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Osteomorphology and osteometry of mandible of desi pig

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Abstract

Pig being the test animal for most of the biological research is less explored in the anatomical arena. Hence, an attempt was made to explore the mandible of pig. Six specimens of mandible from desi pigs were collected and osteomorphological and osteometrical study was made. Many specialties and peculiarities were observed like 39% contribution of mandible to the weight of the skull, etc. Body of the mandible was like handless spatula with two parts namely incisival and premolar part. The horizontal ramus was also with two parts with different contour. The vertical ramus had a triangular part with only less deep masseteric fossa. Dental formula was found out and compared with other species.

Keywords: Osteomorphology, osteometry, anatomical arena

Introduction

Desi animals native of our country is the pride of our nation and the fauna of our country, is with diversified population. Pig supposedly more similar to mankind deserves much attention more than what is paid now, as most of the research works in the field of human medicine gets tested in porcine (Zangrando *et al.*, 2014) [11]. Desi pigs remains unexplored and especially the area of anatomy yearns for much light as there are more dark areas in bony side. Skull being the 'head of the skeleton' has been remaining unfathomed especially in osteomorphology and osteometry. Tamil Nadu has rich population of desi pigs and udumalaipettai area of Tiruppur district has got lot of connoisseurs for porcine meat. Hence an attempt has been made to find out the peculiarities and specialties in the jaw bone of pig, as feed efficiency of pig is of course distantly related to the function of mandible. This study will definitely be a torch bearer though infinitesimal in the porcine industry.

Materials and Methods

Mandibles from six desi pigs of one year age were collected from the slaughter house at eripalayam village of udumalpet taluk, Tiruppur district. Then the six specimens were stored in maceration tank for normal clearing. After a month, the mandibles were cleaned and air dried. The osteomorphological study of the mandible was grossly made and osteometrical studies were made using vernier caliper. The results were tabulated and compared with available literatures.

Results and Discussion

The weight of the skull was 420 g and the weight of the mandible was 165 g which formed 39% of the skull.

It is the largest bone of the skull (Sisson *et al.*, 1975) [9] with the following osteometrical details as listed by Endo *et al.* (2002) [3] in wild pig Breadth between alveoli of corner incisors (BI)–4.3 cm, Breadth between canine alveoli (BC)–5.1 cm, Least breadth of mandible (LBM) – 3.6 cm, Breadth between alveoli of third molar (BM)–7 cm, Breadth between coronoid processes (BCrP)–10.5 cm, Breadth between condyles (BCP)–7.7 cm, Breadth between the angles (BLP)–10.8 cm, length from angle to anterior most point of body (LA)–18.8 cm, Length from the condyle to anterior most point of body (LC)–20.5 cm, Length of Horizontal ramus and body of mandible (LHR)–12.6 cm, Width of Vertical ramus (WVR)–6.2 cm, Length between angle and last molar (ALM)–7.9 cm

