Abstracts of the iv scientific symposium with international participation “bone and muscle diseases and age” commemorating prof. V. V. Povoroznyuk (oct 21-22, 2021, kyiv, online)
Introduction. Osteoporosis (OP) is a systemic skeletal disease characterized by the bone mass reduction, bone microarchitecture deterioration resulting in an increased bone fragility and fracture risk. According to the WHO, the OP ranks fourth after the cardiovascular, oncological and endocrine pathologies in terms of its epidemiological, scientific, preventive and clinical significance. In Ukraine, the OP is diagnosed in 13.4 % of female and 2.9 % of male population. With advancing age, the share of osteoporotic patients reaches 22 % of males and 53 % of females. For a long time, the disease does not manifest any symptoms or outward signs. The ultrasound densitometry has been confirmed as the OP screening method providing opportunity of an early detection for the risk groups who are timely referred to DXA examination. The latter is a safe diagnostic tool using no ionized irradiation. While using ultrasound densitometry for the screening purposes, one may detect and confirm the bone changes earlier prevent them in a timely manner, reduce irrational medicalization. This tool is cost efficient, fast and safe both for the children and pregnant women. It may also be performed within the frameworks of primary care.

The aim of the study is to assess the bone mineral density (BMD) by means of ultrasound and X-ray densitometry in the postmenopausal women.

Materials and methods. The X-ray and ultrasound densitometry was performed in 49 women whose mean age was 65.1 ± 7.6 years (minimum – 47 years; median – 66 years; maximum – 79 years). The sampling was performed according to the FRAX algorithm without consideration of the age-related BMD values. In order to assess the structural-functional bone state one used calcaneus ultrasound densitometry with Hitachi Aloka AOS100E, the following ultrasound parameters were measured: SOS (speed of (ultra)sound), Z-score (compared to the mean normal values of the given age group) and T-score (compared to the normal values of middle-aged adults with a “peak” bone mass). Measuring the BMD was also performed by dual-energy X-ray absorptiometry (DXA) Hologic Discovery machine. Comorbid pathology was detected by means of questionnaires.

Results. Within the group of 49 women, the ultrasound densitometry values confirmed the normal BMD for 3 women (6.1 %), osteopenia means of for 40 women (81.6 %), osteoporosis for 6 women (12.3 %). Present osteoporosis was confirmed by DXA in 6 out of 6 women (100 %), whose ultradensitometry results have also demonstrated the OP to be treated. Osteopenia was found in 13 women (26.5 %) by means of DXA, while osteoporosis was noted in 36 (73.5 %) examined subjects. In the group of women whose OP was confirmed by DXA, the co-existing pathology was revealed in 32 subjects (88.9 %). All in all, 88 conditions were diagnosed, i.e. 2.75 cases of chronic conditions per capita. In the group of women who had their osteopenia confirmed by DXA, 12 subjects (92.3 %) had a co-morbidity detected. All in all, there were 35 diagnosed conditions, 2.92 cases of chronic diseases on average per capita.

Conclusion. Ultrasound densitometry is a fast, mobile and safe method of osteoporosis and osteopenia screening which may be used in the family physician’s practice. Thanks to this screening method one may cover bigger groups of people during the shorter time, detect the osteoporosis and future fracture risk groups. The data obtained enable us to recommend the use of ultradensitometry for the BMD assessment in the family physician’s practice.

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ULTRASOUND DENSITOMETRY IN THE FAMILY PHYSICIAN’S PRACTICE

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Introduction. Wilson disease is a genetically conditioned disease (ATP7B gene mutation) resulting in the copper metabolism disorder and its accumulation in the target organs: liver, brain, cornea, and less frequently in the bone-joint system.

The aim of the study is to explore the bone mineral density (BMD) and Vitamin D status of children with Wilson disease.

Materials and methods. We have examined 35 children with Wilson disease aged 8-11 years. Among those, there were 20 girls (57 %) and 43 % boys (n = 15). All of them had a hepatic form of Wilson disease: chronic hepatitis – 77 % (n = 27), hepatic cirrhosis – 20 % (n = 7), fulminant hepatitis in one of the patients.

In order to measure BMD, all the children have undergone the dual-energy X-ray absorptiometry. Their Z-scores below -2 SD indicated the BMD reduction.

By means of chemiluminescent immunoassay, all the children had their serum 25(OH)D assessed. The optimum rate was set at ≥ 75 nmol/L, the Vitamin D insufficiency at 50-75 nmol/L, deficiency < 50 nmol/L.

Results. The BMD reduction was revealed in 12 children (34 %), their Z-score being -2.3 SD [-2.4 – -2.15]. Out of those, 4 children (33.3 %) had a total skeleton BMD reduced, 3 children (25 %) had reduction of only lumbar spine BMD, 4 children (33.3 %) had one only at the right hip bone level, and one child (8 %) – at the left hip bone level. Most children (n = 23.66 %) had no BMD reduction whatsoever.

The 25(OH)D assay demonstrated that 4 patients (11 %) had the optimal Vitamin D rate. Vitamin D insufficiency was observed in 12 (39 %) examined subjects, while deficiency in 19 (61 %). The mean 25(OH)D rate of children with Wilson disease aged 8-11 years was observed in 12 (39 %) examined subjects, while deficiency in 19 (61 %). The mean 25(OH)D rate of children with Wilson disease aged 8-11 years was observed in 12 (39 %) examined subjects, while deficiency in 19 (61 %). The mean 25(OH)D rate of children with Wilson disease aged 8-11 years was observed in 12 (39 %) examined subjects, while deficiency in 19 (61 %). The mean 25(OH)D rate of children with Wilson disease aged 8-11 years was observed in 12 (39 %) examined subjects, while deficiency in 19 (61 %). The mean 25(OH)D rate of children with Wilson disease aged 8-11 years was observed in 12 (39 %) examined subjects, while deficiency in 19 (61 %). The mean 25(OH)D rate of children with Wilson disease aged 8-11 years was observed in 12 (39 %) examined subjects, while deficiency in 19 (61 %).
RISK FACTORS OF BONE MINERAL REDUCTION AND SYNDESMOPHYTES DEVELOPMENT IN MEN WITH ANKYLOSING SPONDYLITIS: RETROSPECTIVE ANALYSIS

Introduction. Ankylosing spondylitis (AS) is associated with bone turnover disorders, resulting from an inflammatory process or treatment (glucocorticoid use in particular) and provoking a further mobility impairment along with an increased fracture risk.

The aim of the study is to assess the prevalence of the bone mineral density reduction (BMDR) and to explore the factors impacting the osteopenia, osteoporosis and. syndesmophytes (SP) in males with AS.

The study design: observational, retrospective study.

The source of data: medical histories of in-patients of the non-coronary department of cardiac, rheumatologic and therapeutic treatment, SI “Scientific-Educational Center “Institute of Cardiology named after academician M. D. Strazhesko” of NAMS of Ukraine.

The scope of search: from 01.2019 to 01.2021.

The selection criteria of sampling: Diagnosis: AS, male sex, presence of dual-energy X-ray absorptiometry in the study program (DXA: Z-score of lumbar spine, femoral neck), X-ray or magnetic resonance imaging (MRI) (morphopopulationometric vertebral body analysis, inflammation and degree of sacroiliac ankylosis damage), laboratory indices (ESR, CRP).

The studied population: male patients with an AS diagnosis made according to the Modified New York criteria (1984).

The disease outcome manifestations: the share of patients with osteopenia, osteoporosis, fractures, syndesmophytes. The risk factors: we have evaluated the following risk factors of the AS-associated BMDR: age, duration, disease activity (BASDAI), use of glucocorticoids (GC), smoking.

The statistical analysis was performed according to the alignment tables ($\chi^2$ criterion). The level of significance was set at 0.05.

Results. We have analyzed the medical records of 41 male patients with AS diagnosis in line with the Modified New York criteria. The clinical characteristics of the patients are presented in Table 1.

Within the study cohort, 62 % did not have BMDR, 38 % had the following share of BMDR types: osteopenia — 21 %, osteoporosis — 15 %, fractures — 2 %. The frequency of syndesmophites in 38 % patients with BMDR was 21 %, 79 % patients with BMDR had no syndesmophites whatsoever. The AS-associated BMDR risk factor associations are presented in Table 2.
Conclusions. AS is an important medico-social problem. Within its clinical picture, BMDR plays a pivotal role resulting in the impaired bone-muscle function and disability, and requires significant costs for treatment and rehabilitation. Ossification of the intervertebral joints which is typical of AS is directly associated with BMDR: syndesmophites are revealed in 21% patients with osteopenia and osteoporosis signs. The BMDR and syndesmophites have common risk factors: AS activity and duration, smoking and GC use. The age of AS patients does not affect either BMDR or syndesmophites. Further studies are required to detect the pathogenic mechanisms underlying the revealed associations.

