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التشريح الجراحي لمفصل رسخ القدم في الحمير

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أجرى هذا البحث على مفصل رسخ القدم لاربعين حمارا تتراوح اعمارهم بين سنة واحدة واثنا عشرة سنة، تم حقنها كلها بمادة اليوروجرافين ثم قسّمت الى مجموعتين: الأولى اجرى عليها الوصف التشريحي التقليدى، والمجموعه الثانية تم حقنها بمادة البلاستيك الملون، وقد تم وصف هذه المفاصل تشريحيًا وتم تحديد الاماكن التي يمكن من خلالها حقن الحجرات المختلفه لهذا المفصل وذلك بغرض اعطاء العقاقير أو لآخذ عينات من السائل الزلالي الموجود في هذه المفاصل وتحليلها معمليا لتحديد طبيعة الاصابة حتى يتسنى علاجها - هذا وقد تم تجربة هذه النتائج على ثلاثين من الحيوانات الحية لمعرفة مدى صحة واحتمالات فشل هذه الأماكن المحدده

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SURGICAL ANATOMY OF THE TARSAL JOINT IN DONKEY (With 15 Figures)

By

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SUMMARY

The most suitable sites for injection and arthrocentesis of different sacs of the tarsal joint in donkey were exactly determined. The anatomical features were investigated. They differ from those in the horse in that the proximal surface of the fused first and second tarsal bone has only one facet for articulation with the central tarsal bone. The facet on the proximal surface of the central for articulation with the calcaneus which is sometimes present in horse, is not recorded in the present work. moreover, the donkey has an additional short lateral collateral ligament superficial to the long one. A slit like opening is found to be the site of communication between the tarsocrural and proximal intertarsal sac.

INTRODUCTION

The local treatment of arthritis is of value to avoid the deleterious effect of prolonged systemic administration of adrenocortical steroids. Therefore, the anatomical study and radiography are extremely essential in determining the site of injection and arthrocentesis of the joints. Moreover they aid in the interpretation and evaluations of the affected joints. The radiographic diagnosis of arthritis has been well documented by ZELLER (1966), MORGAN (1968) and ADAMS (1974). The sites, for injection and arthrocentesis of the tarsal joint in horse were carried out by many authors. The available literature lacks data about the tarsal joint in donkey except a very brief account given by ATTIA and OTHMAN (1985).

MATERIAL and METHODS

The present work was carried out on 80 tarsal joints obtained from normal adult donkeys of both sexes as well as on thirty living animals. All joints were firstly radiographed and evaluated. Sixty joints of them were dissected and masserated in the fresh state to study the morphological features of the articular surfaces and ligaments and the other related structures to determine the suitable sites for injection of the different sacs of the tarsal joint. The description of the articular capsule was performed on twenty joints injected with gum milk latex coloured by carmine. the living donkeys were injected in the previously determined sites to show the probability of sucess and failure in reaching the different joint cavities particularly for those of the distal intertarsal and tarsometatarsal articulation.

RESULTS

The tarsal joint in donkey is made up of four articulations, the tarsocrural, proximal intertarsal, distal intertarsal and tarsometatarsal articulation (Fig. 1,2).

I- Articular surfaces :

The tarsocrural articulation is formed mainly by the the distal extremity of the tibia and the trochlea of the talus (Fig. 3/A,B) in addition to the three facets on the plantar surface of the talus and corresponding ones on the dorsal border of calcaneus (Fig. 4/A,B). The medial and the lateral malleolus of tibia, as well as the lateral ridge and groove of the talus and the upper part of the dorsal border of calcaneus are easily palpated in the living animal. A synovial fossa (Fig. 4/A) is found just medial to the distal end of the medial ridge of the talus between it and the distal tuberosity and is easily reached by the injecting needles.

The proximal intertarsal articulation is formed between the distal surfaces of the talus and calcaneus (Fig. 5/A,B) and the proximal surfaces of the central and fourth tarsal bones (Fig. 6/A,B) in addition to one facet on the plantar surface of the talus and the corresponding one on the dorsal border of calcaneus (Fig. 4/A,B).

