Laryngology Seminar - Percutaneous Tracheostomy

R3 鄭爵儀
Introduction

- Shelton in 1955: A new method of tracheostomy
- Toye and Weinstein in 1969: A percutaneous tracheostomy device: 6% tube displacement
- The Ciaglia method, developed in 1985, uses graded dilators and is currently the most popular method.
- The Griggs technique, described in 1990, is a one-stage dilation technique using a modified Howard-Kelly forceps as tracheal dilator
Percutaneous tracheostomy

Figura 1

Figura 2

Figura 3

Figura 4
Ciaglia’s Blue Rhino Method
mise en place du guide J et retrait du cathéter

dilatateur de canulation

canule de trachéotomie

aveancer l’ensemble dilatateur-canule de trachéotomie sur le catheter guide jusque dans la trachée

... puis retirer le dilatateur le catheter guide et le guide J
PercuTwist Method

Méthode de FROVA - PercuTwistTM

DIFFÉRENTES FORCES DE ROTATION
Les différents diamètres au niveau de la poignée permettent d’exercer différentes forces de rotation lors de la pénétration dans le tissu, suivant le besoin de chacun. La force exercée est moins importante en haut de la poignée tandis que la rotation du bas de la poignée augmente la force exercée.

SÉCURITÉ OPTIMALE
Le nouveau revêtement hydrophile du pas de vis tranchant facilite l’introduction dans les tissus et réduit ainsi la force requise. Les forces nécessaires à la pénétration peuvent être contrôlées à chaque tour.
Grigg’s Method
Fantoni’s Method

Fig. 1 Kit for TLT with essential components enumerated: 1 rigid cuffed tracheoscope; 2 curved needle; 3 wire; 4 cone-cannula device and cuff balloon and attachable inflating tube with pilot bag; 5 plastic obturator for rotating the cannula; 6 pull handle; 7 cuffed catheter
Fantoni’s Method
Single V.S Multiple dilator

- Prospective randomize trial, 50 patients
- Single-dilator: 6.01+3.03 mins
  Multiple-dilator: 10.01+4.26 mins (P<.0006)
- No significant difference in complication between 2 technique(12:14)
- Single: minimize risk of injury to the posterior tracheal wall
- Routine bronchoscopy is unnecessary if surgeon is directly palpating the trachea

PercuTwist V.S Blue Rhino

- Prospective randomize trial, 70 patients
- PercuTwist:
  - lift anterior tracheal wall during dilation
  - keep tracheal lumen opening
  - unrestricted bronchoscopic view at any time
- PercuTwist:
  - the stoma remains opening even after removal the dilator

**PercuTwist V.S Blue Rhino**

**Table 1** Subjective assessment of the procedure (PT PercuTwist; CBR Ciaglia Blue Rhino)

<table>
<thead>
<tr>
<th></th>
<th>I</th>
<th></th>
<th>II</th>
<th></th>
<th>III</th>
<th></th>
<th>IV</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PT</td>
<td>CBR</td>
<td>PT</td>
<td>CBR</td>
<td>PT</td>
<td>CBR</td>
<td>PT</td>
<td>CBR</td>
</tr>
<tr>
<td>Stoma dilation <em>n</em></td>
<td>30</td>
<td>33</td>
<td>5</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Tracheostomy cannula insertion <em>n</em></td>
<td>21*</td>
<td>33</td>
<td>6</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>6*</td>
<td>0</td>
</tr>
</tbody>
</table>

* *p* <0.05 vs. Ciaglia Blue Rhino

**Stoma dilation**

I – no difficult  
II - some difficult, but possible  
III- impossible, switch another method

**Tracheostomy cannula insertion**

I – no difficult  
II - minor difficult  
III- Very difficult, but possible  
IV- insertion impossible, switch another method

### PercuTwist V.S Blue Rhino

#### Table 2: Complications during PercuTwist (PT) and Ciaglia Blue Rhino (CBR) tracheostomy

<table>
<thead>
<tr>
<th>Complications</th>
<th>Intervention</th>
<th>PT</th>
<th>CBR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Serious complications</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cardiopulmonary arrest</td>
<td>Conversion to CBR after reintubation</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Tracheoesophageal fistula</td>
<td>Surgical repair required</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td><strong>Intermediate complications</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Posterior tracheal wall perforation</td>
<td>None</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td><strong>Minor complications</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cannula false passage</td>
<td>Conversion to CBR</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Cannula insertion impossible</td>
<td>Conversion to CBR</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Tracheal cartilage fracture</td>
<td>None</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Short oxygen desaturation (SpO₂&lt;90%)</td>
<td>None</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Cuff lesion during cannula insertion</td>
<td>Cannula exchange</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Subcutaneous emphysema</td>
<td>None</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Bleeding</td>
<td>None</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td><strong>Overall complications</strong></td>
<td></td>
<td>12</td>
<td>7</td>
</tr>
</tbody>
</table>

Various method comparison


Important details

- Use a deflated ET cuff and increased tidal volume on ventilator → maintain normal PaCO₂
- Adequate skin incision → easy palpable and identify tracheal cartilage
- Directing the cannula needle caudally to proper identify the tracheal air column
- A new ridge on the 8F Teflon guiding catheter → prevent posterior tracheal wall injury by dilators
- Single cannula flexible TT and a longer TT if indicated

Some important details in the technique of percutaneous dilational tracheostomy via the modified Seldinger technique. *Chest 1996; 11028:1262-1266*
Important details

- A double swivel connection and flexible tubing to connect patient to ventilator \(\rightarrow\) lessen trauma to stoma
- Fenestrated TT allow taking in conscious patient
- Use a disposable end-tidal CO2 monitor and bronchoscope \(\rightarrow\) confirm intra-tracheal position
- Minor complication: 6.5% (Total: 254 patient)
  Major complication: 1.5%
  Mortality: 0.39%

Some important details in the technique of percutaneous dilational tracheostomy via the modified Seldinger technique. *Chest* 1996; 11028:1262-1266
PDT versus ST

- 17 randomize clinical trials, 1212 patients
- Wound infection → significant reduction with PDT compared to ST
- PDT was equivalent to ST for bleeding, major peri-procedural and long term complications
- When compared to ST performed in OR → PDT results in lower incidence of bleeding, death and a trend towards shorter duration of translaryngeal intubation prior to tracheostomy

PDT advantages

- Relatively simple technique suitable in ICU
- No requirement of OR room and transport
- Reduce blood loss
- Lower infection rates
- Shorter duration of translaryngeal intubation
- Cosmetic scar

Emergency tracheostomy tube placement

- Difficult to palpate the anatomical landmarks:
  - very obese patient
  - short or bull neck
  - enlarged thyroid
  - nonpalpable cricoid cartilage
  - gross deviation of trachea

- Infection at or near the intended site for tracheostomy
Surgical > Percutaneous

- Malignancy at the site of tracheostomy

- In pediatric group (controversial). Children have a more compliant trachea leading to a tendency to collapse when pressure is exerted with dilators.

- Previous neck surgery may distort the anatomy.

- In unstable cervical spine fracture.

- Uncontrolled coagulopathy (relative contraindication)