**MINERAL DENSITY OF SUBCHONDRAL BONE TISSUE IN FEMALE PATIENTS WITH KNEE OSTEOARTHRITIS**

**Introduction.** Osteoarthritis (OA) has long been considered a primary articular cartilage injury. However, the recent studies are increasingly proving the importance of subchondral bone changes in its pathogenesis. The OA progress is associated with an increased subchondral remodeling rate, which is manifested, among others, by the bone mineral density (BMD) alterations.

The aim of our study was to assess the subchondral BMD in the knee OA patients.

**Materials and methods.** 48 women aged 48-76 years were examined. The main group was made of patients with one knee joint (KJ) affected by OA of II-III stage according to J. H. Kellgren and J. S. Lawrence (n = 24, mean age: 62.40 ± 7.26 years), the control group was made of patients with no present OA of any localization or other diseases potentially impacting the bone tissue (n = 24, mean age: 63.21 ± 7.23 years). The females of both groups did not significantly differ from the control parameters, while the BMD of the injured leg was 11.1% lower than the corresponding value of the control group (0.897 ± 0.103 vs. 0.928 ± 0.087 g/cm², р < 0.05), while 0.746 ± 0.129 vs 0.802 ± 0.121 g/cm² (р < 0.05) respectively. Unlike the control group where such differences were not observed. The more pronounced differences were detected at the proximal tibia; they made 7.5%.

**Conclusion.** The subchondral BMD of the distal hip and proximal shin bone was significantly lower at the level of the injured leg than of the intact one as far as the knee OA patients were concerned. No such discrepancy was observed in the subjects without OA of any localization.

**ASSESSING THE LIFE QUALITY OF PATIENTS WITH SARCOPENIA: VALIDATION OF THE SARQOL QUESTIONNAIRE’S UKRAINIAN VERSION**

**Introduction.** Sarcopenia is a geriatric syndrome characterized by a progressive generalized loss of muscle strength and mass. According to the studies held under the aegis of the Ukrainian Osteoporosis Association, the frequency of 1st stage sarcopenia among the patients of the Ukrainian Scientific-Medical Center of Osteoporosis Problems aged ≥65 years was growing, and reached 7%. Unless the women with obesity being excluded, it was 10%. The male patients of ≥65 years had a confirmed increase of 1st stage sarcopenia’s frequency until it reached 50%. Sarcopenia is associated with an increased risk of falls, compromised life quality, mobility, reduced life expectancy and increased mortality. With this in mind, in 2015 the SarQoL questionnaire (http://www.sarqol.org) was developed in order to assess the life quality of sarcopenia patients. It was later translated in 32 languages.

The aim of the study is to implement the new Ukrainian version of SarQoL questionnaire in order to assess the life quality of sarcopenia patients in a new cultural environment. Since the life quality concept is far from universal, individual countries are obliged to introduce certain adaptations and psychometric validations. This study was aimed at adapting and assessing the reliability and informative value of SarQoL questionnaire in Ukrainian.

**Materials and methods.** The questionnaire translation had 5 stages:
1. Independent direct bilateral translation (one of the translators had medical education, while another had no such). Both translators were Ukrainian native speakers;
2. Synthesis of initial translations to create a unified “Version 1”;
3. Independent back translations of “Version 1” from Ukrainian into English by two bilateral translators. They were English native speakers without medical education,
unexposed to any previous knowledge of SarQoL questionnaire’s original version;
4). Comparison of “Version 1” and back translations by the peer committee resulting in a preliminary Ukrainian version of SarQoL questionnaire and a complete report on the issues arising at every stage;
5). Testing of the preliminary version on 10 patients with sarcopenia to ascertain the purpose the meaning of each item, resulting in a finalized version of SarQoL-UA.

The further validation stage involved 49 subjects. In order to screen them for sarcopenia, we used the following parameters: age, grip strength and shin circumference according to S. Ishii et al.’s test. The validation study of psychometric parameters included the study of discriminating power, internal cohesion, “floor-to-ceiling” effect, validity of construction and reproducibility of results. We have compared the SarQoL questionnaire with other quality-of-life questionnaires: Short-Form 36 and EuroQoL-5 Dimensions.

Results. Based on S. Ishii et al.’s test, 28 subjects were classified as potentially sarcopenic while 21 as potentially non-sarcopenic. The former had a significantly lower life quality (aggregate point of 58.43 ± 17.13 vs 69.89 ± 13.31; p = 0.01). Similar tendency was observed when the patients were classified according to the low/normal grip strength and low/normal gait speed. The internal cohesion was adequate (α = 0.898), with no domains detecting a disproportionate influence on its consistency. The correctness of convergence construction was also confirmed. Our results show an almost perfect degree of reproducibility.

Conclusions. The first Ukrainian version is equivalent to the original one, and as such, it was published (http://www.sarqol.org/sites/sarqol/files/Questionnaire_SarQoL-UA-2017-09_0.pdf). Psychometric results show that the new Ukrainian SarQoL version is reliable, and may be used for further research and clinical practice.
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STRUCTURAL-FUNCTIONAL STATE OF BONE TISSUE IN MALES AND FEMALES WITH HYPERURICEMIA AND GOUT

The aim of the study is to explore the structural-functional state of bone tissue (i.e., bone mineral density and quality) among the postmenopausal women and men with various uric acid rates in blood serum.

Materials and methods. The patients under observation at the SI “D.F. Chebotaryov Institute of Gerontology of the NAMS of Ukraine”, 412 postmenopausal women and 140 males aged 50-80 years. Considering their uric acid rates, the patients were divided into 4 groups by means of quartile distribution: postmenopausal women (Q1: < 235 umol/L; Q2: 235-281 umol/L; Q3: 282-329 umol/L; Q4: >329 umol/L) and men (Q1: < 281 umol/L; Q2: 281-342 umol/L; Q3: 343-404 umol/L; Q4: > 404 umol/L). The uric acid rate was measured by uricase and peroxidase method, while bone mineral density of total skeleton, lumbar spine, femoral neck, radius was measured by «Prodigy». Trabecular bone quality assessment was performed by the installed TBS Insight® software (Med-Imaps, Pessac, France) with X-ray densitometer.

Results. The osteoporosis frequency in postmenopausal women with hyperuricemia is lower than the one of subjects with normal uricemia (23 and 28 % at the lumbar spine, and 17 and 21 % at the femoral neck, respectively). The bone mineral density was significantly higher in the group of postmenopausal women with the highest uric acid rates observed at the femoral neck level, trochanter and ultradistal forearm between Q1 and Q4 (p < 0.05). The bone quality did not affect the uric acid rate in postmenopausal women depending on quartile distribution (F = 0.78; p > 0.05).

The frequency of osteoporosis in men with hyperuricemia was lower than the one of men with normal uricemia (4 and 17 % at the lumbar spine; 4 and 15 % at the femoral neck, respectively). The men with lowest uric acid rates had the lowest bone mineral density. The significant discrepancies were found in the bone density lumbar spine values (F = 2.78; p = 0.04), forearm (33 %) (F = 3.96; p = 0.01) and total skeleton (F = 2.7; p = 0.04) in men according to the quartile distribution of their uric acid rates. It was determined that the bone quality parameters were the lowest in the fourth quartile group with the highest uric acid rates (F = 3.0; p = 0.04).

Conclusions. Postmenopausal women with the highest rates of uric acid had the highest bone density values. However, they did not register any significant discrepancies as to the bone quality according to the quartile distribution of their uric acid rates. The frequency of osteoporosis in men with hyperuricemia was lower than the one of subjects with normal uricemia, while the bone mineral density (at lumbar spine, forearm and total skeleton) were significantly higher in men with the highest uric acid rates. The bone quality values of men were the lowest in case of the high uric acid rate present.

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DOSE-RELATED CALCIUM AND VITAMIN D₃ EFFECT ON RAT MINERAL METABOLISM (EXPERIMENTAL STUDY)

Introduction. Calcium is not only a necessary element but also a regulator, catalyst of the essential body processes sustaining homeostasis and tissue metabolism. Its deficiency provokes a significant number of bone disorders. Insufficient Calcium food intake results in growth impairments and bone peak formation in children, osteoporosis occurrence and its complications in adults. Vitamin D metabolites impact the Calcium absorption to an increasing extent. At present, the scientists have no common ground as to the daily Calcium uptake, which prompted the experimental studies of various Calcium doses affecting mineral metabolism.

