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Tracheo-bronchial angles in the human fetus – an anatomical, digital and statistical study

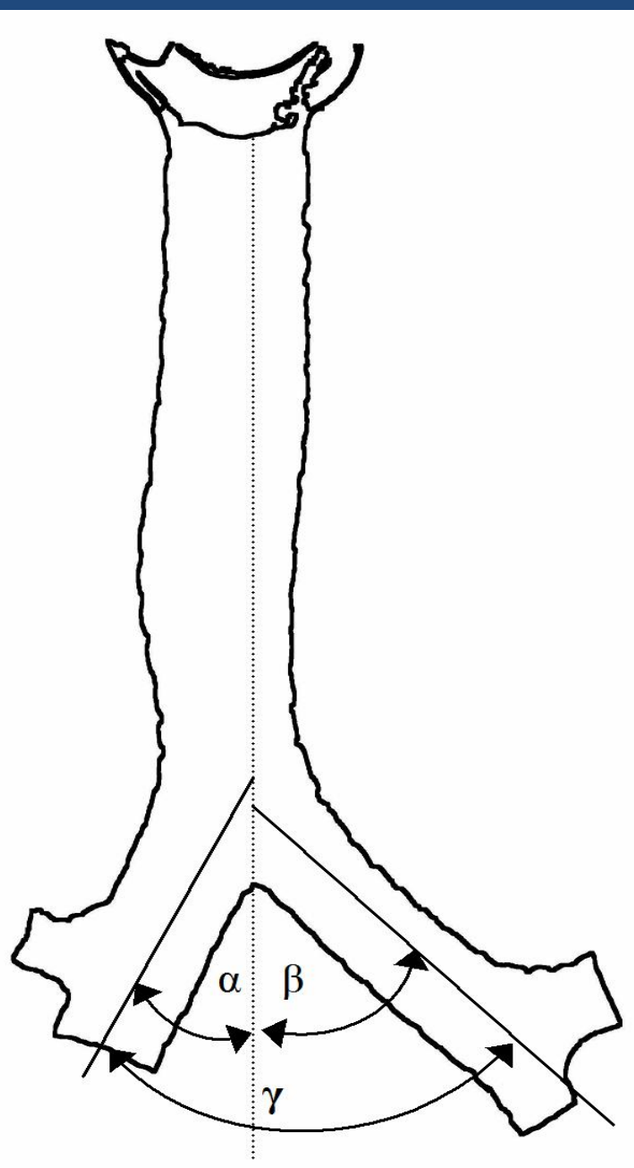
Introduction:

Both the advancement of visual techniques and intensive progress in perinatal medicine result in performing airway management in the fetus and neonate affected by life-threatening malformations. This study aimed to examine the three tracheo-bronchial angles, including the right and left bronchial angles, and the interbronchial angle in the fetus at varying fetal ages.

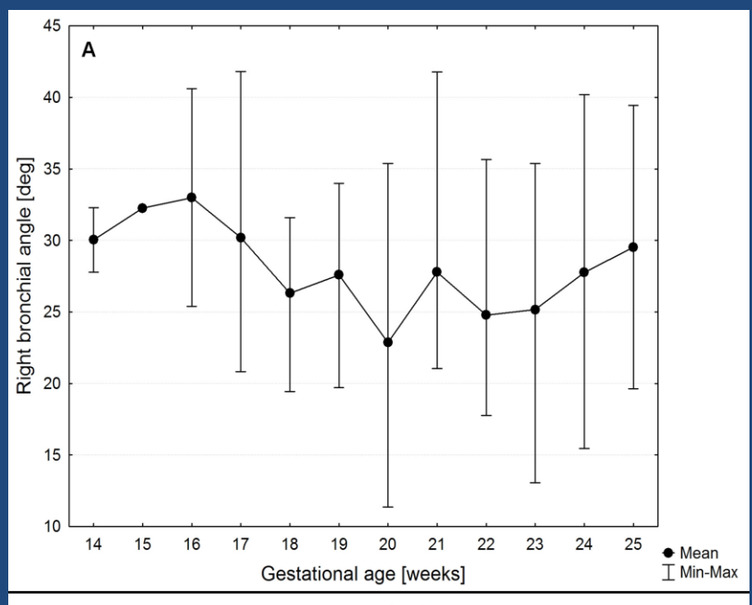
Material and Methods:

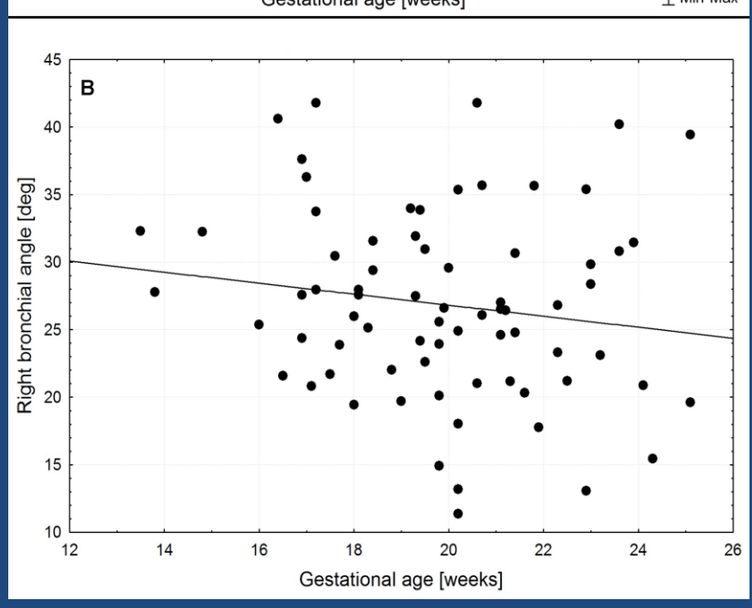
Using methods of anatomical dissection, digital image analysis with an adequate program (NIS-Elements BR 3.0, Nikon), and statistics, values of the two bronchial angles, and their sum as the interbronchial angle were semi-automatically measured in 73 human fetuses at the age of 14−25 weeks, derived from spontaneous abortions and stillbirths.

