



Care of pediatric tracheostomy in the immediate postoperative period and timing of first tube change



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ABSTRACT

Objective: To analyze the safety of a standardized pediatric tracheostomy care protocol in the immediate postoperative period and its impact on tracheostomy related complications.

Study design: Retrospective case series.

Subjects: Pediatric patients undergoing tracheotomy from February 2010–February 2014.

Methods: In 2012, a standardized protocol was established regarding postoperative pediatric tracheostomy care. This protocol included securing newly placed tracheostomy tubes using a foam strap with hook and loop fastener rather than twill ties, placing a fresh drain sponge around the tracheostomy tube daily, and performing the first tracheostomy tube change on postoperative day 3 or 4. Outcome measures included rate of skin breakdown and presence of a mature stoma allowing for a safe first tracheostomy tube change. Two types of tracheotomy were performed based on patient age: standard pediatric tracheotomy and adult-style tracheotomy with a Bjork flap. Patients were analyzed separately based on age and the type of tracheotomy performed.

Results: Thirty-seven patients in the pre-protocol group and 35 in the post-protocol group were analyzed. The rate of skin breakdown was significantly lower in the post-protocol group (standard: $p = 0.0048$; Bjork flap: $p = 0.0003$). In the post-protocol group, all tube changes were safely accomplished on postoperative day three or four, and the stomas were deemed to be adequately matured to do so in all cases.

Conclusion: A standardized postoperative pediatric tracheostomy care protocol resulted in decreased rates of skin breakdown and demonstrated that pediatric tracheostomy tubes can be safely changed as early as 3 days postoperatively.

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1. Introduction

Pediatric tracheotomy has a high complication rate, with a reported incidence of 36–60% [1,2]. Anatomic and physiologic characteristics of the pediatric patient require careful surgical technique and postoperative care to minimize complications [1,3]. Common complications occurring in the immediate postoperative period include hemorrhage, development of interstitial air, accidental decannulation, cannula obstruction, and wound

complications including infection and skin breakdown [1,3–6]. While there are several publications regarding indications for and complications of tracheotomy in children [1,5,7], relatively few articles discuss tracheostomy care in the immediate postoperative period or the optimal timing of the first tube change [3,4,6,8].

At our institution, we noted that our pediatric patients were experiencing areas of neck skin breakdown in the time between tracheotomy and the first tracheostomy tube change. We began a quality improvement project to investigate this problem, explore possible solutions, and create a new standardized protocol for immediate postoperative care of pediatric patients with a tracheostomy. Our goal was to incorporate practices that would decrease skin breakdown while not compromising patient safety.

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2. Methods

2.1. Patient selection

After obtaining approval from the University of Wisconsin-Madison Health Sciences Institutional Review Board, we identified all patients under the age of 18 who underwent tracheotomy between February 1st, 2010 and February 1st, 2014 for chart review. No patients were excluded. The patients were divided into two groups: those who underwent tracheotomy during the two years prior to our protocol change (pre-protocol group) and those who underwent tracheotomy during the two years after our protocol change (post-protocol group).

2.2. Patient treatment

Prior to February 2012, all pediatric tracheostomy tubes were secured in the operating room with twill ties. The ties were secured so that two fingers fit snugly between the strap and the patient's skin. Although surgical technique was similar amongst all surgeons, postoperative wound care was not standardized. A postoperative chest x-ray was routinely obtained. All patients were seen in the critical care unit on postoperative day one by the otolaryngology team, then every other day until the first tube change. The first tube change was performed at the patient's bedside on approximately postoperative day 7 (range day 4–8, median day 7). Dressing changes were not performed routinely prior to the first tube change and twill ties were not changed or manipulated.

