

**SURGICAL AND ANATOMICAL STUDIES ON THE
MANDIBULAR CANAL, THE MANDIBULAR ALVEOLAR
ARTERY AND NERVE IN THE GOAT**

BY

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INTRODUCTION

The mandibular canal of the domestic animals was briefly described in textbooks of Anatomy (Zietschman, 1938; Raghavan/Kachroo, 1964; Sisson/Grossman, 1967, May, 1970; Sisson, 1975; Nichel et al., 1986). Concerning the anatomy of the mandibular canal and its contents in the goats, further studies are needed.

The aim of the present work is to study the anatomical features of the mandibular canal and the structures running therein specially the mandibular alveolar artery and nerve.

MATERIALS AND METHODS

The present study was carried on ten adult heads of normal goats of different ages and of both sexes, free from bony deformities collected from the slaughter house. They were fixed by the ordinary routine methods. The mandibular canal was exposed after removing soft tissues and periosteum by using a chisel and hammer. The arteries and nerves of the mandibular canal were dissected making use of the magnifying lens for the detection of the fine branches.

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For radiographic investigation of the mandibular alveolar artery, the common carotid artery was injected in four specimens with 30% barium sulphate emulsion as a radio-opaque substance, after that the mandible was disarticulated, cleaned and radiographed. In addition a metal malleable wire was introduced via the mandibular foramen and radiographed to demarcate the course of the mandibular canal.

Technique for blocking of the mandibular alveolar nerve.:

The needle was introduced in the depression which present in the horizontal ramus near the Junction with the vertical ramus. Press the needle deeply in the tissues until it passes to the medial surface of the mandible for about 3 cm. in an angle about 80° with the ventral border of the horizontal ramus. Procaine Hcl 2% as analgesic solution was injected in an average dose ranged from 5-7 cm³ (Fig. 4).

Nomenclature used was adopted according to the Nomina Anatomic Veterinaria (1973).

RESULTS

A- Anatomical findings:

Canalis mandibulae:

Measured about 12 to 14 cm. in average length, beginning at the mandibular foramen on the medial aspect of the mandibular ramus and terminated by the mental foramen on the lateral surface of the body. It proceeded rostro-ventrally with a slight lateral inclination. The mandibular foramen was oval or ovoid in shape facing dorsally being situated 3 cm. dorsal to the ventral border and 1 cm. rostral to the caudal border of the ramus of the mandible.

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The wide caudal part of the canal is in the vertical part of the ramus of the mandible measured about 3 to 4 cm. in length, while the rostral was about 10cm. and ran through the molar part and the body of the mandible parallel and above the ventral border by about 0.5 cm. It continued through the body of the mandible beyond the level of the mental foramen. The latter opened on the lateral surface of the mandibular ramus rostral to the first premolar tooth by about 1-1.5 cm. In only one case, an accessory mental foramen was seen caudo-dorsal to the main one.

A. alveolaris mandibularis:

The mandibular alveolar artery (2A, B/1) was detached from the rostral aspect of the maxillary artery on a level of the caudal rete branch. Shortly after its origin it gave the mylohyoid branch, entered through the mandibular canal in which it continued rostrally. It pursued flexuous course detaching along its entire length 6 to 8 alveolar branches to the mandibular teeth, in addition to the alveolar periosteum and gums. The most caudal branch (2B/2) was the larger of all and divided into several twigs that ramified behind the cheek teeth. Furthermore, it also gave two twigs which vascularized the large caudal root of the last, third, molar tooth. The second vessel was distributed to the small caudal and rostral roots of the last molar tooth (2B/3,4). On a level of the fifth inter-alveolar space another branch was detached, which soon divided into twigs, one for the root of the last molar tooth (2B/5) and the other to the last inter-alveolar space (2B/6). Subsequent branch of the mandibular alveolar artery supplied the second molar tooth. Along the course of the mandibular alveolar artery and about the level of the second molar tooth, it gives off another dental branch which immediately divided into two small twigs to the first molar and last, fourth, premolar teeth (2B/8). It will be observed that, the latter tooth received additional off-shot from the next one. In the rostral third of the

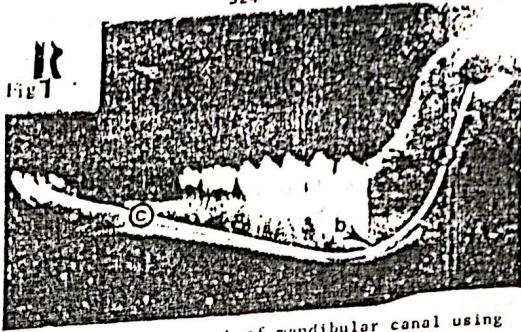


Fig.(1): X-ray photograph of mandibular canal using a malleable wire through the canal.
 a- The mandibular foramen.
 b- The course of the canal.
 c- The mental foramen.

