

Histological study of the Vagus, Accessory and Hypoglossal nerves nuclei in one humped camel *Camelus Dromedarius*

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Summary

The present work making histological studies of certain part of medulla oblongata on seven one humped camel (*Camelus Dromedarius*) of different ages and sexes. The location of Vagus X, accessory XI and hypoglossal XII nerve nuclei. The hypoglossal nerve XII nucleus consist of two nuclei dorsal greater and ventral smaller and the dorsal nuclei observed. Connected with dorsal motor vagal nucleus X by specific arch of fiber in many sections and another observation the root fiber of hypoglossal nucleus XII pass along the lateral border of inferior olivary nucleus and some sections the root fiber penetrate lateral part of inferior olivary nucleus.

دراسة نسيجية للعصب الحائر, الأضافي والتحت اللساني للجمل ذي السنام الواحد
Camelus dromedarius

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الخلاصة

ان البحث شمل الدراسة النسيجية لبعض اجزاء النخاع المستطيل لسبعة ادمغة لحيوان الجمل ذو السنام الواحد بمختلف الأعمار والجنس . ولقد لوحظ ان موقع الأنوية العصبية للعصب التائه,العصب الأضافي والعصب تحت اللساني مشابهة لبقية الحيوانات. لكن حيوان الجمل تميز بوجود اختلاف عن بقية الحيوانات وذلك بان نواة العصب تحت اللساني تتكون من نواتين (ظهرية) كبيرة و(البطنية) صغيرة , كما ان النواة الظهرية تتصل بالنواة الظهرية الحركية للعصب التائه بواسطة قوس ليفي يستمر لعدة مقاطع. كما لوحظ ان جذور الياف العصب تحت اللساني تمر بطنيا ووحشيا لنواة الزيتونية السفلية ولوحظ في بعض المقاطع ان هذه جذور الياف تخترق النواة الزيتونية السفلية من الجهة الوحشية للنواة وان هذه الصفات قد انفرد بها حيوان الجمل ذو السنام الواحد عن بقية الحيوانات

Introduction

Work has been in progress in our neuroanatomy laboratory on the structural and functional nuclei of the central nervous system in camel. This is a continuing study and deals with the quantitative morphological study of the neurons (cells) of the nuclei. To investigate the disease of the central nervous system, it is essential to examine the nuclei in brain stem like the nuclei Vagus, accessory and hypoglossal nerves. These nuclei in camel are closely resembling the nuclei of other domesticated mammals (23). We feel this simple guide helps anatomists and comparative pathologists.

Early study was conducted on these nerve nuclei in avian (1), and the internal structure of the medulla oblongata in sheep (2), and the comparative anatomical studies in mammals in reticular formation (3 & 4), also (5) take observation by degeneration of nerve by rhizotomic, while (6)(12) study the solitary nucleus in Cat.

The cytoarchitecture of the brain by using serial sections of all brain stem (7), in Pig (11); studying reticular formation in brain stem in rats (8). These

nerve are us trigeminal tractomy in monkey (9), the ambiguus nucleus was studied by cutting the glossopharyngeal branches in rabbit (10),in rat(14) studying the dorsal motor vagal nucleus in pigeon By cervical vagotomy and observing degeneration (13), and sheep (16),in rat (14), cat (20), and other animal horse, dog, cat, pig, sheep and goat(17),(16)(21) and with ambiguus (10), and by using cholensteraus in rat (14) the investigation all nuclei in medulla oblongata, found arch of fiber tracts between Vagus and hypoglossal nucleus, and now using immuno-histo-chemical examination axonal, preganglionc neuron in rat(24) the roots of hypoglossal nuclei in camel penetrate the inferior olivary nucleus (23) finally not forget this studying are make in humenbeing (18),(22)

Materials and methods

In this study were used seven brain of one humped (*Camelus Dromedarius*), of different ages and sexes, obtained from Najaf slaughter house. It take the skulls of camel and after slaughter remove the bone of skull and embedded in 10% formaline for 3 weeks and then take spinal cord and medulla oblongata, and cutting serial section by frozen microtome 40 μ and every 20th section was stain with toludin blue and left in plate over night and than fixed in special glass slid and examined by a light microscope.

