

ABSTRACTS of the XXVIII CONGRESS OF THE SPANISH ANATOMICAL SOCIETY

Sercotel Gran Hotel Zurbarán
Badajoz, 1-3 February, 2018, Spain



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SCIENTIFIC PROGRAM

Thursday, 1st February 2018

8,30 Registration and delivery of documentation

9,00 – 11,00 Oral Communications Session 1: **Neuroscience, Embryology, Anatomy Techniques and dissection rooms.**

Chairs:

D. Raquel Mayordomo Acevedo. Universidad de Extremadura.

D. Tomás González Hernández. Universidad de La Laguna.

9,00 (0008) Hippocampal prolactin is involved in the learning and spatial memory consolidation. Experimental study.

Sánchez-Robledo, V. Universidad de Salamanca

9,15 (0035) Development of neural progenitors from mesenchymal stem cells: epigenetic study.

Hernández Pérez M. Universidad de Granada.

9,30 (0050) El papel de las vías neuroanatómicas en la enfermedad de Parkinson.

Flores-Cuadrado A. Universidad de Castilla-La Mancha.

9,45 (0058) Papel de la acuoporina 1, la acuoporina 4 y las isoformas alfa de Na, K-ATPasa en procesos ciliares e iris de ratas espontáneamente hipertensas.

Castañeyra-Perdomo A. Universidad de La Laguna.

10,00 (0006) El FGF2 como activador de la proliferación de precursores neurales.

Lamus Molina F. Universidad de Valladolid.

10,15 (0059) Base molecular del comportamiento diferencial de los axones de la habénula medial y lateral.

De Puelles Martínez de la Torre E. Instituto de Neurociencias de Alicante.

10,30 (0067) La comunicación intercelular mediante uniones tipo GAP como sistema de apoyo en la correcta regionalización del sistema nervioso central.

Echevarría Aza D. Instituto de Neurociencias de Alicante.

10,45 (0052) Utilización de sondas específicas de detección de formol para la vigilancia de niveles de formol en salas de disección.

Sánchez del Campo F. Universidad Miguel Hernández de Elche.

11,30 Official Opening. Salón del Colegio Oficial de Médicos de Badajoz

Opening Conference: **Importancia de la anatomía cardiaca en el diagnóstico y tratamiento de las arritmias**

Dr. José Ángel Cabrera Rodríguez

Catedrático de Cardiología de la Universidad Europea de Madrid y Jefe de Servicio de Cardiología de la Clínica Quirón de Madrid

Intervention of Authorities.

Friday, 2nd February 2018

9,00 – 11,00 Oral Communications Session 2: Clinical Anatomy I.

Chairs:

D. Diego Echevarria Aza. Universidad Miguel Hernández.

D. Angel Gato Casado. Universidad de Valladolid.

9,00 (0029) Validez de los corpúsculos de Meissner y de las células de Merkel para el diagnóstico de neuropatías en la biopsia cutánea.

García Mesa Y. Universidad de Oviedo.

9,15 (0011) Análisis ecocardiográfico de las cardiopatías congénitas en pacientes pediátricos.

- Nevado Medina J. Universidad de Extremadura
- 9,30 (0014) *Los hábitos de calzado influyen en la morfología del pie en las mujeres mayores.*
Mayordomo Acevedo R. Universidad de Extremadura.
- 9,45 (0015) *Variabilidad anatómica en la división terminal de la arteria poplítea.*
Aragones Maza P. Hospital Universitario Santa Cristina.
- 10,00 (0018) *Reconstrucción anatómica de la vaina de los rectos con prótesis. 3 años de experiencia.*
Díaz Pedrero R. Universidad de Alcalá de Henares.
- 10,15 (0019) *Malrotación intestinal asociada a hernia paraduodenal en el adulto.*
Díaz Pedrero R. Universidad de Alcalá de Henares.
- 10,30 (0027) *Variaciones anatómicas del nervio ciático en la región glútea. Referentes anatómicos de relevancia en el abordaje artroscópico del síndrome piriforme.*
Reina-de la Torre F. Universidad de Girona.
- 10,45 (0001) *Factores anatómicos determinantes en el reemplazo transcáteter de la válvula aórtica.*
Macías Gañán Y. Universidad de Extremadura.
- 11,00 – 11,30 *Coffee break.*
- 11,30 – 13,45 *Oral Communications Session 3: Clinical Anatomy II.*
- Chairs:*
- D. José Carretero González. Universidad de Salamanca.
- D. Agustin Castañeyra Perdomo. Universidad de La Laguna.
- 11,30 (0036) *¿Cambia el embarazo la anatomía funcional de la región lumbar?*
Bivià Roig G. Universitat de València
- 11,45 (0038) *Cambios cuantitativos y cualitativos dependientes de la edad en los corpúsculos de Meissner y células de Merkel de la piel glabra digital humana.*
García Piqueras J. Universidad de Oviedo.
- 12,00 (0040) *Estudio anatómico del ligamento colateral ulnar lateral del codo: morfología y distribución neural intraligamentosa.*
Noriego Muñoz A. Universidad de Girona.
- 12,15 (0042) *Diagnóstico de embolia gaseosa arterial en el buceo: sugerencia de modificación de las técnicas de autopsia.*
Casadesús Valbí JM. Universidad de Girona.
- 12,30 (0049) *Importancia de la Anatomía en la cirugía mínimamente invasiva y artroscópica de pie y tobillo. Implicaciones en la descripción del ligamento colateral lateral del tobillo.*
Dalmau-Pastor M. Universidad de Barcelona.
- 12,45 (0053) *Utilización de cadáveres conservados con el método de W. Thiel como simuladores clínicos en la enseñanza del Grado en Medicina.*
Sánchez del Campo F. Universidad Miguel Hernández de Elche.
- 13,00 (0055) *Variaciones anatómicas del origen espinal de los nervios iliohipogástrico e ilioinguinal.*
Valderrama Canales FJ. Universidad Rovira i Virgili.
- 13,15 (0062) *Characterization of the laryngeal nerves in the minipig as the election experimental animal model.*
Maranillo E. Universidad Complutense de Madrid.
- 13,30 (0065) *Anatomic variability of the buccal branch of the extrapetrous facial nerve and its clinical application.*
Maranillo E. Universidad Complutense de Madrid.
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Saturday, 3rd February 2018

8,30 Ordinary Assembly of the Spanish Anatomical Society.

First call.

9,00 Ordinary Assembly of the Spanish Anatomical Society.

Second call.

9,30 – 11,00 Posters Session and Coffee break.

11,15 Oral Communications Session 4: Teaching in Anatomy.

Chairs:

D. Inmaculada Gerrakagoitia Marina. Universidad del País Vasco.

D. Juan Antonio Montero Simón. Universidad de Cantabria.

11,15 (0002) Sonoanatomía del Sistema Nervioso Central

Ortiz-González L. Universidad de Extremadura.

11,30 (0009) Análisis del abordaje práctico en la sala de disección de los alumnos de primer curso de grados sanitarios.

Mingorance Álvarez E. Universidad de Extremadura.

11,45 (0026) Preparaciones anatómicas como modelos de simulación para el aprendizaje de técnicas instrumentales en la atención urgente al paciente traumático (Advanced Trauma Life Support ATLS).

Carrera Burgaya A. Universidad de Girona.

12,00 (0046) Elaboración y uso de videos explicativos de las disecciones anatómicas distribuidos por Youtube: experiencia en la Universidad de Valencia.

Valverde-Navarro AA. Universidad de Valencia.

12,15 (0051) Abordajes clínicos en la sala de disección para la integración de la formación clínica en la formación básica en Anatomía I.

Flores-Cuadrado A. Universidad de Castilla-La Mancha.

12,30 (0054) Utilización de tarjetas NFC para la gestión de cadáveres y especímenes para su disección o utilización en simulación médico quirúrgica.

Sánchez del Campo F. Universidad Miguel Hernández de Elche.

12,45 (0060) Elaboración de un modelo anatómico tridimensional del conducto inguinal de aplicación docente.

Monreal Redondo D. Universidad Europea de Madrid.

13,15 Closing Conference: El rostro enfermo.

Doctor D. Florencio Monje Gil.

Profesor de la Facultad de Medicina de la Universidad de Extremadura y Jefe del Servicio de Cirugía Oral y Maxilofacial del Hospital Infanta Cristina de Badajoz.

14,30 Closing Lunch. Restaurante Castelar, Sercotel Gran Hotel Zurbarán.

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ORAL COMMUNICATIONS

ORAL COMMUNICATIONS SESSION 1

Neuroscience, Embryology, Anatomy Techniques and dissection rooms.

HIPPOCAMPAL PROLACTIN IS INVOLVED IN THE LEARNING AND SPATIAL MEMORY CONSOLIDATION. EXPERIMENTAL STUDY

Sánchez-Robledo V^{2,3,5}, Catalano-Iniesta L^{1,2}, Blanco EJ^{1,2}, García-Barrado MJ^{1,3}, Iglesias-Osma MC^{1,3}, Carretero J^{1,2}, Hidalgo C^{4,5}

¹Laboratory of Neuroendocrinology, INCyL and IBSAL, University of Salamanca, Salamanca

²Department of Human Anatomy and Histology, Faculty of Medicine University of Salamanca, Salamanca, Spain

³Department of Physiology and Pharmacology, Faculty of Medicine, University of Salamanca, Salamanca, Spain

⁴Biomedical Neuroscience Institute (BNI), Faculty of Medicine, Universidad de Chile, Santiago, Chile

⁵Department of Neuroscience, CEMC and ICBM, Faculty of Medicine, Universidad de Chile, Santiago, Chile

Introduction and Objectives: The hippocampus is an anatomical structure which plays an important role in the acquisition of spatial learning and the consolidation of memory. It is also known that prolactin, synthesized mainly in the anterior pituitary, is very versatile in its functions. Among other activities, it is involved in behavior and learning processes. This hormone has been detected in different areas of the SN, including the hippocampus. However, its origin and function in this region is not well determined. The objective was to decide presence and variation of PRL in the different hippocampal strata the trained rats whose memory had been consolidated at different times to know if prolactin is involved in learning.

Material/Methods: The Morris Water Maze (MWM) was used to measure the behavior and learning in 3-month-old male rats. Afterwards, the animals were undergone a post-mortem immunohistochemical study and the protein content of PRL in hippocampal tissue was measured with Western-blot.

Results: The behavioral study at the MWM revealed that there were learning and consolidation of memory at 9 days, 16 days and 25 days after the start of the test. Moreover, the histological study showed an increase of PRL in hippocampus in the animals with memory consolidation at 9 and 16 days, stabilizing after 25 days. Significantly affecting the pyramidal stratum of CA1, CA3 and the granular layer of GD.

Conclusions: These evidences indicate a relationship between PRL and the consolidation of memory.

DEVELOPMENT OF NEURAL PROGENITORS

FROM MESENQUIMAL STEM CELLS: EPIGENETIC STUDY

Hernández R^{1,2}, Rama AR^{2,3}, Jiménez-Luna C², Zafra I², Berdasco M⁴, Prados JC^{1,2}, Melguizo C^{1,2}

¹ Department of Anatomy and Embryology, University of Granada, Granada

² Institute of Biopathology and Regenerative Medicine (IBIMER), Center of Biomedical Research (CIBM), University of Granada, Granada

³ Department of Health Science, University of Jaén

⁴ Programa Cancer Epigenetics and Biology Program, Bellvitge Biomedical Research Institute, L'Hospitalet de Llobregat, Barcelona, Spain

Introduction and Objectives.- Regenerative medicine with mesenchymal stem cells (MSC) allows us to face the complexity of neurodegenerative diseases treatment through the induction of these cells towards differentiated cells with neuronal characteristics that can ultimately be transplanted to the patients. The purpose of this work is to demonstrate its biosecurity and long-term effectiveness before being used in clinical studies by determining the modifications of the methylation pattern.

Material and Methods.- The MSCs have been obtained from lipoaspirates handed over by the Health Hospital of Granada. The isolated and characterized cells have been differentiated into neuronal cell lines using three different induction media (NEU1, NEU2 and NEU3). Neuronal lineage markers were determined and analyzed applying immunofluorescence, RT-PCR and western blotting. The DNA methylation pattern was studied by microarray and the hypermethylated genes were overexpressed to perform a functional analysis.

Results.- The induction of differentiation of MSCs isolated from lipoaspirates allowed us to observe important morphological changes and modulation in the expression of markers of mature neurons such as TAU or TH (tyrosine hydroxylase) or functional neurons such as SNAP25 and CHAT. From the seven genes selected after the methylation studies, we analyzed HOXA5 and obtained stable transfected lines.

Conclusion.- The degree of differentiation of MSCs to neuronal cell lines and the data obtained from the methylation study suggest that the differentiation of MSCs may be an alternative way of treating neurodegenerative diseases.

THE ROLE OF NEUROANATOMIC PATHWAYS IN PARKINSON'S DISEASE

Flores-Cuadrado A, Ubeda-Banon I, Saiz-Sanchez D, Martinez-Marcos A

Neuroplasticity and neurodegeneration laboratory, Ciudad Real Medical School/CRIB, University of Castilla-La Mancha, Spain

Introduction: Parkinson's disease (PD) is the sec-

and more frequent neurodegenerative disorder after Alzheimer's disease. It is characterized by cardinal motor symptoms: tremor, bradikinesia and postural rigidity. Nowadays, the hyposmia and emotional disorders are included in the new diagnostic criteria as non-motor symptoms. Meanwhile, this α -synucleinopathy starts with α -synuclein aggregates in anterior olfactory nucleus and olfactory bulb (Braak's stage 1); while the amygdala and hippocampus are affected in Braak's stages 3 and 4.

Objectives: The rationale of this work is the prion-like disorder hypothesis, according to which the α -synuclein induces conformational changes in others proteins through neuronal and glial connections. The plasticity role of glia associated to learning (tripartite hypothesis) has focus on neurodegenerative diseases.

Material and methods: Based on the proposed hypothesis, immunohistochemistry against GFAP and Iba-1 was carried out on PD human tissue and controls (IDIBAPS Biobanc (Barcelona), BTCIEN (Madrid) and BIOBANC-MUR (Murcia)).

Results: Our preliminary results showed a higher area fraction percentage of glia in olfactory bulb and hippocampus in PD human tissue vs controls.

