

Airways Ultrasound for Pre-Intubation Assessment of Tracheal Tube Size

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Introduction

The tracheal intubation was described so early as 2000 years BC [1]. Nowadays, about 50 million tracheal intubations a year are carried out worldwide.

Determining the size of the tracheal tube that will be inserted in the airways is of great importance. If this tube is very narrow, air leakage takes place in the space between the tracheal wall and the surface of the tracheal tube. Thus, it is necessary to increase the pressure of the cuff to avoid air leakage. For such a reason, it can produce injuries in the tracheal structures. On the other hand, the use of a thick tracheal tube can also result in injuries due to tracheal compressions.

Charts, formulas and mathematical tools have been developed to calculate the size of the tracheal tube that should be placed in a patient [2]. However, they are of questionable utility in adults. Because of this, the cannulation of airways in both healthy adult patients and those with structural lesions of the airways entails a challenge.

It is well-known that the narrowest structure in the airways is located at the level of the cricoid cartilage [3]. The diameter of this space is the best measurement to estimate the size of the tracheal tube required for intubation.

Measuring the traverse diameter of the trachea at the level of the cricoid cartilage can be assessed by means of several images methods: X-rays, computed tomography scan (CTS), magnetic resonance imaging (MRI), and ultrasound.

Among them, the ultrasound is the most appropriate. As diagnostic tool, it is easy-to-use and allows performing the task quickly and next to the patient's bed. Moreover, it does not expose the patient to radiations, is perfectly reproducible and offers mensuration highly correlated with those obtained by RMN.

Description of the technique

The patient is placed in supine with the head centered in the longitudinal axis of the body and lightly extended.

A standard ultrasound machine should be used, with a lineal transducer of 7 - 15 MHz. The scan is performed in traverse plane with the transducer's marker directed toward the patient's right.

The cricoid cartilage, located just below the thyroid cartilage, can be identified by manual palpation (Figure 1). Conductive gel should be applied, and the transducer should be placed perpendicular to the skin in the identified area (Figure 2).



Figure 1: Identification by manual palpation of the cricoid cartilage.

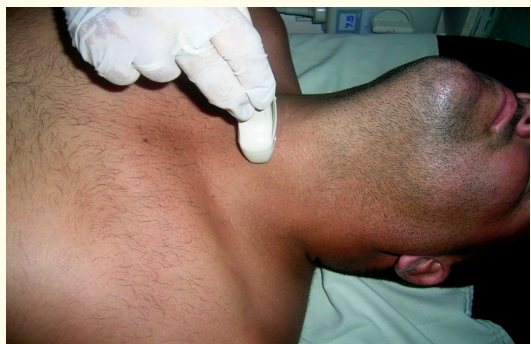


Figure 2: Transducer position for the ultrasound of trachea.

Then the mensuration of the traverse diameter of the column of air in the cricoid cartilage is carried out. The posterior diameter cannot be measured by ultrasound due to the presence of a posterior acoustic shadow (Figure 3).

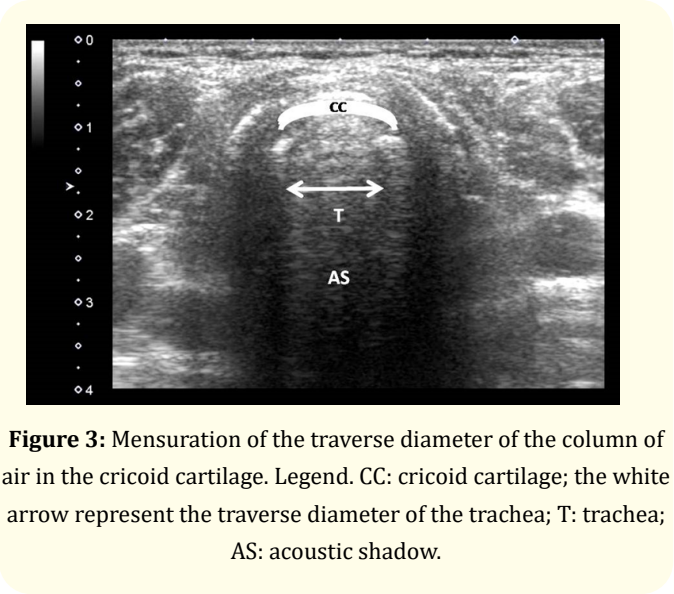


Figure 3: Mensuration of the traverse diameter of the column of air in the cricoid cartilage. Legend. CC: cricoid cartilage; the white arrow represent the traverse diameter of the trachea; T: trachea; AS: acoustic shadow.

The media of the transverse diameter of the airway at level of the cricoid cartilage in adult patients is $15,4 \pm 2,3$ mm [4]; it brings a good correlation with the measures obtained by MRI [5].

According to the measure determined by ultrasound, the size of the tracheal tube that will be placed in the patient can be chosen.

The estimated diameter of the tracheal by means of ultrasound is reliable, quick and reproducible. And again, but not in excess, it is carried out next to the bed of the patient, who won't be exposed to radiations.

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