In Reply:

We thank Xue et al. and Shetty et al. for the interesting letters they sent in response to our recent article.1 We fully agree with the first remark by Xue et al. We did not provide the method of anesthesia induction used in our protocol. However, we thought our method was clear enough to prevent any doubt regarding the technique of induction. All the adult patients received intravenous boluses of appropriate dosage of opioids and hypnotic agents (in most cases sufentanil and propofol, respectively). In our country, inhalation-induction of anesthesia is not popular in adults. Moreover, all the patients received neuromuscular blocking agents. We deliberately standardized anesthesia procedure to prevent poor anesthesia quality affecting airway management quality.

Facemask ventilation (FMV) was attempted only if anesthesia depth and apneic status were confirmed both clinically and instrumentally. We are confident that Xue et al. are fully aware of the methods we have used. Attempting FMV in a nonapneic patient would have been considered as a fault in our standards. In operating room settings, there are very few if any indications for FMV in nonapneic elective patients requiring tracheal intubation. Mechanically-assisted noninvasive facemask spontaneous ventilation has been used in some morbidly obese patients but only while awake. These patients were returned to mechanically noninvasive, fully controlled ventilation as soon as spontaneous ventilation ceased. Moreover, we believe that maintaining spontaneous ventilation at induction may correlate with poor anesthesia quality affecting airway management quality.

The second remark deserves a discussion. We agree with Xue et al. that adequate oxygenation should be the exclusive core goal for all anesthesiologists during airway management. This was our main concern when we built this algorithm: maintaining oxygenation during airway management. We are aware that the decision to administer muscle relaxant in patients with potentially difficult airway is disputable. We decided on injecting succinylcholine at induction of anesthesia either primarily in potentially difficult airway patients or secondarily in grade III–IV difficult FMV, because we previously validated rescue airway tools and plans6–16 that are proposed in the algorithm. Our results combined with our daily clinical practice (the algorithm is still ongoing in our department) confirm that this option (not opinion) is valuable and safe for the type of patients we are managing. We have excluded from the algorithm patients suspected or treated for ear, nose, and throat tumor. Moreover, emergency and obstetric cases use a specific algorithm. We attest that succinylcholine injection never worsened but rather systematically improved FMV quality at induction of anesthesia, suggesting that muscle paralysis is important not only for simplifying tracheal intubation maneuvers but also for improving FMV quality. Almost all “postinduction” patients with grade III difficult FMV improved after succinylcholine reinforcing the strength of our strategy. Moreover, primary succinylcholine administration in case of three or more predictors certainly placed the patients in optimal-best conditions for FMV. We think that the unique pharmacology of succinylcholine promoted such results. The only patient with grade IV difficult FMV we encountered during the trial had received primary succinylcholine. In this patient FMV was difficult because of many reasons, including a narrow and collapsible airway, but also because of the thick beard the patient was wearing. This beard prevented facemask seal, resulting in poor ventilation generation. A second case has occurred very recently in our department. A 58-yr-old woman admitted for elective cholecystectomy demonstrating two predictors (body mass index = 38 kg/m²) received secondary succinylcholine because of grade IV difficult FMV. One min after injection the grade of difficult FMV was III. Because of optimal preoxygenation, arterial oxygen saturation (SaO₂) nadir was 89%. Her trachea was intubated with a gum elastic bougie (GEB) over which the tube was railroaded under direct laryngoscopy (CL = IIb). We understand the concerns of Xue et al., but attempting immediate laryngoscopy in a patient with difficult FMV before admin-
istering a muscle relaxant cannot be a standard in our settings. We believe that this approach, which was discussed in our country 20 yr ago, usually before administrating long-term pancuronium, is no longer performed. Indeed, very efficient pharyngeal, periglottic ventilation tools are available to allow ventilation even in morbidly obese patients. Thus, we believe that there is a need to evaluate for "the chance of achieving successful" orotracheal intubation before injection of succinylcholine. Moreover, our algorithm proposes a very efficient solution for viewed tracheal intubation to be used in paralyzed patients (succinylcholine or rocuronium with sugammadex, correctly dosed, ready for use). The "cannot intubate cannot ventilate" scenario was activated only once in the current study and was solved simply by using the first step alternative device (LMA CTrach™; SEBAC, Pantin, France). Finally, we are as confident as the prehospital emergency medicine physician managing patients with difficult airway and poor oxygenation storage that primary succinylcholine improves airway management quality.