Conclusions: These results could help to understand the role of neuroanatomic pathways in the α -synuclein transmissibility in PD.

Funding by MINECO-FEDER grant (SAF2016-75768-R).

THE ROLE OF AQUAPORIN 1, AQUAPORIN 4 AND Na^+/K^+ ATPASE IN THE CILIARY BODY AND IRIS IN SPONTANEOUSLY HYPERTENSIVE RATS

Castañeyra-Perdomo A^{1,2}, González-Marrero Ibrahim¹, Hernández-Abad LG², Castañeyra-Ruiz L¹, Paniagua L², Abreu-Reyes JA³, Hernández-Díaz ER², Carmona-Calero EM^{1,2}

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³ *Servicio de Oftalmología, Hospital Universitario de Canarias, La Laguna, Tenerife, Islas Canarias, Spain*

Introduction: Aquaporin's 1 and 4 (AQP1 and AQP4) are important for ocular homeostasis and function, and they are associated with the Na^+/K^+ ATPase isoforms, where, the $\alpha 1$ isoform is expressed on the basolateral surface of the ciliary pigmented epithelium (PE) and $\alpha 2$ isoform is located densely in the basolateral membrane of the ciliary non-pigmented epithelium (NPE). AQP1 and AQP4 are important to maintain tear film osmolality, to generate aqueous humor, and to maintain retinal homeostasis. On the other hand, the spontaneously hypertensive rats (SHR) show a lower

intraocular pressure than the normotensive (WKY).

Objective: Therefore the objective of this work is to analyse AQP1, AQP4 and Na^+/K^+ ATPase expression in ciliary body and iris of the SHR, to study a possible link between blood pressure and intraocular pressure.

Method: Eyes from WKY) and SHR rats of 26 weeks of age were used. The immunocytochemistry was performed using antibodies against: AQP1, AQP4 and Na^+/K^+ ATPase $\alpha 1$ and $\alpha 2$ isoforms.

Results: Our results showed that AQP1 is localized mainly in the iris and the AQP4 in the ciliary processes, and hypertension produces, in ciliary processes, a decrease in AQP4 and Na^+/K^+ ATPase $\alpha 2$, and an increase in Na^+/K^+ ATPase $\alpha 1$. Hypertension also produces an increase in AQP1 and Na^+/K^+ ATPase $\alpha 1$ in Iris posterior epithelium.

Conclusions: The hypertension produces changes in the water channel and Na , K pump implicated in the movement of water in both iris and ciliary process that could influence the rate of production of aqueous humor.

Key words: Aquaporin-1, Aquaporin-4, Na^+/K^+ ATPase, Iris, ciliary process, hypertensive rats

Funding statement: This study was supported by the research projects from: "Fundación Canaria Instituto de Investigación y Ciencias de Puerto del Rosario" project no. INIPRO 03/14.

FIBROBLAST GROWTH FACTOR 2 AS MITOTIC INDUCTOR IN NEURAL PRECURSORS

Lamus Molina F¹, Alonso Revuelta MI¹, Carnicero Gila EM¹, Moro Balbás JA¹, Fraile Bethencourt E¹, Caballero García A², Fernández Gómez JMF³, Gato Casado A¹

¹ *Dpto. Anatomía y Radiología, Facultad de Medicina de Valladolid, Spain*

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Introduction and Objectives: Neural stem cells during brain development have an intense activity mainly involved in self-renewing their growing population and the generation of differentiated nervous tissue cells (specifically neurons at the beginning of the development). Our interest was focused in the role of FGF2 as mitotic inductor in neural stem cells able to maintain and expand this cellular population.

Material and Methods: We study the mitotic rate of the brain neuroepithelial tissue in FGF2 Knock-out mice embryos compared with their Wild-Type. To identify mitotic neural stem cells we use immunodetection of BromodeoxyUridine previously incorporated to the embryos.

Results: Our data reveal a significant decrease in the number of mitotic cells across the brain vesic-

cles in Knock-out embryos with respect to the wild-type ones. We also detect this decrease in the subventricular zone niche of adult brain Knock-out mice.

Conclusion: The FGF2 present in the cerebrospinal fluid in contact with the neural stem cells population plays a key role in their self-renewing process.

MOLECULAR BASIS OF THE MEDIAL AND LATERAL HABENULAR AXONS DIFFERENTIAL BEHAVIOUR

Company V, Juárez-Leal I, Murcia-Ramón R, Guerrero-Moreno A, Crespo-Quiles C, Almagro-García F, Echevarría D, Puelles E

Instituto de Neurociencias, Universidad Miguel Hernández-CSIC, Alicante, Spain

Introduction and Objectives.- Our aim is to identify the molecular components responsible of the differential behavior of the medial habenula compared with the lateral habenula axons during the embryonic development.

Material and Methods.- Using the mouse as the experimental model, we realized single and double immunohistochemistry against the protein molecules selected previously in frontal sectioned embryos at different developmental stages. We selected a set of surface molecules candidate to play a role in the behavior displayed by the medial compared with the lateral habenular axons from the public databases.

Results.- These axons share a common route at the beginning of their trajectory towards their target neuronal populations. Later the lateral habenular axons defasciculate and innervate the Substantia nigra meanwhile the medial habenular axons maintain their trajectory up to the interpeduncular nucleus. We have demonstrated that the Neurofilament protein is specific of the lateral habenula axons and that DCC, Robo3 and Cntn2 molecules are specific of the medial habenula axons.

Conclusions.- The use of these markers allowed us to prove that the fibers travel in different compartments inside the retroflex tract. The medial habenular fibers are located in the core of the tract and the lateral habenular axons in the periphery. Neurofilament allowed us to distinguish between the two groups of axons and therefore open the possibility to decipher the signaling mechanisms through experimental embryology.

This work has been supported by PROMETE-OII/2014/014 and Instituto de Salud Carlos III (RD16/0011/0010). V. Company is supported by a FPU fellowship (FPU16/03853).

INTERCELLULAR COMMUNICATION THROUGH GAP-TYPE CONNECTIONS AS A SUPPORT SYSTEM FOR THE CORRECT REGIONALIZATION OF THE CENTRAL NERVOUS SYSTEM

Andreu A, Bosone C, Crespo-Quiles C, Mancinelli S, Company V, Murcia-Ramón R, Guerrero-Moreno A, Juárez-Leal I, Almagro-García F, Puelles E, Echevarría, D.

Instituto de Neurociencias, Universidad Miguel Hernández-CSIC, Alicante, Spain

The gap junction communications (GJC) are integral membrane proteins that allow the direct cytoplasmic exchange of ions and low molecular weight metabolites between adjacent cells. Each connexon contains six proteins, the connexins (Cxs). Current evidence suggests that separation junctions play an important role in ensuring the normal development of the embryo. We determine if GJC are contributing to the early morphogenesis of the vertebrate brain.

Using organotypic cultures of embryonic mouse brain, we perform immunohistochemical and in situ hybridization techniques for the detection of Cx43 and proteins related to the intracellular cascade given by the most important morphogen in vertebrate's brain patterning and regionalization, the fibroblastic growth factor 8 (Fgf8).

Using specific blockers of the GJC, we have been able to alter the morphogenetic activity of Fgf8 in the isthmus between the mesencephalon and rhombencephalon. By contrast modulation of Fgf8 activity, we have managed to modify the expression of Cx43 at E9.5 mouse embryo. Moreover, in the chick embryo we demonstrated that Fgf8 induces the expression of Cx43. Thus, Fgf8 needs the Gap type junctions whose connections are formed by Cx43 for its correct induction along the neural tube. The lack of function of this protein or the lack of Cx43 alters the correct formation of the CNS.

This work has been supported by PROMETE-OII/2014/014 and Instituto de Salud Carlos III (RD16/0011/0010). V. Company is supported by a FPU fellowship (FPU16/03853).

USE OF SPECIFIC PROBES FOR FORMOL DETECTION IN THE SURVEILLANCE OF FORMALDEHYDE LEVELS IN DISSECTION ROOMS

Sánchez del Campo F, Pérez-Crespo J, Sánchez de la Blanca A, Ortuño-Hernandez P, García-Blau R, Sánchez-Ferrer F

Miguel Hernandez University of Elche, Alicante, Spain

Introduction and objectives: The increasingly demanding safety measures regarding the levels of formaldehyde, requires a strict control in the dissection rooms. Taking into account that formaldehyde levels are determined by different parameters: technique used, air renewal, room temperature, activity performed, etc., we believe that the only way to measure formaldehyde levels in real

time is by means of specific probes that detect and quantify this element.

Method: Three specific probes have been used for the formaldehyde, from "PPM Technology: a) in the preparation room, where two tanks are also found, one with Thiel conservation solution and another with formaldehyde conservation; b) in the postgraduate dissection room where only corpses treated by the Thiel method, and a third probe c) are used in the dissection room where the undergraduate students work with 20 corpses fixed with the classic technique with solutions with 5% formalin.

Results: The probes perform measurements automatically every 5 minutes by marking the levels on the display and sounding an audible and optical alarm if the levels reach or exceed 0.3 Ppm; likewise, they record control of these values in a pen-drive that can be later overturned in a computer, where curves can be made in relation to the activities carried out in the different rooms.

Conclusions: The formaldehyde probes are essential to control the temporary exposure of the undergraduate, graduate and staff members in the room.

ORAL COMMUNICATIONS SESSION 2

Clinical Anatomy I.

THE VALIDITY OF MEISSNER'S CORPUSCLES AND MERKEL'S CELLS ANALYSIS IN SKIN BIOPSIES FOR THE DIAGNOSIS OF PERIPHERAL NEUROPATHIES

García-Mesa Y, García-Piqueras J, Feito J*, Torres-Parejo Isidro, Cobo R, Cabo P, García-Suárez O, Vega JA

Departamento de Morfología y Biología Celular, Grupo SINPOS, Universidad de Oviedo, Spain
*Servicio de Anatomía Patológica, Complejo Asistencial Universitario de Salamanca

Introduction: The study of small nerve fibers is an accepted method for diagnostic confirmation in some peripheral neuropathies. Conversely, the large nerve fibers, sensory corpuscles and Merkel cell-neurite complexes have been poorly analyzed.

Objective: Here we investigated the quantitative and qualitative changes in Meissner's corpuscles and Merkel's cells in diabetic neuropathy.

Material and methods: Glabrous skin samples from the distal phalanx of the first toe of clinically and analytically diabetic patients (Hospital Universitario Central de Asturias, Oviedo; n = 20), were processed for the immunohistochemical detection of specific antigens of Merkel's cells (cytokeratin-20) and the main components of Meissner's corpuscles (S100 protein and neurofilaments). Furthermore, the presence of the mechanoprotein Piezo2 in these structures was analyzed in parallel. Similar skin samples from healthy subjects

were used as controls (n = 5).

Results: Results showed that in the diabetic neuropathy there is a reduction in the index of Meissner's corpuscles and Merkel's cells, and the remaining corpuscles displayed aberrant morphology, and abnormal arrangement of the axon and the lamellar cells as well as of the antigenic pattern distribution. Furthermore, in the diabetic subjects the immunoreactivity for Piezo2 was practically absent in both types of sensory structures. Thus, diabetic neuropathy courses with a reduction in the number of Meissner's corpuscles and Merkel's cells, together with changes in the corpuscular morphology and immunohistochemical characteristic, and loss of Piezo2 mechanoprotein.

Conclusions: These findings support the interest of the analysis of Meissner's corpuscles and Merkel's cells in the cutaneous biopsy for the diagnosis-evolution of peripheral neuropathy.

Supported by a grant from Gerencia Regional de Salud de Castilla y León to JF (GRS 1615/A/17).

ECHOCARDIOGRAPHIC ANALYSIS OF CONGENITAL HEART DISEASES IN PEDIATRIC PATIENTS

Nevado-Medina J, Ortiz-González L, Sánchez-Quintana D

Department of Anatomy and Cell Biology, Extremadura University, Badajoz, Spain

Introduction: Congenital heart diseases affect between 4 and 12.5 per 1,000 live births. In addition, 2.8 per 1,000 adults have some congenital heart disease. It is a frequent cause of morbidity and mortality in young and old children. Echocardiography is a useful, safe and non-invasive test, being the technique of choice in the early diagnosis of congenital heart diseases.

Objectives: Analyze the cases diagnosed by ultrasound; and the relationships between age, sex, reason for consulting the pediatrician and consequences of medical diagnosis due to the observed pathology.

Methods: Collection and analysis of clinical histories and echocardiographic images of pediatric patients from 2014 to 2016 of a pediatric clinic in Badajoz.

Results: We analyzed 405 clinical histories and echocardiographic images, of which 59% were children. The average age was 4.05 ± 3.96 years. The most frequent reason for consultation was heart murmur (53.1%). 29.6% of them presented some echocardiographic alteration. The most frequent pathology was a ventricular septal defect (8.4%), followed by an interatrial septal defect type ostium secundum (7.2%). 74.1% of the patients did not require subsequent revisions.

Conclusions: Cardiac alterations were found in a high percentage and they were not detected during the fetal period. We have found a correlation between the age and the pathologies diagnosed, being observed more frequently these in patients

under one year of age.

FOOTWEAR HABITS INFLUENCE THE FOOT MORPHOLOGY IN ELDERLY WOMEN

Mayordomo Acevedo, R, Pérez Pico AM, Marcos Tejedor F, Mingorance Álvarez E

Department of Anatomy, Extremadura University, Plasencia, Cáceres, Spain

Introduction and Objectives: The digital formula in the foot is determined by the relative length of the first finger in front of the rest of the fingers and there are three types of foot: Egyptian foot, square foot and Greek foot. Initially this proportion should not change over time since it is determined from birth. In this work we have analyzed the footwear habits of two different women's populations to determine the influence of the footwear in the modification of the digital formula in the foot.

Material and methods: A total of 164 women were explored by differentiating two groups: one control and the other institutionalized women (with very different lifestyles). The age of both populations was very similar. Their digital formula and digital deformities were determined in addition to analyzing their habits and types of footwear.

Results: The Egyptian foot was the most common in both populations, however, women with occlusive and high-heeled shoe habits showed a greater percentage of square feet compared to women who usually wear non-occlusive and flat footwear, this difference being statistically meaningful. Additionally, a high prevalence of Hallux Valgus (HV) is observed in the women of the control group who have the square foot, this being a significant fact, while in the rest of the women, it is the Egyptian foot that presents the most HV.