Materials and methods. The experimental studies were performed on 50 Wistar rats weighing 120 ± 5 g. Our study was focused on the biochemical parameters of mineral metabolism and histomorphological structural-functional state of growth areas and rat bone tissue. The examined animals were divided into 4 series (10 animals each) and control group. The rats of I-III series received 10, 20, 60 mg oral Calcium doses as Calcium oxide (CaO). The rats of IV series were receiving 10 mg Calcium along with an additional dose of 20 IU Vitamin D₃. The examined animals were subject to a dynamic study of Calcium, alkaline phosphatase and Vitamin D₃ active metabolites in blood serum.

Results and discussion. Our study has shown no unidirectional correlation between an increased Calcium uptake and its blood rate. For instance, the IV series animals receiving 10 mg Calcium reported an increased Calcium blood rate, while the II and III series animals demonstrated Calcium blood rate decrease at the doses of 20 and 60 mg Calcium. After a month-long observation, the I series animals did not report any Calcium blood rate change, it remained within the normal ranges. With that, the phosphorus rate and alkaline phosphatase activity somewhat decreased. The II series animals receiving 20 mg Calcium demonstrated a decreased alkaline phosphatase activity and increased phosphorus rate compared to the initial data; however, the blood Calcium rate diminished significantly (by 11 %). A significant effect of additional Calcium supplementation was observed in the III series rats. Upon administering 60 mg Calcium, its blood rate reduced by 35.7 %. The blood serum alkaline phosphatase activity increased by 12.7 %, while the Vitamin D₃ 1,25- and 24,25-dioxymetabolite rate got reduced (by 55.5 and 52.1 % compared to the initial data, respectively). The IV series rats had their Calcium blood rates growing by 10 %
The findings demonstrate no unidirectional correlation between an increased Calcium uptake and mineral metabolism. The low Calcium doses kept the values within physiological ranges. The high Calcium doses resulted in significant mineral metabolism disorders as well as Vitamin D₃ metabolism disorders. One of the probable causes may be the Calcium-binding protein synthesis suppression associated with high Calcium doses and no Vitamin D₃.

Conclusions. The experiment confirmed that a daily supplementation of 10 mg Calcium for a month improved structural-functional bone state, especially in conjunction with Vitamin D₃. Administering high Calcium doses provokes the mineral disorders and Vitamin D metabolism disorders. The findings also demonstrate no unidirectional correlation between an increased Calcium uptake and body mineral metabolism.

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COMBINED USE OF VITAMIN D AND E IMPROVES THE BONE AND CARTILAGE TISSUE WITH GUCOCORTICOID USE

Introduction. The problem of osteoporosis prevention and treatment remains quite urgent for the modern medicine. One of the osteoporosis development causes is a wide use of glucocorticoids to treat a range of acute and chronic bone-muscular disorders. This is why the study of Prednisolone effect on the Calcium metabolism and structural-functional changes of bone and cartilage tissue with a probable pharmaceutical correction of these changes does not lose its Introduction.

The aim of this study is to explore the Prednisolone effect on the Calcium metabolism and to assess the structural-functional changes of bone and cartilage tissue with an experiment.

Materials and methods. The experimental study was performed on 68 male Wistar rats. Within all the experimental series, the scientists were observing the animals taking various medications during 30 days. After 30 days since the experiment’s start, the animals got their weight measured, their blood sampled for biochemical studies. After that, the samples were taken for morphological and morphometric studies.

Results and discussion. Upon administered D₃ and E vitamins, there was a significant bone mass, ash content, Calcium and Phosphorus bone rate increase exceeding the similar values of animals with only Prednisolone and Vitamin D₃. The mineral and vitamin metabolism got normalized. Vitamin D₃ and E in conjunction with Prednisolone prevented the negative effect of Prednisolone on structural-functional bone state, articular and epiphyseal cartilages which demonstrated dystrophic changes with Prednisolone and no pharmaceutical correction, as well as bone growth disorder.

Conclusions. A long-term Prednisolone use was associated with pathological structural-functional bone and cartilage tissues. The simultaneous use of Vitamin D₃ and E along with Prednisolone prevents its negative effect on structural-functional bone state, articular and epiphyseal cartilages which demonstrated dystrophic changes with Prednisolone use, resulting in a formation and adaptive remodeling disorders.

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SPECIFIC FEATURES OF PROXIMAL HIP FRACTURE SURGICAL TREATMENT IN THE ELDERLY PATIENTS

Introduction. The proximal hip fractures reduce an average life expectancy by 17-19 %. Over 55 % cases could not move on their own, and every one in three people lose their self-care independence.

The study aim is to explore the indications for the proximal hip shaft to treat the proximal hip fractures, as well as to examine the findings related to this method.

Materials and methods. We examined 95 patients with trochanter fractures, 46 subjects being males (48.4 %), 49 subjects being females (51.6 %), their mean age being 72 ± 3 years. The patients had undergone clinical, X-ray and general laboratory assessment.

Based on the axial spiral CT scan models of hip bone with various types of fixation, the staff of SI “Institute of Traumatology and Orthopedics of the NAMS of Ukraine” biomechanics laboratory replicated the special geometry of “fixator-bone” system by means of customized software, generated the finite-element network, 314, 511 nodes, 181, 741 elements. The polyline models were imported into the SolidWorks environment where they created 3-D imitations of proximal hip, using the necessary tools.

Results and discussion. The study revealed that the smallest values of strain impacting the fixator elements differ in terms of shaft’s distal fixation and fracture type. The minimal values of strain were determined with no A1 fracture’s free blockage according to the international AO/ASIF classification, dynamic distal blockage in the oval cavity with A3 fractures and static blockage in case of unstable fractures of types А2.2 and А2.3.

We used this approach for 95 subjects with proximal hip fractures. The surgery outcomes were evaluated from 6 weeks to 3 years. The average number of points by Harris scale after 6 weeks was 57.6, after 6 months was 65.4, after
1 and 3 years — 71.8 and 73.6, respectively. There were no fixator breakdowns or migrations.

**Conclusions.** Using proximal hip shafts for osteosynthesis of proximal hip fractures of elderly patients significantly improves the treatment outcomes in this category. This method has an advantage of being slightly invasive, relatively short-lasting surgery, meager blood loss, possible achievement and maintenance of stable fragment fixation during the entire treatment up to the fracture knitting, as well as an early activation of patients with functional treatment.

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**ALTERNATIVE METHOD OF OSTEOPOROSIS DIAGNOSTICS**

**Introduction.** At present, the attention of Ukrainian and foreign scientists is riveted towards the structural-functional bone disorders as an integral blood supply, metabolism and neuro-humoral regulation component. Osteoporosis is one of the structural-functional bone disorders, significantly restricting the chances of bone sliver stable fixation and effective use of metal implants, deteriorating the local environment of the functional treatment. The topical issue is to develop the cheap, reliable, widely accessible method of bone assessment.

The study aim is to develop a non-machine-made osteoporosis diagnostic tool, to analyze and find correlation with clinical-laboratory methods.

**Materials and methods.** In order to study the signs of structural-functional bone disorders, we have studied 337 subjects with long bone fractures. All the patients had undergone the clinical and X-ray studies, immunological, sonographic, Doppler, densitometric, tomographic, biochemical and histophysiological assays. All the studies were dynamically performed. The statistical processing of data was performed by means of universally accepted tools: divergence criteria of two sets, dispersion and correlation analysis.

**Results and their discussion.** Based on the principal osteoporosis risk factors, we have created a system of indexation and mathematical calculation of coefficients, their impact on the structural-functional bone disorders and developed an alternative (non-machine-based) systemic osteoporosis diagnostic method. The osteoporosis occurrence risk was calculated by the formula:

\[ k = \frac{N_i}{N_i \text{ max}} \]

where \( N_i \) is the number of subjects with a risk factor, \( N \) is the total number of subjects, \( I_{\text{max}} \) is the maximal index risk factor assessment.

The probability of osteoporosis occurrence (\( P \)) was calculated by the formula:

\[ P = \sum_{i=1}^{n} X_i \]

where \( X_i \) and \( X_n \) are the specific indices of osteoporosis risk factor in a specific patient.

With \( P > 1.5 \), the osteoporosis probability was high, within the range of 1.0 to 1.5, it was moderate, with \( P < 1.0 \), it was low.

The study of osteoporosis risk factor prevalence with the developed diagnostic method showed a high degree of correspondence of our findings with ultrasound densitometry results. The present systemic structural-functional disorders revealed by means of densitometric assays correlated with a high risk of osteoporosis (\( p > 1.5 \)) calculated by the algorithm in all the cases. The low probability of osteoporosis (\( p < 1.0 \)) correlated with no structural-functional bone disorders in the patients examined by ultrasound densitometry. The effectiveness of systemic disorder diagnostics was 92%.

