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## Preliminary Report

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# Emergency tracheal intubation of patients lying supine on the ground: influence of operator body position

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**Purpose:** To evaluate the influence of operator body position during emergency intubation of patients lying on the ground.

**Methods:** This study was carried out in the prehospital setting by French mobile intensive care units. Two operator body positions (left lateral decubitus and kneeling) for emergency intubation of patients lying supine on the ground were compared in an observational prospective study. Each operator completed a questionnaire regarding conditions of intubation after patient completion.

**Results:** The incidence of laryngoscopic difficulty was lower in the left lateral decubitus group compared to the kneeling group (11.1% vs 26.9% respectively;  $P < 0.01$ ). The number of attempts required for successful intubation was ( $P < 0.05$ ) higher in the kneeling group than in the left lateral decubitus group.

**Conclusion:** Emergency tracheal intubation of supine patients on the ground may be greatly facilitated by the use of the left lateral decubitus position of the operator.

**Objectif:** Ce travail évalue l'influence de la position de l'opérateur lors d'une intubation en urgence d'un patient gisant sur le sol.

**Méthodes:** L'étude a été réalisée en milieu extra-hospitalier par les équipes des Services Mobiles d'Urgences et de Réanimation. Deux positions de l'opérateur (décubitus latéral gauche versus à genoux) pour l'intubation d'un patient allongé au sol sur le dos ont été comparées dans cette étude prospective. Chaque opérateur remplissait un questionnaire concernant les conditions d'intubation immédiatement après la prise en charge du patient.

**Résultats:** L'incidence des laryngoscopies difficiles est significativement plus faible dans le groupe ayant la position décubitus latéral gauche comparée au groupe à genoux (11,1% vs 26,9%;  $P < 0,01$ ). Le nombre de tentatives nécessaire pour réaliser une intubation était significativement plus grand dans le groupe à genoux ( $P < 0,05$ ) par rapport au groupe décubitus latéral gauche.

**Conclusion:** L'intubation en urgence de patients gisant sur le sol est facilitée par la position en décubitus latéral gauche de l'opérateur.

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**E**MERGENCY tracheal intubation is the definitive procedure for airway management in critically ill patients.<sup>1</sup> This procedure is considered more difficult in the emergency environment and prehospital setting than in the operating room.<sup>2-4</sup>

Intubation of a patient lying supine on the ground involves an added difficulty as the head of the operator is often above the head of the patient. Thus, the operator's visual axis cannot align with the patient's tracheal axis. We have recently described a new operator position, the left lateral decubitus (LLD) (Figure 1), for intubating the trachea in patients who are lying supine on the ground.<sup>5</sup>

The goal of the current study was to evaluate prospectively the LLD *versus* the kneeling (KN) position for tracheal intubation in patients lying on the ground.

### Methods

The study was approved by the ethics committee of our institution and was performed in suburbs of Paris (Seine-Saint-Denis-population 1,500,000). Prehospital advanced life support in France is provided by anaesthetists or emergency physicians. The LLD operator position has been taught in our Anesthesiology and Emergency Medicine departments for the last three years.

In a six-month period, all patients lying on the ground on whom out-of-hospital tracheal intubation was performed were studied prospectively. Only patients in whom intubation was performed with the operator in either the LLD or KN position were included. The operator completed a one page checklist concerning the circumstances of intubation and recorded data pertinent to the patient and intubation procedure upon completion of the patient's care.

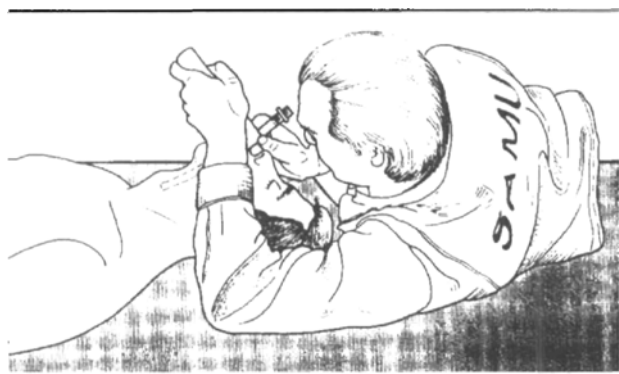


FIGURE 1 Left lateral decubitus position for tracheal intubation in a patient lying supine on the ground

Glottic exposure was evaluated during the first intubation attempt before eventual laryngeal pressure by the first operator and defined by the Cormack grade.<sup>6</sup> Grade I corresponded to complete visualisation of the vocal cords, Grade II to visualisation of the inferior portion of the glottis, Grade III to visualisation of only the epiglottis and Grade IV to a non-visualised epiglottis. Difficult laryngoscopy was defined as a Cormack score of Grade III or IV.<sup>7</sup>

Analysis of categorical variables was performed using the Chi-square test and analysis of continuous variables was performed using the Student's *t* test. Variables with non Gaussian distribution were analysed using the non parametric Mann-Whitney U test. A *P* value < 0.05 was considered statistically significant for all tests.

### Results

During the six months of this study, 374 patients were studied. The patients ranged in age from 2 to 93 yr; the median age (10th–90th percentile) was 54 (28–79) yr. Indications for prehospital emergency intubations were cardiac arrest (278; 74.3%), neurological distress (67; 17.9%), respiratory distress (20; 5.3%), and shock (9; 2.4%). The distribution of indications did not differ in the LLD and KN groups. Six (1.6%) impossible intubations were reported. The median (10th–90th percentiles) number of attempts for successful intubation was 1 (1–3).

