COMPARISON OF TEMPORAL ARTERY THERMOMETRY WITH OTHER NON INVASIVE THERMOMETRY IN FEBRILE CHILDREN LESS THAN 5 YEARS AND ACCEPTANCE OF NEWER NON INVASIVE THERMOMETRY AMONG INDIAN MOTHERS- A CROSS SECTIONAL STUDY

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ABSTRACT:

Aim: To compare the accuracy of Temporal artery thermometry with other non invasive thermometry in febrile children less than 5 years. **Materials and Methods:** This study is conducted among children’s less than 5 years of age with h/o fever. Children with wound in temporal area, anal infection, oral infection, external ear pathologies were excluded. They were subjected to Infrared thermometry of temporal artery and temperature measurement from oral cavity, axilla, anal canal, auricular canal. Those values were collected and analysed statistically. **Results:** A total of 107 patients were included in our study. With a r value of 0.280 there is only a weak positive correlation between temporal artery vs oral, axillary temperature in our study, also there is no or negligible relationship between temporal artery temperature vs aural, anal temperature with a r value of -0.166 and -0.158 respectively. **Conclusion:** Temporal artery temperature measurement doesn’t perform well when compared to other non invasive thermometry in our study. However, it can be used for screening purposes initially.

INTRODUCTION:

There are various non-invasive methods to measure the body temperature. Temporal artery thermometry is one among that technique to measure the body temperature using infrared technique. This measurement is done using scanning the temporal artery. Body temperature measurement is one of the most important steps in monitoring patient vitals, In order to avoid the detrimental effects of hypothermia and to avoid fatal consequences of hyperthermia. The standard sites from which we can accurately measure the core body temperature are pulmonary artery, nasopharynx and distal oesophagus but none of these three sites is easily accessible. Hence there is a need for search of alternate sites to measure core body temperature accurately. So Mouth, axilla, aural canal, temporal artery and rectal are the various sites used to measure core body temperature clinically. Thus the need for this study is to compare the temporal artery thermometry temperature measured using infra red method and other non invasive thermometry.

AIM:

- To compare the accuracy of temporal artery thermometry with other non invasive thermometry in febrile children less than 5 years.
- To find acceptance of newer non invasive thermometry in Indian mothers.

MATERIALS AND METHODS:

This study is a single centered hospital based study conducted in our hospital during the period of January 2020 to September 2020 among children visiting our hospital up to 5 years of age.

Study Location: Chettinad Hospital And Research Institute.

Inclusion criteria: All children’s (0 to 5 years) attending our OPD with complaints of fever.

Exclusion Criteria:

- If temporal area has wound
- If there is any anal infection.
- If there is any oral infection
- If there is any external ear pathologies

This study included a total of 107 patients among which we had 47 female children and 60 male children. All patients were included to study after getting written informed consent from their parents. They were subjected to Infrared thermometry of temporal artery and temperature measurement from oral cavity, axilla, anal canal, auricular canal. Those values were collected and analyzed statistically.
RESULTS:

Age distribution

<table>
<thead>
<tr>
<th>Age Distribution</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 6 months</td>
<td>15</td>
</tr>
<tr>
<td>6 months to 1 year</td>
<td>16</td>
</tr>
<tr>
<td>1 to 2 years</td>
<td>19</td>
</tr>
<tr>
<td>2 to 3 years</td>
<td>21</td>
</tr>
<tr>
<td>3 to 4 years</td>
<td>18</td>
</tr>
<tr>
<td>4 to 5 years</td>
<td>18</td>
</tr>
</tbody>
</table>

A total of 107 patients were included in our study among that 15 children were from 0 to 6 months of age, 16 children were from 6 months to 1 year of age, 19 children were from 1 to 2 year of age, 21 children were from 2 to 3 year of age, 18 children were from 3 to 4 years of age group, 18 children were from 4 to 5 years of age group.
Sex

Among 107 patients we had 60 male children and 47 female children.

Non invasive Temperature Measurement by various methods

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Temporal artery temperature</th>
<th>Oral temperature</th>
<th>Axillary temperature</th>
<th>Aural temperature</th>
<th>Anal temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 6 months (n=15)</td>
<td>37±0.3</td>
<td>37.1±0.4</td>
<td>37.3±0.2</td>
<td>37.1±0.4</td>
<td>37.1±0.4</td>
</tr>
<tr>
<td>6 months to 1 year(n=16)</td>
<td>36.6±0.3</td>
<td>36.6±0.3</td>
<td>37.1±0.4</td>
<td>37.1±0.4</td>
<td>37.5±0.5</td>
</tr>
<tr>
<td>1 to 2 years(n=19)</td>
<td>37.5±0.5</td>
<td>37.3±0.2</td>
<td>37.5±0.5</td>
<td>36.6±0.3</td>
<td>37.3±0.2</td>
</tr>
<tr>
<td>2 to 3 years(n=21)</td>
<td>37.1±0.4</td>
<td>37±0.3</td>
<td>37±0.3</td>
<td>37.3±0.2</td>
<td>37.5±0.5</td>
</tr>
<tr>
<td>3 to 4 years(n=18)</td>
<td>37±0.3</td>
<td>37.5±0.5</td>
<td>37.5±0.5</td>
<td>37.3±0.2</td>
<td>36.6±0.3</td>
</tr>
<tr>
<td>4 to 5 years(n=18)</td>
<td>37.3±0.2</td>
<td>37±0.3</td>
<td>37±0.3</td>
<td>37±0.3</td>
<td>36.6±0.3</td>
</tr>
</tbody>
</table>