The distal intertarsal articulation is made up mainly by the distal surface of the central and the proximal surfaces of the third and the fused first and second tarsal bones (Fig. 7/A,B,C). In addition there are three facets on the medial surface of the fourth (Fig. 7/D) and the corresponding ones on the lateral borders of both the central and third tarsal bones.

It is worthy mentioning that the proximal surface of the fused first and second tarsal bones in the donkey has only one facet (Fig. 7/C) for articulation with central tarsal bone.

The tarsometatarsal articulation is formed between the articular facets on the distal surface of the third, fourth and the fused first and second tarsal bones proximally (Fig. 8/A,B,) and those on the proximal extremities of the third, fourth and second metatarsal bones distally (Fig. 8/A,B,C). In addition there is a facet on the lateral surface of the fused first and second and another on the medial surface of the fourth which articulate with corresponding ones on the medial and the lateral borders of the third tarsal bone respectively. The proximal extremities of the second and fourth metatarsal bones are easily palpated in the living animals.

II- Articular capsule :

The fibrous layer of the articular capsule is common for the four articulations of the tarsal joint. it is blended on sides with the collateral ligaments and plantarally with the plantar and tarsometatarsal ligaments. Dorsally, the capsule is thin except its distal and medial part which is strengthened by the dorsal tarsal ligament. Therefore, gaining the distal intertarsal and tarsometatarsal sac is available only on the dorsolateral aspect of the tarsus.

The synovial layer of the articular capsule form four sacs corresponding to the main four articulations of the tarsus.

The tarsocrural sac which is attached around the margin of articular surfaces is the largest one and is highly tensed and is easily perforated during the extension of the tarsal joint. At its attachment to the cranial border of the talus, the joint capsule has a defect forming a semilunar opening communicating between the tarsocrural and proximal intertarsal sac. it measures 1.5 cm in length and 0.2 cm in width.

The tarsocrural sac when it is fully distended by gum milk latex and urographin revealed a dorsal and a planter pouches. The dorsal pouch (Fig. 10/A) is triangular in outline. It extends undercover of the extensor muscles for about 2.3-3.2 cm. On its dorsal surface and somewhat

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laterally it presents in the injected specimen an impression for the tendon of the *M. extensor digitorum longus*, dividing it into medial and lateral parts. The medial part is slightly higher and larger than the lateral one, while the lateral is easily detected.

The plantar pouch (Fig. 10/B) extends proximally for about 3-4 cm undercover of the flexor muscles. In the latex injected specimen this pouch has an impression for the common flexor tendon which divides it into medial and lateral parts. A small rounded diverticulum (Fig. 10/C) can be observed caudal to the tendon of the *M. flexor digitorum longus* and distal to the lateral part of the plantar pouch, from which it is separated by the medial process of the talus.

The proximal intertarsal, distal intertarsal and tarsometatarsal sacs are very short about 0.4 cm in height which make their injection very difficult. Injection of the tarsometatarsal sac revealed that it lubricates the intermetatarsal articulations.

The amount of synovia which can be aspirated from the communicated tarsocrural and proximal intertarsal sac is 6 ml. However, the overdilatation of these sacs by injection of gum milk latex showed that their reliable capacity is 25 ml. The amount of synovia aspirated from each of the distal intertarsal and the tarsometatarsal sacs is 0.5 ml. while the maximum capacity of each of them is 2 ml.

III- Ligaments :

The ligaments (Fig. 10, 11) of the tarsal joint in donkey resemble those found in horse except that the short lateral collateral ligament in donkey is formed of two parts one of them is found superficial to the long lateral collateral ligament and is separated from it by the tendon of the *M. extensor digitorum lateralis*. This tendon is easily palpated in the living animal. This part arises from the cranial part of the lateral malleolus, passes caudally and somewhat distally crossing the long one to terminate in the lateral surface of the calcaneus near the coracoid process. It measures 4-4.3 cm in length and 0.8-1.0 cm in width. Both the long collateral and plantar ligaments are easily recognized in the living animals.