**Conclusions.** The non-machine-based osteoporosis diagnostic method enables an early detection, treatment and prevention of the compromised structural-functional bone state.

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**UROLITHIASIS, VESSEL CLASSIFICATION AND SECONDARY HYPERPARATHYROIDISM: UNRESOLVED ISSUES OF COMORBIDITY**

**Introduction.** Within the morbidity and mortality structure, the cardiovascular pathology plays a pivotal role. There are certain hypotheses that vessel calcification is one of the cardiovascular event risks growing due to the Calcium departing from its depot, bone tissue, and its accumulating in the vessels. However, the mechanisms of this process remain unclear. There is also an opinion that the Vitamin D deficiency impacts the vascular calcification mechanisms. D-deficiency provokes hypocalcemia, in its turn inducing the secondary hyperparathyroidism and accelerated bone resorption, osteoporosis and accelerated Calcium release from its depot as well as speeding up its intestinal resorption and penetration of vessels (intensifying calcinosis) and kidneys while creating microlites.

The increased arterial hardening due to calcinosis is a well-known independent predictor of cardiovascular events and mortality. The scientists are interested in seeking for new factors of cardiovascular risk among the patients with arterial hypertension and their contribution into the development of vascular hardening and calcification. Numerous studies confirm the correlation between low rates of Vitamin D, increased parathyroid hormone’s rate and vessel hardening indices and myocardial infarction risk, as well as unstable arterial pressure.
The osteoporosis prevention is promoted by the daily supplementation of Calcium-rich food staples as well as Calcium and Vitamin D supplements. However, the preventive treatment is received by under 30 % patients. One of the pivotal causes of insufficient Calcium-based food staples and supplements is the patients’ (and more importantly physicians’) anxiety of the probable provoking and developing the urolithiasis. This worry has some sound considerations since the nephrolithiasis occurs in about 5 % population while the risk of kidney stone formation during the patient’s lifetime is 8-10 %. This is why the study of pathogenetic mechanisms and development of preventative and curative methods for the extraskeletal complications of secondary hyperparathyroidism is very important.

It is worthy of noting that with hypertensive atherosclerotic renal disease, tubulointerstitial renal disorders attended by the reduced glomerular filtration rate (GFR), there is a reduced 1-hydroxylase, enzyme promoting 25-hydroxycholecalciferol (25(OH)D3 calcifediol) conversion into an active Vitamin D₃ - 1,25-dihydroxycholecalciferol (1,25(OH)₂D₃, calcitriol – D-hormone) and secondary hyperparathyroidism development. In this case, in order to correct as well as to treat the urolithiasis (health-resort treatment, compound substances, distance concrement elimination), one should prescribe the active Vitamin D (alphacalcidol) metabolites along with a further monitoring of ionized Calcium, Phosphorus, blood parathormone and X-ray densitometry.

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**SPECIFIC FEATURES OF DIAGNOSTICS AND TREATMENT OF ATYPICALLY LOCALIZED GOUT TOPHI**

**Introduction.** The reference literature describes numerous atypical cases of primary gout-provoked urate depositions starting in the tendons, muscles, skin or kidneys. The diagnostics of this pathology is often problematic and late in making.

The study aim is to explore the atypically localized urate depositions in the orthopedics and traumatology patients, to study specific features of their diagnostics and treatment.

**Materials and methods.** The cases of atypically localized urate depositions (n = 5). Clinical, laboratory, ultrasound, X-ray, spiral CT, MRI, histological assays.

**Results and their discussion.** We have been observing 5 male patients aged 53-64 years old, with a history of gout lasting 8-12 years. They had their metal plates removed after hip (3 cases) and tibial (2 cases) fracture consolidation. After the plate removal, all the patients reported tophi depositions in fibrous cases formed around the plates as well as the screws in the visually significant amounts (5-10 mL). Their wounds got healed by the initial pull tension. The uric acid rate amounted to 485-530 umol/L, while there were no clinical signs of gout inflammation.

**Clinical case.** Patient K.V., aged 53 years old, suffers from gout for about 10 years, receives no systematic treatment, does not keep any restrictive diet, abuses alcohol often. The patient has tophi of medium size on their feet, elbows, aural cavity coils. Six years ago the patient got osteosynthesis of the lower third of right hip fracture made with a plate. There were no complications, the fracture got consolidated, the leg’s functioning was recovered. The patient neglected the doctor’s advice on the plate’s removal. The patient got admitted with complaints of changes around the post-surgery scar, i.e. a non-painful purplish softened lump of 2x2 cm which appeared 3 weeks before the admittance. There was a suspected formation of a “late onset” ligature fistula or abscess around the post-surgery scar. The surgeon excised the scar throughout the soft tissue depth along with a cavity, the plate got removed at the same time.

Upon excision, we have observed the whitish tophi depositions of a paste-like consistency around some of the screws and the plate; their amount reaching 5 mL overall. The post-surgery wound got healed by the initial pull tension. The uric acid rate was 530 umol/L.

While making visual examination of the macropreparation after the capsule excision, we have noticed the release of whitish paste-like masses of up to 6 mL, which were assumed to be the contents of gout tophus. The histological study revealed significant urate accumulations taking the shape of non-structured, sometimes granular masses, located in the dermal layers; some of them looking like acicular crystals. The granular or coarse connective tissue was being formed around their depositions. All in all, the present bioplate pieces demonstrated pathomorphological process characterizing the gout node, i.e. tophus: centralized urate deposit localization; localized tissue dystrophy, necrosis, destruction; the perifocal inflammatory reaction attended by the plasmocellular, lymphoid infiltration with urate phagocytosis resulting in a fibrosis developed at the node’s periphery. The above-mentioned localizations of tophi without any clinical signs were considered to be rare, atypical, and riveted our attention.

**Conclusions.** The chronic gout cases are associated with the perifocal inflammatory changes and gout nodes which may be observed in the intensified regeneration sites, namely around the metal construction implants. The clinical signs of aggravated gout might have been absent. The node localization may be various. The patients suffering from a chronic gout should be regularly monitored for the uric acid rates. After the metal osteosynthesis of fractures or endoprosthetic implant insertion, the uric acid rates should be corrected whenever necessary, and the metal constructs should be removed as soon as it is indicated. In the above-mentioned study sample, the additional diagnostic tools (i.e. laboratory, ultrasound, X-ray, spiral CT and MRI) allow to reveal the potential risk of localized complications at the pre-clinical stage, and take the timely steps for their prevention. While analyzing the pathomorphology of any
SELECTIVE MONITORING ANALYSIS OF VDR GENE BSML AND FOKL POLYMORPHISMS IN CHILDREN

Introduction. The active development of molecular diagnostics promotes a successful diagnosis and characterizing not only the orphan but other diseases, their associations with autoimmune pathology, central nervous system, cardiovascular, bone-muscular and other diseases. At present, one may assume that most genome components are deciphered, and every gene has its own map. The VDR gene’s polymorphisms are only partially explored, six of them actively discussed. It is well-known that BSML and Fokl polymorphisms are in charge of the cell receptors’ response to Vitamin D3, accounting for the Introduction and importance of their study during the active children’s growth periods, bone pathologies and their associations with other diseases.

The study aim is to make a selective monitoring of the VDR gene’s BSML and Fokl polymorphisms.

Materials and methods. There were 205 relatively healthy 9-17 year-old children examined. The study did not include the children with chronic somatic, endocrine, congenital pathologies and bone-muscular diseases. The examination involved medical histories, general clinical examination with physical development (by the WHO «Child Growth Standards», 2007) and sexual development (by Tanner scale), VDR gene’s BSML (c.1024+283 G-A) and Fokl (30920 A>G) polymorphism detection by means of polymerase chain reaction (Realtime). We have used buccal scrape samples for a biomaterial. The findings were analyzed by Microsoft Office Excel 2007 and STATISTICA 7 software.

Results. Our findings demonstrate that 48.76 % children had no VDR gene’s BSML polymorphism mutations, 41.32 % had a heterozygous mutation, 9.92 % had a homozygous mutation. The VDR gene’s Fokl polymorph variants were distributed in the following manner: 27.81 % children had no mutation, 61.95 % children had a heterozygous mutation, and 10.24 % children had a homozygous mutation.

As it is well-known that VDR gene is in charge of Vitamin D3 receptors, its various polymorph pathological mutations result in a suppressed receptor function of cellular membrane, i.e. even with an adequate Vitamin D3 supplementation, the child’s bodily functions won’t be entirely fulfilled.

