

BLOOD SUPPLY OF THE ELBOW AND STIFLE REGION IN DOGS – A REVIEW

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ABSTRACT

The spread of a large number of domestic and stray dogs in recent years has made them the main patients of veterinary surgeons. Compared to other domestic animals, there are a large number of breeds in the dog with significant differences in size, anatomy and physiology.

Traumatic, pathological and degenerative processes of the limbs often occur, where most patients the elbow and stifle joint are affected. In many cases, surgical interventions, operations and even endoprosthesis of these joints are necessary, so the main arteries and veins that provide the blood supply are of great importance. In the elbow region *rete articulare cubiti* is formed from branches of *a. brachialis*, while in the knee region *rete articulare genus* and *rete patellare* are formed, from branches predominantly of *a. poplitea*. Deep venous blood vessels resemble arterial, while the superficial venous net is significantly different and variable in the areas studied. The blood vessels of the thoracic limb are drained in *v. cephalica* and the vessels coming from the pelvic limb in *v. saphena medialis* and *v. saphena lateralis*. After reviewing the current literature there is evidence for a detailed and comprehensive study of the arteries and veins involved in the blood supply of the elbow and knee joint in the dog, which will be a reasonable basis for future anatomical, histological and imaging diagnostic studies on the blood vessels.

Key words: elbow and stifle joint, brachial and popliteal vessels, dog.

Introduction

Main blood supply of the elbow region is from *a. brachialis* and for the stifle region responsible is *a. poplitea*. There is very well-developed superficial venous net, presented by *v. cephalica* for the thoracic limb; *v. saphena lateralis*, greater in dogs, and *v. saphena medialis* – in cats, are the main drainage venous vessels of the superficial network (Evans, H. E. & de Lahunta, A. 2013, Georgiev, 2014). The axillary lymph center (*lymphocentrum axillare*) drains the thoracic limb and consists of the axillary and accessory axillary lymph nodes. In the pelvic limb the main lymphatic node is from popliteal lymph center (*lymphocentrum popliteum*) consists of the popliteal lymph nodes. Dogs only have a superficial popliteal lymph node (*lymphonodus popliteus superficiales*) (Evans, H. E. & de Lahunta, A. 2013).

With great significant for examination of the blood vessels are the arteriography and the phlebography. Through a contrast radiological examination, the arterial and venous vessels are visualized separately, while with computed tomography and angiography gives opportunity to explore them in parallel. Practical significance also finds contrast-enhanced ultrasonography for examination of the elbow and knee joint in norm and pathology.

Arteries of the elbow region

The main blood supply of the elbow joint is given from the branches of *a. brachialis*, that is the continuation of the axillary artery, and lies caudal to the musculocutaneous nerve and cranial to the median and ulnar nerves and brachial vein. The collateral ulnar artery starts from the caudal side of the brachial artery in the distal part of the arm and gives a big branch that supplies the fat and the pouch of the elbow joint capsule (*rete articulare cubiti*) that are located here. *A. brachialis* gives off the superficial brachial artery that passes cranially near to the beginning of the elbow and goes to

the flexor muscle area and in the region of the cephalic vein, where *v. mediana cubiti* detaches, as artery lies under it and passes cranially of the elbow. The artery connects with the collateral radial artery at the angle of the joint and continues as the cranial superficial antebrachial artery. The common interosseous artery is the largest branch leaving the brachial runs from the lateral surface of the brachial artery to the interosseous space. The artery gives off proximally returning branches: *a. recurrens ulnaris* that courses proximally along the medial aspect of the olecranon and may be given also by the ulnar artery, joins *rete articulare cubiti* and anastomoses with collateral ulnar artery; *a. recurrens interossei*, detached from cranial interosseal artery, passes proximally to the lateral aspect of *articulatio cubiti* and contributes to *rete articulare cubiti*. Other branch of the brachial artery in the elbow region is *a. transversa cubiti* that curves laterally and cranially across *articulatio cubiti* (Davis, D. D. 1941, J., Schaller, 2007, Evans, H. E. & de Lahunta, A. 2013).

