

## Blowing the Pipes Clean Works!

We would like to congratulate Gentile and Siobal on their review article concerning the recent advances in equipment for the treatment of ventilator-associated pneumonia,<sup>1</sup> in which they reported different techniques to clear the subglottic secretions that accumulate during intubation. At the time of extubation, they described applying a positive pressure gradient just prior to cuff deflation. The cuff is then deflated and the endotracheal tube removed. Theoretically, any secretions would be pushed from the subglottic space by the escaping gas into the oropharynx where they can be suctioned away. They considered that further investigations into this technique are warranted.

We investigated whether using PEEP during cuff deflation and extubation might be advantageous.<sup>2</sup> We designed a bench-top study to compare the ability of a tracheal suction catheter, adjusting the PEEP setting on the ventilator or squeezing a self-inflating bag to minimize aspiration during cuff deflation and extubation. We intubated a model trachea and attached the proximal end of the endotracheal tube to a mechanical ventilator. Next we placed 10 mL of water above the inflated cuff and then applied one of a number of test protocols. The volume of water "aspirated" into the lungs was determined by weighing the apparatus before and after extubation.

In this model, a PEEP level of 35 cm H<sub>2</sub>O was the most efficacious (mean ± SD pulmonary aspiration volume 1.6 ± 0.1 mL), when compared to the use of tracheal suction catheter (mean ± SD pulmonary aspiration volume 8.2 ± 0.1 mL) or squeezing a self-inflating bag (mean ± SD pulmonary aspiration volume 5.7 ± 1.2 mL). There was an 81% reduction in mean pulmonary aspiration volume using this level of PEEP, compared to a tracheal suction catheter ( $P < .001$ ). We found having a high level of PEEP was the key to the efficacy of this technique. Although, a high pressure can be generated by squeezing a self-inflating bag, the flow rate cannot be sustained long enough to prevent considerable aspiration as the bag quickly empties.

Our study supports the hypothesis generated by Bahhady et al that the application of PEEP is protective against aspiration,

compared to the use of a tracheal suction catheter during extubation.<sup>3</sup> Subsequently, in a survey of routine practice in critical care units in the United Kingdom of 532 healthcare workers, we found that 87% of respondents used a tracheal suction catheter, 6% squeezed a self-inflating bag, and only 1.3% adjusted the PEEP setting on the ventilator during extubation.<sup>2</sup> In light of these findings, we now plan to instigate a clinical trial to confirm the clinical efficacy of this technique, in the hope that it will be used more widely.

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The authors have disclosed no conflicts of interest.

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3. Bahhady I, Howard W, Rothaar R, Epstein SK. Extubation outcome: a randomised control trial to evaluate outcomes using 2 different extubation techniques in mechanically ventilated patients (abstract). International Conference of the American Thoracic Society, Orlando, Florida, 2004.

## The author responds:

Many thanks to Doyle and associates for bringing attention to their *in vitro* test data that compared methods for preventing aspiration of secretions accumulated in the subglottic space during the extubation process.<sup>1</sup>

The concept of purging the subglottic space prior to extubation was introduced

many decades ago<sup>2</sup> and is included in the extubation procedure at my hospital and at other hospitals as well.<sup>3</sup> We currently use a constant-flow-inflated Jackson-Rees resuscitation bag for the purge maneuver. Use of a high continuous positive airway pressure (CPAP) was the most efficacious method described by Doyle and colleagues.<sup>1</sup> The application of pressure support of  $\geq 15$  cm H<sub>2</sub>O resulted in no aspiration in another bench study.<sup>3</sup>

Lack of use<sup>1</sup> and knowledge of the potential benefit of this simple technique is surprising, as most major anesthesiology textbooks describe tracheal extubation via similar methods.<sup>4,5</sup> The technique is also described in respiratory care textbooks.<sup>6,7</sup> However, only low-level evidence exists to support the routine use of this technique.<sup>1,3,8,9</sup> More importantly, this maneuver can induce aspiration if done incorrectly.<sup>1,2</sup>