Conclusions: Using an occlusive shoe and heel can alter the morphology of the foot.

ANATOMICAL VARIABILITY ON THE POPLITEAL ARTERY TERMINAL BRANCHING

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Introduction and objectives: To describe, after human cadaver dissection, different patterns of popliteal artery terminal division. And to propose an useful and simple classification.

Material and Methods: 112 cadavers (224 lower limbs) have been examined; 51 male, 61 female; 109 right and 115 left. Previously published literature has been reviewed and different patterns adapted to our classification.

Results: Our findings were classified into three

groups:

Pattern 1: Popliteal artery division into anterior tibial artery (ATA) and posterior tibial artery (PTA) on the inferior border of popliteal muscle (PM) (213 cases, 95.01%)

Pattern 2: High division of the popliteal artery over the superior border of the popliteal muscle (7 cases, 3.13%.)

Pattern 2.a. ATA runs deep to PM (4cases, 1.79%)

Pattern 2.b. ATA runs superficial to PM (2 cases, 0.88%)

Pattern 2.c. Peroneal artery arises from ATA (1case, 0.45%)

Pattern 3. The three terminal branches arise from a common trunk. They arise close to the inferior border of PM. (4 cases, 1.79%)

Conclusions: The popliteal artery branches varies in 6% of cases. Based in our results, these variations could be classified into three patterns considering high of division and terminal branches number.

ANATOMICAL RECONSTRUCTION OF THE SHEATH OF THE ANTERIOR RECTUS ABDOMINIS WITH MESH. 3 YEARS OF EXPERIENCE

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Introduction: Incisional hernia is an important clinical and economic problem. The tension-free repair of the abdominal wall with the use of a mesh defended by Rives revolutionized hernia surgery in terms of recurrence. The realization of a novel technique, based on the anatomical structure of the sheath of the anterior rectus abdominis with prosthesis, should provide improvements in functional aspects.

Objective: To evaluate the results obtained during three years in the patients who underwent this technique in our Hospital. **Methodology:** Retrospective study of all patients submitted to this intervention between January 2014 and December 2016. It was collected if postoperative hematomas had occurred, superficial dehiscence of skin and subcutaneous tissue, infection or rejection of mesh, recurrence, chronic pain (more than 6 months), as well as the improvement in its functionality.

Results: A total of 59 cases were collected, of which 7 presented a postoperative hematoma, 4 superficial dehiscence (7 were associated with lipectomy). Although a longer period of time is desirable for the evaluation of the results regarding recurrence and the study of functionality, we must point out that until now, there have been no

recurrences and the functional study is giving positive results.

Conclusions: The anatomical reconstruction of the sheath of the anterior rectus abdominis is a safe technique, with good results in the integration of the mesh.

INTESTINAL MALROTATION ASSOCIATED WITH PARADUODENAL HERNIA IN ADULTS

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Introduction: Abnormalities in the development and malrotations of the primitive midgut, give rise to definitive abnormal positions of the intestines, which can also be associated with a certain frequency internal hernias. It is usually diagnosed in the first years of life.

Objectives: Presentation of a case of complete intestinal malrotation associated with midgut herniation in adults.

Material and Methods: Detailed case presentation, providing radiological and of the surgical intervention iconography, making a review of embryology and classic hernias through paraduodenal spaces.

Results: A 46-year-old woman with a psychiatric history, followed up by endocrinology due to eating disorders, without previous surgeries. Physical examination revealed a lower right abdominal quadrant tumor, with clinical signs of intestinal obstruction. Radiological tests reveal an obstructive syndrome secondary to internal hernia. An emergency laparotomy was performed, in which complete malrotation of the entire midgut was observed, with an internal hernia through Landzert's orifice, which causes an obstructive syndrome. An intestinal duplicity is associated in a stretch of about 10cm to 90cm of the ileocecal valve. The intervention of Ladd is performed, also resecting the section of intestine affected by intestinal duplicity. The evolution was favorable.

Conclusions: The knowledge of embryology of the digestive tract is essential to understand pathologies not only at an early age. Such knowledge means that we can surgically correct these defects and avoid visceral injuries, especially at the mesos level.

ANATOMICAL VARIATIONS OF THE SCIATIC NERVE IN THE GLUTEAL REGION. RELEVANT ANATOMICAL REFERENCES IN THE ARTHROSCOPIC APPROACH TO PIRIFORMIS SYNDROME

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Introduction: The arthroscopic approach to the piriformis syndrome needs a precise knowledge either of anatomical variations and anatomical references in the gluteal region.

Objectives: Determination of reference morphometric parameters and description of the sciatic nerve morphology in its trajectory at the deep gluteal region.

Material and methods: Through anatomical dissection, a total of 20 gluteal regions were studied, from voluntary donors of the Donation Service of the Faculty of Medicine in the University of Girona. The main anatomical relationships between the sciatic nerve and the piriformis muscle were determined, and the anatomical variations of the sciatic nerve at this level were analyzed. Likewise, relevant reference distances were determined for the arthroscopic approach of the piriformis syndrome.

Results and conclusions: In 80% of the cases the usual morphology of the sciatic nerve in the gluteal region was confirmed (type A of Beaton). In 20% of the cases, the sciatic nerve pattern in the gluteal region corresponded to type B of the Beaton classification (passage of the peroneal nerve through the muscular belly of the piriformis muscle). Among the quantified distances, the shortest distance was observed between the ischial tuberosity and the point of emergence of the sciatic nerve in the gluteal region.

In cases in which an arthroscopic approach to the sciatic nerve must be done, the anatomical reference closest to its point of emergence is the ischial tuberosity. The anatomical variations found at this level are consistent with the figures in the literature reviewed.

DETERMINING ANATOMICAL FACTORS IN THE TRANSCATHETER AORTIC VALVE REPLACEMENT

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Introduction: Transcatheter aortic valve replacement is the chosen treatment in elderly patients with aortic stenosis, who are not suitable for surgery or with high surgical risk. It is an alternative treatment to valve replacement surgery, which is less invasive method. Special attention must be paid to the complications, due to its devastating consequences for the patient. The two most used prostheses are the Medtronic CoreValve and the Edwards-Sapien.

Objectives: To observe the anatomical variations in the arrangement of the atrioventricular conduction system, which may result in tissue injuries during the transcatheter replacement of the aortic valve.

Material and methods: We have analyzed 57 hearts using histological and morphometric techniques in order to observe these variations.

Results: We have considered determining factors that affect the conduction tissue during valve replacement: i) shorter length of the interventricular membranous septum (17.5% of cases); ii) left deviation of the His bundle and, therefore, greater proximity to the left ventricle outflow tract (38.5%); iii) thickness of the interventricular muscular septum, 6 mm from its ridge, ≥ 11 mm (17.5%); and iv) the presence of calcifications in the aortic valve leaflets, membranous septum or central fibrous body (47%).

Conclusions: Our results show that interventional cardiologists must know these determining factors during the transcatheter replacement of the aortic valve, to avoid an injury of the conduction system that could lead to partial or complete block after valve replacement.

ORAL COMMUNICATIONS SESSION 3

Clinical Anatomy II.

DOES PREGNANCY CHANGE THE FUNCTIONAL ANATOMY OF THE LUMBAR REGION?

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Introduction: One of the most frequent movements of daily life is trunk flexion- extension, which has been related to the appearance of low back pain. However, in pregnant women, although low back pain is one of the most frequent complications, there is little evidence of kinematic and neuromuscular responses during trunk flexion- extension.

Objectives: The objective of the present study was to analyze the effects of pregnancy on the motion of the lumbar spine, and the activation pattern of the lumbar erector spinae during trunk flexion-extension movement in healthy pregnant women.

Material and methods: 34 nulliparous women and 34 pregnant women in the third trimester of pregnancy. The EMG activity of the right erector spinae and the motion of the lumbar spine during trunk flexion-extension in both groups, and 2 months after delivery, were recorded.

Results: In pregnant women, maximum lumbar flexion, the percentage of lumbar flexion during

flexion and the maximum lumbar flexion time decreased compared to nulliparous and postpartum groups. Pregnant women also showed greater activation of the erector spinae during flexion and eccentric contraction and a shortening in its myoelectric silence ($P < 0.01$).

Conclusions: Pregnant women show adaptations in their patterns of lumbar motion and muscular activity of the erector spinae during trunk flexion-extension. These modifications could be related to the changes in abdominal mass and the increase in ligament distensibility caused by relaxin.

Funding sources: This work was supported by a grant from the Universitat de València (UV-INV-AE16-495476; "Estudio de la función lumbopélvica para el tratamiento del dolor lumbar en el embarazo y la lactancia").

QUANTITATIVE AND QUALITATIVE AGE-DEPENDENT CHANGES IN MEISSNER'S CORPUSCLES AND MERKEL CELLS IN HUMAN DIGITAL GLABROUS SKIN

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Introduction: Sensory decline of the somatosensory system is a consequence of the ageing process, and involves the central nervous system, the peripheral nervous system (PNS) and the skin. Nevertheless, the effects of ageing in PNS, especially the sensory corpuscles, are poorly known.

Objective: To study the age-dependent changes in the density and morphology of Meissner's corpuscles and Merkel cells from 20 to 90 years.

Material and methods: Human digital glabrous skin samples were obtained from hand fingers of subjects free of neurological disease. Single immunohistochemistry and double immunofluorescence was used to detect structural elements of Meissner's corpuscles (S100 protein and Neurofilament) and Merkel cells (CK20).

Results: The mean density of Meissner's corpuscles was 116/mm² at early adulthood and 42/mm² at late adulthood. The mean density of Merkel cells is 187/mm² at early adulthood and 49/mm² at late adulthood. Moreover, the morphology of Meissner's corpuscles was different in elderly with respect to the young adults: they were smaller, round shaped and located outside the dermal papillae. Furthermore, some Meissner's corpuscles were found completely or partially denervated. No changes in Merkel cells morphology were noticed. **Conclusions:** Present results demonstrated that the number of light touch mechanoreceptors decreases

es with normal aging process, together with aberrant morphology and localization of Meissner's corpuscles, which sometimes were denervated. Therefore age-dependent mechanosensory decline is associated with a reduced number of light touch mechanoreceptors, but also with an altered structure of Meissner's corpuscles.

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ANATOMICAL STUDY AND PRELIMINARY RESULTS OF NEURAL DISTRIBUTION OF THE LATERAL ULNAR COLLATERAL LIGAMENT OF THE ELBOW

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Introduction and Objectives: To describe the morphology of the lateral ligamentous complex fascicles of the elbow, specifically of the lateral ulnar collateral ligament (LCLU). To analyze the intraligamentous distribution of nerve terminals in this fascicle.

Material and methods: Twenty-five elbow joints obtained from voluntary donors of the Donation Service of the Faculty of Medicine in the University of Girona have been studied. Surgical microdissection of the lateral ligamentous complex of the elbow joint was performed. Their morphometry and anatomical variants have been analyzed. Sensory nerve distribution in the ligament parenchyma was studied by immunohistochemical staining with antihuman PGP9.5 antibody.

Results and conclusions: Three morphological variants of the lateral ulnar collateral ligament have been identified, related to three patterns of insertion at the ulnar level. The origin is in the lateral epicondyle. It's average length is 4mm and it changes depending on the degrees of flexo-extension of the joint. It's width is 18.04 mm and it's average thickness is 1.43 mm. We can observe that these fibers tighten in supination.

Preliminary results of the intraligamentous neural distribution show an asymmetric distribution with greater density in the middle and distal third of the ligament.

The detailed anatomical description of the lateral ulnar collateral ligament of the elbow remains controversial. It's morphology and biomechanical behaviour seems to reveal an important functional role in the posterolateral stability of the elbow.

DIAGNOSIS OF ARTERIAL GAS EMBOLISM IN SCUBA DIVING: MODIFICATION SUGGESTION

OF AUTOPSY TECHNIQUES

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Objectives: Suggest modifications of autopsy techniques in order to improve post-mortem diagnosis of arterial gas embolism (AGE) based on multidisciplinary investigation of SCUBA diving fatalities.

Methods: Five human adult specimens from the voluntary donation program of the Human Anatomy Laboratory, and twelve judicial autopsied corpses of SCUBA divers from the Forensic Pathology Service were used. Before performing the autopsies, we accessed the diving plan and the divers' profiles for each case. The technical procedure included identification, isolation and manipulation of carotid, vertebral and thoracic arterial systems.

Results: Using the suggested technical procedure, those vascular structures allowing to optimally isolate the systemic arterial circulation were identified and ligated. In five of twelve judicial cases, we had a strongly suggestive history of arterial gas embolism following pulmonary barotrauma (Pbt/AGE). In these cases, the proposed technical modifications allowed us to clearly diagnose AGE in three of them. The autopsy of the rest of the cases showed other causes of death such as asphyxia by drowning and heart attack.

Conclusions: These results allow us to suggest a specific autopsy technique divided into four steps, aimed at confirming or excluding some evidence of dysbaric disorders according to a re-enactment of the incident. We have demonstrated the presence of large volumes of intravascular air, which is typical of Pbt/AGE.

IMPORTANCE OF THE ANATOMY IN FOOT MINIMALLY INVASIVE SURGERY AND ANKLE ARTHROSCOPY. IMPLICATIONS ON THE DESCRIPTION OF THE LATERAL COLLATERAL LIGAMENT OF THE ANKLE

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Introduction and Objectives: To review how minimally invasive and arthroscopic surgical procedures have changed the way surgeons visualize anatomy. To analyze the innovations that this change offers through the collaboration between Anatomists and Surgeons. To present an anatomical study about the lateral collateral ligament of the ankle, which arthroscopic visualization has changed the dissecting approach. This has led to the discovery of new connections between its components.

Methods: Literature review of anatomical studies published in the last years about the clinical and surgical anatomy of the foot and ankle. The anatomical study presented has been performed on 30 fresh-frozen human ankles.

Results: The review of the anatomical structures implicated in new surgical procedures has produced new knowledge that is added to the classical anatomical descriptions. In the anatomical study fibers connecting the anterior talofibular ligament (ATFL) and the calcaneofibular ligament (CFL) have been found. The ATFL is always formed by two fascicles, which behave differently when dynamically observed.

