INTRAUTERINE GROWTH CURVES OF BONE ULTRASOUND VELOCITY.

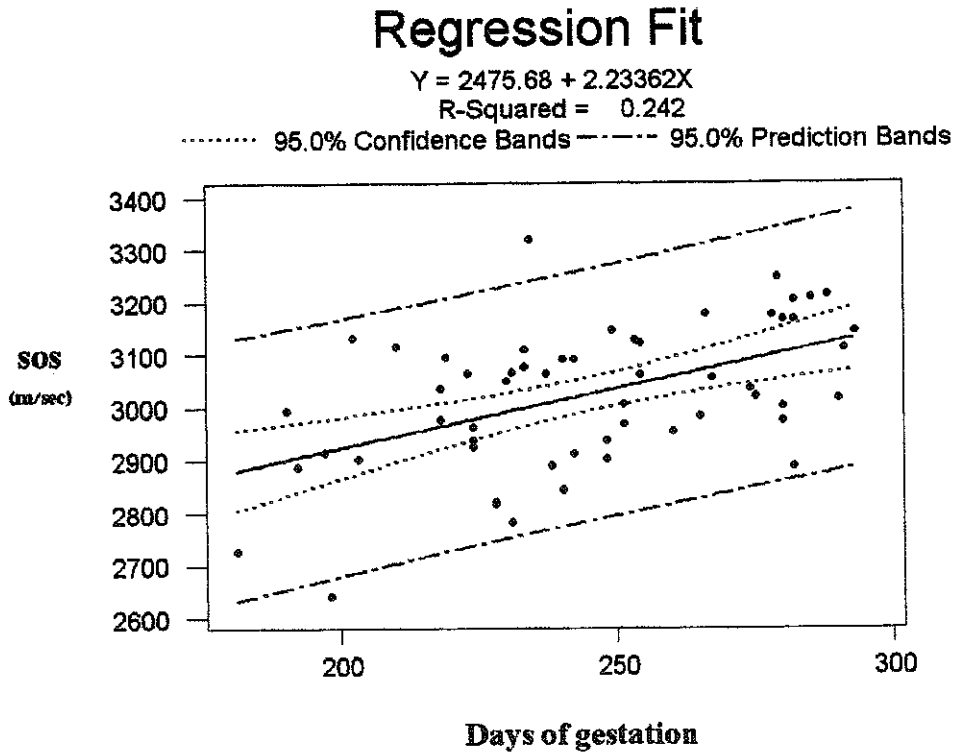
Yoav Littner, MD, Dror Mandel, MD, Francis B Mimouni, MD & Shaul Dollberg, MD. Department of Neonatology, the Lis Maternity Hospital, and the Sackler School of Medicine, Tel Aviv, Israel.

Background: physical evaluation of bone status in infants has been performed in the past 20 years using single beam or double beam photon absorptiometry, or dual energy X ray absorptiometry. These techniques require expensive equipment and are all associated with radiation exposure. Ultrasound velocity has been proposed as a non-invasive method of evaluation of bone status in infants, but until the past year, no commercial instrument was available.

Objective: we used a FDA approved device to establish intrauterine curves of bony speed of sound (SOS). We hypothesized that SOS correlates with both gestational age and birth weight.

Methods: we measured SOS within the first 96 hours of life at the right tibial midshaft location in 57 neonates. We used the Omnisense instrument (Sunlight, Rehovot, Israel) which measures axially transmitted speed of sound (SOS), generated as inaudible high frequency pulsed acoustic waves at a center frequency of 1.25 MHz. Ultrasonic waves are successively transmitted and received by transducers embedded in the ultrasound probe. All infants were singletons, appropriate for gestational age, ranging in gestational age from 25 to 41 weeks, and in birth weight from 825 to 3880 grams. They were for the most part Jewish Caucasians. One single investigator obtained all measurements. Statistical analyses included linear regression and computation of 95% CI regression lines; a p value of <0.05 was considered significant.

Results: there was, as hypothesized, a significant correlation between gestational age (or birth weight) and SOS. Ninety-five percent confidence intervals were established, that may be used as reference ranges for further studies. There were no significant differences between male and female infants.



Conclusion: We conclude that SOS may be measured in infants. It represents a non-invasive method for the evaluation of bone status. We suggest that the curves hereby presented may serve as a basis for further studies of bone metabolism in neonates.

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BONE ULTRASOUND VELOCITY DECREASES POSTNATALLY IN PRETERM INFANTS.

Yoav Littner, MD, Dror Mandel, MD, Francis B Mimouni, MD & Shaul Dollberg, MD. Department of Neonatology, the Lis Maternity Hospital, and the Sackler School of Medicine, Tel Aviv, Israel.

Background: In the last trimester of pregnancy, fetal mineral accretion reaches 150 mg/Kg/d for calcium (Ca) and 75 mg/Kg/d for phosphorus (P). Preterm infants missing the third trimester of pregnancy in part or in totality are delivered with significantely reduced mineral stores. It is nearly impossible to reach the intrauterine levels of mineral accretion posnatally, in particular if the infant is fed using total parenteral nutrition (TPN).

Objective: We used a FDA approved device to test the hypothesis that postnatally, bone speed of sound (SOS) does not increase at the "intrauterine" rate established cross-sectionnally at birth.

Methods: SOS was measured within the first 96 hours of life and at 36 weeks post-menstrual age at the right tibial midshaft location in 27 neonates. We used the Omnisense instrument (Sunlight, Rehovot, Israel) which measures axially transmitted speed of sound (SOS), generated as inaudible high frequency pulsed acoustic waves at a center frequency of 1.25 MHz. Ultrasonic waves are successively transmitted and received by transducers embedded in the ultrasound probe. All infants were singletons, ranging in gestational age from 25 to 34 weeks, and in birth weight from 825 to 2400 grams. They were for the most part Jewish Caucasians. One single investigator obtained all measurements. Statistical analyses included linear regression and computation of 95% CI regression lines; a p value of <0.05 was considered significant.

Results: consistent with the hypothesis, postnatally, SOS did not increase at the "intrauterine" rate. Furthermore, most infants had a postnatal drop of SOS. SOS at 36 weeks and the change in SOS from birth to 36 weeks correlated inversely with the gestational age at birth ($R=0.55$, $P=0.007$, and $R=0.63$, $P=0.001$).

Conclusion: We conclude that SOS drops postnatally in small preterm infants. Since SOS is believed to represent bone strength, we speculate that a postnatal decrease in bone strength may explain the increased risk of fractures in preterm infants.

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