Two hundred and seventy-one (72.5%) patients were included in the KN group and 72 (19.2%) in the LLD group. Other operator positions included prone (21; 5.6%), and sitting (10; 2.7%). There was a (*P* < 0.001) relationship between glottic exposure and operator position (Figure 2A). The incidence of laryngoscopic difficulty (Cormack grade III or IV) was lower in the LLD group than in the KN group (11.1% *vs* 26.9%; *P* < 0.01). The frequency of using external laryngeal pressure was also lower in the LLD group (15.3% *vs* 36.5%; *P* < 0.001).

Distribution of number of attempts required for successful intubation for the two positions is shown in Figure 2B. The number of attempts required was (*P* < 0.05) lower in the LLD group (median, [25th–75th] percentiles were 1, [1–1] respectively) than in the KN group (median, [25th–75th] percentiles were 1, [1–2] respectively).

### Discussion

Our study demonstrated that the LLD operator position was associated with easier laryngoscopic glottic exposure and easier intubation than the KN position. Previous studies indicated three anatomical constraints which prevented visualisation of the vocal cords: (1)

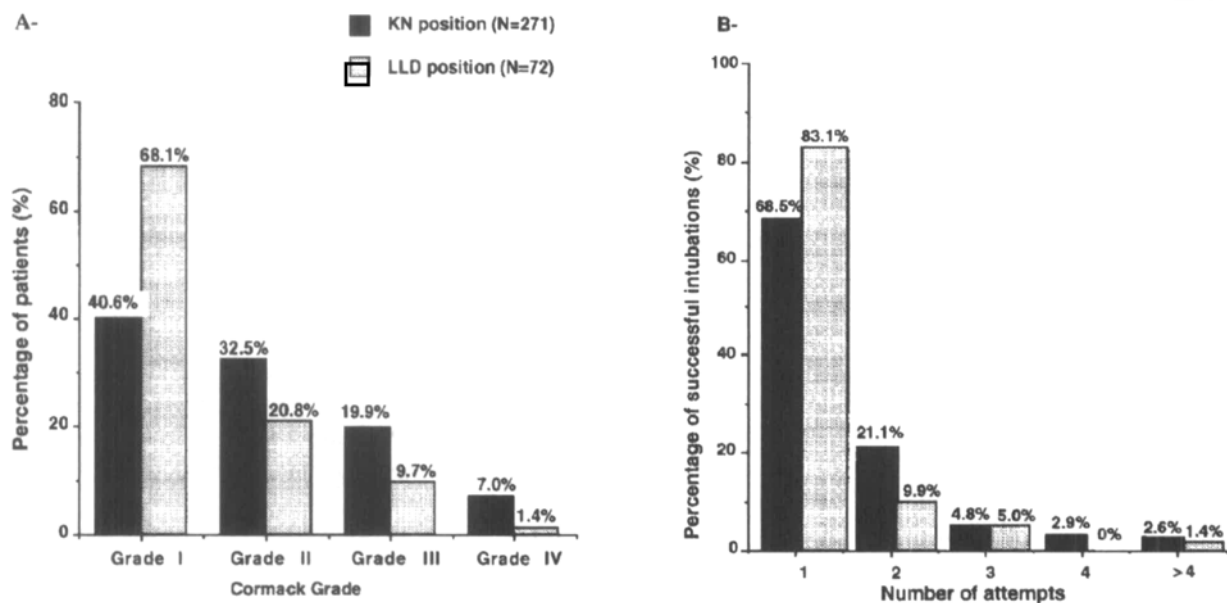


FIGURE 2 Intubation and laryngoscopic difficulties as function of operator body position

A Cormack Grade distribution.

B Number of attempts for successful tracheal intubation.

prominent upper incisors; (2) large and posteriorly located tongue and (3) anterior larynx.<sup>7</sup> As patients in these studies were generally lying on an operating table, the visual axis of the operators was not a constraint. Visualisation of the vocal cords involves alignment of the operator visual axis and the patient tracheal axis. We have postulated that the KN position does not allow this alignment since the operator head must be very low for alignment to occur. Among positions with the head of operator close to ground, we have preferred the LLD for several reasons: (1) the head of the physician is lowered, thus bringing the visual axis in line with the glottic axis; (2) the left forearm acts as a lever during exposure, minimising effort during the exposure; (3) the right arm remains free to permit tube placement and suctioning. Furthermore, the left forearm lever effect provides stability in maintaining glottic exposure, thus eliminating the need for wrist pivot and subsequent dental trauma. Our previous study with mannequins showed that this LLD position was associated with easier and faster intubation.<sup>5</sup>

The number of attempts required for successful intubation differed between the LLD and KN positions. However, the relationship between number of attempts and quality of glottic exposure remains unclear. Few studies report successful intubation on the first or second attempt without visualisation of the glottis.<sup>8</sup> Operators in our study were able to change position if the first attempt at intubation in the KN

position was unsuccessful. However, only the first position and first laryngoscopy were investigated. We suspect that when an operator was unable to visualise the laryngeal aperture, he moved his head closer to the ground to facilitate intubation.

Although we prefer the LLD position for tracheal intubation in patients lying on the ground, a lack of space in the prehospital setting may occasionally preclude its use. The findings of this preliminary report will require verification in a randomised trial.

In conclusion, operator position is an important factor in determining difficulty of tracheal intubation in patients lying supine on the ground. The LLD position is associated with better glottic exposure and easier intubation than the kneeling position for emergency intubation of patients lying supine on the ground.

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