Conclusions: Evolution of surgical procedures to minimally invasiveness, where visualization of the structures is reduced, inexistent or is obtained through a camera increases the importance of anatomical knowledge. The connections found between the ATFL and CFL will change the way ankle instability is diagnosed and treated, as the lesions of its components will produce either a microinstability or an instability of the ankle joint.

USE OF CORPSES PRESERVED WITH THE W. THIEL METHOD AS CLINICAL SIMULATION IN TEACHING THE DEGREE IN MEDICINE

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Introduction and Objectives: The aim is to prepare corpses previously treated with the W. Thiel method, in order to be used in the practical teaching of the physical examination in clinic and in the evaluation of the ECOE test.

Methodology: In order to explore cardiopulmonary auscultation; NCF labels are implanted in the classic points of cardiac auscultation, as well as in the centers of respiratory auscultation. Such labels activated by radiofrequency, are implemented so that when activated by the card reader (like a stethoscope), we can auscultate the normal or pathological sounds, previously selected in a library loaded on a computer. The student must make the appropriate diagnoses. In the same way, spheres of different size and consistency are implanted in several regions: cervical, supra clavicular, inguinal axillary, mammary

etc., in order to simulate nodules to palpation. We also implant, through laparoscopy, bags filled with pressure fluids, that simulate palpable abdominal masses (in hypochondria, iliac, supra pubic, etc.).

Results: The preparation of different corpses with distribution of nodules or masses in different regions, as well as different auscultable pathologies will be evaluated in the next ECOE carried out in our Faculty.

Conclusions: We believe that the corpses thus prepared can be of great use in the teaching of physical examination, before performing practices with patients.

ANATOMICAL VARIATIONS OF THE ILIOHYPOGASTRIC AND ILIOINGUINAL NERVES: CADAVERIC STUDY, REVIEW OF THE LITERATURE, AND PROPOSAL OF A NEW CLASSIFICATION OF CLINICAL INTEREST

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Introduction: To analyse the variations of the iliohypogastric and ilioinguinal nerves in a cadaveric sample, to develop a meta-analysis based on the obtained results and in an extensive review of the main literature on the topic, and to propose a simple classification of such variations.

Material and methods: Forty-six human cadaver retroperitoneum and their iliohypogastric and ilioinguinal nerves were studied.

Results: A total of 87 retroperitoneum sides were described in the cadaveric sample. Four types, Type IA, Type IB, Type IIA, and Type IIB have been established in the classification. Type IA, the iliohypogastric and ilioinguinal nerves arise together and remain together, incidence was 37.9%; Type IB, the iliohypogastric and ilioinguinal nerves arise together but split into two independent structures, incidence was 10.3%; Type IIA, the iliohypogastric and ilioinguinal nerves arise independently but join together, incidence was 2.3%; Type IIB, the iliohypogastric and ilioinguinal nerves arise and remain independent, incidence was 49.0%. In addition, the level of origin of the nerves is consigned by means of a subscript; the most prevalent variations were Type IAL_{L1-L1} (37.9%) and Type IIB_{L1-L1} (30.0%).

Conclusions: The iliohypogastric and ilioinguinal nerves originate jointly in one out of three cadavers, run together –at least until the anterior superior iliac spine– in one out of five individuals, and originate from L1 in four out of five cases; but there are other anatomical variants with relevant inci-

dences. There are no differences in the type incidences by side or sex. A simple, comprehensive and useful classification is proposed.

CHARACTERIZATION OF THE LARYNGEAL NERVES IN THE MINIPIG AS THE ELECTION EXPERIMENTAL ANIMAL MODEL

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Introduction and objectives: Last studies in micro dissection of the larynx have demonstrated the existence of a high number of connections between the three laryngeal nerves but an exhaustive a description or their functional role have not been yet deeply studied. Our aim is to characterize the laryngeal innervation patterns, nerves and connections in the minipig, who is the preferred animal model used in laryngeal reinnervation studies.

Material and Methods: A total of 12 adult minipigs were studied. The procedures were carried out at the Gregorio Marañón Experimental Medicine Centre. We have analyzed the electromyographical (EMG) response of three of the intrinsic laryngeal muscles (cricothyroid, tiroarytenoid and posterior cricoarytenoid muscles) after a selective left side stimulation of the internal (ILN), external (ELN) and recurrent (RLN) laryngeal nerves. Posteriorly the larynges nerves were dissected. The laryngeal function (opening and closing of the vocal folds) was evaluated by means of laryngoscopy pre and post-intervention.

Results: Our results show that after selective stimulation of each laryngeal nerve were evoked in a variable way activity in muscles did not expected to be contract. After dissection we have found until four different connections between the Laryngeal nerves located ipsi and contralaterally.

Conclusions: These findings suggest that the neuroanatomy of the minipig is more similar to the humans. Therefore, the minipig is an excellent model for studies of the laryngeal regeneration and reinnervation.

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ANATOMIC VARIABILITY OF THE BUCCAL BRANCH OF THE EXTRAPETROUS FACIAL NERVE AND ITS CLINICAL APPLICATION

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Introduction and objectives: The facial nerve gives, in its extracranial course, two main divisions in the parotid area, the temporofacial and the cervicofacial branches, which finally give off five terminal branches: temporal, zygomatic, buccal, marginal and cervical. The buccal branch gives the motor supply to the midface and buccal sphincter muscles. The aim of this review is to study the variability of the buccal branch.

Material and Methods: We have studied 23 embalmed Caucasian adult cadavers (11 male and 12 female) belonging to the Bodies Donation and Dissecting Rooms Centre of the Complutense University of Madrid. We had dissected 38 facial nerves to study the buccal branch, its diameter, length and connections with other branches.

Results: The buccal branch has the most variable origin compared with the other branches. In 18 cases (47.37%) it arose from the temporofacial division, in 16 cases (42.11%) from the cervicofacial division and in 4 cases (10.52%), it had a double origin. It usually gives 1 to 3 terminal branches. We often found connections between the zygomatic, buccal and marginal branches.

Conclusions: It is important to know the buccal branch variability in origin, number of terminal twigs and connections, as it can prevent a facial palsy of the midface during surgery.

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ORAL COMMUNICATIONS SESSION 4

Teaching in Anatomy.

SONOANATOMY OF THE CENTRAL NERVOUS SYSTEM

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Introduction: The indications of neuro-ultrasonography are numerous, especially in the infant (from 0 to 12 months of age), where the subsequent closure of fontanelles makes them adequate acoustic windows for displaying the different brain structures. In this way, ultrasound is the first choice technique to study infant brain. It is an innocuous quick portable technique that also requires training, an experience curve, and the results are dependent on the skill, knowledge and explorer experience. To do this, the bregmatic fontanelle is used as an acoustic window. The exploration is performed through coronal and sagittal sections.

Objectives: To show the correlation of the images obtained by cerebral ultrasound study with ana-

tomical pieces of necropsies from 22 weeks of gestation (weight equal to or greater than 500 g).

Material and methods: Sections of fetal heads from necropsies were performed with similar orientation to the projections obtained by the transfontanellar ultrasound study.

Results: Illustrations that show the identical correlation of the anatomical pieces with the ultrasound images are obtained.

Conclusions: Anatomical knowledge is determinant for the identification of structures through diagnostic imaging tests. The correlation of fetal and infant necropsies images in the same way and orientation that those obtained in systematic brain ultrasound slices is very useful and interesting to the explorer training and to the teaching of ultrasound study.

ANALYSIS OF PRACTICES AT DISSECTION ROOM FOR STUDENTS OF FIRST COURSE OF SANITARY DEGREES

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Introduction: Since the introduction of the degree, the teaching of basic human anatomy is a common reality that must be overcome by all students of sanitary degrees. The dissection room is not a very frequent resource for these degrees except for Medicine.

Objectives: Determine how students of Podiatry, Nursing and Physiotherapy are facing the practices with cadavers and the possible alterations suffered during the practical activity.

Material and methods: observational and descriptive study conducted on 172 students. After the first practice in the dissection room, a questionnaire of 29 simple dichotomous alternative response questions (yes/no) was completed. The questionnaire was structured in three sections: the physical reactions, the disturbances and the coping methods used by the students.

Results: The most frequent physical reactions to the dissection room were: disappointment, discomfort and nausea. Regarding the disturbances, they highlighted: the smell of the corpses and the smell of the dissection room followed by the appearance of the corpses. The most commonly used methods of coping were: being with friends, eating well before practicing, and prior study with anatomy books and CDs.

Conclusions: The students of sanitary degrees suffer physical and emotional reactions at the dissection room. It is fundamental, to favor its adaptation, the social support and the teaching staff as well as the previous practice with tools such as anatomical models and atlas.

PROSECTIONS AS SIMULATION MODELS

FOR LEARNING OF INSTRUMENTAL TECHNIQUES IN THE TRAUMATIC PATIENT EMERGENCY CARE (ADVANCED TRAUMA LIFE SUPPORT ATLS)

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Objectives: Design and assessment of interactive learning models based on the use of anatomical prosections in the context of ATLS training courses organized by the Spanish Association of Surgeons (AEC).

Material and methods: Based on learning objectives of the practical stations in the ATLS courses, real simulation models were designed to develop practical skills for the stations of airway, shock, peritoneal washing, thoracic drainage, cricothyroidotomy and pericardiocentesis. Models consisted of anatomical prosections made in our laboratory aimed at the total or partial realization of the technique and the verification of the final result. When the students finished, they answered a questionnaire of satisfaction in which different aspects related to the usefulness as well as the design and relevance of the anatomical specimens were assessed.

Results: There was a high degree of acceptance and satisfaction regarding the use of simulation models from anatomical prosections. It is important to highlight their opinion in the sense that the use of real anatomical prosections brings advantages with respect to the use of other models. The best understanding of the anatomical references and the greater correlation of the technique with the real situation are those aspects best valued.

Conclusions: As conclusions we have found that the use of anatomical prosections specifically designed for the learning of medical and surgical procedures continues to have high relevance in the continuing education of different clinical disciplines.

ELABORATION AND USE OF EXPLANATORY VIDEOS OF ANATOMICAL DISSECTIONS DISTRIBUTED BY YOUTUBE: EXPERIENCE AT THE UNIVERSITY OF VALENCIA

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Introduction: The current university curriculum assign students a low number of contact hours for the study of the corpse, which hinders their learning.

Objectives: Our aim is to provide students an almost unlimited access to the explanation of the anatomical dissections that the professor performs during the practice sessions (in Dissection Room), which are included in the curriculum of the subject of General Anatomy, dedicated to the study of the Locomotor Apparatus Anatomy, in the Degree of Medicine of the University of Valencia.

Material and methods: Videos will be recorded and edited, including the signaling of both the name in Spanish and in the *Nomina Anatomica* of every anatomical structure. To facilitate its diffusion and access, they will be uploaded to a specific YouTube channel. To evaluate the functioning of this methodological measure, evaluations of both the students (through the Google Forms platform) and the General Anatomy teaching team will be taken into account.

Results: It is expected that, with this new teaching resource, General Anatomy students will experience a substantial improvement in the acquisition of knowledge of the practical curriculum of the subject, referred to the Human Anatomy of the Locomotor Apparatus. This improvement in learning will be reflected not only in the evaluation of the practical section, but also in the general evaluation of the subject.

Conclusions: For students, videos are a very useful resource that, combined with the creation of this specific YouTube channel, is also very accessible to them.

CLINICAL APPROACHES IN THE DISSECTION ROOM FOR CLINICAL AND BASIC TRAINING IN LOCOMOTOR ANATOMY

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Introduction: Among the main characteristics of the teaching methodology used in the Ciudad Real medical school are the "multidisciplinary learning, which integrates the basic, clinical and psychosocial sciences" and the "reinforcement of learning with practices both in laboratories and the dissection room as well as clinical skills laboratories and clinical practices in hospitals".

Objectives: The goal is the vertical integration of the basic training in locomotor anatomy with the clinical training in the Ciudad Real Medical School.

This proposal has been included in a Teaching Innovation Project.

Material and methods: 77 participants are involved and coordinated to develop integrating activities that facilitate the student's acquisition of both general and specific skills, as well as its applicability as future physician, increasing their motivation and, therefore, promoting learning and holistic student training. During the academic courses 2017-2018, 2018-2019 the students of the first, second and third year will receive seminars, practices, visits, presentation of updated clinical cases, among other activities, in which the theoretical and practical content of the subjects will be combined with the clinical vision of it. In the specific case of locomotor anatomy, coordination has been established with the Traumatology Service of the General University Hospital of Ciudad Real.

Results: Quantitative analysis will be carried out using surveys in a Likert scale. Preliminary assessment of students and teachers who have taught in this subject.

Conclusions: The strategy is being positive for the motivation and learning of the students.

USE OF NFC LABELS FOR THE MANAGEMENT OF CORPSES AND SPECIMENS FOR THEIR DISSECTION OR USE IN MEDICAL SIMULATION SURGERY

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Introduction and Objectives: To develop a procedure that allows the identification and management of donated corpses prepared with the different techniques, even from tanks or maintenance refrigerators, to have personal information of the age, gender, anthropological data, treatments used, conservation methods applied and so on.

Methodology: We have used corpses from the dissection room of the Miguel Hernández University Medical School, in Elche (Alicante). They were fixed using both, formalin or Thiel preservative techniques or its variants and, at the time of their preparation, we made a 1 cm long incision in the scalp, at the level of the cranial vertex, and laid a NFC tag, closing the incision with a sealant. These labels are activated by radiofrequency using a reader and the "Go To Tag" program. The reading of the labels can be done by means of an extension cord, even inside the conservation tanks.

Results: it is not common in the dissection rooms to find means of identification other than the fixing numbers in the corpses or implanting microchips similar to those used in veterinary, which only have a serial number for identification

and a higher cost than the labels. Allowing the labels to be implanted in separate segments will permit the identification of each one of them.

Conclusions: We propose a method of corpse management based on the use of NFC tags, which is very effective for this purpose.

ELABORATION OF A THREE-DIMENSIONAL INGUINAL DUCT ANATOMIC MODEL WITH TEACHING APPLICATION

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Introduction: In view of the students' difficulties in understanding the normal inguinal duct anatomy, we have developed a complementary teaching material.

Objectives: To develop an auxiliary material in order to understand the inguinal duct anatomy, that meets several requirements: Availability: Students can use a three-dimensional inguinal duct model easy to build up. Simplicity: It must be easy to build up and understand. Accuracy: It includes the necessary elements to understand the three-dimensional inguinal duct anatomy, its comprising structures and its anatomical relationships.

