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ORIGINAL ARTICLE

A prospective, randomised, cross-over trial comparing two standard polyvinyl chloride tracheal tubes. Are all the tubes the same?☆

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KEYWORDS
Endotracheal tube;
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Abstract
Background: A randomised study was conducted on the number of attempts made during the conventional endotracheal intubation of a mannequin using two polyvinyl (PVC) tracheal tubes, apparently similar but from different manufactures: Intersurgical (IS; Intersurgical S.L., Madrid, Spain) and Mallinckrodt (ML; Mallinkrodt Medical S.A., Madrid, Spain).
Methods: A total of 26 anaesthesiologists, in randomly established order (generated by Epidat 3.1) intubated a mannequin twice using a different tube each time. The tubes were masked by painting them to prevent recognition. The main outcome of the study was to compare the number of attempts needed to complete the manoeuvre for each tube. Data on intubation time and failed intubations were also collected.
Results: The number of attempts with the ML tube was significantly lower than with the IS tube. Intubation was completed on the first attempt with the ML tube in 93.3% of cases, while using the IS tube the percentage fell to 30.8% (Fisher exact test, $p < 0.001$). The time required to complete the manoeuvre was greater with the IS tube (median 10.8 s, interquartile range 6–22) than with the ML tube (median 4.4 s, interquartile range 3.5–6.3).
Conclusions: The PVC tube from the ML manufacturer was superior when compared with the IS, the latter was also associated with a larger number of attempts to complete intubation using a conventional Macintosh blade.
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PALABRAS CLAVE
Tubo endotraqueal;
Morfología;
Manejo de la vía aérea;
Punta

Estudio prospectivo, aleatorizado y cruzado que compara 2 tubos endotraqueales de polivinilo. ¿Son todos los tubos iguales?

Resumen
Introducción: Los autores comparan de forma aleatorizada el número de intentos durante la intubación endotraqueal convencional de un maniquí utilizando 2 tubos de polivinilo (PVC) aparentemente similares pero de distinto fabricante: Intersurgical (IS; Intersurgical S.L., Madrid, España) y Mallinckrodt (ML; Mallinkrodt Medical S.A., Madrid, España).
Método: Veintiséis anestesiólogos experimentados intubaron 2 veces un maniquí utilizando un tubo diferente en cada ocasión y cuyo orden fue establecido de forma aleatoria (secuencia aleatoria generada por Epidat 3.1.). El tubo fue pintado para enmascararlo y no ser reconocido por el participante. El objetivo principal del estudio era comparar el número de intentos necesarios para completar la maniobra con cada tubo. El tiempo de intubación y las intubaciones fallidas también fueron recogidos.
Resultados: El número de intentos con el tubo de ML fue significativamente menor que con el tubo de IS. Con el de ML se completó la intubación al primer intento en el 93,3% de los casos, mientras que con el de IS el porcentaje se redujo al 30,8% (test exacto de Fisher, $p < 0,001$). El tiempo necesario para completar la maniobra fue mayor con el tubo de IS (mediana 10,8 s, rango intercuartílico 6-22) que con el tubo de ML (mediana 4,4 s, rango intercuartílico 3,5-6,3).
Conclusiones: El tubo de PVC de la casa ML se mostró superior al compararlo con el de IS, asociándose este último a la necesidad de un mayor número de intentos para completar la intubación de un maniquí. Los autores han atribuido estos resultados a un defecto en la curvatura de la punta del tubo de IS.
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Introduction

Over 50 different endotracheal tubes (ETT) are currently available on the market. They are all very similar, but each has a particular distinguishing feature. It is important to understand the characteristics of these tubes in order to choose the most suitable device in each situation.

The body of the ETT comprises a standard 15 mm connector and an optional inflatable cuff. The characteristics of the tube can differ in terms of the shape of the bevel or the presence or absence of a Murphy eye. The shape of the tube can also differ, depending on the material used in its manufacture.

The shape of the ETT tube will affect its passage through the vocal cords during endotracheal intubation.[1]

Few studies have compared the morphological differences between various tubes,[2–4] and even fewer have compared the effects of the tip design on the conventional intubation technique: direct Macintosh laryngoscopy.[5–8]

Differences in the tip angle can optimise or in some cases hinder intubation in apparently simple clinical situations.[6–8]

In routine clinical practice, anaesthesiologists will be more concerned about which device to use than the type of endotracheal tube and the requirements it must meet to ensure a satisfactory outcome.

This is the first prospective randomised study comparing the success rate of 2 polyvinyl (PVC) ETTs from different manufacturers. The intubation was performed using Macintosh larygoscopy in a mannequin. Although very similar at first glance, the tubes differed slightly in both shape and consistency.

The aim of this study was to explore the effect of qualitative differences between the tubes on the success rate of endotracheal intubation performed on a mannequin

Materials and methods

The sample size was calculated for an expected first-attempt success rate of 90% using the ML device, and 50% using the IS device. A total of 23 paired observations were needed to compare paired proportions with a confidence interval of 95% and a statistical power of 80%. All 26 anaesthetists in our department were invited to take part in the study, assuming a refusal rate of 10%.

All members of the department (from the difficult airway school of Denia Hospital CEDIVA) with over 3 years experience as an anaesthetist were included in the study. The experimental intubations were performed on a mannequin with Cormack–Lehane grade II visualisation of the glottis, following alignment. A Macintosh number 3 blade was used. Two number 8, PVC tubes were used. The standard Mallinkrodt tube (ML; Mallinkrodt Medical S.A., Madrid, Spain) was the control tube, and the standard Intersurgical (IS; Intersurgical S.L., Madrid, Spain) device was the experimental tube. The tubes were similar except for a slight variation in the angle of the distal third. Study participants were unaware of this difference.

Each participating anaesthetist used first 1 model and then the other, according to a randomised sequence

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