IV- Sites of injection :

The most suitable site for injection of the tarsoorural sac (Fig. 12, 14, 15/A) is located on the dorsolateral aspect of the tarsus distal to the level of the lateral malleolus in an area bounded by the lateral ridge of the talus medially and the tendon of the *M. extensor digitorum longus* medially where the lateral part of the dorsal pouch is situated. The needle is introduced into the skin in this area, then directed plantaromedially for about 3 cm. to gain the groove of the talus. this is the best site for injection of the tarsocrural sac.

Another site for injection of the tarsocrural sac (Fig. 14, 15/A) is found at the dorsomedial aspect of the tarsus distal to the medial malleolus. This area is bounded medially by the cranial border of the long medial collateral ligament and laterally by the medial (cunean) tendon (Fig. 14/7) of the *M. tibialis cranialis* as well as the saphena vein (Fig. 14/10) which is often visible in the living animals. The needle is introduced into the skin, then directed plantarwards and somewhat laterally for about 2.5 cm to reach the synovial fossa which is described on the medial aspect of the talus. The injection in the beforementioned two sites is best performed while the limb is extended at the tarsus.

The site of injection of the tarsometatarsal sac (Fig. 13/B, 14, 15/C) is found on the dorsolateral aspect of the tarsus in a horizontal line just above the head of the fourth metatarsal bone. The needle must be introduced into the skin just medial to the tendon of the *M. extensor*

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digitorum lateralis (Fig. 14/6) which is easily palpated. After that the needle passes through the M. Extensor digitorum brevis just above the distal annular ligament to gain the articular capsule where it must be directed laterally in a horizontal direction for about 2 cm.

The site of injection of the distal intertarsal sac (Fig. 13/A, 12, 14, 15/B) is found 1 cm above that described above and 2.5 cm distal to the lateral ridge of the talus. However, as the needle gain the articular capsule it should be directed laterally but for only 1 cm to avoid the entrance of the tarsal canal where the A. tarsae perforance and its homologus evin are present.

Failure in the process of injection of the distal intertarsal and tarsometatarsal ac was met in three out of 60 tarsus of the living animals.

DISCUSSION

GETTY (1975) stated that the proximal surface of the central tarsal bone in horse sometimes has a facet for the calcaneus. This facet is not recorded in the present work. The two facets described on the proximal surface of the fused first and second bone by the same author in the same animal are fused in donkey forming one facet. Added to that the synovial fossa on the medial surface of the talus and the superficial part of the short lateral collateral ligament which are recorded in donkey are not described in horse by SISSON and GROSSMAN (1969).

The preferable site for injection of the tarsocrural sac in donkey is found on the dorso-lateral aspect of the tarsus medial to the lateral ridge of the talus. From this site the needle is easily introduced into the groove of the talus which is directed lateralwards. Moreover, the articular capsule in this site does not come in contact with the bones and the groove of the talus caudal to it makes the space of injection very wide. However, in horse (VAN KRUIJNINGEN, 1963 and VAN PELT, 1966) and in donkey (ATTIA and OTHMAN, 1986) the site of injection of the same sac was described on the dorsomedial aspect of the tarsus at the level of the medial malleolus. The present study on donkey as well as the study of VAN PELT (1966) in horse revealed that a communication between the tarsocrural and proximal intertarsal sacs is always present. However, VAN KRUIJNINGEN (1963) did not describe any communications between these two sacs in horse. The communications of the tarsometatarsal with the distal intertarsal and with the proximal intertarsal sacs which are recorded in rare cases in the horse (BROWN and VALKO, 1980 and SACK 1981) were not observed in the present work. The authors added that most of the animals showed the previously communication were gelding or bonies. Moreover, SACK (1981) in horse mentioned that incidence of communication between the tarsometatarsal and distal intertarsal sac may be slightly increased by using high (clinical) pressure. Therefore, the two joint must be injected individually as that followed in the present work. The author added that this communication takes place through the tarsal canal. In this respect it is worthy mentioning that this canal is found extrarticular and through which pass blood vessels.

