Bedside ultrasound has changed medical practice. Ultrasonography can confirm endotracheal intubation, assess vocal cord function, detect endobronchial intubation and diagnose pneumothorax. We present a novel use of real-time ultrasound to guide tracheal intubation in a series of 25 children. This new technique is called Ultrasound Guided Tracheal Intubation (UGTI). It is kinesthetically similar to the traditional stylet technique with visual guidance provided by the ultrasound image. We present our initial success rate with this new technique.

Introduction

Consent for intubation was obtained and all patients were intubated under general anesthesia. Twenty one patients were paralyzed for the intubation. The induction drugs, patient head position and tracheal tube stylet configuration were not standardized. A styletted tracheal tube was used for all intubations. The bend angle of the tube varied from a hockey stick angle to a 90 degree angle depending on the patient’s anatomy.

After general anesthesia was induced the ultrasound probe was placed transversely on the neck of the patient at the level of the hyoid bone. The probe was panned craniocaudally until a clear view of the vocal cords and glottic opening were obtained. The operator used their non dominant hand (thumb and index finger) to pull the mandible forward. The dominant hand inserted the styletted tracheal tube in the midline of the pharynx along the curved trajectory of the tongue until the tube was observed on the sonogram as a hypoechoic shadow.

Once visualized, the trajectory of the tracheal tube was altered in order to direct it through the glottic opening. A characteristic widening of the vocal cords was seen when the tracheal tube entered the glottic opening. An enhancement of shadowing was often seen at the glottic inlet as the tracheal tube was inserted.

Technique

UGTI Patient Data (n=25)

<table>
<thead>
<tr>
<th>Male</th>
<th>14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>11</td>
</tr>
<tr>
<td>Success</td>
<td>23</td>
</tr>
<tr>
<td>Failure</td>
<td>2</td>
</tr>
<tr>
<td>Muscle Relaxant</td>
<td>21</td>
</tr>
<tr>
<td>Age Range</td>
<td>1.5 to 23 years of age</td>
</tr>
</tbody>
</table>

Discussion

We report our experience with UGTI in 25 patients. Seventy percent of patients were intubated on the first attempt. This first attempt success rate is poor when compared to direct laryngoscopy, however 96% of patients were intubated within three attempts. The failed attempts were related to three main factors.

1. An inappropriate bend at the tip of the breathing tube
2. The inability to elevate the epiglottis to allow passage of the styletted tube.
3. The inability to localize the tracheal tube on the sonogram due to large patient size relative to the ultrasound probe size.

Two patients failed direct laryngoscopy (Grade 4 views) and were intubated with UGTI on the first attempt in less than 30 seconds. We plan to investigate the utility of UGTI in patients who fail direct laryngoscopy. We suspect UGTI may offer particular advantages when blood or secretions impair the view of the airway. There was no airway morbidity in any of the patients.

Conclusion

We have presented a new approach to intubation using real time ultrasound. UGTI represents a different approach to intubation (looking from the outside in rather than from the inside). Although this overcomes some limitations of standard direct laryngoscopy it presents new challenges and several questions remain.

1. Does UGTI offer any advantages in patients with failed direct laryngoscopy?
2. Is a single provider approach as successful?
3. What influence does paralysis have on the technique?
4. What is the optimal bend angle of the styletted tube?

UGTI is a new approach to intubation that may have unique advantages in patients with failed direct laryngoscopy. Ninety six percent of patients were intubated within three attempts.

References