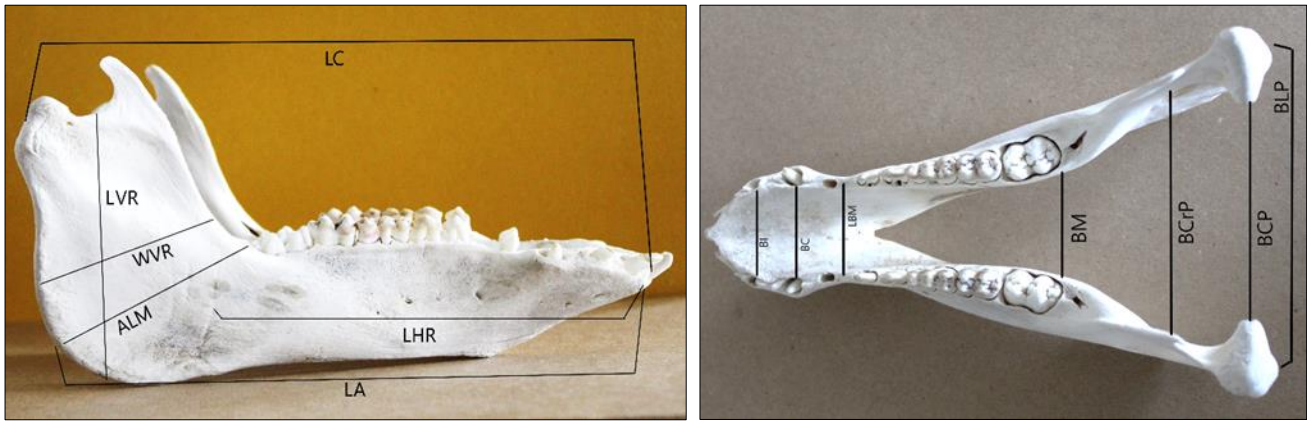


Fig 1 & 2: Osteometry-Mandible of Desi Pig

Body of the Mandible

Body of the mandible was like handleless spatula. As described by Ghosh (2020) [4], the body of the mandible in desi pigs had two parts— anterior or incisival and posterior or premolar part. The body in its ventral part was anteriorly convex and it was endowed with two nutrient foramen whereas the junction of body and horizontal ramus was concave and studded with one larger mental foramen (Sisson *et al.*, 1975) [9]. The ventral part (mental part) of the body of mandible was giving an appearance of ‘canoe boat’ in its anterior part and such description was not reported in the literatures screened.

In the incisival part, the anterior end was narrow and the proximal part was strongly concave from lateral-to-lateral border. In the median portion, there was no indication of fusion as in camel and horse (Getty, 1975) [9] whereas in ox (Raghavan, 1964) [8], in buffalo (Khatra, 1979) [5] in dog (Miller *et al.*, 1964) [6] and in cattle (Sisson *et al.*, 1975) [9] the unossified symphysis was reported. In its anterior portion, as in the mandible of blackbuck (Choudhary, 2018) [1] there were three incisors and one canine on either side.

In the premolar part, around one cm behind the canine, first

premolar was placed. The interalveolar borders were significant between canine and first premolar. The fusion of horizontal ramus with body was clearly demarcated in its lower end.

Horizontal ramus of Mandible

Horizontal ramus was divided into two parts. The anterior one-third of horizontal ramus in the proximal extremity had the second and third premolars. The posterior two-third of the horizontal ramus had all the molars and was anteriorly convex and in its extreme posterior part, it was flat.

Around one cm behind the mental foramen, there were small well-formed minute foramina for the branches of mandibulo-alveolar artery. The second premolar was placed with a gap of around one cm from the first premolar. The premolars and molars were not strongly fixed with the alveoli and hence the movement of teeth was variable.

Ventral border of horizontal ramus was relatively broader in anterior part whereas in the posterior part where it joined with vertical ramus was very narrow and thin. These observations made in the present study were not found in the screened literatures.

Vertical Ramus of Mandible

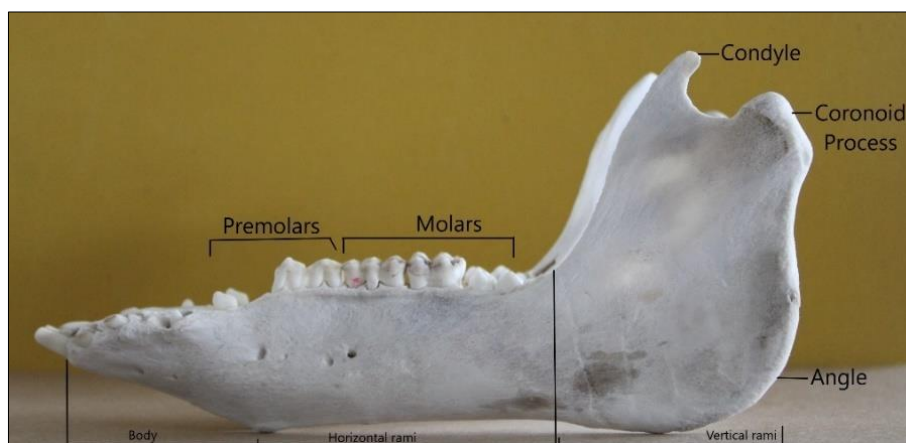


Fig 3: Lateral view of Mandible of Desi Pig

Vertical ramus had a triangular part, with its narrow edge in the upper part of posterior extremity being continuous with the condyle whereas the upper part of the triangle was nearly straight and joined with the extreme posterior part of horizontal ramus. The posterior part of triangular portion was bent in the extreme anterior part and joined with the distal

border of horizontal ramus and it was relatively broader in the proximal part and narrower in distal part.