Result

- Vagus nerve X :

The Vagus nerve a mixed nerve associated with four nuclei in medulla oblongata:-

1. *Dorsal motor nucleus of the Vagus X* .

This nucleus in camel extended from the cranial extremity of inferior olivary nucleus to the junction of spinal cord with medulla oblongata (Fig 1,2,4).

The nucleus located dorso- lateral to central canal and dorsal to hypoglossal nucleus XII (Fig 1,2,4); and takes more lateral location to XII nucleus in floor of fourth ventricle; the nucleus it is more longer than the XII nucleus and *intercalate nucleus* (Fig 2,4) ,(it located between X , XII nucleus) .

This nucleus is characterized by three type of cell , large multipolar shape with nucleus and dark nuclei and dark Nissle bodies , the other is medium spindle or

conical shape with central nucleus and scatter Nissal bodies, the later cell is small a rounded or oval with central nucleus with dark Nissle bodies.

2. Nucleus ambiguus.

This is also known as ventral motor nucleus of Vagus X. This nucleus in camel extended as continuous of accessory nucleus XI caudally till reach rostral part of the medulla oblongata, the nucleus located medial to spinal tractus of trigeminal V , i.e. ventro-lateral to medulla oblongata (Fig 2,4). This nucleus may contain few cells, so it is very difficult to differentiated from reticular cells in some plane. The ambiguous nucleus in camel represented as the source of roots of glossopharyngeal IX , Vagus X , accessory XI nerve which pass ventro-lateral of nucleus transvelly to spinal tract of trigeminal V nucleus to emerge from lateral surface of medulla oblongata. This nucleus have cells contain central nucleus with dark Nissle bodies.

3. Nucleus of spinal tract of trigeminal V.

This nucleus extends rostrally from the level of caudal pole of the inferior olivary nucleus to plane through the caudal pole of the nucleus facial nucleus VII. The nucleus located dorsally and laterally of medulla oblongata (Fig 2, 4).

The nucleus comprising cells rounded, Spindle which small and medium size, while the larger size is stellate cells with dark nucleus and Nissle bodies

4. Nucleus Soltarius.

This nucleus in camel extended from pyramidal decussation .It located dorso-lateral to central canal; dorsal and paraller to dorsal to dorsal motor Vagus nucleus X (Fig2, 4). This nucleus have three types of cells large multipolar and medium it is spindle and small oval, each cells contain dark nucleus with Nissle bodies .

This nucleus represented as a source of fiber roots of glossopharyngeal IX , Vagus X and facial VII nerve.

- *Accessory nerve XI*

The accessory nerve in camel have two roots, the spinal and cranial roots arise from the caudal pole of the nucleus ambiguus in medulla oblongata. The nucleus located in camel in caudal portion of medulla oblongata, ventral to spinal tracts of Trigeminal V nucleus and it is cranial part of nucleus it continuous of along the dorsal horn of grey matter of cervical segment and along the ambiguous nucleus cranially (Fig 1).

This nucleus contain cells characterized by larger multipolar neuron with central nucleus and dark Nissle bodies.

This nucleus due to scatter cells, it's difficult to differentiate it from cells of reticular formation in some regions . *lateral reticular nucleus* this nucleus in camel is one of prominent nucleus in reticular formation in medulla oblongata . it extended from caudal pole of facial nucleus to caudal pole of inferior olivary nucleus .

It is located lateral to olivary and pyramids (Fig2,4). This nucleus contain large multipolar it located dorsal of nucleus, while in ventral of nucleus it contain mostly of medium and small cells. Here must explain the *inferior olivary nucleus*.

