

means of immunohistochemistry. The outcome of these examinations may provide new insights in the aetiology, as hoof canker still represents a relevant veterinary problem. Hoof-samples were minced, washed and digested in collagenase I to isolate primary keratinocytes for cell culture. Additionally, samples of healthy and affected hooves, as well as cultured keratinocytes, were fixed in 4% formaldehyde and embedded in paraffin for morphological and immunohistochemical investigations. Preliminary results demonstrated an increased cell doubling rate in hoof-canker keratinocytes compared to normal hoof keratinocytes *in vitro*. Cell formation *in vitro* was altered in affected keratinocytes resulting in spheroidal formations compared to normal monolayers of keratinocytes. The immunohistochemical assays will allow further insights in both, the alterations of hemidesmosomal proteins and ECM interactions in hoof-canker keratinocytes *in vivo* as well as protein expression patterns in diseased and healthy equine hoof keratinocytes *in vitro*.

#### **ANATOMICAL STUDY ABOUT ANTERIOR MANDIBULAR LINGUAL FORAMINA**

S. BERNARDI, C. RASTELLI, C. LEUTER, M.A. CONTINENZA

<sup>1</sup>*Department of Life, Health & Environmental Sciences, University of L'Aquila,*

**Introduction:** In descriptions of surgical procedures in the inferior jaw, often there is no mention of an important anatomical variance, the spinal lingual foramina, where nerves and vessels go through. Aim of this study is to investigate the frequency, the shape and the dimension of anterior mandibular lingual foramina and their canals, in order to give more information to operators who have to consider these structures in a correct planning of the surgical procedures. **Materials and methods:** 25 computed tomography dentascans were analyzed with an implant planning software (MICERIUM IMPLANT PLANNING-M.I.P.). The parameters considered were the frequency, the number, the localization, the diameters and the length of canals, and for each patient a table was made where the measured data were inserted. These data were statistically analyzed and compared with the ones found in literature. **Results:** The results of measurements agree with the ones found in earlier studies, except for the length of the inferior spinal canals which resulted lesser than those found in literature (4.38 mm  $\pm$  1.43 vs 6.1mm  $\pm$  2.6 ). The frequency of the inferior spinal foramina and the data related to the inferior spinal foramina diameter (cross section scan) and the measurements related to the superior spinal foramina diameter (axial scan) resulted major than those found in earlier studies (respectively 49% vs 38(1)/13.34(2)%, 1.09 mm  $\pm$  0.4 mm vs 0.8  $\pm$  0.4 and 1.24 mm  $\pm$  0.29 vs 0.7 mm  $\pm$  0.2). **Conclusion:** This study is clinically interesting because it has been used an implant planning software that is daily used by operators and that permits *in vivo* investigations. Furthermore, due to the possibility of hemorrhagic accidents in the anterior region of the mandible, the oral surgeon has to perform an accurate planning, attending to search also the structures less

known than others, like the alveolar inferior nerve canal.

#### **A HUMAN CADAVER CT-STUDY ON THE COURSE OF THE INFERIOR ALVEOLAR ARTERIES**

K. BERTL<sup>1</sup>, L. HIRTNER<sup>2</sup>, T. DOBSAK<sup>1,3</sup>, A. GAHLEITNER<sup>1,4</sup>, C. ULM<sup>1</sup>, H. PLENK<sup>5</sup>

<sup>1</sup>*Division of Oral Surgery, Bernhard Gottlieb School of Dentistry, Medical University of Vienna, Vienna, Austria.* <sup>2</sup>*Center for Anatomy and Cell Biology, Department of Systematic Anatomy, Medical University of Vienna, Vienna, Austria.* <sup>3</sup>*Austrian Cluster for Tissue Regeneration, Vienna, Austria.* <sup>4</sup>*Department of Diagnostic Radiology, Division of Osteoradiology, General Hospital, Medical University of Vienna, Vienna, Austria.* <sup>5</sup>*Bone and Biomaterials Research, Institute for Histology and Embryology, Medical University of Vienna, Vienna, Austria.*

**Background:** The inferior alveolar arteries (IAA) enter the mandibular canal at the mandibular foramen, where they accompany the inferior alveolar nerve and veins until the mental foramen. They represent the major blood supply to the mandible and mandibular teeth. The aim of this radiographic study was to display its bilateral course within both mandibular canals. **Materials and Methods:** Contrast agent (Peritrat, iodine concentrations: 180 and 400mg/ml) was injected bilaterally into the external carotid artery of 15 fresh cadaver heads. Mandibular CT scans with a standard dental CT investigation protocol were acquired immediately afterwards. The course of the IAA was assessed in the dental reconstruction slices. **Results:** Injection with both iodine concentrations enabled to display the entire course of the IAA from the mandibular to the mental foramen. The higher iodine concentration (400mg/ml) improved the visibility still without creating artefacts. The course of the IAA appeared similar on the left and the right side in two thirds of the subjects, and up to two arterial branches were visible. On average, the IAA changed 4.3-times its position in the canal. Cranial position was most frequently detected (right: 42.1%, left: 41.9%), followed by lingual (right: 35.6%, left: 36.5%), caudal (right: 17.8%, left: 13.8%) and buccal position (right: 4.5%, left: 7.8%). **Conclusions:** This study presents a radiologic method to display post mortem the course of the IAA in the mandibular canal by injecting contrast agent before CT recording. Compared to previous histological studies (Kim 2009, Pogrel 2009) this non-invasive method enables to study easily the entire course in the mandibular canal simultaneously on both sides.