Above and anterior to the triangular part of vertical ramus was the moderately deep masseteric fossa, above which the coronoid process was observed as stated by Choudhary (2018) [1] in Blackbuck. The proximal part of masseteric fossa was

non-sharp and had the appearance of unequal triangle with its narrow end joining with the anterior border of vertical ramus and this border in its proximal extremity had the coronoid process.

The mandibular condyle in the form of a triangle was broader in its top side. The proximal portion was almost elliptical in shape with its lateral end being broader and was otherwise.

Medial view of Mandible

The medial part of horizontal ramus anteriorly in its lower part was convex whereas its corresponding upper part was concave in its anterior one-third. The middle part of horizontal ramus proximally ran for a considerable length and its lower part was having a groove. In the extreme posterior part, the area was flat.

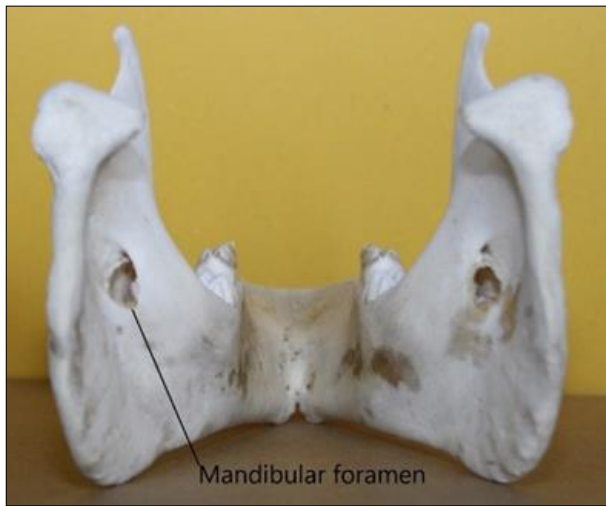


Fig 4: Caudal view of Mandible of Desi Pig

Medially, the vertical ramus was broader in appearance, the breadth being most in the distal part. The mandibular foramen (Sisson *et al.*, 1975) [9] was having the entrance separated by narrow curved ridge from top to bottom. The proximal part of vertical ramus anteriorly was having an elevated area in front of the mandibular foramen whereas above this area, the area was flat just below the curved ridge connecting the coronoid process and condyle. Above and behind the mandibular foramen, the elliptical area was highly concave and the conjoining area was convex which was proximally joining with mandibular condyle.

Internally where the two horizontal rami met, there was a pair of median mental foramina just in front of the junction of rami and end of the body as described by Stembirek *et al.* (2012) [10].

Dental anatomy

Incisor

There were three incisors each on either side of body of the mandible. The incisors were like a sword with handle, the sharp portion being placed interiorly into the alveoli. Nickel *et al.* (1979) [7] described that the incisors were long, straight and chisel like rods. The alveoli for the incisors were nearly circular. The handle like portion of the incisor was seen outside with its flat circular anterior most part. The third and second incisors were only partly visible being around 0.5 cm. The first incisor was the longest and second were longer and third was least in the length. The third did not have the depression in between the sharp posterior and flat anterior

portion rather it was progressively and uniformly reducing in the circumference and the interior most end was very narrow. The second incisor had the division between the sharp and narrow end and was less in depth.



Fig 5: Incisors-Pig

Canine

The canine was placed around one cm behind the corner incisor. The lingual part of it was sharp but not pointed.

Premolar

The first premolar was having a triangular cap like structure and distally it had a 'V' shaped division in its middle. In between the crown and the root, there was a clear demarcation into two divisions. As stated by Dyce *et al.* (2002) [2], the crowns of cheek teeth increased from first to last. The second premolar was broader than the first premolar and the two divisions had an interval between them above the alveoli and it was longer than the first premolar. The second and third premolar was having an anterior lower part and middle part was the point of zenith and posterior was sliding down. Below the crown, the teeth was divided into two and in between the interval, the mandibular extension emerged in between.