This nucleus extended through obex i.e. from cranial to caudal obex. It located dorso-lateral to pyramid, this nucleus divided in camel into principle dorsal accessory and ventral accessory part (Fig2, 4)

- *Hypoglossal nerve XII*

In this study appear that hypoglossal nucleus XII extended from pyramidal decussation caudally to the plane caudal of cranial pole of dorsal motor vagal nucleus. This extension appears that the hypoglossal nucleus XII pass parallel to Vagus nerve nucleus in one side (Fig1, 2, 3, 4). In other side it is shorter than Vagus nucleus X. Through investigation the section found in camel that caudal pole of nucleus located ventro-lateral to central canal and ventrally to dorsal motor vagal nucleus (Fig1,2,3,4).

The hypoglossal nucleus XII it contain two nuclei dorsal and ventral nuclei, dorsal it is greater than that ventral nucleus which appear in caudal part of medulla oblongata, and suddly disappear in cranial section , ventral nucleus contain small cell triangular or conical shape cell with central nucleus with dark Nissel bodies. While the dorsal nucleus it characterized by large cell and giant cell and small cells. The large, it is multipolar stelate with central nucleus and dark nuclei with Nissle bodies. The giant cells it is scatter like large cell in shape while small cells is few oval in shape.

The dorsal nucleus it is arising fiber rootlets which is a cheif source of hypoglossal XII nerve which pass toward the ventro- medial margin of this cells group, here they become combined to form well marked nerve strands, which than pass obliquely ventral and lateral to reach the peripheral approximately along the lateral border of the inferior olivary nucleus. In some section it penetrates the inferior olivary nucleus.

It is only in camel found that is the significant properties in camel(Fig 2,4). Between this strands or fasciculus it is accumulation of cells median and small cells in size, this cells called inter *fasciculus hypoglossal nucleus*, another nucleus observed in cranial extremity or pole of hypoglossal nucleus XII it is accumulation of cells large and medium and small cell oval or spindle in shape, while the larger it is multipolar this cells form nucleus named *prepositus hypoglossal nucleus* (Fig 4).

The another more important thing it show the arch of fiber between dorsal motor vagal nucleus X and hypoglossal nucleus XII (Fig 1).

This arch clear in some distant of the nucleus, this arch play important role in combination of two nucleus X , XII and the function of this arch must study by the neurosurgeon and

Neurophysiologic authors to explain the relationship between two nuclei in camel, the camel which face suffering weather through walking through out the hot desert.

Discussion

1. Vagus nerve nuclei X

The Vagus nerve nuclei in camel dorsal motor vagal nucleus, it is located dorsal to central canal it is same location in Birds (2), Rats (14), other Mammals (19), Cats (7) and in Equine (17).

While the shape of cells in this nucleus, large multipolar it is also found in Cat (20),(7), Pigeon (13), while in Human being, Rats and Sheep, the large cells it is scatter (14),(18).

The ambguus nucleus in camel it occupy , the same region in medulla oblongata of camel like Equine (17), Human being (18) and other animal (21), while the shape and size of ambguus cells in camel, it refers also in Sheep(2),Cat(7), Rabbit (10), Rat (14), Pig (11).The ambguus it is source of fiber root of glossopharyngeal XI, Vagus X, accessory XI nerve it found in Rabbit (10) and Sheep (16).

The solitorii nucleus in camel it is like in Sheep (2), Cat (7) and Pig (11). the solitorii nucleus it is the origin of fibers of facial VII , Vagus X and accessory XI it refers also in (17),(5).

2. Accessory nerve nucleus XI

The accessory nucleus in camel, its location in medulla oblongata also mentioned in Equine (17), Human being (18) and other animal (21) and its cell shape in camel also refers in Sheep (2).

The hypoglossal nucleus XII in camel takes the same location in all animals except in Human being it is located lateral to the central canal (18). The hypoglossal nerve in camel has two nuclei, dorsal and ventral, which are similar in birds (7), but in camel the dorsal nucleus is greater than the ventral nucleus, while other animals have only one nucleus of the hypoglossal nerve XII.

The cell shape of the hypoglossal nucleus XII. It is smaller when studied in sheep (2) and human beings (18), but differs in cats which have not so small cells (7). The rootlets of the hypoglossal nerve nuclei XII in camel are directed ventro-laterally from the inferior olivary nucleus (7),(2),(18) and (11).

