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#SCIENCE4HEALTH2021

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Abstracts of winners

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WELCOME!

On behalf of the Institute of Medicine of Peoples' Friendship University and staff, I welcome you to the proceedings of the International Students' Scientific Conference #SCIENCE4HEALTH2021.

The Conference has been held since 2009 eleven times and for the fourth time it takes part only in English. In previous years about 3000 students, residents, graduate students, practicing doctors and teachers from 15 countries have participated in our conference. Within the framework of the conference, there are competitions of practical skills in dentistry, surgery and pharmacy, and lectures by Russian and foreign professors, round tables and master classes. It was my distinct honor to chair the conference and have the privilege to work with our distinguished colleagues. We greatly appreciate the continued support in publishing the annual conference proceedings they did for the past four years.

We thank Prof. Bela Merkely and all the members of organizing committee for making this opportunity possible. These proceedings would not be possible without the tireless effort of many people. Firstly, I wish to acknowledge the excellent submissions by authors. Indeed, the authors are the reason for the existence of this conference, and this supplement is a snapshot of important research in our field. A career in science begins with the Student Scientific Society. Some ideas will turn into profound research while others turn out to be only basic projects which will help other researchers in the future.

We would like to thank our distinguished reviewers. Reviewers provide the ratings and comments that the organizing committee uses to select the papers and abstracts presented at the conference each year. Their rich, insightful, diverse and expert opinions are absolutely essential to the success of the papers and the abstracts presented at the conference. Additionally, I would like to thank the extremely talented group of individuals that bring a wealth of expertise, counsel, experience, creativity, and unusual diligence that is essential to shaping the proceedings. Keep pace with time and do not miss those opportunities that you are provided with. Be passionate in your work and in your quest to gain success. I wish everyone happiness, good health and success.

Best regards,

Alexey Abramov, MD, PhD, DSc
Director of Institute of Medicine,
RUDN university,
Chairman of the organizing committee,
Moscow, Russia

Dear participants of our conference!

I am glad to welcome you to our annual international Students' Scientific Conference #SCIENCE-4HEALTH2021! The situation with the pandemic has led to some adjustments, so this year our conference will be held online! According to the established tradition, participants will be able to speak in eleven thematic sections. Also, this year we divided the participants into two groups, a group of students and a group of young scientists and specialists! It is important for us to create fair competitive conditions and a comfortable environment for you! We also tried to attract leading experts in their field to speak in each section with an open report on the problems, difficulties and successes in the fight against COVID-19! We have more interesting formats and ideas for you, but as it says think globally but act locally!

I wish you all the best in your scientific research and good luck!

Best regards,

Vyacheslav Goryachev, MD, PhD
Ass. Professor of the Department
of General Pathology and Pathological Physiology
named after V.A. Frolov,
Head of Students' Research,
Institute of Medicine, RUDN university,
Moscow, Russia

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SCIENTIFIC STUDENTS SOCIETY

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THE FIRST EXPERIENCE OF USING TISSUE-ENGINEERED CONSTRUCTS FOR SURGICAL CORRECTION OF ANTERIOR VAGINAL WALL PROLAPSE

Ailar Assambayeva ✉, ***Anatoliy Ishchenko***, ***Irina Khokhlova***

Department of Obstetrics and Gynecology, V.F. Snegirev Clinic of Obstetrics and Gynecology, I.M. Sechenov First Moscow State Medical University, Moscow, Russia

✉ *asambaeva_a@staff.sechenov.ru*

INTRODUCTION

Pelvic organ prolapse is defined by herniation of the anterior vaginal wall, posterior vaginal wall, uterus or vaginal apex into the vagina or beyond. The most common type of prolapse is a descent of anterior vaginal wall. Although pelvic organ prolapse can affect women of all ages, it more commonly occurs in older women. It is known that 30.8% of women suffer from this disease in Europe, 19.9–49.6% of women in the Middle East. It is anticipated that by 2050 the number of women experiencing pelvic organ prolapse will increase by approximately 50%. (Pelvic organ prolapse. ACOG Practice Bulletin No. 214. American College of Obstetricians and Gynecologists. Obstet Gynecol 2019;134:e126–42). Currently, various surgical techniques are used for the treatment uterine prolapse, including the use of synthetic implants, however, recurrence rate in such patients remain high and ranges from 40 to 60%. Thus, we aim to assess the efficacy of new surgical treatment using tissue engineered constructs.

