Biomechanical Significance of Zygomatic Arch in Identifying the Animals

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Received: 26 February 2013; Accepted: 10 April 2013

SUMMARY

The present study was conducted on some domestic and wild animals (ox, horse, dog, deer, nilgai and leopard) to explore the species differences on the basis of zygomatic arch and evolving indices to ascertain the species with optimum accuracy. The study revealed that the zygomatic index of malar bone was useful in identification of animals like horse, dog, nilgai and deer, while the zygomatic index of squamous temporal bone was useful in identification of animals like ox, horse, dog and leopard.

Key words: Species identification, Zygomatic arch

Zygomatic arch formed by the zygomatic process of squamous temporal bone with the zygomatic process of the malar bone (Nickel et al., 1986) plays a crucial role in the transmission of the forces generated by the jaw muscles towards the tangential direction for the efficient movement of the jaws, there by relieving the impact of the jaw muscles on the crucial sites such as cranial cavity as well as orbital cavity and their vital organs (Adams and Eddy, 1949). This structure serves an insertion area for the jaw muscles and is exposed to bending stress in side view of head (Raghavan, 1964). Morphological details of the zygomatic arch (curvature, profile, suture) is well suited to sustain the evoked stresses by the minimum stress on the jaws (Kent, 1954). The present study was undertaken to explore the biomechanical significance of the zygomatic arch in animals.

Heads of different animals like ox, horse, dog, deer and nilgai were collected at the time of postmortem examination after their natural death. The heads were macerated in cold water, sun dried and the zygomatic indices for malar bone and squamous temporal bone were recorded to explore the bio-mechanical significance of zygomatic arch in the animals.

For the present study, the measurements of length (L) and width (W) of the zygomatic processes of above animals were recorded by scale and Vernier callipers. The zygomatic index of malar and squamous temporal bones was calculated by formula: \[ \frac{W}{L} \times 100 \]
where \( W \)= width of the zygomatic processes of malar bone and squamous temporal bone, respectively and \( L \)= length of the zygomatic processes of malar bone and squamous temporal bone, respectively.

The following measurements were recorded on the the zygomatic arch of different animals by recording the length and width of zygomatic processes of squamous temporal and malar bones as per pre defined sites i.e length of zygomatic process of malar bone was recorded from rostral point of zygomatic arch to the termination of zygomatic process of malar bone along its length while the length of zygomatic process of squamous temporal bone from the rostral point of the squamous temporal up to the temporal crest. All the measurements were tabulated.

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Fig. 1. Photograph of skull of ox showing the zygomatic process of malar bone (A) and the zygomatic process of squamous temporal bone (B).
affording mechanical force for vertical and sidewise movements of vertical ramus of mandible as per the type of food in the mouth cavity. The zygomatic index of malar bone can be useful in identifying the animals like horse, dog, nilgai and deer. Similarly, the zygomatic index of squamous temporal bone can be useful in identifying the animals like ox, horse, dog and leopard (Table 1).

REFERENCES


<table>
<thead>
<tr>
<th>Animals</th>
<th>Zygomatic index for malar bone (cm)</th>
<th>Zygomatic index for squamous temporal bone (cm)</th>
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<tbody>
<tr>
<td>Ox</td>
<td>22.76±1.19</td>
<td>18.38±1.13</td>
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<tr>
<td>Horse</td>
<td>17.65±0.306</td>
<td>33.71±0.279</td>
</tr>
<tr>
<td>Dog</td>
<td>33.16±2.28</td>
<td>30.50±1.97</td>
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<tr>
<td>Nilgai</td>
<td>28.57±2.64</td>
<td>17.74±2.06</td>
</tr>
<tr>
<td>Deer</td>
<td>18.18±2.11</td>
<td>17.02±2.05</td>
</tr>
<tr>
<td>Leopard</td>
<td>24.07±2.43</td>
<td>25.60±2.50</td>
</tr>
</tbody>
</table>

(Table 1), summerised and subjected to statistical analysis to derive mean and standard error. The zygomatic processes under study delimited the ventral aspect of the temporal fossa where temporalis muscles along with the part of the vertical ramus of the mandible was lodged (Nickel et al., 1986). The zygomatic arch provided substantial support to the lateral cranial muscles besides