The third comment from Xue et al. concerns our failure to report intubation in all patients and apnea time in patients with difficult airway. These data are missing from our reports. However, recording intubation time and apnea time in the large number of patients we included was technically unrealistic. Although we do not fully agree with the computed model-based calculations of SaO2 drop rate applied to clinical reality, we confirm that some morbidly obese patients with difficult airway required more than 3 min for the completion of orotracheal intubation maneuvers. Indeed, the computed model does not take into account the reventilation actions we are doing in the event that SaO2 concentration drops less than 90%. We have implemented our algorithm with new optical devices based on their efficiency at maintaining optimal SaO2 during difficult airway management. Moreover than time measurement, we focused on oxygenation quality recordings. For many years, we have settled oxygenation quality standards that are applied in clinical practice. Our standards depend on the situation: emergency medicine/operating room anesthesia situations. In the operating room, we recommend activating the ventilation arm of the algorithm if SaO2 concentration drops less than or cannot be maintained at more than 90%. In emergency situations, the inferior limit of SaO2 is settled at 85%. Moreover, we have defined time limits for all maneuvers, also depending on the clinical situation. Because of the efficiency of our alternative methods, we have decided to define failure for each airway management tool (usually two failed attempts), but also theoretically limited the time duration for the maneuvers. We have settled a time limit of “2-min job” for each step of the algorithm in case of operating room situations, and “1-min job” for the emergency cases, including the obstetric cases. Figure 1 illustrates our previously published prehospital emergency medicine algorithm. Moreover, we apply the following rule during difficult airway...
management: “Do not struggle against the patients, just skip to the next step of the difficult airway management algorithm.”17 Because of these standards, we did not measure intubation or apnea times. We thank Xue et al. for their pertinent propositions, some of them being currently applied for several years.

We have responded to three issues of Shetty et al. in our response to Xue et al. We have precisely defined exclusion/inclusion criteria including fiberoptic tracheal intubation indications in the methods section of our trial. There is no upper limit in the number of predictors to exclude the patient or to propose fiberoptically tracheal intubation.

The fourth issue from Shetty et al. deserves short explanations. The CL in the three patients intubated with the combination of the Airtraq® (Vygon, Ecouen, France) and GEB cannot be scored properly. In these patients the glottis was visible (CL = 1) but the larynx was sitting laterally far from the distal tip of the blade, and a long and narrow partially floppy epiglottis misdirected systematically the endotracheal tube into the pyriform fossae. We had observed that in two circumstances GEB dramatically shortened and simplified tracheal intubation with the Airtraq™ laryngoscope: in the presence of an abnormally distant larynx, the Sellick maneuver is applied. Then in these cases we use GEB to shorten tracheal intubation with the Airtraq™ laryngoscope. We have recorded videos of such maneuvers we could send to Shetty et al.

During this maneuver the Airtraq™ position is stabilized in optimal best position, the endotracheal tube is rearmed in the channel (but not pushed) toward the glottis. GEB is passed through the endotracheal tube armed in the channel. Then manipulations of the distal tip of GEB in combination with soft changes in Airtraq™ position permits tracheal access and endotracheal tube railroading. We agree with Shetty et al. that we should have described this maneuver more extensively. We are ready to publish a case series demonstrating the value of GEB in case of difficult Airtraq™ intubation.

Gilles Dhonneur, M.D., Ph.D.,* Roland Amathieu, M.D., M.D., Xavier Combes, M.D. Jean Verdier University Hospital of Paris, Paris, France. gilles.dhonneur@jvr.aphp.fr

References


(accepted for publication April 26, 2011)