#### **THORACIC VAGUS NERVES IN FETUSES**

S. N. BIASUTTO, G. A. F. CECCON, M. DE LA ROSA, P. A. BORTOLIN

*Institute of Normal Anatomy, Faculty of Medical Sciences, National University of Cordoba, Cordoba, Argentina.*

Studies on vagus nerves and traditional literature are clear in the description at the base of the neck, the lower part of the thorax and associate their final position with gastric rotation occurred between the 4<sup>th</sup>

and 6<sup>th</sup> week of gestation. If we assume there won't be variations during the following weeks this knowledge is important during esophagus surgical procedures in neonates and early childhood (esophagus fistulas, hernia of hiatus, gastro-esophageic reflux, etc.). The objective of this study was to observe vagus nerves in the thorax, describe the variations in number, position and distribution and determining the relation with the gastric rotation. We dissected vagus nerves from the inferior neck to the abdomen, in 30 fetuses with 12 and 23 weeks of gestation. Recurrent nerves were identified. Dissection of the 2<sup>nd</sup> third of the thorax let us observe the cardiac and pulmonary branches which were cut to continue dissecting the nerves around the esophagus. Final position at the hiatus was described and the diaphragm was opened to access the abdominal portion. The gastric rotation was associated with nerves position. Vagus nerves entered the thorax laterally to the common carotid arteries and included in the same sheath. At this level it had a big diameter. After giving the recurrent nerve, the main branch addressed to the pulmonary pedicle and provided the cardiac and pulmonary branches. Under the tracheal division, vagus nerves remained as a thin branch (1/3 or 1/4). Both nerves showed many variations under the pulmonary pedicle and at the diaphragmatic hiatus. The 2 cases with unrotated stomach had a multiple divided right nerve and an anterior left nerve. According to our observations the distribution and position of the vagus nerves in the thorax is variable and complex. It does not seem so easy to associate vagus nerves location with the stomach rotation.

#### **BRACHIOCEPHALIC TRUNK ANOMALIES AND VARIATIONS**

S. N. BIASUTTO, R. R. CECENARRO, G. A. F. CECCÓN, M. L. ÁLVAREZ, M. DE LA ROSA, P. A. BORTOLÍN

*Institute of Normal Anatomy, Faculty of Medical Sciences, National University of Cordoba, Cordoba, Argentina*

Knowledge of anatomical anomalies and variations on the brachiocephalic trunk (BCT) are important in medical practice, mainly for the interpretation of diagnostic images, in surgical procedures of thorax and neck, and may also be of high risk for life. We studied 50 fetuses, of both genders, between 12 and 21 weeks of gestation and described the variations we found according they happened at the origin, the position or the branching of the brachiocephalic trunk. We reviewed the literature and organized the articles (most of the case reports on eventual findings) following the same criteria. Fifteen percent of the studied fetuses were female. On 9 occasions we observed a common origin of the brachiocephalic trunk and the left common carotid artery. We found one case where there was no brachiocephalic trunk, as the right common carotid artery originated from a common trunk with the left common carotid artery, but the right subclavian artery was a branch of the left pulmonary artery. Another case showed the emergence at the BCT division of a third descending branch to the

pulmonary pedicle, as an anastomosis to the right pulmonary artery. The remaining cases presented in the manner usually described; there were not positional variations. Some other variations and anomalies found in the literature are mentioned and correlated with our findings. Some of those cases were not compatible with life but most of them are asymptomatic and only eventually found surgically or during studies by diagnostic images. The anatomical information was associated to the clinical aspects and therapeutic procedures described in the published papers.

#### **THE LIGAMENTUM CAPITIS FEMORIS – AN ANATOMICAL EVALUATION OF FUNCTION IN SITU**

P. BINDER<sup>1</sup>, S. NEUHÜTTNER<sup>2</sup>, C. LAMPERT<sup>3</sup>, E. BRENNER<sup>1</sup>

*<sup>1</sup> Division of Clinical and Functional Anatomy, Medical University Innsbruck, AT. <sup>2</sup> Department of Orthopaedic Surgery and Traumatology, Cantonal Hospital St. Gallen, CH. <sup>3</sup> Orthopaedics 'Am Rosenberg', St. Gallen, CH*

Introduction: Reviewing the literature there is evidence that lesions of the Lig. capitis femoris (LCF) can have a pathologic value. Hitherto, the arthroscopically performed reduction, resection, or trimming of ruptured or injured ligaments causing impingement are state-of-the-art. Latest examinations of the LCF found similarities with the anterior cruciate ligament (ACL). This leads to the question whether reconstructions of the LCF are worth to be considered. Material and Methods: Twenty-one cadaver hips were dissected down to the joint capsule and bone. Parts of the lamina quadrangularis were removed to open the fossa acetabuli from the pelvic side. Both, 30° and 70° angled optics were used to examine the performance of the LCF during different movements. Results: Each form of the LCF described in the literature was found. We could separate only two distinct bundles, and proof a „continuous recruitment of fibres" when approaching different positions; in nearly each movement parts of the LCF get tightened. The LCF gets the highest tension in flexion-adduction-external rotation, and in extension-abduction-external rotation. The most relaxed position for the LCF is in 0° rotation (extension or flexion), whereas each kind of rotation (internal or external) tightens different sections of the LCF. The more the rotation gets, the more fibres are recruited. Discussion: This technique of examining the LCF offers the opportunity to evaluate the actions of the LCF during the full range of motion, and the tensioning of fibres in different positions, respectively. It is one of the first studies on the LCF performed in situ. The LCF gets tensioned in each form of rotation, independent of the flexion-extension. In flexion-adduction-internal rotation (impingement-position), the posterior fibres are strongly tensioned. The other positions show tensioning of different fibres, depending on the motion. This supports the theory of the mechanic stabilising effect of the LCF in hip joints.