Conclusions. Over 50 % children, residents of the Kharkiv region, demonstrated pathological polymorph variants of Vitamin D3 receptor gene, while 73 % children have pathological Fokl polymorph variants. It means that children are at risk of Phosphorus-Calcium metabolism and bone mineralization disorders. Our findings are not conclusive enough to study the specific features of VDR gene’s polymorph variants at the entire Kharkiv region’s children population level. This is why our study is ongoing.

NUTRITIONAL PATTERNS AND OSTEOPOROSIS: CONCEALED RISKS

Nutrition is the key modifiable influence on human health, namely the structural-functional bone health. It is well-known that the nutrients are not only plastic materials capable of an indirect effect on bone tissue via general and immune modulation response or acid-alkaline regulation. Besides the widely-known nutritive factors affecting the bone mineral density (BMD), such as Calcium and Vitamin D3, one should take into account the BMD and other micronutrient consumption, as well as other food staples and nutritional patterns in general. For instance, the single-point studies demonstrate higher BMD rates of people consuming comparatively greater amounts of Magnesium, Vitamin A, beta-carotene, flavonoids, Vitamin E etc.

The classic use of multidimensional scaling allows us to detect certain nutritional patterns which are BMD-associated. The positive association is revealed, for instance, in those nutritional patterns which involve wholegrain cereals, legumes and fruits, poultry and fish. The negative association is revealed for those patterns which are in line with or close to the Westernized nutrition (rich in raffinated products, purified cereals, sweets and processed meats). One may attribute the findings to the pro-inflammatory vector of the Westernized nutrition, confirmed by the low BMD values at the lumbar spine and femoral neck, osteoporosis and fracture risk associated with dietary inflammatory index. On the other hand, the nutritional pattern may affect the BMD values via bone Calcium’s intervention in the acid-alkaline regulation. For instance, with higher rates of acid precursor products, purified cereals, sweets and processed meats. One may attribute the findings to the pro-inflammatory vector of the Westernized nutrition, confirmed by the low BMD values at the lumbar spine and femoral neck, osteoporosis and fracture risk associated with dietary inflammatory index.

While describing the osteoporosis risk-related nutritional patterns, some researchers dispute the role of protein-rich products. The adequate protein consumption is necessary for the normal BMD maintenance. At the same time, there are controversies concerning the meat and dairy consumption rates, which may be explained by the disparate product groupings in the nutritional patterns of various studies, as well as various nutritional cultures of individual countries.

The obtained findings confirm an existing association of nutritional patterns and bone tissue. The nutritional modification in order to prevent and treat the osteoporosis should
involve the micronutrient rate improvement, as well as to reduce the pro-inflammatory effect and acid-alkaline balance loading.

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**SPIRONOLACTONE OF ELDER RHEUMATOID ARTHRITIS PATIENTS COMBINED WITH RESISTANT ARTERIAL HYPERTENSION: EFFICACY OF MYOCARDIAL RESTRUCTURING**

**Introduction.** The rheumatoid arthritis (RA) patients have a double cardiovascular risk increase correlating with an increased arterial hypertension (AH) rate, worse control and resistant AH (RAH) resulting in a greater myocardial restructuring.

The study aim is to explore the spironolactone effect within the 12-month combined therapy (ACE inhibitor, Calcium channel blocker, diuretics, statins, immune suppressors (Methotrexate)) on structural myocardial changes of RAH patients with RA.

**Materials and methods.** 60 patients were examined (mean age: 67.0 ± 8.0 years; 52 % women) with RA-attended RAH and divided into two groups. The 1st Group received a triple anti-hypertensive therapy in combination with spironolactone (n = 30), the 2nd Group received an unmodified treatment (n = 30). The treatment lasted for 12 months. The patients had undergone echocardiography, left atrium (LA) dilatation rate measurement. Based on the relative wall thickness (RWT), left ventricular (LV) myocardial mass index (LVMI) and end-diastolic volume (EDV)/body surface area (BSA), 4 types of LV geometry were determined: concentric left ventricular hypertrophy (LVH) with dilatation, concentric LVH without dilatation, eccentric LVH with dilatation, eccentric LVH without dilatation and LV normal geometry.

**Results.** With spironolactone added to therapy, the number of patients with LV dilatation reduced from 86.7 to 63.3 % (χ^2 = 4.4, p = 0.037), and with LVH reduced from 90.0 to 80.0 % (χ^2 = 3.9, p = 0.048). These data were combined with the eccentric and concentric LVH and LV dilatation reduced by 2.2 and 2.5 times, respectively, with a progressive hypertensive LV remodeling in patients who did not receive spironolactone. The concentric LVH detection increased by 16.7 % with no LV dilatation (χ^2 = 3.3, p = 0.04). The spironolactone resulted in LVMI reduction (by 13.0 %, p<0.01) via reduced LV dilatation rate (by 7.3 %, p<0.01) and regressed wall thickness increase (interventricular septum (IVS) and posterior wall (PW) of LV by 17.3 i 15.2 %, respectively, both p < 0.01). The regressed LVH is associated with an improved LV contractile ability on a regional (FS) and global scale (ejection fraction (EF)): by 15.5 and 7.9 % respectively (both p < 0.01).

**Conclusions.** For the RAH-attended RA patients, received spironolactone promotes a significant dilatation regression via the reduced wall thickness followed by the improved contractile myocardial ability.

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**THE PAINFUL HUMERUS-ELBOW-WRIST ANGLE: STATUS QUO FOR THE ELDERLY PATIENTS**

The painful humerus-elbow-wrist angle is a frequent challenge for the family physicians and orthopedic traumatologists, hand surgeons etc., which is attributed to a complex of diagnostic problems intended to be solved by the above-mentioned physicians. The pain may be acute or chronic, with a differential diagnosis involving wrist bone injuries, capsular-tendon apparatus damages, ligament tenosynovitis, pseudo-gout. 74 % patients with a latter condition have a humerus-elbow-wrist angle calcification (Saffar), while 50 % distal radio-ulnar instability cases go undiagnosed at the primary consultation (Wassink), along with vascular, neurological conditions and deforming osteoarthritis of the distal radioulnar joint (DODRUJ) and intrawrist joints. The medical history is a pivotal factor for the elderly patients, since the osteoporotic fractures of distal epimetaphysis of the radial bone with no displacement causes instability in the future (from 11 to 19 % by Qualbauer) and DROJ arthritis. The physical examination is based on the knowledge of anatomy and understanding of this localized condition’s semiotics (over 50 pathologies) along with provocative maneuvers, such as keyboard test, bulloiting of elbow bone head, crescent-trifacet rolling and other specific tests. Methods of additional examination, such as hand MRI, became very advanced though precise patient’s placement is of utmost importance. In the recent years, the Ukrainian physicians start using hand arthroscopy for diagnostic and treatment purposes. This is a method of choice for patients with major comorbidities and elderly patients. The report is based on about 600 patients with painful humerus-elbow-wrist angle, examined and treated at the SI “ITO of the NAMS of Ukraine” since 2014. The patients were aged 50–75 years on average. Our sample allows us to determine the decision-making algorithm for the patients with this condition.

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**STUDY OF BONE MARROW ASPIRATION EFFECT ON THE DENERVATED MUSCLE BY THE ELECTROMYOGRAPHIC DATA**

**Introduction.** Within the structure of overall injuries, peripheral nerve injuries account for 1.3–2.8 % cases. The metaanalysis of references on the outcomes of peripheral nerve microsurgical recovery held throughout 2005 dem-
onstrates that only 51.6 % cases were associated with satisfactory functional recoveries. The modern view of denervation-reinnervation process occurring within the “peripheral nerve — skeletal muscle” system implies that the main causes of negative outcomes are the denervation changes occurring in the Schwann cells of the distal site of injured nerve, neuromuscular synapses and secondary changes affecting the muscle fibers during the long-term denervation.

The study aim is to study the effect of bone marrow aspiration on denervation-innervation processes in the skeletal muscles using experimental neurophysiological methods.

Materials and methods. The experimental study was performed on 36 mature rabbits weighing 3-4 kg. The basic experimental model involved peripheral nerve injury. Experimental animals were divided into 4 groups involving 9 animals each (3 animals for each of the experimental stages). On 8, 12, 16 weeks following the surgical intervention, all the animals were subjected to the needle electromyography of target muscles (m. gastrocnemius, and m. tibialis anterior) in order to study the denervation-reinnervation changes.

Results and discussion. The results of electromyography of experimental animals’ target nerves are presented in the report. We have considered normal the parameters of motor unit action potential (MUAP) registered during the study of contralateral (non-subject to surgery) pelvic animal sites.

