

# New method for the fixation of the endotracheal tube in patients with facial hair

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طريقة جديدة لتثبيت أنبوب التنبيب الرغامى في مرضى يغطي الشعر وجوههم  
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**الخلاصة:** يواجه أطباء التخدير في البلدان الإسلامية مشكلة رفض المرضى حلق لحاهم، وقد لا يصبح من الممكن تثبيت أنبوب التنبيب الرغامى في هؤلاء المرضى، فيما قد يسبب الرباط القطني الذي يلف حول العنق انسداداً في طريق حود الدم الوريدي. وقد تمت مقارنة أداة جديدة مصنوعة على شكل قناع من الجلد الاصطناعي مع طريقتين أخريين في تجربة اعتشائية (موزعة عشوائياً) على 900 مريض أجري لهم تخدير عام. ولم يلاحظ لدى المجموعة الأولى تغير في موضع أنبوب التنبيب الرغامى أو انضغاط أوردة العنق أو حدوث تفاعل جلدي، لدى استخدام القناع الجلدي، بالمقارنة مع المجموعة التي تستخدم الشريط اللاصق والمجموعة التي تستخدم الرباط القطني. ويمكن لهذا القناع الجلدي أن يستخدم لمرات متكررة وأن يعقم بالمؤسدة، وأن يصنع بمقاييس مختلفة، وأن يقيس الأريحية التي قد تحدثها الشرائط اللاصقة، كما أنه ملائم لتنظير الرغامى ومص المفرزات وإدخال الأنبوب الهوائي عبر الفم.

**ABSTRACT** A problem faced by anaesthetists in Islamic countries is the unwillingness of patients to shave their facial hair. Adhesive tapes may not adequately secure an endotracheal tube in these patients, and a cotton band around the neck may cause obstruction of the venous return. A new device, a synthetic leather mask, was compared with the two other methods in a randomized trial on 900 patients undergoing general anaesthesia. No displacement of the endotracheal tube, pressure on the neck veins, or skin reaction were observed in the mask group compared with the adhesive tape and the cotton band groups. The mask can be reused, autoclaved and made in several sizes, prevents allergies to adhesive tape and is suitable for laryngoscopy, suctioning and inserting the oral airway.

## Nouvelle méthode de fixation du tube endotrachéal chez les patients ayant une pilosité faciale

**RESUME** Dans les pays islamiques, la réticence des patients à raser leurs poils faciaux constitue un problème auquel les anesthésistes sont confrontés. Les rubans adhésifs peuvent ne pas fixer correctement le tube endotrachéal chez ces patients, et une bandelette de coton autour du cou peut causer une obstruction du retour veineux. Un nouvel appareil - un masque en cuir synthétique - a été comparé avec les deux autres méthodes dans un essai randomisé chez 900 patients subissant une anesthésie générale. On n'a observé aucun déplacement du tube endotrachéal, aucune pression sur les veines du cou ou réaction cutanée dans le groupe portant le masque par rapport aux groupes pour lesquels le ruban adhésif et la bandelette de coton ont été utilisés. Le masque peut être réutilisé, stérilisé à l'autoclave et fabriqué en diverses tailles ; il évite les allergies au ruban adhésif et convient à la laryngoscopie, l'aspiration et l'intubation endotracheale.

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## Introduction

Fixation of the endotracheal tube (ETT) has long been a concern of anaesthetists particularly when the patient needs to be intubated for a long period [1]. Unintentional or accidental extubation or endobronchial intubation are undesirable complications in mechanically ventilated patients [2–5].

One of the major problems of anaesthetists in the Islamic Republic of Iran is the unwillingness of patients to shave their facial hair due to religious beliefs or personal reasons, and this problem may be observed in many other Islamic countries. No standard and appropriate method has yet been suggested to solve this problem.

Two methods—employing adhesive tape or a cotton band around the neck—have been described in the literature. Adhesive tape is used to secure the ETT to the maxilla or mandible [3]. However, this technique may not adequately secure the ETT in patients with facial hair and may cause allergic reactions to adhesive tape [3]. Using a cotton band around the neck may cause the obstruction of the venous return and raise the intracranial pressure in susceptible patients. This method limits the access to the jugular vein and also does not securely fix the ETT tube [3].

No helpful technique to overcome these problems in patients with facial hair has been described in the literature, except Khorasani and Bird, who reported the fixation of the ETT by adhesive tape to the moustache hair [3]. However, anaesthetists do not regard it as an ideal method. In this study, we have devised a mask to solve these problems and the new technique is compared with the two existing methods: adhesive tape and cotton band.

## Methods

A synthetic leather mask was introduced as a new device for the fixation of the ETT. This mask has a hole for the ETT—there is no need to attach adhesive tape to the patient's skin (Figure 1). The inner surface of the mask is covered with a natural cotton textile to reduce allergic reactions. The mask is held tightly in place by four Velcro tapes and is attached to an occipital circle shape pad. The ETT passes through the orifice in the mask and is fixed tightly to it by adhesive tape.

Nine hundred patients (aged from 20 to 50 years) who were to be under general anaesthesia for at least 2 hours were randomly selected to compare these 3 methods. The patients were divided into 3 equal groups, as follows:

- *Cotton band group.* A cotton band encircled the ETT and tied around the neck.



Figure 1 Fixation of the endotracheal tube using the new mask

- *Adhesive tape group.* The ETT was fixed with two zinc oxide adhesive tapes (20 cm length, 1 cm width). Tincture of benzocaine was applied to all contact surfaces [6]. After drying and formation of a firm grip, the adhesive tape was encircled around the tube and was fixed to the maxilla above the upper lip and down the lower lip portions [5].
- *Mask group.* The ETT was fixed as in the second group except that all the contact points were on the outer surface of the mask and adhesive tape made no contact with the patient's skin. The mask has an opening for the ETT to facilitate access to the airway.