Material and Methods: Based on the dissection facts and the descriptions of several classics textbooks about the inguinal duct anatomy, the inguinal duct morphological structures are drawn on paper in such a way they keep the normal anatomical relationships when the paper is cut, pasted and folded.

Results: A PDF file can be sent by mail to the students or can be upload to the virtual campus. Printing the two double-sided sheets of paper and following the instructions, the students have got a figure with the three-dimensional inguinal duct anatomy.

Conclusions: We present an original auxiliary teaching material easy to employ in the classroom and the laboratory practices, complementary to the existing anatomical models, virtual dissection programs or dissection. This material facilitates the student learning about the normal inguinal duct anatomy.

POSTER SESSION

CLINICAL ANATOMY

CHARACTERIZATION OF THE NAIL PLATE AND ITS CONSIDERATION AS A RISK FACTOR IN THE DEVELOPMENT OF ONYCHOCRYPTOSIS

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Introduction: The characteristics of the nail plate can influence the development of some pathologies in the nail.

Objectives: Determination of the characteristics of the nail plate from the point of view: macroscopic, molecular and ultrastructural. Besides, we want to study of these characteristics as risk factors in the development of onychocriptosis.

Methodology: Observational and descriptive study on 140 individuals. The ungueal consistency was determined by palpation of the nail plate, the thickness of the lamina by means of a vernier caliper and a sample was taken for further molecular analysis by Western Blot and ultrastructural analysis with electron microscopy. By means of a survey, sports activity and gender were determined and, through exploration, the presence of onychocriptosis was determined.

Results: The thickness of the nail plate is not related to its ability to flex. Women are more likely to have onychocriptosis. The nail of hard consistency is the most frequent in athletes and among these, men, are the most prone to suffer onychocriptosis. We are working on the development of Western Blot to determine the differential presence of type I keratins depending on the detected consistency. On the other hand, the preliminary results of the ultrastructural analysis of the samples reveal differences according to the consistency determined initially.

Conclusions: The characterization of the nail plate and the knowledge of sports habits, among other factors, make it possible to predict the appearance of onychocriptosis and establish preventive actions.

ABNORMAL ORIGIN OF THE LEFT CORONARY ARTERY: ANATOMOPATHOLOGICAL FINDING. CLINICAL REPORT

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Objectives: A clinical case corresponding to an anatomopathological finding consisting of a coronary anomaly is presented.

Material and methods: By means chirurgical microscope we dissected the anatomical variation for its detailed morphological description.

Results and conclusions: The anatomopathological finding consisted of an anomalous origin of the left coronary artery in the right coronary sinus with ostium tangentially oriented and smaller diameter.

After its origin, the left coronary artery followed an interarterial pathway between the ascending aorta and the pulmonary trunk. This trajectory showed an evident decrease in its diameter and an apparent loss of elastic properties. After reaching the left auriculoventricular groove, the left coronary artery showed an usual pattern of distribution. The anatomical variations in the origin and initial path of the coronary arteries should be taken into account as a possible cause of death in patients under 35 years of age.

TESTICULAR ATROPHY INDUCED BY LACK OF IRS2 IN PERIPHERAL RESISTENCE TO INSULIN

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Introduction: Insulin receptor substrate-2 (Irs-2) is an intracellular protein susceptible to phosphorylation after activation of the insulin receptor. Its suppression affects the development of the testis. In addition, its absence induces peripheral resistance to insulin.

Objectives: The aim of this study is determine changes in the testicular structure and variations of expression in aromatase P450, necessary for the development and maturation of germ cells, all associated with the deletion of Irs-2.

Material and Methods: Adult male Irs2^{-/-} mice (6- and 12-weeks old) and age-matched wild type (WT) mice were used in this study. Immunohistochemistry and western blotting techniques were performed to study proliferation (PCNA), apoptosis (active caspase-3) and aromatase P450 in testicular histological sections.

Results: Deletion of Irs-2 causes a decrease in the number of epithelial cells of the seminiferous tubule and rete testis. It is common the appearance of aberrant cells in the epithelium of Irs2^{-/-} mice, as well as variations of the spermatogonias, showing a small hyperchromatic nucleus, being accompanied by polynuclear and anuclear structures. Cell proliferation of Irs2^{-/-} mice fell significantly compared to WT, while apoptotic processes were more abundant. Reactivity for aromatase P450 was higher in knock out mice, being even higher at 12 weeks than at 6.

Conclusions: Our results suggest that Irs2 is a key element in spermatogenesis since the absence of

Irs2 induces the appearance of a testicular atrophy that develops in a sequential process and that mainly affects the germ cells present in the seminiferous tubule, probably involving to aromatase P450.

THE MEISSNER'S CORPUSCLES AND MERKEL'S CELLS IN MULTIPLE SCLEROSIS AND AMYOTROPHIC LATERAL SCLEROSIS

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Introduction: The involvement of the peripheral sensory nervous system in some predominantly motor neurodegenerative pathologies has been recently proposed.

Objective: Here we have investigated the changes in cutaneous Meissner's corpuscles and Merkel's cells in patients undergoing multiple sclerosis and amyotrophic lateral sclerosis.

Material and methods: Glabrous skin samples from the distal phalanx of the first toe were obtained from patients diagnosed with multiple sclerosis and amyotrophic lateral sclerosis (n = 2 and n = 1, respectively; Hospital Universitario Central de Asturias, Oviedo). Immunohistochemistry was used in association with a battery of specific antibodies for different components of Meissner corpuscles and Merkel cells. In addition, to the occurrence of the putative mechanoproteins Piezo2 and ASIC2 was investigated.

Results: In comparing Meissner's corpuscles from those patients with age-matched healthy subjects, Meissner's corpuscles were smaller, showed a rounded morphology and were placed deep in the dermis; moreover, the density of the Merkel cell was strongly reduced. The immunoreactivity for the Piezo2 and ASIC2 also declined. Therefore, multiple sclerosis and amyotrophic lateral sclerosis course with anomalies in Meissner's corpuscles and Merkel cells that might explain, at least in part, the altered somatosensitivity, especially mechanoreception, in these patients.

Conclusions: These results demonstrate the importance of the study of peripheral mechanosensitive structures in the diagnosis and monitoring of neurological pathologies.

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KERATAN SULFATE PROTEOGLYCANS IN THE EXTRACELLULAR MATRIX OF HUMAN MEISSNER'S AND PACINIAN CORPUSCLES

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Introduction: The extracellular matrix (ECM) consists of different molecules such as proteoglycans, collagens and fibronectins. Keratan sulfate proteoglycans (KSPG) have been shown to inhibit axonal growing and regeneration processes, and are widely distributed in peripheral nervous system, but in sensory corpuscles remain to be characterized.

Objective: To investigate the occurrence and cellular location of several KSPG in human Meissner's and Pacinian corpuscles.

Material and methods: Human digital glabrous skin samples were obtained from the palmar aspect of the distal phalanx of amputated hand fingers from subjects free of neurological disease. Single immunohistochemistry and double immunofluorescence were performed to detect several KSPG (lumican, PRELP, keratocan and aggrecan) and to label the main structural elements of sensory corpuscles (S100 protein to label Schwann cells, Neurofilament to axon and CD34-antigen to endoneurial cells).

Results: Both Pacinian and Meissner's corpuscles showed positive immunoreactivity for lumican, which colocalized with S100 protein (Schwann-related cells). Neurofilament proteins and CD34 did not colocalize with lumican. Others KSPG immunoreactivities were negative.

Conclusions: These results demonstrated that lumican is present in the ECM of Pacinian and Meissner corpuscles. Its expression here is justified because a basal lamina (a major differentiation of ECM) is present in Schwann cells. However, its role is less evident. Respect to inhibition of axonal growing and regeneration processes in sensory corpuscles lumican could be involved in controlling and guidance of the axon. Other studies have related lumican with collagen fibres assembly. Lumican could be involved in the maintenance of corpuscular structure in relation with collagen stability.

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ANATOMICAL STUDY OF THE RIGHT SUPERIOR COLIC VEIN AND ITS IMPORTANCE IN LAPAROSCOPIC SURGERY OF THE RIGHT COLON

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Introduction: The right superior colic vein (RSCV) has been proposed as the main cause of bleeding of the superior mesenteric vein by avulsion during laparoscopic right hemicolectomy. **Objectives:** Our aim is to identify, by a human dissection study, the main vessel that causes tension of the transverse mesocolon during the extraction of the surgical piece or the extracorporeal anastomosis.

Material and methods: The anatomical study was carried out in both fresh corpses (not embalmed) and in formalized corpses. We simulated a right hemicolectomy and measured the length of transverse anastomotic colon (TAC) exteriorization before and after sectioning the vessel that caused the externalizing tension.

Results: RSCV was present in 100% of the specimens. In 95% of the cases, it drained in the gastrocolic trunk of Henle, and in the remaining 5% it did directly in the superior mesenteric vein (SMV). In 100% of the corpses, RSCV caused tension when extracting the TAC. In formalized corpses, the average length of exteriorization of the TAC before and after the section of RSCV was increased by 44%. In fresh corpses, the average length of exteriorization increased by 28%.

Conclusions: RSCV is the main cause of tension in the extraction of the surgical piece after right hemicolectomy. Its high ligation increases the length of the exteriorization of TAC by approximately 3 cm, which could reduce the risk of bleeding of the SMV during a laparoscopic right hemicolectomy by facilitating a stress-free extracorporeal anastomosis.

RADIOLOGICAL AND ANATOMICAL STUDY OF THE PTERYGOMAXILLARY FISSURE FOR A SURGICAL ACCESS TO THE PTERYGOPALATINE GANGLION

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Introduction: The pterygomaxillary fissure (PMF) is the main access for the surgical approach to the

Pterygopalatine Ganglion, which has recently become a therapeutic target for the treatment of several painful syndromes.

Objectives: Our aim is to study the anatomical dimensions of the PMF and establish a typological classification according to the morphological patterns which have been found.

Material and methods: 242 PMF were analyzed in parasagittal images of computerized tomography by using the Osirix program. The measurements were taken in the upper (Measure A), medium (Measure B) and lower parts (Measure C) of each PMF.

Results: From the measurements of A, B and C of each PMF, four types of aforementioned fissures were established. The widest PMF, type I (values equal to or greater than 2 mm in the three measurements) and type II (values equal to or greater than 2 mm in measurements A and B), were found to be the most frequent (98,28% in men and 88.89% in women). The narrowest, both type III (values equal to or greater than 2 mm only in measure A) and type IV (values less than 2 mm in the three measurements) only accounted for 1.72% of the male PMF and 11.11% of the women.

Conclusions: The existence of different types of PMF forces us to perform an anatomical study prior to surgery of the pterygopalatine fossa. However, future studies are necessary in order to correlate the proposed types of fissures with the ease/difficulty in the surgical approach to the pterygopalatine ganglion.

SCIATIC NERVE. ANATOMICAL AND EMBRYOLOGICAL STUDY

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Introduction and objective: To classify different variations in the constitution of the sciatic nerve as well as in its relation with piriformis muscle and the level in which the nerve gives off its terminal branches.

Material and Methods: Gluteal and posterior aspects of the lower limb have been dissected in 59 adult human cadavers donated to the Body Donation Centre of the Complutense University of Madrid. On the other hand, serial sectioned embryos (21) and fetuses (13) have been observed with optical microscope. In both samples the relation between the sciatic nerve and the piriformis muscle has been studied as well as the division level of the nerve. Our results have been compared with those previously published in a metanalysis.

Results: The relationship between the nerve and

the muscle is established during the 8th week of the development. In 90% of cases nerve and muscle are related in the classically described way (Pattern A) but different variable situations have been described in both samples (Patterns B, C, D, E and F). On the other hand, the nerve branches higher than expected in 25% of cases.

Conclusions: These variable situations, which could explain or predispose to a piriformis syndrome in some cases, have to be taken into account when performing any invasive procedure in this region.

INFLUENCE OF THE LACK OF INSULIN RECEPTOR SUBSTRATE TYPE 2 (IRS2) ON THE THYROID GLAND

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Introduction: Although the in vitro participation of IRS2 in the proliferative effects of IGF-I on follicular thyroid cells has been well described, there are not studies analyzing the in vivo effects of the lack of IRS2 on proliferation and apoptosis of these cells.

Objectives: So the aim of this study is to analyze the in vivo relevance of IRS2 in the proliferation and apoptosis of thyroid cells, using IRS2 knock out mice.

Material and Methods: For this purpose an immunocytochemical study for PCNA- and active caspase 3-positive follicular cells was carried out accompanied by a morphometric analysis of the thyroid follicles and the determination of the serum levels of free thyroid hormones, in wild type and IRS2-KO adult mice.

Results: Thyroid hormones were lower in IRS2-KO than in wild type animals. These findings were accompanied with increases in the area, perimeter and diameter of thyroid follicles from IRS2-KO mice. Moreover, IRS2-KO animals showed an increase in the proliferation rate of follicular cells and decreases in the percentage of apoptotic cells, more evident in the central than in the marginal region of the gland. Gender related differences were found when compared among female and male mice: Follicular epithelium height in the marginal region of the gland was higher in male than in female mice, as well as the follicular area, follicular perimeter and follicular diameters in WT mice. Changes in the percentage of proliferating PCNA-positive cells were significant in male but not in female mice. Active caspase 3-positive cells were more abundant in male, WT and IRS2-KO mice,

than in female.

Conclusions: Our results suggest that directly or indirectly IRS2, and its intracellular signal cascade activated after its phosphorylation, could be involved in the maintenance of thyroid cells and in the normal endocrinology of the thyroid gland. This study was supported by Instituto de Salud Carlos III (FIS-PI030818; FIS Spanish grant PIO-21803).

TEACHING IN ANATOMY

BASIC KNOWLEDGE IN CONGENITAL BIRTH DEFECTS

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Introduction and Objectives.- Medical students at the Valladolid University have a specific subject relative to congenital birth defects. The subject try to show them a multidisciplinary approach to this pathology, which is really prevalent and usually in the degree organization remains disperse on different subject as Embryology, Gynecology or Pediatric.

Material and Methods.- Our subject was based in several lectures given by specialists who include Embryologists, Developmental Biologists, Genetics, Gynecologists or Pediatricians, each one contributes with their own point of view.