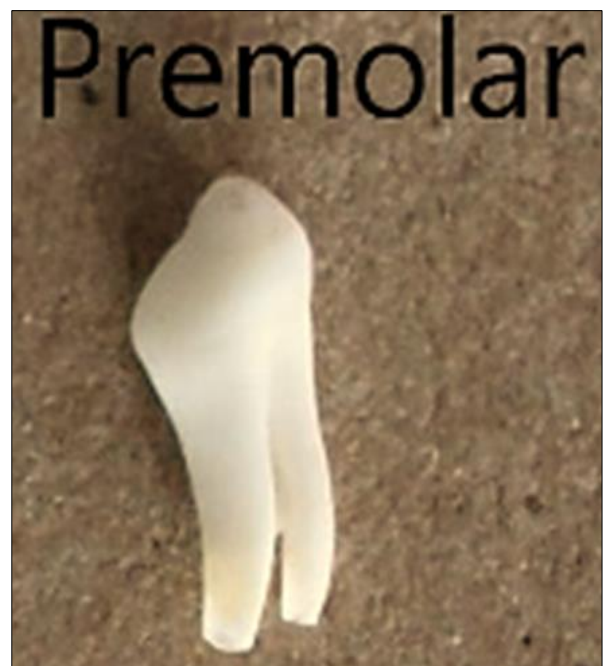


Fig 6: Premolar

Molar

The first molar was having three parts deeply divided by grooves. The first part was smallest and circular, the second and the third part proximally was supposedly square like. The second part was elevated at medial and lateral side whereas the anterior and posterior side was narrow when compared to lateral side. Distally in the third part, the posterior side was longest and anterior was the smallest and the medial and lateral parts were almost equal in size. The first molar below the crown was having an inverted 'V' shaped division. Each end was inserted into a separate alveolus.

The second molar was having anteriorly and posteriorly two separate elevations divided by irregular grooves. The two lateral elevations were shorter than medial elevations. The medial elevations were regularly shaped than the lateral elevation and behind the elevation in the extreme upper part of second molar, there was a small elevation.

The third molar was having anteriorly and posteriorly two divisions separated in the middle by the dentinal ridges. The medial part looked like two triangles separated in upper part and united in lower part and the sharp edge was being most proximal. Behind the four elevations, in the extreme posterior part there was a middle larger elevation flanked by two narrow divisions. Behind the last molar, the horizontal ramus was having a wedge like interval.

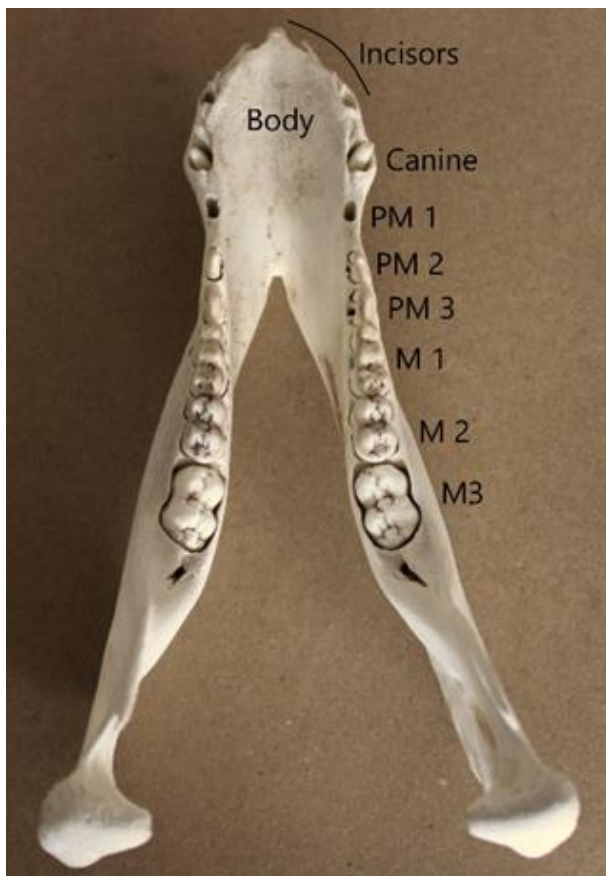


Fig 7: Dorsal view of Mandible

View of dentition in lateral aspect

Laterally, the first premolar did not show any division below the crown. The crown appeared triangular. The second premolar placed around 1 cm behind was having crown with two extreme ascending area with its zenith in the middle. Below the crown, the tooth was divided into two parts in its distal portion. In the third premolar, the crown looked

rectangular with its proximal side curved in nature like an arc. In the lower part of crown, the division was only distal whereas in the medial aspect, it was from the proximal part.

The first molar in the lateral part distally was found to have three parts with two broader anterior and posterior parts and a narrow middle part.

The second molar had the anterior root part broader than the posterior part. The anterior part was roughly circular and posterior was roughly rectangular. The third molar was shorter in length relatively when compared with second molar.

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