The fiber that penetrates the inferior olivary nucleus is only shown in camel and has invited all authors in neuroscience to study or experimentally investigate to explain the relationship of the hypoglossal and inferior olivary nucleus.

About the arch of fiber of band connection between the dorsal motor vagal nucleus and the hypoglossal nerve nucleus XII. It is a significant observation in camel and also here I depend on the neuro-surgery and neuro-physiology authors to research about this arch by experimental vagotomy of the nerve and seen degeneration of the nucleus and describe the function of two nuclei to organ innervations in the chest and abdominal cavity.

Finally the prepositus_hypoglossal nucleus XII in camel it is also found in Sheep (2) and Cats (7). and also the intercalated nucleus in camel it is similar in all animals except in Pigeon (13). While the shape of cells in camel it is like in Cat (7) and differs in Human being (18) and sheep (2).

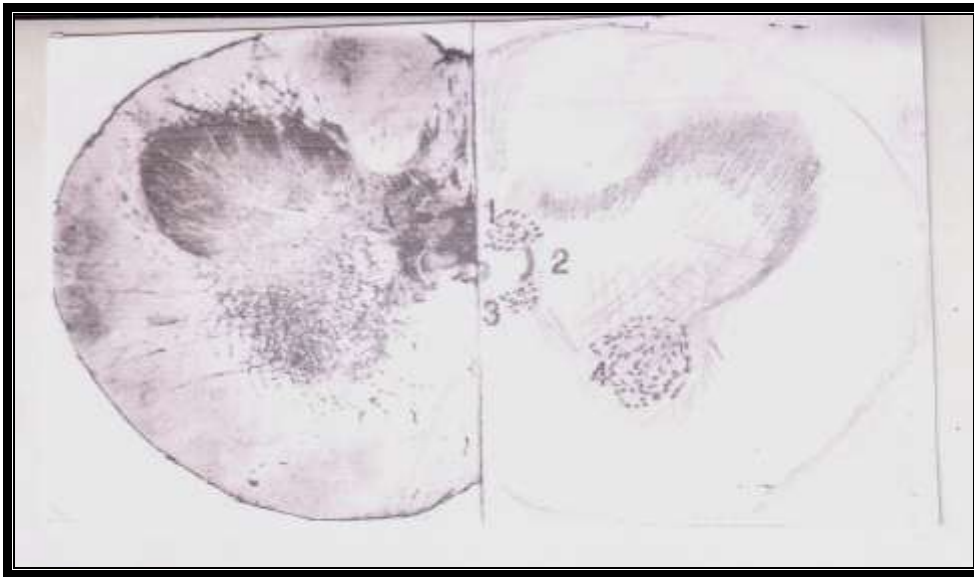


Fig (1): caudal region of medulla oblongata X 12 show nuclei around central canal and arch

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|---------------------------------|-------------------------|
| 1. Dorsal motor vagal nucleus X | 2. Arch of fiber |
| 3. Hypoglossal nucleus XII | 4. Accessory nucleus XI |