All patients were subjected to various non invasive temperature assessment methods like Temporal artery temperature using infrared method, Using digital thermometer to access oral, axillary, aural and anal...
temperature and the interpretation of our study is as follows. We divided our study population into 6 groups, we had 15 children in 0 to 6 months of age group, 16 children in 6 months to 1 year of age group, 19 children in 1 to 2 years of age group, 21 children in 2 to 3 years of age group, 18 children in 3 to 4 years of age group, finally 18 children in 4 to 5 years of age group. Our interpretation is the mean body temperature and its standard deviation in children of 0 to 6 months age measured in temporal artery, oral, axillary, aural and anal temperature is 37, 37.1, 37.3, 37.1, 37.1 respectively with a standard deviation of 0.3, 0.4, 0.2, 0.4, 0.4 respectively. In children of 6 months to 1 year age measured in temporal artery, oral, axillary, aural and anal temperature is 36.6, 36.6, 37.1, 37.1, 37.5 respectively with a standard deviation of 0.3, 0.3, 0.4, 0.4, 0.5 respectively. In children of 1 to 2 years age measured in temporal artery, oral, axillary, aural and anal temperature is 37.5, 37.3, 37.3, 37.5, 36.6, 37.3 respectively with a standard deviation of 0.4, 0.2, 0.5, 0.3, 0.2 respectively. In children of 2 to 3 years age measured in temporal artery, oral, axillary, aural and anal temperature is 37.1, 37.3, 37.3, 37.5 respectively with a standard deviation of 0.4, 0.3, 0.2, 0.5 respectively. In children of 3 to 4 years age measured in temporal artery, oral, axillary, aural and anal temperature is 37, 37.5, 37.5, 37.3, 36.6 respectively with a standard deviation of 0.3, 0.5, 0.2, 0.3 respectively. In children of 4 to 5 years age measured in temporal artery, oral, axillary, aural and anal temperature is 37.3, 37.3, 37, 36.6 respectively with a standard deviation of 0.2, 0.3, 0.3, 0.3 respectively.
Mean temporal artery temperature vs Oral temperature

Mean temporal artery vs. axillary temperature
These scatter diagrams show that only few points are clustered around each other and other points are scattered throughout the graph suggesting only a minimal correlation between various non invasive thermometry techniques used.
### Pearson coefficient

<table>
<thead>
<tr>
<th></th>
<th>R value using Pearson coefficient</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temporal artery vs. oral Temperature</td>
<td>0.280226</td>
<td>Weak positive relationship</td>
</tr>
<tr>
<td>Temporal artery vs. axillary temperature</td>
<td>0.22877</td>
<td>Weak positive relationship</td>
</tr>
<tr>
<td>Temporal artery vs. aural temperature</td>
<td>-0.16656</td>
<td>No or negligible relationship</td>
</tr>
<tr>
<td>Temporal artery vs. anal temperature</td>
<td>-0.15893</td>
<td>No or negligible relationship</td>
</tr>
</tbody>
</table>

With a r value of 0.280 there is only a weak positive correlation between temporal artery and oral temperature in our study, also there is only a weak positive relationship between temporal artery temperature and axillary temperature, and there is no or negligible relationship between temporal artery temperature vs aural, anal temperature with a r value of -0.166 and -0.158 respectively.

### DISCUSSION:

Body temperature measurement is most vital for managing pediatric patients. However accurate measurement of core body temperature can be done by invasive techniques like pulmonary artery temperature, temperature at distal end of esophagus and nasopharynx as these techniques are clinically cumbersome and socially unacceptable by patients and their parents. There is a constant need for some accurate non invasive techniques. The most accurate non invasive technique available clinically to measure body temperature is measuring anal temperature.

However in our study the temporal artery temperature assessment was not comparable to other non invasive thermometry and there is only a negligible relationship between anal and temporal artery temperature measurement. In contrast there was a weak positive relationship between temporal artery temperature vs oral and axillary temperature measurement in our study.

In a study conducted by Ester Opersteny et al, temporal artery thermometry was more precise and accurate. It was more precise than oral and axillary thermometers (p<0.001 vs. axillary, p=0.001 vs. oral). Temporal artery measurements were higher on average than axillary and oral, by 0.7°C and 0.6°C respectively.

In a study conducted by Panagiotitis kiekkas et al mean TA temperature was lower than core temperature by 0.01 °C (95% limits of agreement, -0.06 °C to 0.03 °C). Average summary sensitivity and specificity for fever detection were 0.72 (95% confidence interval, 0.66-0.79) and 0.91 (95% confidence interval, 0.86-0.93) respectively.
In study conducted by Kiran Hebbur et al, in febrile (>38 degrees C) patients, bias in rectal-temporal artery and rectal-axillary was significantly greater than in temporal artery-axillary pairs (p < .001). Mean bias in pulmonary artery catheter-rectal pairs was also significantly smaller than in other pairs for all patients (p = .008) and febrile patients (p = .049).

Also temporal artery temperature measurements were more acceptable among parents as it is a simple method, non-invasive one and also it is less disruptive with child activities. Hence it can be used clinically.

The major limitation in our study is repeatability of a value is not checked. Also throughout the procedure we used a single thermometry device and the accuracy of our device was not compared with other various standard devices available in market. Also various interfering confounding factors such as presence of shock were not considered in our study.

CONCLUSION:

Temporal artery temperature measurement doesn’t perform well when compared to other non-invasive temperature in our study. Hence a large scale study is needed before using this technique in routine clinical practice for temperature measurement even though it is socially acceptable and easy to use. However it can be used for screening purposes initially.

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