Results:

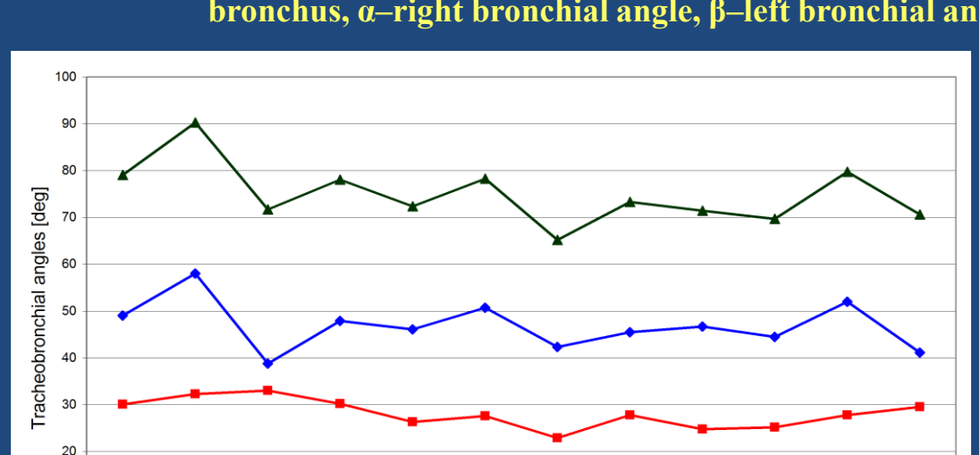


Tracheo-bronchial angles in a male fetus aged 19 weeks: 1–trachea, 2–right main bronchus, 3–left main bronchus, α–right bronchial angle, β–left bronchial angle, γ–tracheal bifurcation angle

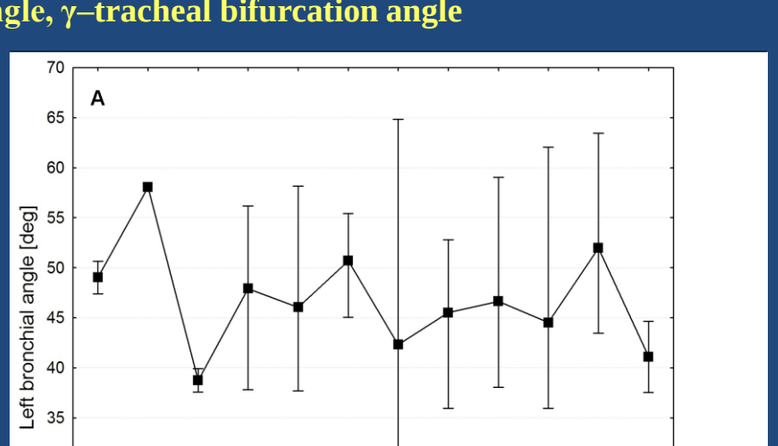




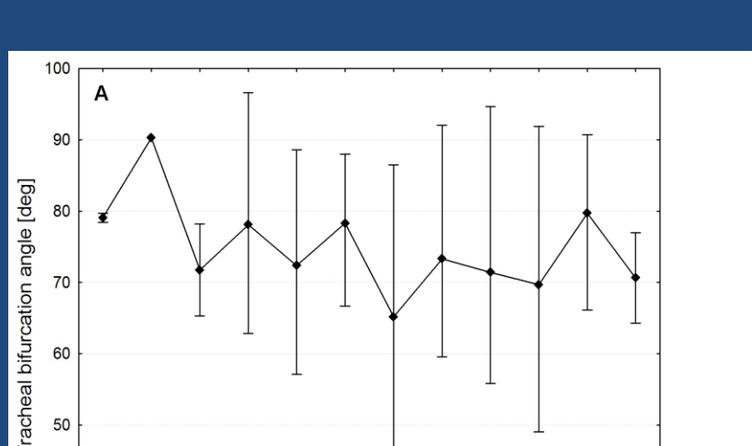
Right bronchial angle in the human fetus *vs.* age



Developmental trend of the tracheo-bronchial angles in the human fetus



Left bronchial angle in the human fetus *vs.* age



Tracheal bifurcation angle in the human fetuses *vs.*age

Conclusions:

1. The tracheo-bronchial angles change independently of sex and fetal age.
2. The left bronchial angle is wider than the right one.
3. Values of the three tracheo-bronchial angles are unpredictable since their regression curves of best fit with relation to fetal age cannot be modelled.
4. The three tracheo-bronchial angles are of relevance in the location of inhaled foreign bodies, and in the diagnosis both cardiac diseases and mediastinal abnormalities.