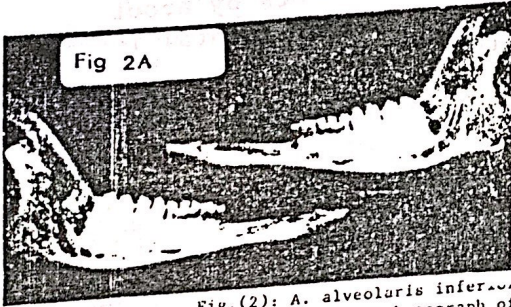


Fig 2 B

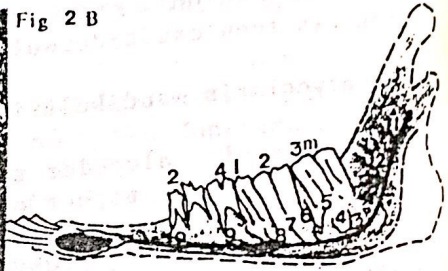


Fig.(2): A. alveolaris inferior.
 A- X-ray photograph of the artery injected with barium sulphate.
 B- X-ray sketch of A.
 1- The inferior alveolar artery, 2- The most caudal branch. 3,4,5-Twigs to the roots of the last molar tooth. 6-Twigs to the last interalveolar space. 7- Branch to 2nd molar tooth. 8- Dental branch to 1st molar and last premolar teeth. 9- Dental branch to 3rd premolar tooth. 10-Dental branch to 4th premolar tooth.

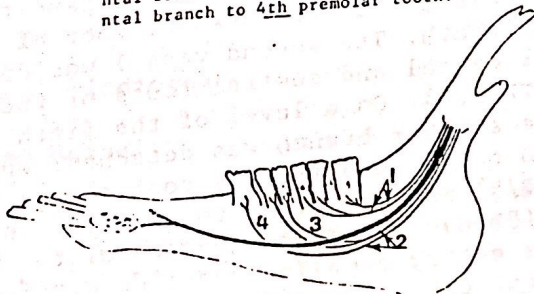


Fig.(3): The distribution of the inferior alveolar nerve.
 1- Rami alveolaris inferiores caudales.
 2- Rami alveolaris inferiores medii.
 3- Short branch of 2,
 4- Long branch of 2.

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mandibular canal two another independent branches were given to supply the second (2B/9) and third (2B/10) premolar teeth. Before the mandibular alveolar artery emerged from the mental foramen it gives a delicate vessel continued within the alveolar canal to vascularize the incisor teeth.

N. alveolaris mandibularis:

The mandibular alveolar nerve appeared as a large thick nerve which turned rostro-ventrally to reach the mandibular foramen, where it accompanied the artery inside the mandibular canal. During its course within the mandibular canal it released the mandibular alveolar branches which could be divided into caudal, middle and rostral groups.

Rami alveolaris mandibulares caudales:

Represented by two branches (3/1), the first arose from the parent trunk on a level of the caudal border of the root of the last molar tooth. It ran rostro-ventrally for about 0.5 cm. before dividing into delicate twigs that passed through the apical foramen of the last, third, molar tooth. The second exhibited a similar course of the first but received a twig from it. Such a branch divided after a short distance into three twigs, two of them ran rostrally to pass through the root of the second molar tooth, while the other continued towards the root of the first molar tooth.

In only one case, this second branch gave also a twig to the last molar tooth.

Rami alveolaris mandibulares medii:

The middle rami (3/2) were two of different lengths, short and long, blended with those of the caudal for some distance with which it exchange some twigs.

