may be that a direct look followed by use of an alternative instrument indicates an inadequate view of the larynx at direct laryngoscopy. This follows Mallampati's precedent of using an inadequate direct laryngeal view as the indicator of a difficult intubation. That precedent was set in 1985, however, and well before the common use of either the indirect laryngoscope or the gum bougie. At that time, no commonly used instrument could improve an inadequate direct view at laryngoscopy. Today, though, the video laryngoscope and the gum bougie are both familiar and readily available to most practitioners, and the limitations of direct laryngoscopy have lost much of their significance. As a result, the adaptation of newer technology has effectively overridden Mallampati's definition for difficult intubation.

This is the crux of an important contradiction between the goal and the method of this study. It uses instruments not available in 1985 to define a difficult intubation, but then those same instruments provide a path to successful intubation. This means the study results come from a methodology that tries to preserve the limits of 1985 laryngoscopy, when that same methodology actually demonstrates the increasing irrelevance of those limits.

At first, this seems to challenge the value of Langeron *et al.*'s study. However, that comes from seeing it as an extension of the Mallampati's examination model. In a different light, the study results are seen to derive largely from the individual clinician's judgment as to whether an intubation should be done using traditional or newer instruments. This is a significant change from results based on a graded laryngeal view that defines difficulty, although there is a significant overlap in the airways that each method takes note of. The change means that the airway examination no longer looks for an anatomical limit for just one type of instrument, but rather it seeks a way to distinguish which airways are better managed by one type of instrument or another.

This should be seen as the true paradigm shift of this study. By incorporating the observation that different types of instruments now contribute to successful intubations, the authors have moved the airway examination away from its original task of predicting failure. Instead, their examination differentiates airways according to their suitability for different types of instruments. By doing this, it reorients the examination to the improvement of overall laryngoscopy success rates. Furthermore, the results indicate that their airway examination may perform this task better than the older one predicted failure.

I believe it is fair to say that this study brings the predictive airway examination from the 20th century into the 21st, accounting for current technology in both the prediction and the performance of laryngoscopy. I also believe that newer technologies, such as computerized face recognition, will continue this evolution. They will continue to form the airway exam into a evaluation tool that guides us toward specfic patient-appropriate intubating instruments.

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In Reply:

We thank Dr. Knapp for highlighting our recent article on prediction of difficult tracheal intubation.[1] We agree with his comments. Indeed, he raised two major issues: the first one is the lack of universal definition for difficult tracheal intubation and the second one is when such a difficulty has been predicted, it is not the end of the story based on anatomic thoughtfulness, but the beginning of solutions according to various strategies related to new devices such as videolaryngoscopes overcoming a difficult laryngoscopy with conventional direct laryngoscopy.

Requirement of an alternate technique to conventional laryngoscopy seems an important way to define, even nowadays, a difficult airway. It means you overcome the difficulty with another device alone or in adjunct to the conventional laryngoscope. Nevertheless, you have already succeeded in performing tracheal intubation, but the "therapeutic pressure" was not the same. For example, in septic shock patients with the same mean arterial pressure of 65 mmHg, if in one case a norepinephrine support is 0.5 mg/h and in another case 5 mg/h for norepinephrine support, seriousness of these patients is obviously totally different.

The main paradigm change in difficult tracheal prediction we tried to highlight in our article was to decrease the proportion of patients in the inconclusive zone (gray zone) to implement an optimized airway management strategy according to the patient's risk, with the necessity or not to master a difficult tracheal intubation with an appropriate alternate technique to conventional laryngoscopy or to maintain this standard technique by excluding such a difficulty. This anticipated difficulty in a given patient is an *a priori* approach and is different from the one using an