

BRIEF REPORT

Diametrical differences between Blue-Rhino® kit loading dilators and percutaneous tracheostomy tubes

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SUMMARY

Percutaneous tracheostomy is a common procedure in intensive care unit. The different diameters of loading dilators in the standard Blue Rhino percutaneous tracheostomy kit and available tracheostomy tubes means that difficulties may be encountered during the procedure due to formation of a 'step' between the tube and the loading dilator. This increases the potential for complications and might add to the cost. In order to find out the best combination of tracheostomy tubes and loading dilators, this study compared the various tracheostomy tubes. Size 8 of all tracheostomy tubes had the best fit when used with specific loading dilators in the standard Blue Rhino Kit. It is recommended that a size 8-tracheostomy tube be chosen with the standard Blue Rhino technique for percutaneous tracheostomy. If a smaller tube is deemed necessary, a size 7 will provide a good fit.

Key Words: Percutaneous tracheostomy; Blue Rhino; Tracheostomy tubes; Loading dilators

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INTRODUCTION

Percutaneous Dilatational Tracheostomy (PDT) is a common procedure performed on critically ill patients in intensive care. Ciaglia Blue Rhino™ (Cook, 5690 AE Son, The Netherlands) is the most popular PDT set used in the United Kingdom (1) and is currently the standard choice in our unit. Among other contents, the standard Blue Rhino kit (manufacturer's package reference: C-PTIS-200-WCE-HC)² contains three soft loading dilators of varying outer diameters (OD), i.e. 21F (7 mm), 24F (8 mm) and 28F (9.3 mm). PDT technique involves introduction of a guide wire into the trachea followed by dilatation using a variable diameter single dilator (the Blue Rhino) and passage of the tracheostomy tube loaded over one of the three loading dilators. The standard kit does not come prepackaged with a tracheostomy tube although combined sets are available.

Informal survey among the practitioners in our unit revealed that difficulty in insertion of the tracheostomy tube after percutaneous dilatation is common. An 'escalated step' between the loading dilator and the

tracheal tube due to mismatch in diameters of the tracheal tube and the loading dilator is the cause of this difficulty. Occasionally, this has produced deformation of the tracheostomy tube (Fig 1), further increasing the risk of traumatic complications such as a false passage, posterior tracheal wall perforation, or fracture of the tracheal rings³. We have noted this anomaly on several occasions and tracheostomy tubes have been wasted due to repeated failed attempts caused by the lack of a good 'fit' with the loading dilators. We conducted a simple study to find out the best combination of loading dilators and tracheostomy tubes that avoided the 'escalated step' to minimize the potential for tracheal trauma.

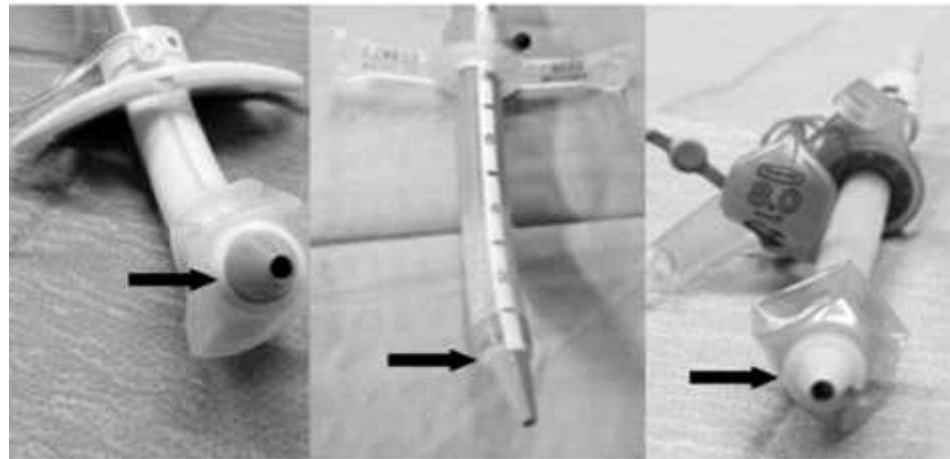
METHODOLOGY

We chose four different brands of tracheostomy tubes in three different sizes. These were: Shiley® tracheostomy tubes of sizes 6, 8 and 10 (Tyco Healthcare UK Ltd, Gosport, UK); Bivona® Hyperflex Adjustable Flange sizes 7, 8 and 9; Portex® Blue-Line adjustable Flange sizes 7, 8 and 9; and Bivona® Fome-Cuff sizes 7, 8 and 9. The



Shiley 10
Dilator 28F

Fig 1: The 'escalated step' and deformity (Arrow) caused by the 'step' during the process of insertion of the tube.



