CORE
Metadata, citation and similar papers at core.ac.uk
Provided by Elsevier - Publisher Connector

Aerobic power seems to be among the determinants of bone parameters. Also, exercise programs might be effective in preventing osteoporosis in general population, and in improving exercise tolerance in COPD patients. However, the modalities and components of training program to be prescribed are still undetermined. The aim of the present study was to compare the effect of two 16-week training programs (endurance, ET, vs. endurance+strength, EST) on BMD in patients with COPD.

Methods: COPD patients were randomly assigned to the training programs. They underwent 3 sessions per week for 16 weeks. Upper intensity training limits were considered as 40-50% heart rate reserve for ET and 50% of 1 repetition maximum (1RM) for EST (ACSM, 2006). Before training and after six months, COPD patients underwent clinical assessment, nutritional assessment using the EPIC questionnaire, and evaluation of BMD by Dual-energy X-ray absorptiometry (DXA).

Results: Thirty-one patients (18 females; mean age: 71±9 y; FEV1: 61 ± 14% of predicted) in the ET program, and 26 patients (11 females; mean age: 74±6 y; FEV1: 59 ± 18% of predicted) in the EST program completed the study. No significant differences were found in the baseline hip T-score or in BMD between groups. According to multivariable linear regression model, the values of T-score and BMD at follow-up were significantly associated with ET program, after adjusting for potential confounders (Table 1).

Conclusion: A 16 weeks endurance training is associated with significant improvement in hip BMD parameters, and might complement routine treatment for COPD in older population.

The research was supported by the Italian Health Ministry, Project Code: GR-2009-1596137.

Table 1

	T-score			Bone Mineral Density		
	B	95% CI	P	B	95% CI	P
Age (each yr)	-.01	-.02 −.01	.883	-.06	-.23 −.52	.923
Sex (female)	-.11	-.35 −.12	.335	.02	-.02 −.02	.874
Body Mass Index	.04	.03 - .07	.026	.01	.01 - .02	.046
Baseline T-score	.89	.76 - 1.01	<.0001	.95	.85 - 1.05	<.0001
Vitamin D intake (mcg/day)	-.11	-.26 −.05	.169	-.01	-.02 −.01	.861
Calcium intake (mg/day)	1.75	-.01 −1.80	.994	1.31	-.03 −1.45	.573
Protein intake (g/day)	.03	-.06 −.13	.502	.01	-.01 −.01	.675
Endurance training	.30	.09 - .51	.007	.02	.02 - .04	.030

IBDW2014-00101-F0031
ACCURATE AND PRECISE CARTILAGE VOLUME AND THICKNESS MEASUREMENTS ASSESSED BY HIGH RESOLUTION MICRO-COMPUTED TOMOGRAPHY IN NON OA KNEES

C. Delecourt [a], S. Touraine [a], M. Relier [a], H. Bouhadoun [a], K. Engelke [c], J. D. Laredo [a,b], C. Chappard [a]
[a]*B2OA, UMR CNRS 7052, University Diderot-PRES Sorbonne Paris Cité, Paris, France*
[b]*Service de Radiologie Ostéo-Articulaire, Hôpital Lariboisière, Paris, France*
[c]*Institute of Medical Physics, University of Erlangen-Nürnberg, Erlangen, Germany*

Introduction and aims: In osteoarthritis (OA), loss of articular cartilage, changes of the cortical subchondral plate and alterations in subchondral bone architecture are observed. At the microscopic level no established 3D method exists to measure cartilage volume and thickness. The objective was to develop an easy-to-implement method for precise and accurate measurements of cartilage volume and thickness from micro-CT images.

Methods: Twenty-five left cadaveric knees without OA as determined from radiographs using an adapted Kellgren-Lawrence scale (grade<2) from 13 women and 9 men (mean age 80.9±10.0 years) were included in the study. After dissection, vertical cores (7 mm in diameter) were extracted in the lateral region of the medial tibial plateau. The native cores were imaged with micro-CT (Skyscan 1172®, voxel size 10.2mm). Every 25- 50 of the 400-700 reconstructed slices, the cartilage was contoured manually. In the interleaving, slices contours were interpolated (Skyscan: CtAn®) to determine cartilage volume (Cart.Vol, mm^3). Cartilage thickness (Cart.Th, mm) was determined manually (man) in one projection and by using the thickness plugin of BoneJ (plug), which is originally developed to measure trabecular thickness and is a 3D analysis. In a subgroup of 20 cores, short term reproducibility (RMSCV%) was determined from 3 acquisitions with intermediate repositioning. In addition reanalysis precision was determined by analyzing the first acquisition of each of the 20 cores 3 times by the same observer. For accuracy measurements in a subgroup of 10 cores holes with diameters of 2mm, 3mm, and 4mm were artificially generated with a dermatological punch. The nominal hole size was determined in the projection, which was also used for the manual measurement of Cart.Th. The Cart.Vol accuracy error was determined by comparing nominal and measured hole sizes (Wilcoxon test and Bland and Altman plots).