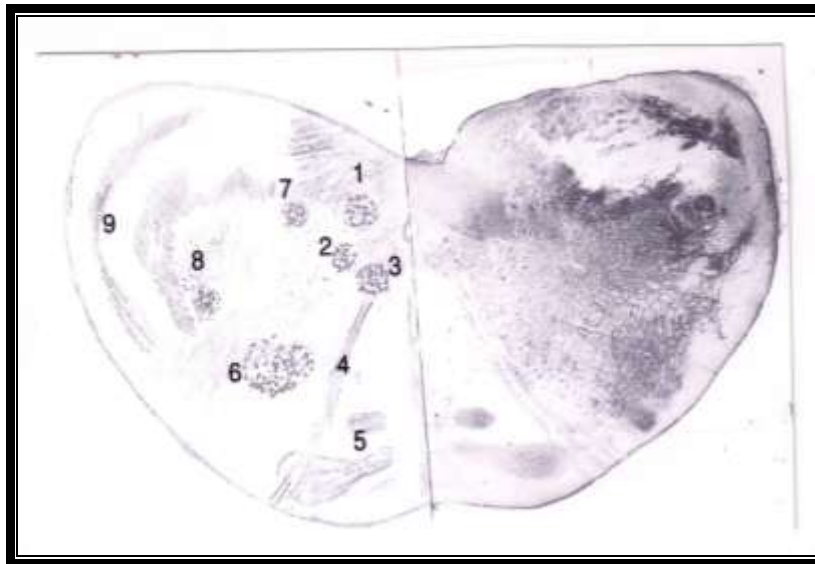
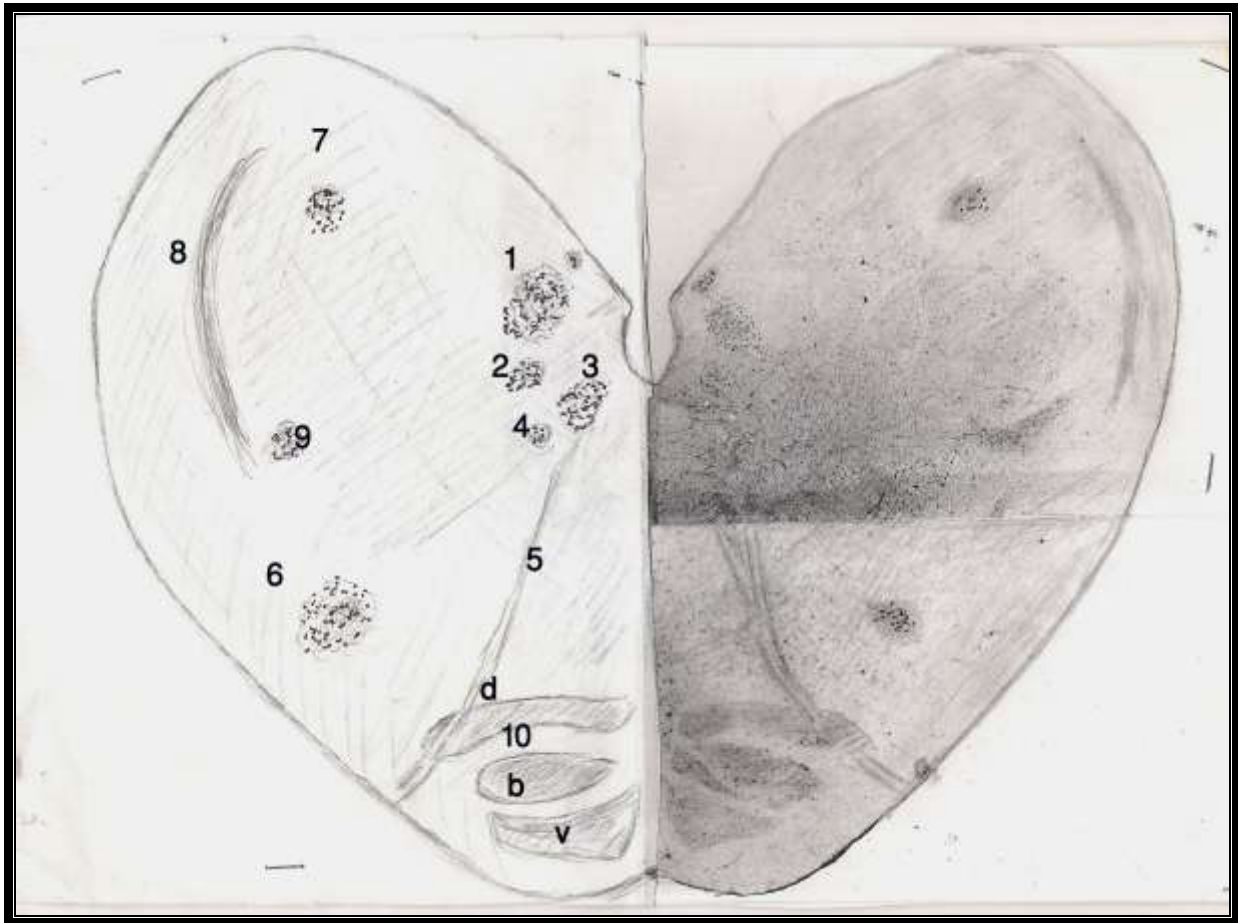