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They emanated a little rostral to the preceding nerves from the ventral border of the third, last, molar tooth. Both branches followed the course of the parent nerve, being covered by the mandibular alveolar artery. The short branch (3/3), traversed the space between the third and second molars. On reaching the space between the second and first molar teeth it decided into two twigs, of these the smaller, crossed the root of the first molar tooth to reach the periosteum of the last, fourth, premolar, where it pierced the periosteum to pass through the root of the latter tooth. The other long twig crossed the roots of the first molar and fourth premolar to reach the root of the third premolar where it was distributed. The long middle branch (4/3) proceeded rostrally, along the root of the premolar teeth till the second one where it passed through its root.

At the level of the first molar tooth it gave a communicating branch to the short branch, in addition to fine gingival branches along its course. In only one case, the middle branch was represented by only one long filament that innervate the second premolar tooth. In such a case, the third and fourth premolars were innervated by twigs from the second branch of the caudal mandibular alveolar nerves.

Ramus alveolaris mandibularis rostralis:

The rostral mandibular alveolar nerve was given from the parent trunk near the mental foramen and passed inside the incisive canal to innervate the incisor teeth.

B- Clinical finding:

Mandibular alveolar nerve block through the present technique, resulted in variable degrees of analgesia to the mandible and the associated structures. Anaesthesia gradually developed within five minutes following injection of the local anaesthetic. Its maximum

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effect appeared after ten minutes and lasted for up to one hour. Slight salivation and loss of sensation were observed.

DISCUSSION

The present investigation revealed that the mandibular foramen was situated 3 cm. dorsal and 1 cm. caudal to the cranial border of the medial surface of the mandibular ramus. The mandibular alveolar nerve can be blocked by the deposition of the local anaesthetic solution in the neighbourhood of the foramen. This can be achieved by introducing the needle in the depression which present in the horizontal ramus near the junction with the verticle ramus, for about 3 cm. Hillmann (1975) reported that mandibular foramen in the horse and ruminants was found on the middle of the medial surface of the mandibular ramus. The mental foramen opened on the lateral surface of the mandibular ramus midway between the first molar and the lateral incisor. Similar findings were given by Raghavan/Kachroo (1964) in the ox and May (1970) in sheep. The presence of an accessory mental foramen was recorded by Sisson/Grossman (1967) in canines.

The present investigation revealed that, the origin of the mandibular alveolar artery in the goat was from the maxillary artery, similar to that given by Heeschen (1958) in sheep, Schwarz (1959) in goat, Nickel/Schwarz (1963) in cat, dog, swine, bovine, sheep, goat and horse, Sisson/Grossman (1967) and Ghoshal (1975) in domestic animals. Six to eight dental branches were given through the mandibular alveolar artery, which were revealed by several investigators in domestic animal without giving any number for them. The present study also showed that the last molar tooth received its blood supply for its large caudal root from the caudal dental branch, and the small caudal and rostral roots were supplied by the next two dental branches. So precaution should be

taken during extirpation of that tooth to avoid any unexpected haemorrhage. On the other hand, the first and second molars were supplied by a separate dental branch for each which in a line with statement of Simons/De-Vos/Lauwers (1979) in domestic mammals.

The distribution of the mandibular alveolar nerve inside the mandibular canal as caudal, middle and rostral mandibular alveolar nerves in the goat simulated those recorded by Godinho/Getty (1975), Seiferle/Bohme (1984) in domestic animals. The caudal mandibular alveolar branches supplying the caudal molar teeth in the horse (Godinho/Getty, 1975), were represented by two branches in the goat, one for the last molar and the other for the first and second molars. Moreover, the present work revealed exchanging filaments between the both. The mandibular alveolar nerve detached two large middle mandibular alveolar branches at the rostral border of the last tooth. The first branch bifurcated into two twigs for the fourth and third premolar teeth. The second branch was single supplying the second premolar tooth and exchanged twigs with the caudal mandibular alveolar branches. In contrast, Godinho/Getty (1975) in ruminants and Taylor (1955) in the dog mentioned that the middle mandibular alveolar branches supplied the rostral and caudal molar teeth. The present work, simulated the findings of Godinho/Getty (1975) in domestic animals where they reported that the rostral mandibular alveolar branch was given near the mental foramen and passed through the incisive canal to the incisor teeth. Such a branch was termed the incisive alveolar mandibular branch by Ellenberger/Baum (1943) and Seiferle/Bohme (1984) in domestic animals.

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