The site of injection of the tarsometatarsal joint in donkey differs from that described in horse by BROWN and VALKO (1980) and SACK (1981). BROWN and VALKO (1980) mentioned that a percentage of 10% of specimens could not be injected and SACK (1981) admit to 2% failure for reaching this sac and the incidence of failure increased in attempting to inject alive uncooperative horses. In the present work the incidence of failure did not exceed than 5% in the living subjects. Moreover, SACK (1981) pointed that the needle when passes through his described site of injection, causes injury to the cunean bursa which in turn possess problems. However, the site described in donkey is apart from the beforementioned bursa.

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LEGENDS

- Fig. (1):** Caudocranial and plantarodorsal radiograph of the left tarsal joint in donkey (left) and labeled tracing (right).
- Fig. (2):** Lateromedial radiograph of the left tarsal joint in donkey (left) and labelled tracing (right).
- | | |
|---------------------------------------|--|
| a- Tarsocrural articulation. | b- Articulation between the talus and calcaneus. |
| c- Proximal intertarsal articulation. | e- Tarsometatarsal articulation. |
| d- Distal intertarsal articulation. | |
- | | |
|---|------------------------------------|
| 1- Medial malleolus of the tibia. | 2- Lateral malleolus of the tibia. |
| 3- Trochlea of the talus. | 4- Calcaneus. |
| 5- Central tarsal bone. | 6- Third tarsal bone. |
| 7- Fused first and second and the fourth tarsal bones (superimposed). | |
| 8- Fourth tarsal bone. | 9- Second metatarsal bone. |
| 10- Third metatarsal bone. | 11- Fourth metatarsal bone. |
| 12- Second and fourth metatarsal bones (Superimposed). | |
- Fig. (3 , 4):** Bones of the left tarsocrural articulation.
- Fig.(3)** A- distal extremity of the tibia. B- Trochlea of the talus.
- Fig.(4)** A- Plantar surface of the talus and the arrow points.
B- Dorsal border of the calcaneus, its synovial fossa.

Fig. (5 , 6): Bones of the left proximal intertarsal articulation.

Fig.(5) A- Distal surface of the talus. B- Distal surface of the calcaneus.

Fig.(6) A- Proximal surface of the central tarsal bone.

B- Proximal surface of the fourth tarsal bone.

Fig. (7): Bones of the left distal intertarsal articulation.

A- Distal surface of the central tarsal bone.

B- proximal surface of the third tarsal bone.

C- Proximal surface of the first and second tarsal bones.

D- Medial surface of the fourth tarsal bone.

Fig. (8, 9): Bones of the left tarsometatarsal articulation.

Fig.(8) A- Distal surface of the third tarsal bone.

B- Distal surface of the fourth tarsal bone.

C- Distal surface of the fused first and second tarsal bones.

Fig.(9) A- Proximal extremity of the third metatarsal bone.

B- Proximal extremity of the fourth metatarsal bone.

C- Proximal extremity of the second metatarsal bone.

Fig. (10): Left tarsal joint of donkey; medial view:

A- Dorsal pouch of the articular capsule.

B- Plantar pouch.

C- Diverticulum of b.1- Long medial collateral ligament 2,2- Short medial collateral ligament. 3- Dorsal tarsal ligament.

Fig. (11): Left tarsal joint of donkey; lateral view:

1- Long lateral collateral ligament.

2- Short lateral collateral ligament.

3- plantar tarsal ligament.

Fig. (12): Mediolateral radiograph of the tarsal joint showing:

A- Site of injection of the tarsocrural.

B- Site of injection of the distal intertarsal sac.

Fig. (13): Mediolateral radiograph of the tarsal joint showing:

A- Site of injection of the distal intertarsal sac.

B- Site of injection of the tarsometatarsal sac.

Fig. (14): Diagram of the dorsal aspect of the right tarsus in donkey showing the sites of injection of the A, A tarsocrural, B- distal intertarsal and C- tarsometatarsal sac.