Veins of the elbow region

The cephalic vein, the most popular choice for intravenous injections, follows the cranial border of the forearm and is the only large superficial vein of the thoracic limb. The median cubital vein (*v. mediana cubiti*) passes laterally of the elbow and extends between the brachial and the cephalic vein and it is the connection between the deep and the superficial system of veins. The axillobrachial vein (*v. axillobrachialis*), the continuation of *v. cephalica* passes laterally of the triceps and caudal to the humerus and connects with the axillary vein. Another superficial vein is *v. omobrachialis* that leaves the axillobrachial vein proximal to the cephalic vein, joins the external jugular vein and receives small vessels only from the fascia and the skin. The deep system of veins is presented by *v. brachialis* and its branches that follow the eponymous artery (Gómez, O., Giner, M. & Terrado, 2007, Dyce K.M., Sack W. O., Wensing C. J. G. 2010, Evans, H. E. & de Lahunta, A. 2013).

Arteries of the stifle region

Some branches of the femoral artery and its direct continuation – the popliteal artery, are the vessels responsible for the blood supply of the stifle joint. The middle caudal femoral artery (*a. caudalis femoris media*) arises from the femoral artery, continues caudodistally, gives small branches for the muscles and anastomoses with the distal caudal femoral artery. The artery is accompanied by a satellite vein. The distal caudal femoral artery (*a. caudalis femoris distalis*) detaches from the caudolateral surface of the femoral artery and runs caudodistally on the gastrocnemius muscle. The distal caudal femoral artery is accompanied by the large proximally lying lateral saphenous vein. The saphenous artery (*a. saphena*), detaches from the medial surface of the femoral artery, distally passes medially of the stifle and sends genicular branch (*r. articularis genus*) to the skin and fascia that cover the medial surface of the knee. The descending genicular artery, comes from *a. femoralis* and is the main blood supply to the stifle joint. Running distally the artery lies deeper than *r. articularis genus*, gives muscle branches and when reaches the medial surface of the knee in the level of the medial epicondyle of the femur it divides into articular branches. These end-branches supply the medial part of the femoropatellar and the medial division of the femorotibial joint capsules. The popliteal artery is the direct continuation of the femoral artery and gives genicular arteries as it passes caudally of the stifle joint. These branches are the middle genicular artery (*a. genus media*) and medial and lateral proximal, and distal genicular arteries. They supply the capsule of the joint, including the cruciate and collateral ligaments and provide the largest blood supply of the stifle joint. Branches of this arteries form networks – *rete articulare genus* – around the knee joint and *rete patelle* – at the patella. The accompanying veins do not have individual names but are

called in general vv. genus. Cranial tibial artery gives off a returning branch *a. recurrens tibialis cranialis*, that also joins *rete articulare genus* and supplies the joint capsule of the knee. Other branches of the popliteal artery in this region are aa. Surales that supply m. gastrocnemius (Klaus-Dieter Budras, Patrick H. McCarthy, Wolfgang Fricke, Renate Richter 2007; Schaller, 2007; Evans, H. E. & de Lahunta, A. 2013).

Veins of the stifle region

The most important superficial veins are the lateral and medial saphenous vein, which are commonly used for venipuncture. The lateral saphenous vein begins collecting its caudal and cranial branches on the lateral and flexor surface of the tarsus and proximally ends in caudal femoral vein. *V. saphena medialis* starts again with the fusion of its cranial and caudal branches and proximally the prominent medial genicular vein from the stifle joint ends in it. The deep venous system is presented by the satellite veins of the main arteries in the region which have the same courses and branches as the arteries. (Klaus-Dieter Budras, Patrick H. McCarthy, Wolfgang Fricke, Renate Richter 2007; Schaller, 2007; Evans, H. E. & de Lahunta, A. 2013)

Visualizing the blood vessels

Important place in the blood vessels visualization takes the arteriography and the phlebography. The contrast radiological examination shows the arterial and venous network separately, while the computed tomography angiography allows to explore them in parallel.

Conclusion

Anatomical variations of the blood vessels in the elbow and stifle region are important in clinical. Pre-anatomical knowledge and frequency of vascular variation help us as future prospects for understanding the vascular model. Future anatomical, histological and imaging diagnostic studies on the blood vessels will help in understanding the pathological conditions in these regions and surgical approaches.

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