In order to compare the benefits of the 3 methods, the following were noted:

- Displacement of the ETT in or out of its original position for at least a distance of 1 cm after 15, 30, 60 and 120 minutes after induction of anaesthesia and fixation of the ETT in the absence of any head movement.
- Displacement of the ETT in or out of its original place at least 1 cm when the head was tilted left or right after 15, 30, 60 and 120 minutes after induction of anaesthesia and fixation of the ETT in the absence of any head movement.
- Compression of the external jugular vein recognizable by the naked eye on either side of the fixed device after 15, 30, 60 and 120 minutes after induction of anaesthesia and fixation of the ETT in the absence of any head movement.
- The presence of any skin reaction such as rash or redness after 2 and 12 hours after induction of anaesthesia and fixation of the ETT.
- The presence of any problem in laryngoscopy or suctioning during the operation.

The patients in the adhesive tape group whose ETT was considerably displaced (more than 2 cm) were omitted from the study for ethical reasons, and fixation was reinforced by using a cotton band. All results were statistically analysed and compared using the chi-squared and Mantel-Haenszel tests.

## Results

Table 1 compares the 3 methods of securing the endotracheal tube (ETT) in 223 patients with and 677 without facial hair, showing the probability that the tube was not displaced and did not put pressure on the jugular vein. The results show that in patients with facial hair, the displacement was most likely in the adhesive tape group (i.e. lowest probability not to cause displacement). Displacement was less likely in the cotton band group and was absent in the mask group. Displacement due to head movement was mostly probable in the adhesive tape group too and was lower in the cotton band group and absent in the mask group. Pressure on the neck veins was seen in the cotton band group but absent in both adhesive tape and mask groups. The differences between the three treatment groups were statistically significant ( $P < 0.0001$ ).

In patients without facial hair the ETT was most likely to be displaced in the cotton band group, and less likely in the adhesive tape group. No displacement was found in the mask group ( $P < 0.0001$  comparing treatment groups). Displacement of the tube due to head movements was seen mostly in the cotton band group, but was observed in the adhesive tape group after 120 minutes of the operation. No such displacement was present in the mask group.

**Table 1 Comparison of 3 methods of securing the endotracheal tube (ETT) in 223 patients with and 677 without facial hair: probability that the tube was not displaced and did not put pressure on the jugular vein**

Measures	Probability that ETT was not displaced:			
	After 15 minutes	After 30 minutes	After 60 minutes	After 120 minutes
<i>Displacement</i>				
Without facial hair				
Cotton band	0.97	0.95	0.94	0.93
Adhesive tape	1.00	1.00	1.00	0.99
Mask	1.00	1.00	1.00	1.00
With facial hair				
Cotton band	0.96	0.96	0.96	0.96
Adhesive tape	0.84	0.81	0.81	0.79
Mask	1.00	1.00	1.00	1.00
<i>Displacement in rotation</i>				
Without facial hair				
Cotton band	0.98	0.97	0.97	0.97
Adhesive tape	1.00	1.00	1.00	0.88
Mask	1.00	1.00	1.00	1.00
With facial hair				
Cotton band	0.92	0.90	0.90	0.88
Adhesive tape	0.84	0.84	0.84	0.84
Mask	1.00	1.00	1.00	1.00
<i>Pressure</i>				
Without facial hair				
Cotton band	0.94	0.91	0.87	0.76
Adhesive tape	1.00	1.00	1.00	1.00
Mask	1.00	1.00	1.00	1.00
With facial hair				
Cotton band	0.86	0.78	0.74	0.64
Adhesive tape	1.00	1.00	1.00	1.00
Mask	1.00	1.00	1.00	1.00

The greatest probability of pressure on the neck veins was observed in the cotton band group but was not seen in the adhesive tape and mask groups ( $P < 0.0001$ ).

A skin reaction was observed in 30 patients in the adhesive tape group and 3 of the cotton band group after 2 hours. After 12 hours, the reactions were visible only in 5 patients of the adhesive tape group. In the

mask group, no skin reactions were observed.

## Discussion

This mask has been introduced as a new device allowing anaesthetists to have not only a secure endotracheal tube but also

trouble-free extubation. The advantages of the mask are: it can be reused; it can be prepared in several sizes; it can be used in a supine position, especially in long-term ventilatory management; and there is no limitation for laryngoscopy, suctioning and accessing the oral airway. It can also be sterilized: autoclaving for 20 minutes at 134 °C was sufficient for the sterilization of the device [7]. Autoclaving for 3 hours was performed several times without any damage to the mask.

The mask easily overcomes the problems with adhesive tape and cotton band methods and is superior to that of Khorasani and Bird [3], because they have not recommended their method in long-term ventilatory management and also the cuff must be placed 3–4 cm distal to the vocal cords. Our method does not require long facial hair [3].

Displacement of the tube in the adhesive tape group could be as a result of a decrease in the adhesive power of the tape.

Pressure on the neck veins in the cotton band group causes soft tissue oedema and decreases the space for blood flow. The most frequent displacement of the ETT was observed in the cotton band group and may be due to elongation of the cotton band fibres.

No unwanted extubation or tubal dislocation was observed in the mask group and as external jugular vein obstruction and allergic reactions were also absent in this group, we can highly recommend the mask for patients who are unwilling to shave their face due to religious beliefs or personal reasons or for those who are allergic to adhesive tapes. However, this mask is not recommended for patients in the prone position.

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