Results.- Given the growing interest of the non-physician people in the health problems and the demand of information mainly throughout the web, we decide to collaborate in a global program of the University of Valladolid named "Saber Extender: Píldoras de conocimiento" making small videos with the basic Knowledge of each lecture with a specific format (10 minutes length a powerpoint composition as graphical support and the image of the lecturer). Until now, we made 12 videos which were spread out freely by YouTube, from the platform of Valladolid University. After that, the amount of readers reveals the interest from many thousand people for the content.

Conclusions.- Our main conclusion is that a proper knowledge in deep and extension can be easily proportionate to the people in an open way using

the TICs from the University contributing to increase a rigorous and safe education.

ANALYSIS OF THE USE OF 3D TECHNOLOGY APPLIED TO THE TEACHING OF ANATOMY

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Introduction: There are still few studies that demonstrate the advantages of 3D technology over classical anatomical models. It has a long-term low cost and allows the creation of models from real magnetic resonances, echography or an others imagine technology.

Objectives: Use materials made with 3D printing in the practical development of contents previously explained in reference to the skeleton of the foot.

Methodology: A total of 100 students participated in an evaluation test, in the anatomy laboratory of the degree of Podiatry, which consisted in the identification of 8 of the bones of the foot, after the use of the traditional models (50) and after the use of 3D models (50). The time of practical development was the same for all the groups of practices and was always carried out in the same room.

Results: The use of 3D models is more efficient than classical models, since only 10% of students who used 3D models had any failure to identify bone structures, compared to more than half of those who used traditional models. The motivation of the students who used the 3D models was greater as well as the time dedicated to the study of them, in addition they consider that they studied the anatomy in a more real way.

Conclusions: The use of 3D models favors the assimilation of concepts and improves the results of students who perform practices with them against the use of classical models.

DEVELOPMENT OF A NEW APPLICATION AS A TOOL FOR THE STUDY OF ANATOMY IN THE DEGREE OF MEDICINE

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Introduction and Objectives: To develop a free application compatible with iOS, Android and Windows that facilitates the study of the subject of Human Anatomy-III (esplachnology) in the Degree of Medicine.

Material and methods: Preparation of the application by programming a native application (Java

Development-Kit, Software Development-Tools and Android Development-Tools). Recording and editing of original videos with material from the Department of Human Anatomy (models, anatomical subjects, radiology, etc.) on the practical topics of the subject Anatomy-III. Finally, design of tests about the content of the videos.

Results: Original material has been generated in the Department of Human Anatomy and Embryology of the University of Granada (video and photo) of the digestive system through the use of anatomical subjects fixed by GreenFix. Self-assessment systems for students have been developed based on this material. The material is being treated for its incorporation into the application and it will be evaluated by the students in a trial period through questionnaires, including suggestions to know its functionality and possible improvement.

Conclusions: The generation of materials for the study of Human Anatomy-III (Splanchnology) and the access to them through a free application, will allow us to adapt our teaching to the new technologies, facilitating the access of students to the contents of the subjects through any device in an easy and economical way. Thus, they can deepen their knowledge of Anatomy, improve the performance of practices and avoid possible problems of availability of anatomical material.

EVALUATION AND DEVELOPMENT OF SPECIALIZED WORKSHOPS IN THE DEPARTMENT OF HUMAN ANATOMY: INTRALESIONAL INFILTRATION IN FOOT PATHOLOGY

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Introduction and Objectives: To develop and evaluate the learning of the first specialized workshop on podiatric techniques for the treatment of foot pathology by intralesional infiltration performed in the Department of Human Anatomy of the University of Granada.

Material and methods: The workshop was designed by the Department in collaboration with the Andalusian College of Podiatrists of Seville (Spain) and Herbitas S.L. Fresh anatomical pieces were used to work on infiltration, infiltration regions and complications. The valuation was carried out by means of a specific questionnaire for the workshop that included four blocks: satisfaction, acquisition of practical knowledge, teacher evaluation, organization of the workshop and aspects of improvement. The questionnaires were treated statistically to obtain results.

Results: The workshop on intralesional infiltration obtained a very positive assessment by the students in relation to the organization, selected material and teaching staff. The practical knowledge acquired and the possibility of application in clinical practice, as well as in the didactic material generated for their training, were highly valued.

Conclusions: The first workshop on intralesional infiltration in foot pathology has been a valuable tool for improving professional practice. The elaboration and analysis of questionnaires has allowed us to know the strengths of the workshop and also the weaknesses that will need more attention in the next editions.

EVALUATION AND DEVELOPMENT OF SPECIALIZED WORKSHOPS IN THE DEPARTMENT OF HUMAN ANATOMY: ANATOMY AND RADIOLOGY APPLIED TO PODIATRIC SURGERY

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Objectives: Development and evaluation of the workshop "Anatomy and Radiology applied to podiatric surgery" taught in the Department of Human Anatomy for podiatry professionals.

Methodology: The Andalusian School of Podiatrists of Seville (Spain), the Herbitas Company and the Department of Anatomy of the University of Granada programmed and developed the workshop based on the use of fresh anatomical parts to work on specific vascularization of the foot, anatomical bases of surgical techniques, radiological anatomy, initiation to foot surgery and pathology of the first metatarsal. The assessment was made by means of a specific questionnaire for the course that included four blocks: satisfaction, acquisition of practical knowledge, evaluation of the teaching staff, organization of the workshop and aspects of improvement. The questionnaires were statistically treated to obtain results.

Results: The evaluation of the workshop carried out showed a high qualification in terms of practical learning for its application in clinic and organization. However, weaknesses or aspects of improvement were detected, among which the development of skills on the part of the students, the material contributed as well as the teaching material developed.

Conclusions: The workshop of anatomy and radiology applied to podiatric surgery has allowed improving the clinical practice of specialists in this

area, being necessary to improve aspects related to the achievement of specific skills in relation to foot surgery.

APPLICATION OF A THREE-DIMENSIONAL SYSTEM FOR LEARNING ANATOMIC STRUCTURES: VALUATION IN THE DEGREE OF MEDICINE

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Objectives: Offer our students of Health Science a tool based on 3D images that allows them to train individually and outside the scope of practical classes or departmental spaces in the understanding of anatomical structures, their relationships and their correlation with medical images.

Methodology: Professors from the areas of Anatomy, Anthropology, Medicine and Computer Systems have selected bone pieces, anatomical models and dissection material, radiological (RX and RMN) and videographic (arthroscopies). The three-dimensional images were obtained by 3D laser scanner to generate geometric information (cloud of points) and texture that was processed (Rapidform program) to generate triangles meshes and coordinates (B-rep representation) that were labeled. The application allowed the association of anatomical structures with medical images. The program was evaluated by the students of the degree of Medicine through specific surveys.

Results: A computer application has been developed ("Anatomy Project") that allows the study of anatomical structures and their correlation with medical images, having been valued by students of the medical degree with a high acceptance and improvement of said abilities.

Conclusions: The development of our computer application is presented as a complementary element of the study of human anatomy that is necessary due to the technological advance and the new organization of the theoretical and practical teaching of our discipline in the different grades.

ANATOMY BASES OF HINDFOOT SURGERY: ASSESSMENT OF ADVANCED TRAINING COURSE IN TRAUMATOLOGY

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Objectives: The advance in the development of new surgical and instrumental materials, particularly the low profile plates (LCP), have improved the level of success in corrective interventions for hindfoot pathologies (cavus feet, flat feet, etc.). The objective of this course was the acquisition of specific skills for the proper use of these new materials and tools and the improvement of hindfoot surgery.

Methodology: The advanced training course was developed at the Department of Anatomy and Human Embryology facilities at the University of Granada. This course included the use of five fresh cadaveric pieces on which Dwyer and Evans osteotomies (and their corresponding fixation) were performed, with LCP plates. A total of 10 orthopedic surgeons, a team of multidisciplinary professors of the university and technicians for the assessment of the osteosynthesis materials used were involved in the course.

Results: The learning results were reflected in development of skills for the correct use of new materials for hindfoot surgery. The questionnaires carried out by the participants shows the high degree of satisfaction and the usefulness of this postgraduate training in their professional training.

Conclusions: The course helped students to develop clinical skills and expand their knowledge of the hindfoot anatomy area. From participants' point of view, the practical comprehension of these specific area of the anatomy allows a more successful hindfoot surgery.

SPECIALIZED LEARNING WORKSHOP IN A DEPARTMENT OF HUMAN ANATOMY AND EMBRYOLOGY: ANATOMY BASES IN MIDDLE AND FOREFOOT SURGERY

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Introduction and Objectives: Low profile plates give to the surgeons fewer problems with the overlying soft tissue and allows the use of locking screws, improving the level of success in corrective interventions of medium and forefoot problems. The objective has been to develop a workshop that allows the practice of such interventions on fresh cadaveric pieces as a training system for orthopaedic surgeons who wish to deepen in this particular field of orthopaedics.

Material and Methods: We developed a work-

shop with five cadaveric pieces on which forefoot osteotomies and arthrodesis of the medial column of the foot were performed with plates. Tendon transpositions were also performed after dissecting the pieces. Ten orthopaedic surgeons participated, monitored by three orthopaedic surgeons, professors of the university. We counted on the collaboration of technicians of the osteosynthesis materials used.

Results: The result of the experience evidences as strengths of the training process the acquisition of the anatomical knowledge, necessary for the development of the surgery of the middle and forefoot. In addition, the questionnaires carried out by the participants reflect a high degree of satisfaction with the material of the Department of Anatomy and Human Embryology of the University of Granada and the usefulness of this postgraduate training in their professional training.

Conclusions: The course helped to develop the clinical skills and expand the knowledge of the anatomy of the midfoot and forefoot. In the opinion of the participants, the practical knowledge of the specific anatomy of this area will allow the development of a more successful surgery.

PERCEPTION OF DENTISTRY STUDENTS ABOUT THE TEACHING MATERIAL FOR ANATOMY

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Objectives: To know the habits and the perception on the use of teaching resources by the students of Dentistry of the University of Barcelona.

Methodology: After obtaining the approval of the Ethics Committee and their informed consent, 50 first-year students and 50 fifth-year students (2015/16) answered a written questionnaire about their criteria for selecting and using the Anatomy teaching material, as well as their opinion on its usefulness throughout the career.

Results and Conclusions: All the respondents used specialized textbooks in paper format (32 and 34%) in a similar percentage to those who preferred their personal notes (27 and 38%).

Only 15/17% of students reported using virtual applications or videos. The students of both courses consult the books of the Campus Library, being a minority those that acquire them in specialized bookstores. The selection in the first course is based on the recommendations of the classmates (41%) and in the fifth course in the professor's opinion (44%); in both groups the main use is the preparation of the exams. 51% use Atlas, 42% textbooks and only 8% prefer manuals. Seventy-nine percent of fifth-grade students reported using Anatomy texts for 4 or more subjects throughout

their studies.

EMBRYOLOGY

MICE UTERO ORGANOTYPIC IN VITRO CULTURE: AN IMPROVED TECHNIQUE FOR EMBRYO IMPLANTATION STUDIES

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5 IECSCYL

Introduction and Objectives: A valuable and physiological model for embryonic implantation studies is necessary to develop more safe and effective techniques in In vitro fecundation. Here we try to validate an organotypic culture technique in order to test an experimental design with different transfer media for embryo implantation.

Material and Methods: We use uterus explants from pregnant mice cultured in agarose support in DMEM F-12 media supplemented with Fetal Calf Serum and Progesterone, cultured at 37°C and 5% CO₂ atmosphere. Simultaneously we obtain mice embryos at the Blastocyst stage of development, by washing the proximal end of pregnant mice uterus. Embryos were gently placed on top of the mucous surface and they were cultured for 72 hours.

Results: Our technique allow the maintaining of normal tisular structure in the uterine explants, which shown an optimal epithelial surface, and a great number of glandular structures in the stroma as in vivo. With these conditions the blastocyst was able to contact and start the implantation process in the uterine epithelial surface.

Conclusion: The culture technique reported here is a valid tool to study the influence of different transfer medium in the implantation of in vitro fertilized embryos.

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IMPORTANCE OF FETAL ANATOMO-ECHOCARDIOGRAPHY CORRELATION IN THE DIAGNOSIS OF CONGENITAL HEART DISEASES

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Introduction: The rapid changes that have taken place in recent years in relation to techniques used to image the fetal heart have emphasized the need to have a detailed knowledge of normal cardiac anatomy. Without such knowledge it is difficult to recognize the multiple facets of congenital cardiac disease. From the inception of fetal echocardiographic screening, the importance of basic knowledge of cardiac anatomy has been well recognized.

Objectives: So as to match the advances made in imaging, we have now revisited our understanding of normal cardiac anatomy in the mid-gestational fetus by correlation with the echocardiographic patterns of Yagel.

Methods: We have dissected 10 fetal hearts, preparing in addition histological sections, to produce planes that mimic the standard ultrasound follow the echocardiographic views described by Yagel, known as the "five short axis views". The fetuses ranged in gestational age from between 22 and 27 weeks.

Results: We obtained correlation between the ultrasound images corresponding to fetal ultrasound with anatomic images of the atrium, ventricles, atrioventricular valves, sigmoid valves and arterial trunks obtained from fetal necropsy hearts.

Conclusions: Anatomy is a central discipline in the knowledge of fetal cardiac echocardiography. We show that the views now obtained using current technology reveal many details of anatomy not always appreciated at earlier times. Knowledge of these features should now permit diagnosis of most congenital cardiac malformations. The anatomic-echocardiographic correlations additionally provide a valuable resource for both the understanding and teaching of fetal echocardiography.

EPIGENETIC PROFILE CHARACTERIZATION OF THE EMBRYONIC INTERDIGITAL TISSUE

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Introduction: The formation of the digits in the limb bud of the vertebrate embryo is accompanied by a massive process of programmed cell death that models the interdigital tissue. Most of the degenerating cells exhibit an apoptotic appearance, but the control of this process is still to be clarified. Bone morphogenetic proteins (BMPs) are cytokines involved in the induction of cell death in the interdigital tissue, however, in the adjacent tissue, where the precursor of the digits are found, they promote growth and differentiation of digit cartilages and ligaments. Caspases and lysosomal cathepsins are proteolytic enzymes that function as central effectors of interdigital cell death, although their pharmacological inhibition or genetic silencing is not followed by syndactyly or any digit phenotype.