1- M. extensor digitorum longus, 2- M. fibularis tertius, 3- M. tibialis cranialis,

4- M. extensor digitorum lateralis, 5- Tendon of 1, 6- Tendon of 4,7- Medial

(cunean) tendon of 3, 8- M. extensor digitorum brevis 9- Distal extensor retinaculum 10- V. Saphena.

Fig. (15): Diagram of the dorsal aspect of the right tarsus in donkey showing the sites of injection of the A, A, tarsocrural, B- distal intertarsal and C- tarsometatarsal sac.

1- Tibia.

2- Groove of the trochlea of the talus.

3- Dorsal tarsal ligament.

4- Entrance to the tarsal canal.



Fig. 1

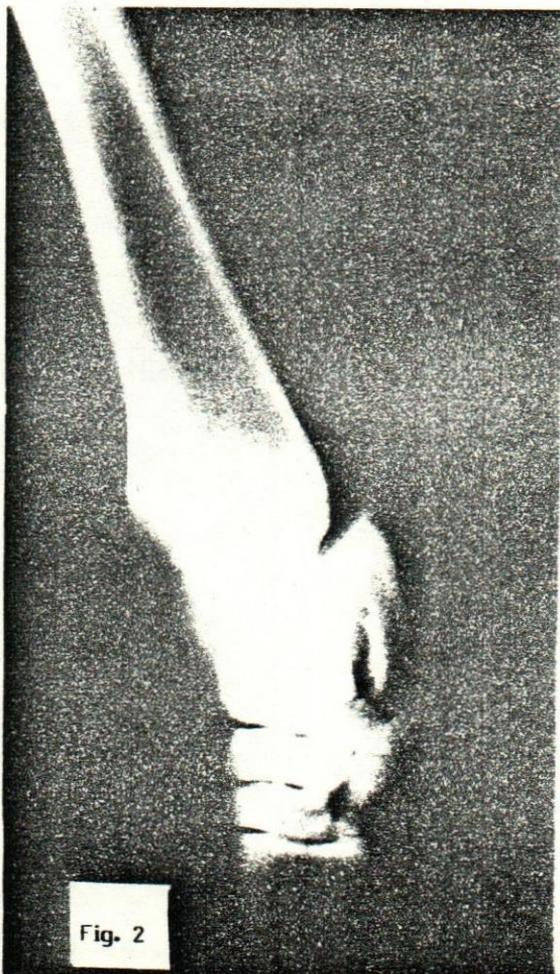
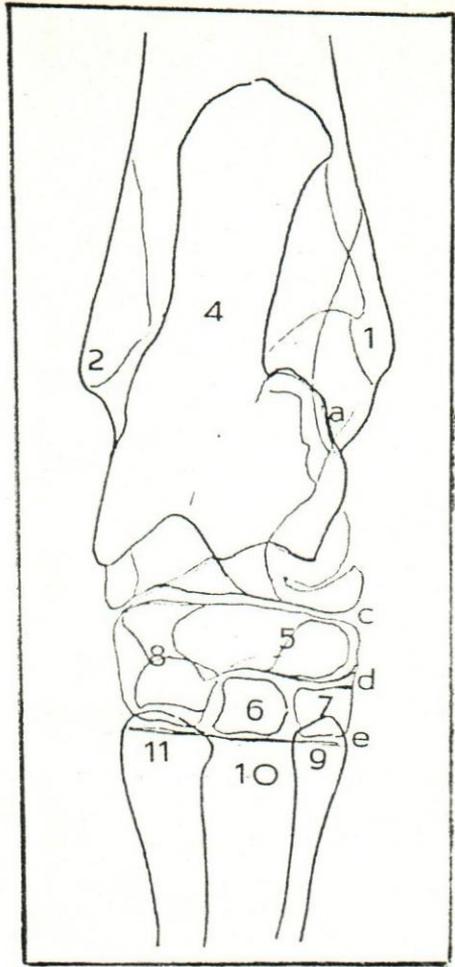


Fig. 2