Results: Mean values were: Cart.Vol: 69.6±10.9mm3, Cart.Th: 1.75±0.29mm (man) and 1.78±0.26mm (plug). For plug, mean and maximum thickness variations were 0.13±0.06mm and 1.94±0.26mm, respectively. Correlation between the two Cart.Th analysis techniques was high ($r=0.94$, $p<10^{-4}$). RMSCV% of Cart.Vol with repositioning (reanalysis alone) was 1.35% (0.42%). Nominal hole volume (Mean±SD) was 7.2±2.0mm^3 (2mm), 16.7±4.1mm^3 (3mm), 27.9±8.6mm^3 (4mm), compared to the measured hole volume of 7.7±2.4 mm^3 (2mm), 17.1±5.75 mm^3 (3mm) and 27.6±8.6mm^3 (4mm), respectively, with no significant difference. Mean bias between the two methods (Mean±SD) was +0.49±1.6mm^3 (2mm), +0.41±4.2mm^3 (3 mm) and -0.34±4.4mm^3 (4 mm).

Conclusion: In conclusion, with micro-CT, it was possible to measure the cartilage volume and thickness in 3D in humans with good precision and accuracy.

IBDW2014-00102-F0032
FLUID-STRUCTURE INTERACTION ANALYSIS ON BLOOD FLOW AND ARTERIAL WALL OF VERTEBRAL ARTERIES DURING CERVICAL (PHYSIOLOGICAL) ACTIVITIES

Wang Huihao [a], Zhan Hongsheng [a], Chen Bo [b], Li Linghui [a], Du Guoqing [a], Shi Yinyu [a]
[a]*Shi's Center of Orthopedics and Traumatology, Shuguang Hospital Affiliated to Shanghai University of TCM , Institute of Traumatology & Orthopedics, Shanghai Academy of TCM , Shanghai, PR China*
[b]*Institute of Orthopaedics and Traumatology, Shanghai, PR China*

Introduction and aims: The main aims of this experiment were to develop a C0—T1 finite element complex with bilateral vertebral arteries and to study the fluid-structure interaction of blood flow and arterial wall.

Methods: The C0—T1 finite element complex with bilateral vertebral arteries was simulated in flexion and extension, right and left lateral bending, and right and left axial rotation movements under physiologic velocity. The biomechanical interaction between the vessel wall and the fluid was calculated by fluid-structure interaction equation, and the blood fluid data of hemodynamic parameters was then obtained.

Results: Maximum stress usually concentrated on both sides of C2 transverse foramen, where the second arc of vertebral arterial wall is towards the cranial direction during the cervical spine activities, which was pronounced during extension and lateral bending movement with strain ratios being 23.04% and 35.5%, respectively. The maximum stress on the vessel located in the position of contralateral transverse foramen during lateral bending movement while the maximum stress on the vessel located in the position of ipsilateral transverse foramen during lateral bending movement. For cervical spine ROM, minimum volume flow rate occurred in the 30-40% of physiological ROM. The curve of volume flow rate was similar between bilateral vertebral arteries during flexion and extension movement. The occurrence of peak and valley of ipsilateral blood flow on volume flow rate curve was earlier than contralateral blood flow during lateral bending movement and the opposite was found during rotation movement.

Conclusion: The minimum volume flow rate appeared in similar angle during flexion, extension, lateral bending and axis rotation activities. The relationship between blood flow rate and vessel wall stress concentration was not linear, with maximum stress usually in limited position and substantial fluctuation during movements. The results demonstrated the small biomechanical effect on vessel wall and blood flow during flexion and extension movement. However, lateral bending and axial rotation movement would evidently change blood flow on one side. When the cervical spine movement lowed vascular blood flow on the healthy side and vascular blood flow reduction on the contralateral side could not be compensated, total blood supply for the brain would decrease. The development of this model would provide a platform for research in vertebral artery-related diseases.