DNA damage is a precocious event in interdigital degeneration that precedes the intracellular activation of the death machinery in the interdigital tissue, as we have previously demonstrated. We found that this alteration of the DNA is accompanied by the activation of the mechanisms of DNA repair. In addition, DNA damage is also rapidly promoted (3 h) when cell death is ectopically induced by the administration of exogenous BMP. Based on all these observations, our working hypothesis is that interdigital apoptosis is caused by a sensitization of their cells to secreted factors toward cell death, the same factors that nonetheless promote growth and differentiation in the neighboring digit mesoderm. Therefore, we set out to explore the possible implication of epigenetic factors in the promotion of the degenerative mechanisms. We are developing comparative analysis of the epigenetic profile of the interdigital cells fated to die and the cells that survive forming the digits in the embryonic limb.

Results: Here, we show the data obtained from immunolabeling analysis of interdigital cells of chicken embryos, of epigenetic modifications including DNA methylation or histone acetylation and methylation.

FOUR AND A HALF DOMAIN 2 (FHL2) SCAFFOLDING PROTEIN AND THE CONNECTIVE TISSUES OF DEVELOPING DIGITS

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Introduction and Objectives: FHL2 is a scaffolding protein of well-known function in cancer models where it modulates cell signaling cascades and gene transcription. However, its function in embryonic systems is poorly characterized. Here we propose that FHL2 participates in the differentiation of the connective tissues of developing digits. In the embryonic limb, FHL2 exhibits a restricted and dynamic expression around the tendons of the developing digits, the interphalangeal capsules of the joints and the fibrous peridigital tissue.

Results and Discussion: At cellular level, immunolabeling analysis of the skeletal progenitors identified a predominant cytoplasmic distribution of FHL2 in association with the actin cytoskeleton and the focal adhesion points. In cultures of mesodermal precursors of the limb bud under chondrogenic conditions, the expression of FHL2 is negatively regulated. However, the culture acquires a predominant fibrogenic appearance after experiments of overexpression of FHL2. Furthermore, different functional experiments show a positive transcriptional influence of FHL2 on the expression of fibrogenic markers including Scleraxis, Tenomodulin, Tenascin, Big-h3 and Tgif1. Finally, FHL2 is induced by profibrogenic signals that include

Tgfbeta, all-trans-retinoic acid and canonical Wnt signaling molecules, and negatively regulated by prochondrogenic factors of the BMP family. In summary, our data suggest a role for this FHL2 in the differentiation of fibrous tissues during digit formation, including ligaments and tendons.

FGFR EXPRESSION PATTERNS IN THE DEVELOPING CHICK INNER EAR

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Introduction. The vertebrate inner ear is a complex three-dimensional sensorial structure with auditory and vestibular functions. The molecular patterning of the developing otic epithelium creates various positional identities, consequently leading to the stereotyped specification of each neurosensory and non-sensory element of the membranous labyrinth. Fibroblast growth factors (FGFs) have a diverse range of functions, including roles in proliferation, differentiation and survival, and axon guidance. The activity of the FGFs is ultimately controlled by their high affinity transmembrane tyrosine kinase receptors (FGFRs). There are at least four FGF receptors genes, FGFR1-4. The specific interactions between unique combinations of FGF and FGFR isoforms signal a whole array of different developmental functions. In the inner ear, as in other systems, FGFs regulate proliferation, differentiation, and migration by binding FGFRs 1-4.

Objectives. A prerequisite for understanding FGFs function in the inner ear is to characterize its receptors and the possible FGFs compensatory signals that could account for the partially penetrant phenotype.

Material and Methods. Obtainment of riboprobes, obtainment of patterns of expression of genes by in situ hybridization, and immunohistochemistry against axons with 3A10 antibody.

Results. Expression profiles have been generated for FGFR1, FGFR2, FGFR3 and FGFR4 during avian otic development.

Conclusions. Data suggest roles for FGFR1, FGFR2, and FGFR3 during otic vesicle morphogenesis and differentiation. The receptor tyrosine kinase signal transduction cascade is critical for the control of proliferation and differentiation in the inner ear epithelia.

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CYTOCHROME P450 (CYP) EXPRESSION PATTERNS IN THE DEVELOPING CHICK INNER EAR

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Introduction. The vitamin A metabolite retinoic acid (RA) is a nutritionally derived small molecule essential for normal embryonic development, but also causes birth defects when present in excess. Consequently, mechanisms have evolved both to optimize procurement and retention of vitamin A, as well as to control tissue exposure to its activated form. The cytochrome P450 (CYP) gene superfamily consists of a large number of genes encoding enzymes, which typically catalyse reactions. One of this group is Cytochrome P450 type 26 family (CYP26A1, B1, and C1), which are retinoic acid hydroxylases. Although it has been suggested that metabolites generated by the CYP26 enzymes may be biologically active, genetic evidence indicates that the principal role of CYP26 is the degradation of RA. CYP1 family consists of four subfamilies (CYP1A, CYP1B, CYP1C and CYP1D) of xenobiotics. CYP1B1 is capable of synthesising RA from retinol.

Objectives. Characterizing the expression patterns of genes encoding the enzymes involved in RA homeostasis may give insights into the functions of RA in the developing inner ear.

Material and Methods. Obtainment of riboprobes, obtainment of patterns of expression of genes by in situ hybridization, and immunohistochemistry against axons with 3A10 antibody.

Results. Expression profiles have been generated for Cyp26A1, Cyp26B1, Cyp26C1 and Cyp1B1 during avian otic development.

Conclusions. The precise spatio-temporal control of Cyp26s and Cyp1B1 expression during embryogenesis are necessary to limit tissue exposure to RA and is an essential aspect of the specification and normal morphogenesis of the developing avian inner ear.

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LGR GENE EXPRESSION PATTERNS IN THE DEVELOPING CHICKEN INNER EAR

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Introduction: The inner ear is a complex sensory organ responsible for the perception of sound and balance. Sensory hair cells of the inner ear are susceptible to damage from a variety of sources including aging, genetic defects, and environmental stresses such as noise or chemotherapeutic drugs. In humans, the consequence of this damage is often permanent hearing/balance problems. Although many genes and proteins have been identified as possible regulators of cell differentiation, their possible roles in hair cell regeneration remain unknown. Members of LGR family - leucine-rich repeat-containing, G protein-coupled receptors - code to transmembrane proteins involved in transduction of hormone signals.

Objectives: Interestingly, all of them have been recently identified as novel stem cell markers in several systems. The main goal of our work is to study the spatio-temporal distribution of LGR transcripts in the chick developing inner ear by means of *in situ* hybridization on cryosections.

Results: LGR5 transcripts were detected in a reduced portion of all sensory elements. On the contrary, LGR4 and 6 transcripts were observed in the epithelium of ampullae, whereas LGR7 was detected in the wall of the vestibule, the endolymphatic system, and the cochlear duct.

Conclusions: This study of conditionally immortal cell lines from auditory and vestibular sensory epithelia should provide insight into the study of molecular mechanisms of cell regeneration for further clinical application in hearing and balance disorders.

NEUROSCIENCES

ACTIVATION OF THE DOPAMINE D3 RECEPTOR INDUCES AUTOPHAGY AND PROTECTS STRIATAL MEDIUM SPINY NEURONS IN A MURINE MODEL OF HUNTINGTON'S DISEASE

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Introduction: Huntington's disease (HD) is a neurodegenerative disorder characterized by the formation of abnormally large polyglutamine tracts in the huntingtin protein (HTT). Mutated huntingtin (mHTT) forms soluble oligomers which aggregate and form intranuclear inclusions. The oligomeric soluble form of mHTT is toxic, particularly in striatal medium spiny neurons (msn), leading to the motor symptoms HD. Autophagy plays a key role in the degradation of misfolded proteins. Recent data suggest that dopamine D2/D3 receptor (D2R/D3R) agonists activate autophagy, and we know

that msn express D2R/D3R.

Objective: The aim of this study was to investigate whether the D2R/D3R agonist pramipexole modifies mHTT expression and protects msn in a genetic model of HD. **Material and Methods:** R6/1 mice and their wild-type littermate received 4 weeks pramipexole treatment (0.15mg/kg/d, i.p.). Brain samples were processed for immunofluorescence and western-blot for HTT, mHTT, different markers of autophagy and msn.

Results: PPX treatment: 1. reduces striatal levels of soluble mHTT and increases the size of intranuclear inclusions, 2. increases the number of DARPP-32 (an msn marker) immunoreactive neurons and DARPP-32 levels in the striatum, and 3. Increases LC3-II levels and reduces p62 and Tollip levels, supporting autophagy activation. These changes were reversed by co-treatment with the D3R selective antagonist NGB2904.

Conclusions: Taken together, these findings indicate that activation of the dopamine D3R protects striatal neurons enhancing the clearance of mHTT through autophagy.

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LATERAL VENTRICLE SUBPENDIMAL ZONE CONTRIBUTION TO THE HIPPOCAMPAL NEUROGENESIS IN THE ADULT MICE BRAIN

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Introduction and Objectives: Here we try to show that the hippocampus Stem Cell Niche are not restricted to the Dentate Girus but also includes the Subependimal Zone of the posterior end of the brain Lateral Ventricles in the adult mice.

Material and Methods: We perform an intraperitoneal injection of BromodeoxyUridine (BrdU) which substitute the Thymidine during DNA synthesis and which allow identify the Neural Stem Cells (NSCs) in the nervous tissue by immunocytochemistry.

Results: We detect the presence of a significant number NSCs in the Subependimal zone in all cases, suggesting the existence of a self-renewing locus of NSCs related with the ventricular surface and probably under the influence of the Cerebro-Spinal fluid. We also detect the presence of NSCs (BrdU positive) with migratory characteristics (DCX positive) at the Dentate Migratory Stream under Hippocampus CA3, which strongly suggest a migration of these cells to the Dentate girus. Finally, we found some of these NSCs at the Hilus, undergoing a neuron differentiation (β III Tubulin positive) process just behind the Subgranular Zone of the

Dentate Girus.

Conclusion: In adult mice brain, the Subependymal Zone seems to be part of the NSCs Hippocampal niche, probably as NSCs Self-renewing area involved in the maintaining of the non-differentiated population.

POTENTIAL EFFECTS OF THE UNDER-EXPRESSED GPR98 GENE IN THE EPILEPTIC HAMSTER GASH: SAL

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Introduction: *GPR98* gene, also known as *VLGR1b* or *Mass1*, is related to the sound perception. It encodes a G-protein, *Vlgr1*, located in the extracellular links between the stereocilia of hair cells in the organ of Corti. *Vlgr1* binds calcium and activates signaling pathways that cause overexcitation and epilepsy.

Objectives: to study the relation between *GPR98* expression, the inner ear stereocilia morphology and the auditory sensory perception in the GASH:Sal experimental model.

Material and Methods: *GPR98* expression in the inferior colliculus, a nucleus that triggers the audiogenic crises, was studied using PCR in basal conditions and after ictal events in controls and GASH:Sal. To study the hearing function, ABRs and immunohistochemical studies were performed using antibodies against *VGluT1*, that specifically label the primary auditory afferents. Finally, the stereocilia of hair cells was evaluated by scanning electron microscopy for comparison between controls and GASH:Sal.

Results: *GPR98* was under expressed in the GASH:Sal as compared to controls in equal conditions. Consequently, *Vlgr1* protein was found scarcely present and stereocilia of hair cells exhibited disorganization, indicating inefficient transduction. *VGluT1* immunostaining showed less glutamatergic inputs in the cochlear nucleus, and therefore a higher threshold of hearing, which was confirmed in the ABRs.

Conclusions: The *GPR98* under-expression gene could be related with the origin of ictal events and the morphofunctional changes observed in the epileptic hamster GASH:Sal.

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EFFECT OF GROWTH FACTORS HGF AND

VEGF ON NEURAL DIFFERENTIATION OF MESENCHYMAL STEM CELLS

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Introduction: Currently there is no effective treatment against degenerative diseases of the central nervous system. The adipose derived stem cells (ADSC) have a demonstrated plasticity and facility to be obtained from adipose tissue, which allow us to approach this problem by inducing them towards neuronal lineage cells.

Objectives: The aim of this study is to isolate and characterize ADSC and submit them to an induction process in order to study the modulation of nervous tissue markers expression.

Material and Methods: The characterization of ADSC isolated from lipoaspirates was studied by flow cytometry and they were induced using an enriched differentiation medium with growth factors HGF, VEGF and EGF during 15 days. The morphological modifications were analyzed with optical microscopy and the expression of neural markers using immunofluorescence, RT-PCR and Western Blot techniques.

Results: Characterization of ADSC demonstrated the expression of mesenchymal markers such as CD73, CD105 and CD90, and the lack of expression of hematopoietic markers such as CD45, CD34 and CD133. The induction with the growth factors produced appreciable morphological changes and modulation in the expression of markers associated with microtubules or intermediate filaments such as nestin, neurofilaments or tubulin III.

Conclusions: These results suggest that mesenchymal stem cells have a high plasticity, being able to differentiate into neural lineage cells that can become an alternative route for the treatment of neurodegenerative diseases.

ALTERATIONS IN THE OLIVOCOCHLEAR EFFERENT SYSTEM IN THE EPILEPTIC HAMSTER GASH: SAL

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Introduction: The genetic audiogenic seizure hamster of Salamanca (GASH:Sal) exhibits generalized tonic-clonic seizures induced by sound stimulation. The morphofunctional alterations in the auditory system of the GASH:Sal that might contribute to seizure susceptibility have not been thoroughly determined.

Objectives: to analyze the olivocochlear efferent system of the GASH:Sal that modulates the cochlear receptor, including the outer and inner hair cells, as well as the olivocochlear neurons.

Material and methods: we carried out a multi-technical approach that combines scanning electron microscopy, morphometric analysis of labeled olivocochlear neurons after unilateral Fluoro-Gold injections into the cochlea, and 3D-reconstruction of the lateral superior olive (LSO). We also assessed the distortion-product of otoacoustic emissions (DPOAEs) to study the activity of the olivocochlear efferent system.