The groups which were subject to the bone marrow aspiration of the target muscles registered a significantly greater (p = 0.07) MUAPs compared to the group which was not subject to the bone marrow aspiration. The changes of registered MUAPs in all groups were in line with the general characteristics of denervation-reinnervation process.

Conclusions. The bone marrow aspiration into the target muscles during the surgery and the early stages of reinnervation is significantly improving ( = 0.07) the reinnervation muscle processes, and the latter improvement is manifested by the greater MUAPs.

**Underlying Causes of Shoulder Endoprosthetics in Patients with Proximal Shoulder Injuries and Their Consequences**

The study aim is to analyze the underlying causes of proximal shoulder metaepiphysis injuries resulting in the shoulder endoprosthetics.

Materials and methods. The retrospective analysis of 160 patients subject to the unipolar total and reverse shoulder endoprosthetics treated from 2010 to 2020 at the Department of the Arm Reconstrucive and Recovery Surgery of the State Institution “Institute of Traumatology and Orthopedics of the NAMS of Ukraine” (Kyiv). The mean age of patients was 64.2 ± 10.9 years, 72 of them being men and 89 being women. The patients aged 14-44 years made 5.2 %, patients aged 45-64 years made 36.8 %, and patients aged 66 years and older made 58 %. The mean point of patient’s making appointment after injury fluctuated for 24 ± 10.9 days, after the beginning of treatment – 50.6 ± 81.1 months. Among the appointment causes, fresh injuries made 41.25 %, and post-injury damages made 36.8 %. The mean duration of in-hospital period was 13.74 ± 7.05 days. The mechanism of injuries involved: domestic falls using hand as a support (n = 97), car crashes (n = 10), post-metal osteosynthesis condition (n = 113). The diagnostics of primary shoulder injuries was made by means of X-ray, MRI, CT prior to surgery.

Results and discussion. According to our findings, the physicians of the Arm Reconstruction and Recovery Department were resorting to the shoulder endoprosthetics with splinter fractures of proximal shoulder epiphysis (Type 3 and Type 4 by Neer) – 63 patients (41.25 %); old-time massive injuries of rotator cuff – 13 patients (8.1 %); post-traumatic aseptic necrosis – 34 patients (21.2 %), and with pseudovoi 12 patients (7.5 %).

The structure analysis demonstrates that most surgeries were performed after the acute trauma and old-time injuries of shoulder head and surgical neck, namely in case of patients older than 66 years (82.55 % cases). The proximal shoulder epimetaphysis fractures were caused by high-energy fractures: fall from the height of over 2 m on the patient’s hand (57 cases), fall from the patient’s own height on the patient’s hand (32 cases), direct hit of the shoulder (10 cases), car crash (10 cases) or epileptic attack (6 cases). The CT revealed 28 Type 3 fractures of proximal shoulder epimetaphysis by Neer, 35 Type 4 fractures by Neer.

Among the fracture consequences, we have singled out: 1) post-traumatic aseptic necrosis of shoulder head (21.2 %) attributed to the previously performed shoulder osteosynthesis (18 patients); and old-time undiagnosed shoulder injuries (over 1 year) with patients not making any appointments (5 patients); 2) pseudo-joints (pseudarthrosis) after the previously performed conservative A1-A2 fracture type treatment (ASIF, 5 patients); 3) post-osteosynthesis of B1-B2 fracture type (ASIF) with special plates attributed to the osteosynthesis principle disruption and other factors (7 patients).

The rotary cuff arthropathy was performed for patients with massive 3 degree injuries of ligaments according to Snyder attributed to the patients’ falls form their own heights on their own hands (6 patients), 3-4-degree lipid dystrophy of supraspinatus by Goutallier (2 patients) attending the ligament injuries and degenerative ageing changes and conditions after the non-effective previously performed surgery (shoulder arthroscopy, sutures, debridement) in 2 patients.

The shoulder head aseptic necrosis was detected in most patients after the iatrogenic intervention: intra-articular GC injections (over 10 injections into 1 joint, 8 patients), previous chemotherapy (2 patients), long-term power training (powerlifting, 5 patients), congenital disorders (2 patients) and undiscovered etiologies (10 patients).

Most patients had undergone the unipolar total and reverse shoulder endoprosthetics: 126 (78.7 %) cases, among them reverse (25 patients, 15.6 %) and total endoprosthetics (9 patients, 5.6 %).
Conclusions. Our findings have shown that the underlying causes of shoulder endoprosthetics are the grave injuries following the high-energy traumas, unsatisfactory outcomes of the previous surgeries, iatrogenic effects etc.

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PARTIAL INJURIES OF PECTORALIS MAJOR

Introduction. Partial injuries of pectoralis major (PM) occur very rarely; however, they require further study.

Materials and methods. We have performed a prospective analysis of medical histories with PM injuries from 2011 to 2020; the patients being treated at the Department of Microsurgery and Arm Reconstructive and Recovery Surgery of the SI “Institute of Traumatology and Orthopedics of the NAMS of Ukraine” (Kyiv). The inclusion criteria made us select patients with partial pectoralis major (PM) injuries, observed for at least a year. We have selected 9 patients who complied with selection criteria. At the first consultation, physicians have collected anamnesis, performed clinical and ultrasound examinations as well as MRI. The patients have filled the Quick DASH questionnaire and “Questionnaire on the Subjective Evaluation of Patients with PM Injuries” (during the 1st consultation and after 12 months); responses were analyzed using statistical methods.

Results. The mean age of patients with partial PM injuries was 37.4 ± 10.8 years (from 22 to 54 years), 8 of them men and 1 of them a woman. The observation period was 12 ± 2.8 months after surgery or with no surgery. 5 patients (55.6 %) obtained IIC tendon–muscle attachment injury; 3 patients (33.3 %) obtained IID tendon injury, and 1 patient (11.1 %) obtained IIB muscle injury by Cordasco (2020). All patients denied taking steroids to increase their muscle mass. The surgical treatment took 10-643 days. 2 patients had acute injuries (up to 8 weeks) and 3 patients had old-time injuries (over 8 weeks).

Prior to treatment, the patients’ condition according to Quick DASH after surgery was 77.4 ± 12.05 points, after the conservative treatment – 87.3 ± 9.21 points (p = 0.69). According to the “Questionnaire on the Subjective Evaluation of Patients with PM Injuries”, the patients’ condition after surgery and prior to treatment was evaluated at 79 ± 10.56 points, and the patients’ condition after conservative treatment was evaluated at 81.3 ± 2.63 points (p = 0.69). According to both questionnaires, the groups were unified and complied with their unsatisfactory condition.

After 12 ± 2.8 months, one made a repeat evaluation of treatment outcomes. By the Quick DASH scale, the group of surgical treatment was evaluated at 14.2 ± 9.55 points, and the group of conservative treatment was evaluated at 69.8 ± 6.4 points (p = 0.00003). According to the calculations, there was a statistically significant difference, results of conservative treatment being evaluated as unsatisfactory.

By the Quick DASH scale and the “Questionnaire on the Subjective Evaluation of Patients with PM Injuries”, the patients’ condition was negative in both group at the treatment onset. After a year of treatment, the group with surgery demonstrated either exemplary or good results, the group with conservative treatment demonstrated negative results. We have observed no complications after surgery in this group of patients.

Conclusions. Partial PM injuries occur rarely and frequently go undiagnosed. The injuries require a thorough differentiation and additional diagnostics. The “gold standard” of partial PM injury diagnostics is MRI. The physically active patients with partial PM injuries require surgical treatment, allowing them to obtain exemplary and good results, while conservative treatment brings unsatisfactory results. Due to a small sample of patients, the tactics of partial PM injuries should be studied in depth.

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SURGICAL COMPLICATIONS OF ELDERLY PATIENTS WITH PROXIMAL HIP FRACTURES

Introduction. Treatment of elderly patients with proximal hip fractures is an important medico-social issue. The patients with osteoporosis signs even after the surgical intervention have up to 7-15 % complications at the post-surgery stage. The study aim is to determine the character of post-surgical complications in the elderly patients with proximal hip fractures.

Materials and methods. We have analyzed the treatment outcomes of 98 elderly patients (mean age: 76.2 ± 10.3 years), 12 patients being male and 56 patients being female. After the general clinical examination, orthopedic review, hip joint X-ray were performed to determine the fracture type and degree of dislocation. During the following 3 days, the patients have undergone osteosynthesis by PFNA cephalomedullary nail fixation. In the fracture group, 84.8 ± 7.1 % patients had fractures of predominantly 31 A2.2-2.3, A3.2-3.3 types. The observation was performed during 36 months, involving 68 patients who provided their feedback.

