Normal Range of Intracranial Translucency in Healthy Turkish Pregnancies and its Association with First Trimester Maternal Serum Biochemistry and Ductus Venosus Pulsatility Index
Intracranial translucency (IT) is the translucent appearance of the 4th cerebral ventricle in normal fetuses.

In case of neural tube defects (NTD), caudal displacement of the brain results in the compression of the 4th ventricle and loss of the IT image.

This finding was the key point for the earlier detection of the spina bifida.

For the measurement of IT, the same plane of nuchal translucency (NT) is used: The true mid-sagittal plane should be obtained.

The true mid-sagittal plane is seen with the nasal tip anteriorly and the NT posteriorly. The rectangular shape of the palate is seen with the central translucent circle appearance of diencephalon.

The appearance of the zygomatic bone is the sign of the rotation of the fetal head which ends up in false plane.

- The image should be magnified so that only fetal head and upper thorax were included in the image.
- IT is bordered with posterior line of the brain stem anteriorly and choroid plexus of the 4th ventricle posteriorly.
- In normal fetuses, IT is the third translucent space in mid-sagittal plane: the lowest part represents NT, the second one represents cisterna magna (CM) and the third one is IT.

The normal ranges of IT have been the topic of the recent few studies.

In this study, we aimed to evaluate the normal ranges of IT in a Turkish population and establish the association of the biochemical parameters of 11-14 week screening and also ductus venosus doppler indices with IT measurement.


Materials & Methods

- Singleton uncomplicated pregnancies admitted to our perinatology outpatient department for 11 + 0 to 13 + 6 weeks screening
- Approved by the Institutional Ethics Committee and conducted for six month period
- All examinations were carried out via transabdominal probe by two operators (B.A.U. and H.G.P.) accredited with the “Certificate of Competence” for the 11-14 week screening by the Fetal Medicine Foundation (FMF)
- The examinations were carried out by one of the operators, at that time the other operator was observing the fetal planes and measurements independently
Measurement protocol

- A Voluson 730 Pro system with a RAB 3,5-MHz array probe (GE Medical Systems, Milwaukee, WI) was used.

- The true mid-sagittal plane was confirmed by assessing the presence of the tip of the nose anteriorly, the nuchal membrane posteriorly, the translucent diencephalon and midbrain in the middle, and by showing the rectangular shape of the palate.
Measurement and statistical protocol

- IT was measured “in to in” at its widest part
- Two independent measurements were taken and averaged to obtain the final measurement used in the calculations
- Statistical analysis was performed with SPSS for Windows 20.0 software package
- Regression analysis was used to determine the association between IT and NT, pregnancy-associated plasma protein-A (PAPP-A), free β-human chorionic gonadotropin (fβ-hCG) and CRL length. A p-value of <0.05 was considered statistically significant
- CRL: 45-84 mm (11+0 to 13+6 weeks' gestation)
- Mid-sagittal view (fetus may either be facing towards or away from the transducer)
- Landmarks on the profile: skin over the nasal bridge and the nasal tip (solid arrows)
- Intracranial structures: thalamus (t), pons (p), medulla oblongata (mo)
- The intracranial translucency (double arrow) is located behind the pons.
1. **NT** is usually easily visible at the true mid-sagittal plane of the fetal profile.

2. Nuchal translucency (NT) thickness measurements.
Results

- One hundred and ninety 11-14 week scans were performed during the study period.
- The assessment of IT was not possible in 13 cases: resolution of the images was suboptimal, mainly due to abdominal obesity in 7 cases; appropriate fetal position and neutral mid-sagittal plane could not be provided for the remaining 6 cases.
- The assessment rate of IT was 167/190 (87.89%).
Results

- The mean maternal age was 29.71±5.43
- The mean maternal weight was 66.62±11.65 (range: 48.0-105.0)
- The mean CRL length was 63.63±10.05 and mean gestational week was 12.28±0.75
- The mean NT and IT measurements were 1.23±0.43 (range: 0.20-2.68) and 2.29±0.49 (range: 0.18-3.80) respectively
Results

- There was no significant correlation between IT with maternal serum PAPP-A MoM ($r = -0.34$, $p = 0.698$) or maternal serum $f\beta$-hCG MoM ($r = -0.79$, $p = 0.363$), respectively.

- There was low- but statistically significant correlation between IT with CRL length ($r = 0.301$, $p < 0.001$), gestational week ($r=0.286$, $p=0.001$) and NT measurement ($r=0.224$, $p=0.007$), respectively.

- There was no significant association between IT with ductus venosus doppler pulsatility index ($r=0.108$, $p=0.213$).
Table-1: Descriptive data of the study population

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
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<tbody>
<tr>
<td>Maternal weight</td>
<td>66,6222</td>
<td>11,65100</td>
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<tr>
<td>PAPP-A MoM</td>
<td>1,1167</td>
<td>0,83361</td>
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<tr>
<td>fβ-hCG MoM</td>
<td>1,3140</td>
<td>0,98155</td>
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<tr>
<td>CRL</td>
<td>63,6323</td>
<td>10,05322</td>
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<tr>
<td>Gestational week</td>
<td>12,2857</td>
<td>0,75356</td>
</tr>
<tr>
<td>NT</td>
<td>1,2341</td>
<td>0,42973</td>
</tr>
<tr>
<td>IT</td>
<td>2,2983</td>
<td>0,49074</td>
</tr>
<tr>
<td>Ductus venozus PI</td>
<td>1,1553</td>
<td>0,57394</td>
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</tbody>
</table>
**Table-2:** Correlation analysis of IT with maternal weight, PAPP-A MoM, fβ-hCG MoM, CRL, NT and gestational week

<table>
<thead>
<tr>
<th>IT</th>
<th>Maternal weight</th>
<th>PAPP-A MoM</th>
<th>fβ-hCG MoM</th>
<th>CRL</th>
<th>Gestational week</th>
<th>NT</th>
<th>Ductus Venosus PI</th>
</tr>
</thead>
<tbody>
<tr>
<td>r</td>
<td>0.172</td>
<td>-0.34</td>
<td>-0.79</td>
<td>0.301</td>
<td>0.286</td>
<td>0.224</td>
<td>0.108</td>
</tr>
<tr>
<td>p</td>
<td>0.047*</td>
<td>0.698</td>
<td>0.363</td>
<td>&lt;0.001*</td>
<td>0.001*</td>
<td>0.007*</td>
<td>0.213</td>
</tr>
</tbody>
</table>
- Our findings showed that IT can be easily measured while scanning for NT.
- Consistent with recent data, our IT measurements show positive correlation with gestational week and CRL length.
- Maternal serum biochemistry does not have any effect on IT.
- Besides, our study highlights that IT is correlated with NT and adds newly to the literature that there is no correlation of IT with ductus venosus pulsatility index.