Results: the GASH:Sal exhibited absence DPOAEs in a wide range of frequencies, and also showed differences between the left and right ears, indicating asymmetrical hearing alterations in the GASH:Sal. All these alterations in the auditory function correlated to morphological alterations in the cochlea. The GASH:Sal showed marked distortions of the stereocilia from basal to apical cochlear turns, which were not observed in the control hamsters. At the brainstem level, olivocochlear neurons had reduced soma areas compared with control animals. The lateral olivocochlear neuron shrinkage contributed to reduction in the LSO volume of the GASH:Sal as shown in the 3D reconstruction analysis.

Conclusions: our study indicated morphofunctional alterations in the olivocochlear efferent system, which might contribute to its audiogenic seizure susceptibility.

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INJECTION OF ANTI-NEUROTROPHIN-3 ANTIBODIES IN PERINATAL STAGES: DEFECTS IN RETINA ORGANIZATION OF RATS

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Introduction and Objectives: To study possible phenotype alterations of rats using the blockage strategies with specific antibodies against NT-3 (neurotrophin 3) and TrkC (tyrosine kinase C) during perinatal stages in which the experimental models of knockout (KO) animals for genes that encode these proteins have high mortality.

Methods: We performed intraperitoneal injections with anti-TrkC and anti-NT-3 antibodies every 2 days in both pregnant and newborn rats to study the P0 (postnatal 0), P7 and P14 stages.

Results: We observed defects, in a different degree, in some structures from the Nervous System that mimic those described in KO animals for NT-3. We found punctual defects, areas with hyperplasia in outer layers of the retina, in all ages studied. Hyperplasia also affected the ciliary body. The defects were less pronounced as the development progressed, being lower in the postnatal stage P14.

Conclusions: Validate the experimental model of blocking with antibodies for growth factors, whose KO-models show high mortality. Our results may be related to the unprecedented role described for NT-3 by Fariñas in 2014 as a quiescent factor for neural stem cells.

STUDY OF SLEEP DISTURBANCES IN A CHRONIC PAIN MODEL IN RAT

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Objectives: The aim of this project is to study the existence of sleep disturbances in a model of myalgia induced by reserpine in rat, and also to analyze the role that Dorsal Raphe (DR) and Locus Coeruleus (LC) monoaminergic nuclei may have in the development of these alterations.

Methodology: Sleep disturbances were studied by recording local field potentials through the implantation of chronic electrodes in the hippocampus (CA1) and in the primary somatosensory cortex (S1), as well as electromyogram electrodes in the hindhead. Activity of DR and LC was evaluated by fluorescent immunodetection of Fos. **Results:** An alteration of the sleep architecture in the rats subjected to the model of myalgia induced by reserpine has been observed. During the implantation of the model, a significant increase in REM sleep was observed, with a predominance of theta waves and atony. In the following weeks, sleep pattern changes, and there is observed a predominance of slow wave sleep with few spindles, and a significant increase in transitions between sleep states. The spectral analysis shows the presence

of alpha wave intrusions during slow wave sleep. On the other hand, immunohistochemical analysis shown an increase in DR activity and a decrease in LC activity at 5 and 15 days after the model implantation.

Conclusions: The reserpine induced myalgia model produces alterations in sleep patterns. These disturbances could be mediated by the changes in the activation patterns observed in DR and LC.

ANATOMICAL CHARACTERIZATION OF THE LOCUS COERULEUS ACTIVATION PATTERN PROGRESSION IN A MODEL OF MYALGIA INDUCED BY RESERPINE IN RAT

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Objectives: To analyze the activation patterns of Locus Coeruleus (LC) neurons in the reserpine-induced model of myalgia in rat, and to observe the progression of these patterns during pain chronification. On the other hand, it has been also studied if the application of an acute inflammatory pain during the progression of the myalgia model modifies the activation of LC.

Methodology: The study was carried out by double labeling fluorescent immunohistochemical detection. Immunodetection was carried out on the early expression gene c-fos, and on the enzyme tyrosine-hydroxylase, precursor of the neurotransmitter noradrenaline (NA), in order to determine whether the Fos-positive neurons were the noradrenergic type.

Results: Animals subjected to this myalgia model showed a high LC activation at 6 hours after the model implantation and a drastic reduction at 5 and 15 days after model implantation. This pattern and its progress is not modified by the introduction of an acute inflammatory stimulus. Likewise, results showed that neurons that modify their activation pattern are approximately 90% noradrenergic.

Conclusions: Noradrenergic neurons of LC decrease their activity during the chronification of the model of myalgia induced by reserpine. This is congruent with alterations of pain thresholds described in this model, which is similarly found in fibromyalgia patients. With this study, we provide evidence to the hypothesis which postulates that fibromyalgia could be related to an alteration in monoaminergic systems.

HYDROCEPHALUS INDUCED BY LACK OF INSULIN RECEPTOR SUBSTRATE PROTEIN IRS2. EXPERIMENTAL STUDY IN IRS2 KNOCKOUT MICE

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Introduction and Objectives: The pathogenesis of hydrocephalus is multifactorial and genetic, epigenetic and environmental factors coexist for this illness. Diabetic patients develop degeneration in central nervous system by 3 different ways: vascular diabetic affection, bad cellular use of glucose, and Alzheimer type neurodegeneration. Always this degeneration is accompanied by ventricular dilatation and cortical atrophy. However, the presence of hydrocephalus is not well determined.

Results: In this study we demonstrated, by means of a morphometric analysis of images obtained by NMR and histologic studies, the presence of hydrocephalus in the central nervous system of non-diabetic knockout male mice induced by the lack of one intracellular substrate protein of the insulin/IGF1 receptor: IRS2.

Conclusion: The results suggest that genetic alterations of IRS proteins, mainly IRS2, could be involved in the pathogenesis of hydrocephalus.

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STRUCTURAL CHANGES IN AGE-RELATED ADULT HUMAN HIPPOCAMPUS

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Introduction: Recent advances in the study of the brain have highlighted the interest of differentiating hippocampal subfields in assessing the effects of normal and pathological aging.

Objective: The aim of this study is to observe regional differences and vascular alterations in different cornu ammonis (CA) parts of the hippocampus and individual variability in age-related adult human.

Method: Hippocampus samples from six human brains (75 to 85 years old) were used. Hippocampus was formalin fixed, dehydrated and embedded in paraffin under standard conditions. The samples were cut into four serial coronal sections. A section was stained by the hematoxylin-eosin method. The other sections were analyzed by immunohistochemically techniques using anti-collagen IV. Image J was used for densitometry and data were

analyzed by Mann-Whitney U test, the statistical analysis was conducted with IBM SPSS Statistic 21 software.

Results: It has been observed a reduction of the cell population in CA2 and CA3 parts related to aging. The vascular distribution is appreciably more torturous, with thickening of the walls and narrowing of the vessel lumen in older subjects of the study.

Conclusion: Our results indicate that CA2 and CA3 regions are most affected by aging, were CA3 participates in trisynaptic connection that is important in explicit memory and the progressive loss of irrigation is also determinant. These alterations would stimulate chronic hipoperfution/hipoxia stages and they generate an evident neural damage. In this way, it would produce a commitment of the homeostatic brain microenvironment, that could predispose the appearance of stroke and vascular dementia.

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SPATIAL AND TEMPORAL PATTERNS OF HORIZONTAL CELL DIFFERENTIATION DURING RETINAL HISTOGENESIS IN AN ALTRICIAL AVIAN SPECIES

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Introduction: Among birds, the developmental rate and acquisition of retina structures is associated with altricial or precocial life-history styles. The zebra finch (*Taeniopygia guttata*) is an altricial songbird belonging to the large avian order Passeriformes that has particular impact in developmental biology.

Objetives: The main objectives of the present study were: 1) to identify non-apical mitotic figures during development of the retina of an altricial bird species by using classical histological methods and immunohistochemical techniques, 2) to describe the spatiotemporal patterns of non-apical mitotic figures throughout avian retinogenesis, and 3) to compare the results obtained with those described for precocial bird species. Material and methods: Semi-thin sections were toluidine blue stained to identify mitotic activity in the developing retina of an altricial bird species: *Taeniopygia guttata* (Zebra finch). Furthermore, mitotic figures were also detected immunohistochemically by using an antibody against phospho-histone H3 (pHisH3) on retinal cryosections. Results: In the

present study, a high number of non-apical mitoses were observed in the retina of *T. guttata* from St34 to St44 (E7.25-E12). During these stages, an obvious central to peripheral change in the pattern of appearance of mitotic figures was seen. Horizontal cell differentiation occurred at later embryonic stages in *T. guttata* than in the chicken (*Gallus gallus*).

Conclusions: Anti-pHisH3 antibody is a powerful tool in *T. guttata* neurogenesis research. Moreover, the high number of non-apical mitosis makes the developing retina of *T. guttata* a preeminent system for studying the development of horizontal cells.

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EXPRESSION AND FUNCTION OF CLASS III B-TUBULIN IN THE DEVELOPING AND MATURE RETINA IN VERTEBRATES

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Introduction: The retina is utilized as a model in developmental biology studies. Immunohistochemical markers are required in order to identify the different retinal cell types. Among these markers, we can find Tuj-1 antibody, that recognized the class III β -tubulin.

Objectives: The main objectives of the present study were: 1) to identify retinal cell types in which III β -tubulin is expressed, 2) to study the expression pattern of III β -tubulin during retinogenesis, and 3) to compare the retinal cell types that show immunoreactivity between the vertebrate species studied.

Material and methods: Immunohistochemical techniques were performed on cryosections of embryonic and mature retinas from several classes of vertebrates (*Scyliorhinus canicula*, class Pisces; *Xenopus laevis*, class Amphibia; *Mauremys leprosa*, class Reptilia; *Taeniopygia guttata*, class Aves; *Mus musculus*, class Mammalia).

Results: Tuj-1 antibody identifies different cell types in the retina of all classes of vertebrates analysed, with the exception of *X. laevis*, which showed no immunostaining. It can be considered as an early differentiation neuronal marker, a finding that could be used in future studies of retinogenesis in vertebrates. The immunoreactivity patterns of III β -tubulin were quite similar between the species studied. It identifies ganglion, amacrine and horizontal cells in the mature vertebrate retina.

Immunoreactive photoreceptors were also found in the retina of reptiles and mammals, but not in the retina of fish, amphibians, and birds.

Conclusions: Tuj-1 antibody is a powerful tool in neurogenesis research. Studies like this one could become the basis for others that address neuronal differentiation in other experimental models.

This work was supported by grants from the Spanish Ministerio de Ciencia y Tecnología (BFU2007-67540) and Junta de Extremadura (PRI06A195, GR15158).

BALANCE BETWEEN MMR AND MMR EXPRESSION IN GLIOBLASTOMA MULTIFORME CELLS; A DECISIVE ROLE IN TEMOZOLAMIDE RESISTANCE?

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Introduction: Glioblastoma multiforme (GBM), the most common primary tumor that affects glial cells of the central nervous system, is characterized by poor prognosis with a survival rate of 9 to 12 months. In recent years radiotherapy with temozolomide has become the standard treatment for these patients. However, the survival of these patients remains poor.

Objective: Analyze mechanisms of resistance against temozolomide in Glioblastoma cell lines. Methodology: Glioblastoma cell lines with high basal expression MGMT (SK-N-SH, SF268) and a high resistance to temozolomide and with no MGMT expression (LN229 and A172) and relatively sensitive to temozolomide were used. After temozolamide treatment, analysis of the MGMT and MMR expression was carried out. Demethylating agents, such as 5-Aza-2'-deoxycytidine, or compounds that block its action, such as O6-benzylguanine, was also used. In addition, P-glycoprotein expression was determined.

Results: Following temozolomide exposure in lines with low MGMT basal expression we found an increase in the level of MGMT expression and a decrease in MMR repair complex, suggesting the contribution of both mechanisms in increasing temozolomide resistance of these lines. MDR was insufficient to influence resistance of these lines. Analysis of the CD133, which increases upon exposure to temozolomide cell cultures, may be responsible for conferring resistance to the cells.

Conclusions: The levels of MGMT and MMR expression seem to be decisive in glioblastoma cells resistance to treatment whereas the classical system of multidrug resistance (MDR) mediated P-

glycoprotein did not play a fundamental role.

ESTROGENIC REGULATION OF MRNA EXPRESSION OF THE PROLACTIN RECEPTOR (L1 ISOFORM) IN THE MICE HIPPOCAMPUS

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Introduction and Objectives: Estrogens develop a stimulatory effect on the pituitary hormone, Prolactin. Moreover, there are evidences that suggest an important role of prolactin on hippocampal neuron functions and on its neuroprotection.

Material and Methods: Because aromatase p450, the enzyme responsible of androgen aromatization to estrogen, is expressed in hippocampal neurons and local estrogen induces important neuroprotective effects on these neurons, a study of expression of mRNA of prolactin receptor L1 isoform in the hippocampus of aromatase knock out (Arko) mice was carried out by in situ hybridization.

Results: In wild type mice, the expression of the receptor was higher in female than in male mice. In both sexes, Arko mice showed a significant decrease of prolactin receptor. This decrease was statistically significant in the dentate gyrus and CA3 region of the hippocampus, without significant changes in CA1 region.

Conclusions: The results obtained suggest that hippocampal locally synthesized estradiol is important to maintain the prolactin receptors and the effects of prolactin on hippocampal neurons and this could be one of the pathways for neuroprotective effects of neurosteroids.

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ANATOMY TECHNIQUES AND DISSECTION ROOMS

SECURITY MEASURES THAT MUST BE USED IN A HUMAN ANATOMY LABORATORY

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Objectives: To systematize the security measures and the individual protection equipment that should be used in the daily work of a human anatomy laboratory.

Material and methods: A sequential analysis of the corpse cycle has been made since its arrival at the Anatomy Laboratory until its final disposal. The different kinds of actions that both the technical staff and the faculty and students perform on the specimens have been identified. Depending on the different types of biological and / or chemical hazards in each of these actions, and in accordance with the protocols established by the Security Office of the University of Girona, a visual action diagram has been drawn up.

Results and Conclusions: An action diagram has been designed and safety pictograms have been used. The protocol consider the main actions that we can perform on the corpse and what are the general and individual security measures that we must use.

Both technical staff and teaching staff, researchers, students and anyone who performs activities in an anatomy laboratory must follow the security protocols established by the Security Offices. It is important that the technical managers and teachers of these laboratories facilitate that any person in the lab would know what are the safety standards that should be used in a fast and visual way.