Purpose of the Study:

To estimate the effectiveness and safety of a novel surgical procedure to correct the anterior vaginal wall prolapse using tissue-engineered constructs.

MATERIAL AND METHODS

After preliminary experimental work on the creation and evaluation of the biocompatibility of tissue-engineered constructs based on non-biodegradable (polypropylene and titanium endoprotheses) mesh implants with an autologous cellular component (rat and human dermal fibroblasts), four patients aged 44, 54, 70 and 75 years were examined. Inclusion criteria: anterior vaginal wall prolapse (stage II–III); consent to the installation of tissue-engineered construct. A four-stage surgical program providing for the correction of stage II-III anterior vaginal wall prolapse using tissue-engineered constructs of individual size was used.

RESULTS

In the early postoperative period, one patient was diagnosed with a small hematoma of the anterior vaginal wall. During the first month after surgery, one patient complained of gradual perineal pain, another patient of frequent urination. Subsequently, these symptoms stopped. After 3, 6, 9, 12, 15 months after surgery, during the pelvic examination at rest, the Valsalva maneuver and transperineal ultrasound, no displacement of organs was detected, ultrasound clearly visualized a tissue-engineered construct without displacement and deformation.

CONCLUSION

We have developed an original technique to correct the prolapse of the anterior vaginal wall using tissue-engineered constructs based on polypropylene and titanium with an autologous cellular component; which helps to optimize the results of surgical treatment, reduce the frequency of disease recurrence and the risk of developing mesh-related complications.

Keywords:

anterior vaginal wall prolapse, surgical correction, tissue-engineered constructs.

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A CLINICAL ANATOMY INSIGHT INTO THE BIOMECHANICS OF THE IDIOPATHIC ROTATIONAL DEFORMITIES OF LOWER EXTREMITIES

Ekaterina Zmeeva[1], Yury Yurshev[1], Zinfira Kaitova[2]

[1] School of Medicine, Lomonosov Moscow State University, Moscow;
[2] Institute of Medicine, Peoples' Friendship University of Russia, Moscow, Russia

zinfira_kaitova@mail.ru

INTRODUCTION

An increase in the physiological torsion angle of the extremities leads to rotational deformities. It is usually accompanied by pain in the hip and patellofemoral joints or tibia. The etiology of this disease is not clarified.

Purpose of the study is to examine and to make a theoretical reconstruction of the idiopathic rotational deformities of lower extremities from the clinical anatomy point of view.

MATERIALS AND METHODS

The method for this research was an analysis of the data of rotational deformities of lower extremities obtained by CT and MRI.

RESULTS

Rotational deformities in transverse plane (comparing with frontal and sagittal) frequently remain undetected via visual examination therefore the diagnosis of this condition is made with accurate techniques CT and MRI. Further 3D modeling makes it possible to clearly localise the topography of deformations.

According to the data obtained by CT and MRI, there is an increase in the cross-sectional area of the gracilis muscle and the medial head of muscle gastrocnemius and a decrease in the cross-sectional area of the muscle sartorius and the long head of biceps femoris muscle. This is consistent with the biomechanical characteristics of their functions: muscle gracilis rotates the tibia medially, the medial head of muscle gastrocnemius raises the heel during gait; accordingly, their compensatory hypertrophy indicates an increased need for their strength in rotational deformity of the tibia externally and of the femur internally. Also, muscle sartorius rotates laterally the femur, the long head of biceps femoris muscle rotates laterally the tibia, their cross section is reduced in comparison with the normal, which allows us to conclude a reduced need for the functions they perform. A turned inward axis of patellofemoral joint motion is observed when there is a combination of medial femoral and lateral tibial rotation. It has been established that the normal foot position during locomotion is maintained when the external tibial torsion compensates for the laterally directed forces in the patellofemoral joint due to an increased medial femoral anteversion which itself results in an internally oriented gait. Rotational deformities of femur and tibia dramatically influence on biomechanics of a knee which results in osteoarthritis of hip and patellofemoral joints as complications which require surgical treatment (endoprosthesis implantation) in the long run.