Beginning in February 2012, the new standardized care protocol was initiated and every tracheostomy after that date was managed in accordance with this protocol. There was no change in operative technique. All tracheostomy tubes were secured in the operating room with a soft foam strap with hook and loop closure rather than twill ties. The strap was secured so that two fingers fit snugly between the strap and the patient's skin. A suture was placed through the strap at all adjustable sections so that the tension could not be altered (Fig. 1). A split drain sponge was placed under the tracheostomy tube in the operating room. A postoperative chest x-ray was routinely obtained. All patients had their drain

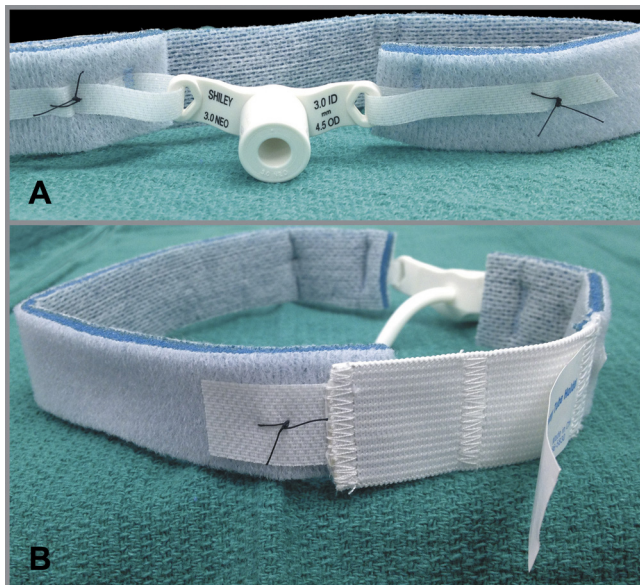


Fig. 1. Front (A) and rear (B) views of foam strap with hook and loop closure and sutures placed at all adjustable points.

sponge changed daily by the otolaryngology team. The first tube change was performed at the patient's bedside with an attending otolaryngologist or senior otolaryngology resident and the patient's nurse on postoperative day 3 or 4. Stomal maturity was carefully assessed by the otolaryngology team. A stoma was considered to be adequately mature if the tract had epithelialized and the open edges of the tracheal wall had secured to the subcutaneous tissues. A respiratory therapist was present for tube changes on children receiving ventilatory support.

2.3. Surgical technique

All tracheotomy procedures were performed in the operating room. Three pediatric otolaryngologists performed all tracheotomies in both groups. Depending on the patient's age and anatomy, one of two tracheotomy techniques was employed in both the pre-protocol and post-protocol groups. In the majority of patients, a standard pediatric tracheotomy was performed. Specifically, a skin incision was made and the subcutaneous fat near the incision was removed. Absorbable sutures secured the skin edges to the anterior tracheal wall, maturing the stoma. Bilateral full thickness stay sutures were placed through the anterior tracheal wall and a vertical tracheal incision made. Tracheal cartilages were not excised, nor were cartilage flaps or tracheostomy flanges sutured to the skin. The stay sutures were labeled left/right and taped to the anterior chest wall until the time of first tube change.

In a subset of older patients (ages 12 to 17 years) with more mature anatomy, an adult style tracheotomy was performed. Specifically, the tracheal incision was horizontal, and an inferiorly-based Bjork flap was created. Separate analyses were performed for the two types of tracheotomy.

All patients were cared for in the pediatric intensive care unit (PICU) until the first tracheostomy tube change. Most patients had medical comorbidities requiring critical care management; however, it is our institutional practice to monitor pediatric patients with a fresh tracheostomy in the PICU setting – even if they are otherwise not critically ill – as our PICU medical personnel are most familiar with managing the critical airway should a complication arise. The tube change was done at the bedside with suction equipment and a spare tracheostomy tube available. Patients were positioned with the neck extended and the tube suctioned if necessary prior to removal. A new tracheostomy tube of the same brand, model, and size as the original tube was inserted with the obturator in place, and the obturator was removed immediately after successful insertion. No tracheostomy tube was changed over a catheter, although equipment for this was available at bedside. Stay sutures were removed after the tube change. Feedings were not restricted before the procedure.

2.4. Statistical analysis

Patient characteristics including demographic information, indications for the tracheotomy, details of the tracheotomy, complications prior to the first tracheostomy tube change, complications related to the tube change, difficulty with the tube change, whether the patient was mechanically ventilated at the time of the first tube change, postoperative day of the first tube change, maturity of the stoma, and the presence of skin breakdown related to the tube or securing straps were collected. Skin breakdown was defined as loss of integrity of the normal skin barrier and included erosions (loss of portion of epidermis) and ulcers (loss of part or all of dermis). Consistent, standardized language was not available in documentation to determine ulcer staging. Accordingly, all instances were considered as “skin breakdown” and not further subdivided according to severity.

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