Results. Secondary post-surgical dislocation of bone fragments with a cut-out neck component was detected in 7.4 % (n = 5) patients during 6 months after surgery; neck component migration in 4.4 % (n = 3) patients during 1 month. The neck component location disorder (by Parker index) following osteosynthesis was detected at the control X-rays of 3 patients, which may be attributed as an underlying complication. The post-surgery wound suppuration occurred in 2.9 % (n = 2) cases. The general complication index made 14.7 % during 36 months.

Conclusions. The complications (cut-out, migration) depend not only on the technical deficiencies of surgery performed on the elderly patients, but other causes, namely bone state, requiring the pre-surgical detection and monitoring during the post-surgery drug correction.
BODY MASS POLARITIES AND BREATHING MECHANICS WITH COPD COMORBIDITIES AND DIABETES MELLITUS

Introduction. Chronic obstructive pulmonary disease (COPD) is a common pathology whose frequency is ever increasing in the future years, according to forecasts. Its importance will reach the 3–4th rank among the morbidity and mortality causes. The diabetes mellitus (DM) incidence growth across the world does not cause any doubts, inspiring anxiety and awareness of the importance of these nosologies. It is well-known that the DM risk in the COPD patients is higher, especially with its grave forms — C and D groups. Most COPD patients have associated chronic conditions, namely skeletal muscle dysfunctions, sarcopenia and obesity, resulting in an unsatisfactory effect on the pulmonary ventilation. Obesity, as well as sarcopenia, is often linked to ageing; together they may result in progressing conditions, such as diabetes and cardiac failure. However, the data on pathophysiological mechanisms underlying this association are inconclusive and poorly known.

The study aim is to evaluate the metaanalysis findings on muscle disorders associated with COPD and DM comorbidities.

Results. According to the EWGSOP2 recommendations (2018), the key sarcopenia criterion is muscle strength. However, the COPD makes this criterion contestable. Specific features of the COPD clinical course allow us to determine the patients’ phenotypes depending on the constitutional changes: bronchital and emphysematous. Patients with bronchital type are characterized by an excessive body mass or obesity, while those with emphysematous type — by the growing muscle atrophy, body mass loss. Jaitovich A. et al. (2019) analyzed the COPD-attended sarcopenia prevalence in Europe, Asia, South America. The authors claimed that sarcopenia was registered in 7.9–66.7 % COPD patients aged 62–84 years. Taking into account the multitude of lean mass analysis methods, the findings differed due to heterogeneity of sources: under the clinical conditions (12.4–28.1 %), in the residential areas (7.9–8.4 %) or nursery care facilities (53.8–66.7 %). The sarcopenia prevalence among the latter group was the highest, upon this group’s exclusion the sarcopenia’s frequency decreased by 16.5 %. Tskeoura M. et al. (2020) demonstrate the sarcopenia prevalence among the COPD patients was 24.6 %. The DM-attended sarcopenia’s frequency was higher (12.9 %) compared to control (5.4 %) (Pechmann L. M. et al., 2020).

Numerous findings show that with COPD the muscle mass loss is closely associated with endocrine disorders, namely “somatotropic hormone — insulin-like growth factor I”, testosterone and testosterone precursor rate (Dehydroepiandrosterone (DHEA)) decrease, as well as an increased cortisol/ DHEA ratio. However, the molecular mechanisms of insulin, fat tissue hormone effects on muscular system remain poorly studied, especially in combination with COPD and DM comorbidities. The special role of endogenous hormone imbalance is observed in case of anabolic properties. Reduced muscle fiber size is associated with insulin-sensitive target tissue mass loss promoting the insulin resistance, DM, and consequently, obesity and metabolic syndrome. Due to the above-mentioned factors, the muscle (lean) mass loss is not an isolated process; it occurs along with an accumulated fat mass.

Wannamethee S. G. et al. (2016) demonstrate that obesity is attended by an excessive production and lipid utilization disorder; lipids accumulating ectopically in the skeletal muscles. Such intraskeletal lipids and their derivatives induce mitochondrial dysfunctions, disabling -oxidation of fatty acids in the muscles and promoting active oxygen forms. Kalinkovich A. et al. (2017) consider that it promotes lipotoxic environment and insulin resistance, as well as increases some pro-inflammatory myokine secretion, augmenting the inflammatory processes in fat tissue as well as maintaining the subclinical chronic systemic inflammation. This fact was confirmed by Satoshi Kurose et al. (2021), stating that blood adiponectin rates negatively correlate with the body mass markers and skeletal muscle strength. The COPD–Gene study shows that lipid content in the muscles correlates with a reduced activity of oxidizing fermenters and physical ability. Thus, myostatin and adiponectin both play an important role in the skeletal muscle function regulating the insulin signal pathways, energy metabolism and creating the “vicious circle”, maintaining the overall inflammatory process in fat tissue and skeletal muscle.

Conclusions. Sarcopenia and obesity are polar opposites of body mass which perform a double loading with COPD and DM comorbidities.
at the SLE onset being 19–44 years (n = 161; 62.4 %), III – age at the SLE onset ≥ 45 years (n = 45; 17.4 %). The clinical data were evaluated with SLE activity index (SLEDAI) detected, erythrocyte sedimentation rate (ESR), C-reactive protein (CRP) rate, specific auto-antibody rate measured. For a multiple comparison of qualitative and quantitative values, one used χ² and Cruskall–Wallis test respectively.

Results. Erythematous face rash resembling a butterfly was observed significantly more often among the SLE patients with a childhood-age onset (40.4 %) and adult-age onset (34.4 %) compared with a late onset (15.6 %; p = 0.04 and p = 0.05, respectively). The discoid rash frequency and photosensibilization rate did not differ among groups. The adult-onset SLE was associated with a higher alopecia rate (38.8 %) compared with a juvenile SLE (19.2 %; p = 0.04). Furthermore, the patients with SLE debutting at an age of 19–44 years reported lymphadenopathies more frequently (56.3 %), since the late-onset SLE group demonstrated the lymphadenopathy rate of 25.8 % (p = 0.001). One also detected a statistical difference between the renal condition groups: the SLE patients with childhood-age and adult-age onset had the higher rate of lupus-nephritis (55.8 and 49.4 %, respectively) than the SLE patients with a late onset (23.8 %; p = 0.012 and p = 0.014, respectively). The frequency of nephrotic syndrome did not differ among the groups (p = 0.224). The serositis occurred more frequently in the SLE patients whose disease debuted at older (54.5 %) and adult age (43.8 %) rather than at the juvenile age (23.1 %; p = 0.01 and p = 0.034, respectively). We did not detect any differences among the groups in terms of mucous lining, joint, lung, nervous system injuries, hematomal signs, constitutional symptoms. The CRP rate of patients with a late SLE onset was significantly higher (14.0 (1.1–46.4) mg/L) than with a juvenile onset (0.7 (0.0–12.0) mg/L) (p < 0.05). However, the ESR and SLEDAI index did not differ among the groups. The antibodies to double-stranded DNA (Anti–dsDNA) occur significantly more frequently in those patients whose SLE debuted at childhood (68.6 %) and at the adult age (70.1 %) compared to the late onset (31.3 %) (p = 0.016 and p = 0.001, respectively).

Conclusions. The patients with SLE debutting at childhood and at an adult age have a butterfly-remesbling erythema, renal disorders and Anti–dsDNA positivity more frequently than others. The patients with SLE debutting at an age of 19–44 years have alopecia and lymphadenopathies more often than others. Patients with juvenile SLE develop serositis more often than other age groups. The CRP rate is higher for patients with late-onset SLE.

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SPONDYLOARTHRITIS-ATTENDED OSTEOPOROSIS: DXA FINDINGS

Introduction. The bone loss (osteopenia or osteoporosis) and osteoporotic vertebral fractures are visible complications of spondyloarthritis, especially ankylosing one (Mitra D. et al., 2000). Osteopenia and osteoporosis may develop both at the late and early spondyloarthritis stages. M.A.C. van der Weijden et al. (2011) have been the first to explore the dual-energy x-ray absorptiometry (DXA) findings of early spondyloarthritis patients. They determined that the prevalence of a low bone mass (BMD) reaches 47 % for hip and lumbar spine. At the same time, the dynamics of osteoporotic and osteosclerotic spinal changes makes DXA findings inconclusive in case of spondyloarthritis.

The study aim is to measure BMD of spondyloarthritis patients and to determine its correlation with disease duration, spondyloarthritis activity, sacroiliac changes according to the MRI data.