Shiley 8
Dilator 28F

Bivona 8
Dilator 24F

BlueLine 8
Dilator 24F

Fig 2: Best fit combinations: Size Shiley 8 and 28F loading dilator; Size 8 of both Bivona Hyperflex and Portex Blue line Adjustable flange with 24F loading dilator. There is no gap between the loading dilator and the tube (Arrows).

last three come from the same manufacturer (Smiths Medical International Limited, Kent, UK). The tubes were sequentially loaded on the three standard loading dilators and any 'escalated step' equivalent to a diametrical mismatch visualised was noted for each combination. The combination having best fit with the available loading dilators was noted for each of the tubes. This was verified by consulting the measurements published in the accompanying product information sheets.

RESULTS

All types of tracheostomy tubes of size 8 have the best fit as their internal diameter matched the diameter of loading dilators in Blue Rhino kit (Fig 2). The only difference is the choice of loading dilator to be used where a Shiley 8 requires 28F and others require 24F (Table 1).

Table 1: Best fit combinations of different tracheostomy tube sizes to be used with the loading dilators in the Standard Blue Rhino Kit.

Loading dilator Size	21F	24F	28F
Shiley	-	6	8
Bivona Fome cuff	7	8	-
Portex Blue Line® Adjustable Flange	7	8	-
Bivona Hyperflex™	7	8	-

Size 7 of all the tubes has a good fit except Shiley to match

the 21F introducer (Table 1). All other sizes have varying degrees of 'escalated step' with any combination of loading dilators. Bivona Hyperflex size 9 has an additional issue in the form of insufficient length of the loading dilators although a modification of the technique of insertion has been reported to get around this problem⁴.

DISCUSSION

During PDT, it is important to get the correct combination of the tracheostomy tube and the Blue Rhino loading dilator, to minimize the duration and number of attempts, traumatic potential and tube wastage. The presence of only three sizes of loading dilators means that only certain combination of tubes will be a good choice. It would have been ideal if the loading dilators in the standard Blue Rhino PDT kits matched all the available tracheostomy tubes although this is likely to push up the cost.

Our study shows that a size 8 tube should be the first choice if the standard Blue Rhino Kit is used for PDT. If a smaller tracheostomy size is deemed necessary, a size 6 of Shiley or size 7 of other brands of tubes should be used. This approach will minimize wastage of resources by avoiding opening numerous tubes to find the best fit.

Ciaglia Blue Rhino PDT tracheostomy tube custom sets are available². These sets have a single size Tracoe twist tracheostomy tube (TRACOE medical GmbH, Frankfurt/Main, Germany) with an appropriate size

dilator. A new product is also available (TRACOE experc PDT set, TRACOE medical GmbH, Germany), which has a collapsible silicone sleeve at the introducer tip. This virtually eliminates the step and in theory, should aid easy insertion of any size tube, but again the choice of tracheostomy tubes becomes limited to the one supplied; and complications have been reported with this set too⁵.

An issue which might cause confusion is about the best fit of an apparently smaller Shiley (Nellcor Puritan Bennett LLC.) size 8 (ID 7.6 mm) fitting over a larger 28F introducer (9.3 mm OD). The explanation lies in the terminology used. The tube sizes are indicated by the ID of inner tubes in Shiley. Hence, the inner diameter of a size 8 Shiley inner tube is 7.6 mm. However, during PDT, the inner tube is removed. The ID of the outer tube is 9.3 mm which fits well over a similar diameter 28F introducer⁶. This is not an issue with other tubes that do not have an inner tube.

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Editor's Note: As the article entitled 'Diametrical differences between Blue-Rhino® kit loading dilators and percutaneous tracheostomy tubes' by Dr. Amer Majeed,

FCARCSI and Professor Santhana Kannan, FRCA addressed the products manufactured and marketed by Cook Medical, it was felt that the company must be requested for their comments/observations, so that the readers might get an unbiased view point. Below are the comments offered by Mr. Dan Sirota, Vice President, Global Business Unit Leader, Critical Care Division of Cook Medical.

Dr. Khan,

Thank you for the opportunity to review this excellent paper and also to Drs. Majeed and Kannan for providing valuable insight comparing the best combination of loading dilators.

The availability of a variety of percutaneous tracheostomy sets and the variety of commonly used tracheostomy tubes makes establishing uniformity among loading dilators challenging. Cook manufactures loading dilators to accommodate many of the variations in tracheostomy tube providers, many of which use different sizing standards. For example, Portex uses the International Organization for Standardization (ISO) sizing while Shiley uses the Jackson sizing system.

Cook currently provides five total loading dilators to meet the needs of various tracheostomy tubes. There are also various Cook percutaneous tracheostomy sets and trays available to address the multitude of tracheostomy tubes and sizing standards that are on the market.

It is important that manufacturers and clinicians continue to forge closer relationships to determine which set or tray would be the best fit based on specifications to further better patient care. Cook believes it is important to further educate on the size of the loading dilators and their compatibility with various tracheostomy tubes. Each Cook tray was designed to fit either the ISO sizing or Jackson sizing system.

In hopes to further patient care and safety, Cook would like to thank you for the opportunity to review the paper and continue to welcome opportunities in which we can improve medical procedures throughout the world.

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