Fig (2): caudal obex X 12



Fig (3): magnification of part from (Fig2)

- 1- Dorsal motor vagal nucleus X 2- Intercalated nucleus
3- Hypoglossal nucleus XII 4- Root fiber of XII nerve
5- Inferior olivary nucleus 6- Lateral reticular nucleus
7- Soltarius nucleus 8- Ambiguus nucleus
9- Spinal tract of trigeminal V



Fig(4) :cranial obex X 12

- 1- Dorsal motor vagal nucleus X 2- Intercalated nucleus
3- Hypoglossal nucleus (dorsal nucleus) 4-Hypoglossal nucleus (ventral nucleus)
5- Root fiber of hypoglossal nerve 6- Lateral reticular nucleus
7- Soltarius nucleus 8- Spinal tract of trigeminal V nucleus
9- Ambguus nucleus
10- Inferior olivary nucleus
d- Dorsal b- principle v- ventral

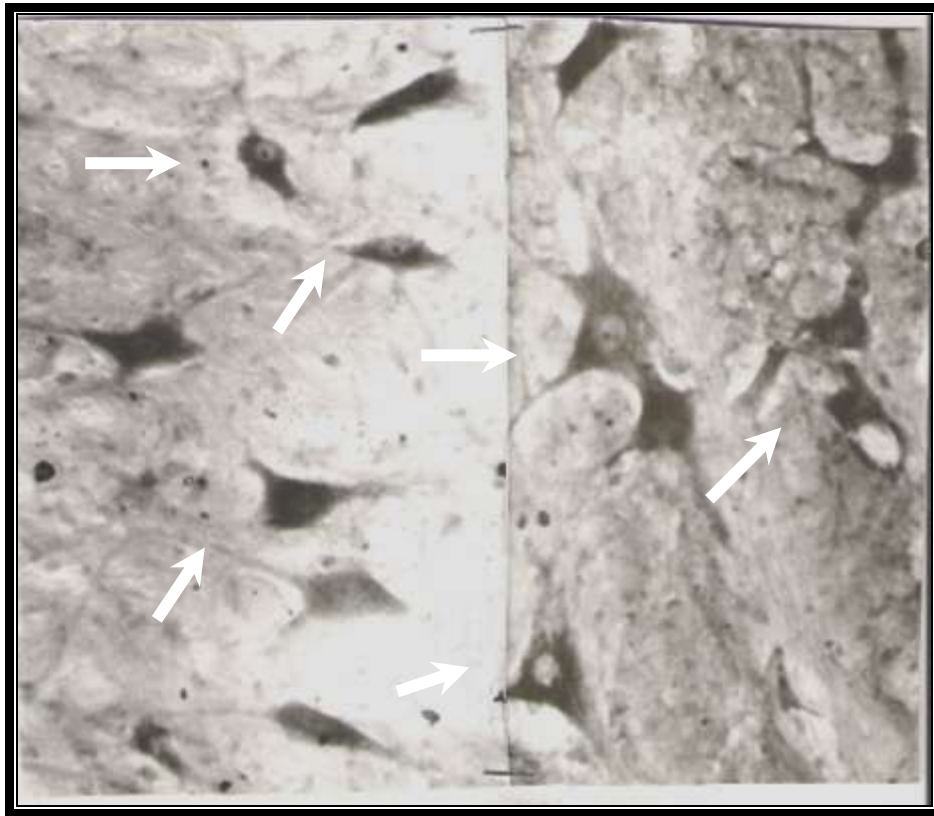


Fig (5: shape of multipolar neuron X 25

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