A tracheal stenosis can be caused by a direct traumatic injury to the trachea, severe tracheitis, or by factors related to intubation, i.e. cuff pressure, non-stabilised tube and poor hygiene. Persistent high cuff pressure results in the destruction of the tracheal wall. The careful monitoring of cuff pressures, tube stability and hygiene of an endotracheal or tracheostomy (ET/TT) tube could play an important role in the prevention of tracheal stenosis.

During the past few years an alarming number of patients have presented with acquired tracheal stenosis in the Bloemfontein area. Most patients were treated in intensive care units (ICUs) in the Free State. Therefore, the aim of this study was to establish whether ICU staff were adequately informed about the use and care of ET/TT tube cuffs.

Method
One hundred and twelve qualified nurses, working in 11 different ICUs, were asked to complete an anonymous questionnaire regarding endotracheal/tracheostomy tube cuffs. The nurses had to have been working for at least 6 months in their respective ICUs. The study took place over a 2-week period to ensure that the questions were answered impromptu, thus eliminating the chance of the nurses researching the topic. The ethics committee of the Faculty of Health Sciences, University of the Free State (UFS), approved the study.

Results
The results highlight the following three areas of concern: (i) there was an overall misconception in 38% of the respondents that the function of the cuff was to secure the tube in position in the trachea to prevent self-extubation; (ii) accurate regulation of cuff pressure was not routine practice in any of the ICUs; and (iii) only half of the respondents felt their training regarding cuff care management was sufficient.

Conclusions. ICU staff had misconceptions regarding the function and care of endotracheal/tracheostomy tube cuffs. The concept of a higher cuff pressure for better stabilisation of the tube is probably an important factor that could have caused the increase in tracheal stenosis in the Bloemfontein area. Critical care nursing needs to emphasise the use of current techniques, discourage routine cuff deflation, and encourage collaboration with ICU physicians on standards of care. A protocol that could be used in the ICUs regarding the use and care of an endotracheal/tracheostomy tube cuff is proposed.

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These results highlight the following three areas of concern:

1. **Stabilisation of the ET/TT tube**

   Stabilisation of the tube (and cuff) is crucial in tracheal mucosa protection. Pressure necrosis at the site of tracheostomy stoma can be reduced by the use of swivel connectors and ventilator tubing supports that will prevent undue traction on the tracheostomy tube. The tracheal mucosa is sensitive to the motion at the tip of the tube against the tracheal wall, which can be reduced by correct positioning and securing of the tube.

2. **Local infection control**

   Careful wound care can help prevent local infection that may lead to further destruction of the exposed tracheal stoma or cartilage. Although routine cuff deflation is not indicated, it can be used in the following selective situations: to clear the upper airway of secretions, to allow patients to vocalise, and to check for a cuff leak.

   The use of positive pressure when deflating cuffs to pre-
vent aspiration of upper airway secretions is a good technique that can help to prevent infection.11

3. Cuff pressure

Most physicians believe that a soft cuff on the ET/TT tube provides adequate protection of the tracheal mucosa. These soft cuffs can, however, produce suprisingly high mucosal pressures and tracheal wall necrosis if the cuff pressure is not controlled.12 The literature recommends both the minimum leak technique (MLT) and the minimum occlusive volume (MOV) for cuff inflation and the monitoring of cuff pressure to prevent tracheal injury.11 The MLT is the smallest volume of air needed in the ET/TT tube cuff, that still allows for a small air leak on inspiration.11 The MOV is the smallest volume of air needed in the ET/TT tube cuff to prevent an air leak on inspiration.11

In patients receiving mechanical ventilation with increasing airway pressures, the tracheal diameter widens on inspiration, and cuffs require higher cuff volumes and pressures to seal the dilated airway. The phenomenon known as ‘chasing the trachea’ can occur, which essentially is the scenario where more air volume is required in the cuff as the trachea is gradually ‘stretched’. In this scenario, the cuff is inflated to a recommended safe range during inspiration, when the trachea is normally dilated, but during expiration, when the trachea narrows, the inflated cuff can cause stretching of the tracheal mucosa. Over time cuff pressure decreases and ventilation pressure also decreases because of air volume leaking around the cuff due to the loss of tracheal wall integrity.

Increasing amounts of air are then required in the cuff to seal the trachea and profound dilation of the trachea can occur.

To prevent tracheal injury the ultimate cuff is one that would be partially inflated on inspiration and partially deflated on exhalation.1 Any inflatable cuff, no matter how soft, is potentially hazardous when confined within the tracheal lumen with no safety mechanism for pressure control.10 The volume of air necessary to raise the cuff pressure from the point of seal to an unsafe pressure (greater than 30 mmHg) is only 2 - 3 cc of air.10 It is, however, unrealistic to expect that the inflation volume be monitored so closely in a busy ICU.10

In some modern ICUs there are continuous cuff pressure monitors relayed to the patient’s digital display, enabling ICU staff to monitor cuff pressure accurately and continuously. The intra-cuff pressure is measured and this differs slightly from the tracheal mucosal wall pressure that is exposed to the cuff. This measurement is, however, sufficient in obtaining a reference value that can be monitored. In Third-World countries this technology is not readily available and a dynamic cuff system is sought that can safely control cuff pressure by continual measurement in an inexpensive way. The dynamic fluid-filled cuff system is being investigated as a possible option at the Faculty of Health Sciences, UPS, Bloemfontein.

This study has shown that ICU staff had misconceptions regarding the function and care of ET/TT tube cuffs. The concept of a higher cuff pressure for better stabilisation of the tube is probably an important factor that could have caused the increase in tracheal stenosis in the Bloemfontein area. Critical care nursing needs to emphasise use of current techniques (MLT, MOV),11 discourage routine cuff deflation, and encourage collaboration with ICU physicians on standards of care. A protocol that could be used in the ICUs regarding the use and care of an ET/TT tube cuff is proposed in Table IV.

REFERENCES