Materials and methods. 30 patients with spondyloarthritis (mean age: 39.57 ± 10.67 years, average disease duration: 8.24 ± 7.71 years) have undergone DXA measurement. Osteopenia and osteoporosis were detected by T-score of -1 to -2.5 and under -2.5 SD, respectively. The active inflammatory changes of sacroiliac joints were measured by MRI, according to the Spondyloarthritis Research Consortium of Canada index (SPARCC, a range of 0–72) (Maksymowycz W. P. et al., 2015). The chronic sacroiliac changes by MRI were evaluated by the Danish count (a range 0–48) (Madsen K. B., Jurik A. G., 2010). The disease activity was measured by ASDAS (Ankylosing Spondylitis Disease Activity Score), BASDAI (Bath Ankylosing Spondylitis Disease Activity Index), C-reactive protein rate (CRP, mg/L) and erythrocyte sedimentation rate (ESR, mm/hour).

Results. The mean DXA values for the forearm BMD were 0.76 ± 0.09, T-score = (-0.09) ± 0.90, Z-score = 0.28 ± 0.89; for the spinal BMD – 0.94 ± 0.15, T-score = (-1.28) ± 1.28, Z-score = (-1.03) ± 1.27; for the hip BMD – 0.84 ± 0.16, T-score = (-0.92) ± 0.94, Z-score = (-0.65) ± 1.07. Osteoporosis was detected in 4 patients (13.3 %), osteopenia in 20 patients (66.7 %). Duration of the disease correlated negatively with an overall T-score (r = -0.41, p = 0.02). The hip BMD showed a negative correlation with CRP (r = -0.37, p = 0.048). There were no other correlations found.

Conclusions. The BMD of spondyloarthritis patients were correlating negatively with a disease duration and CRP rate. The problem of DXA measurements under cumulative osteoporification in spondyloarthritis patients remains quite burning.

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SPECIFIC FEATURES OF BACK PAIN IN ADULT WOMEN

The study aim is to explore the prevalence of inflammatory back pain in adult women, with no established spondyloarthritis diagnosis, and to evaluate its principal characteristics and role of sex distinctions.

Materials and methods. The questionnaire performed among 1019 adult women who had no established spondylo-
loarthritiis diagnosis. The questionnaire included 39 items; it was developed to specify the back pain characteristics and to explore its prevalence. Out of this group, one has selected 894 questionnaires of women with registered back pain (discomfort or stiffness), except for an isolated cervical spine injury. The group of men included 696 patients, with 591 questionnaires selected in a similar manner. The inflammatory character of pain syndrome was determined in case of ≥ 4 out 5 ASAS or Calin criteria. The mean age of patients registering back pain issues was 41.9 ± 17.5 years, while the mean age of subjects complying with ASAS criteria was 37.3 ± 15.8 years. The significance of discrepancies was evaluated according to Fisher’s exact test (the discrepancy being considered significant at p < 0.05). One evaluated back pain association with other articular and extra-articular signs, analyzed the present gender-related discrepancies.

Results. According to the questionnaire results, 87.6 % women reported some problems with their backs (except for an isolated cervical spine injury). They had also made an appointment for this reason. The pain syndrome prevalence did not differ between sexes. The inflammatory pain character was detected by ASAS in 8.2 % women-patients, and by Calin in 17.6 % women-patients without an established diagnosis of spondyloarthritiis (no significant distinctions between men and women). The most frequent age of pain syndrome onset is 20-30 years (45.1 %), while its most typical localization is lumbar spine. While comparing the groups of inflammatory (by ASAS) and mechanic back pain, women with inflammatory pain were subject to more frequent MRI scans (37.3 and 26.4 %, respectively); physicians observed painful reactions in the costal-muscular thoracic area (41.3 and 28.0 %, respectively). However, there were no significant differences in frequency of other articular (arthritis, synovitis, morning stiffness etc.) and extra-articular signs (psoriasis, talalgia, iritis/uveitis etc.) detected. Within the group of gender-related distinctions, the male back pain was often preceded by injury (30.3 and 21.0 %, respectively), while physical exercises alleviated it more frequently (52.1 and 45.3 %, respectively). Both men and women tended to suffer from a gradual pain onset and experienced its lessening after rest. For women, the back pain was often attended by articular pain (35.1 %), pain in the costal-muscular thoracic area (29.1 %), conjunctivitis among women (p < 0.05). In order to neutralize the groups of inflammatory (by ASAS) and mechanic back pain, about a half of men and women are evaluated back pain association with other articular and extra-articular signs, analyzed the present gender-related discrepancies.

Results. According to the questionnaire results, 87.6 % women reported some problems with their backs (except for an isolated cervical spine injury). They had also made an appointment for this reason. The pain syndrome prevalence did not differ between sexes. The inflammatory pain character was detected by ASAS in 8.2 % women-patients, and by Calin in 17.6 % women-patients without an established diagnosis of spondyloarthritiis (no significant distinctions between men and women). The most frequent age of pain syndrome onset is 20-30 years (45.1 %), while its most typical localization is lumbar spine. While comparing the groups of inflammatory (by ASAS) and mechanic back pain, women with inflammatory pain were subject to more frequent MRI scans (37.3 and 26.4 %, respectively); physicians observed painful reactions in the costal-muscular thoracic area (41.3 and 28.0 %, respectively). However, there were no significant differences in frequency of other articular (arthritis, synovitis, morning stiffness etc.) and extra-articular signs (psoriasis, talalgia, iritis/uveitis etc.) detected. Within the group of gender-related distinctions, the male back pain was often preceded by injury (30.3 and 21.0 %, respectively), while physical exercises alleviated it more frequently (52.1 and 45.3 %, respectively). Both men and women tended to suffer from a gradual pain onset and experienced its lessening after rest. For women, the back pain was often attended by articular pain (35.1 %), pain in the costal-muscular thoracic area (29.1 %), conjunctivitis among women (p < 0.05). In order to neutralize the groups of inflammatory (by ASAS) and mechanic back pain, about a half of men and women are evaluated back pain association with other articular and extra-articular signs, analyzed the present gender-related discrepancies.

Conclusions. The adult women’s back pain prevalence is rather high (87.6 %). The detection of ≥ 4 out of 5 inflammatory back pain criteria by Calin in 17.6 % women and by ASAS in 8.2 % women implies presence of a certain segment of subjects with an undiagnosed spondyloarthritiis/ spondylitis.

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CLINICAL AND X-RAY DIAGNOSTICS OF HIP JOINT PATHOLOGY IN PATIENTS WITH INFANTILE CEREBRAL PALSY

Introduction. The diagnostic issues associated with treatment and prevention of subluxation, sprain and contracture of hip joint are topical for the infantile cerebral palsy patients.

The study aim is to improve the diagnostics of hip joint pathologies by detecting the objective X-ray findings.

Materials and methods. The overall number of patients is 20 (40 joints), 10 being boys and 10 girls. 16 joints out of 40 were subject to surgery. The age of patients fluctuated from 3 to 15 years. The X-ray was performed to determine the cervical-diaphyseal angle (CDA) and hip torsion (projection and actual one by Koval’s tables), acetabular angle and transverse angle of the acetabular inlet (also called Sharp’s angle). The hip torsion was determined clinically by Ruwe. The intrasurgical determination of torsion was performed by our staff (patent № a200512793). All patients were examined according to our own methodology (patent № 137567).

Results. According to Student’s t-distribution for independent samples, one has compared hip joint parameters and detected significant differences among the CDAs in the standardized laying and the CDAs in one’s own laying (p < 0.05), as well as among the CDAs in the standardized laying and actual CDAs by Koval (p < 0.05). According to Fisher’s exact test, the torsion by Ruwe and by Koval differ significantly (p < 0.05) — F empir. 1.87 > F crit. 1.7. By means of “odds ratio”, we have determined that the sensitivity of torsion detection by Ruwe Se is 0.7, while specificity by Ruwe Sp — 0.83 (OR = 11.67; 95 % CI: 1.94-70.18), confirming that the chance of correspondence by Ruwe is 11.67 times greater than by Koval (compared to the intrasurgical data). The hip torsion size was detected precisely by Ruwe, enabling detection of true hip joint parameters by our own methodology.

Conclusions. Our own methodology enables determination of objective clinical and X-ray (diagnostic) parameters of patients with hip joint pathologies. While performing one X-ray, one may detect all the key hip joint parameters (hip torsion, CDA, Wiberg angle, Reimers angle, index of vertical migration, acetabular angle, transverse angle of the acetabular inlet) and standardize the infantile cerebral palsy patients who should be subject to screening during the whole period of their development. In such a way one may collect X-ray data of patients with pronounced neuromuscular disorders (III and IV GMFCS).