Further study of the application of this maneuver should focus on efficacy as well as developing the best technique (eg, high CPAP or CPAP with high pressure support). A standardized method that could be universally applied across multiple ventilator platforms and that does not require that the patient be disconnected from the ventilator would be ideal. In addition, as aspiration of colonized secretions accumulated in the subglottic space is known to be the primary cause of ventilator-associated pneumonia, clinical investigation in use of this technique as part of a ventilator-associated pneumonia prevention bundle is also warranted.<sup>10</sup>

Given this cursory data and the benefits of preventing aspiration of subglottic secretions during the extubation process, it is reasonable to recommend the clearing of subglottic secretions prior to any planned extubation or cuff deflation, because limiting the aspirated volume of oropharyngeal secretions is probably a good thing to do.

As an alternative to referring to this intervention as "blowing the pipes clean," I propose that the terminology "subglottic purge maneuver" be used for this airway care procedure, and that this new terminology be introduced into current medical lingo.

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#### Abdominal Tuberculosis

I read with interest the article by Tulczynska et al on abdominal tuberculosis: an unusual cause of abdominal pain.<sup>1</sup> I have a few queries regarding the management of that patient.

The Directly Observed Treatment, Short-course (DOTS) strategy is a government-funded national program in India, and is applicable to all patients with tuberculosis, including children. As per DOTS, 6 months of treatment is sufficient for the treatment

of abdominal tuberculosis.<sup>2</sup> I work in a municipal general hospital where many patients are unable to afford anti-tuberculosis therapy from private sources. Most of the children with abdominal tuberculosis are therefore referred to DOTS for free treatment. We have treated more than 100 children with abdominal tuberculosis, using the 6-month regimen, in the last 5 years. We have not had treatment failure or relapse in any patient who has complied with therapy.

It is not clear in the article<sup>1</sup> on what basis the patient was given anti-tuberculosis therapy for 21 months (initial 9 months plus additional 12 months). Tulczynska et al probably restarted anti-tuberculosis therapy for recurrence of symptoms. However, as the symptoms subsided within 2 days of starting treatment, it is less likely to be due to tuberculosis. Also, if failure or relapse of the disease was considered by Tulczynska et al, then the correct therapy as per DOTS would be a 5-drug anti-tuberculosis therapy.<sup>2</sup> The regimen for failure or relapse cases of tuberculosis as per DOTS is 2 months of isoniazid (H), rifampicin (R), pyrazinamide (Z), ethambutol (E), and streptomycin (S), followed by one month of HRZE, followed by 5 months of HRE therapy. I feel that extending the duration of the anti-tuberculosis therapy without any definite evidence will also extend the duration for which the patient will be exposed to the adverse effects of anti-tuberculosis drugs.

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*The author responds:*

Thank you for your interest in our recent publication regarding abdominal TB. We hope this letter will answer your questions and will address the issues mentioned in your letter.

As you know, intestinal TB is a distinctive form of abdominal TB, causing extensive scarring of the intestinal wall, followed by progressive decrease of lumen of the involved intestine (stricture formation). This process may continue for many months after anti TB treatment is completed, which raises a question whether stricture formation represents prolonged healing or, perhaps, is a reaction to an ongoing infection.

In our patient the diagnosis of intestinal TB was presumptive, the treatment was empiric, and the patient was not on a Directly Observed Therapy protocol. Because of the controversy surrounding efficacy of pharmacologic agents in treating this form of TB, we were swayed to repeat a full course of treatment (RIPE [rifampin, isoniazid, pyrazinamide, and ethambutol]) for a total of 12 months, which has been used by a number of authors.<sup>1-3</sup>

Partial intermittent bowel obstruction is a known complication of intestinal TB. The cause of this condition is mechanical obstruction and it may not relate to TB infection itself. Treatment is symptomatic. Although symptoms of partial bowel obstruction were the sole reason for our patient returning to the clinic, it did not play any role in our decision making to repeat a full treatment course. The main reason for this decision was a lack of documented evidence of the patient's compliance with prior therapy.

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