CONCLUSIONS

For the purposes of eliminating rotational deformity of lower extremities in children, we recommend to take preventive steps in preschool and school institutions and at home, to ensure ergonomically optimal working and resting environment. It will allow us to form muscle memory in a biomechanically correct position. If medial femoral rotation is more than 20° and lateral tibial rotation is more than 25°, derotational osteotomy is the treatment of choice. Numerous studies have revealed that surgical treatment of rotational deformities normalises the biomechanics of extremities, relieves pain improving the quality of life for years. More research is required to understand the causes of this disease.

Keywords:

Biomechanics, Cross-Sectional Anatomy, Lower Extremity, Osteotomy, Tomography.

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HEART RATE VARIABILITY IN THE SIMULATION OF SEPTOPLASTY IN RATS USING DIFFERENT SCHEMES OF GENERAL ANESTHESIA

Darya Tsigura[1], Pavel Shmaevsky[1], Georgy Khamidulin[1], Yulia Gushchina[2], Valentin Popadyuk[3], Vladimir Torshin[1], Margarita Kostyaeva[4], Igor Kastyro[1]✉

[1] Department of Physiology,
[2] Department of General and Clinical Pharmacology;
[3] Department of Otorhinolaryngology;
[4] Department of Histology, Cytology and Embryology, Peoples' Friendship University of Russia, Moscow, Russia

✉ ikastyro@gmail.com

INTRODUCTION

Septoplasty is a powerful surgical stressor [1–3]. After surgical interventions in the nasal cavity in the body of animals, stress reactions occur [4–6], due to an increase in predominantly nociceptive impulses that occur at the site of injury [7, 8].

Purpose of the Study:

to assess changes in heart rate variability in the simulation of septoplasty in rats under the influence of phthorothane and zoletil.

MATERIALS AND METHODS

The study was carried out on 24 sexually mature outbred male rats weighing 185–250 g. To assess the state of the autonomic nervous system (ANS), an analysis of heart rate variability (HRV) was carried out in rats before surgery (control data) and on the second, fourth and sixth days after operations. All rats were divided into two groups of 12 animals each. In group 1, phthorothane was used for anesthesia and in group 2, zoletil was used. The operation was performed by 2-sided zigzag scarification of the nasal septum mucosa. Interpreted 30-second fragments of records containing an average of 189 RR intervals without artifacts. Isolation of a 30 second fragment took place in the Biopac Student Lab 4.1 software. After that, the parameters of spectral analysis were calculated in the Kubios HRV program. The spectral component of heart rate variability was assessed using the Wilcoxon test for connected samples.

RESULTS

In both groups, STD RR increased slightly (group 1 (5.12 ± 0.56 ms) (p> 0.05); group 2 (5.27 ± 0.57 ms) (p> 0.05). day STD RR increased in group 1 (6.38 ± 0.74 ms) (p <0.01), while in group 2 it decreased (4.0 ± 0.39 ms) (p <0.01) , compared with control (4.76 ± 0.5). On the sixth day in both groups, STD RR returned to preoperative values (4.32 ± 0.77 ms and 4.31 ± 0.72 ms, respectively) (p> 0.05). On the second day, Mean HR increased in groups 1 and 2 (411.35 ± 9.89 bpm and 411.23 ± 10.32 bpm, respectively) (p <0.001). On the fourth day, Mean HR in group 2 increased (423.04 ± 11.56 beats / min) (p <0.001), and in group 1 Mean HR decreased, but still remained above the control (396.88 ± 11.02 beats / min) (p <0.01). On day 6, Mean HR in both groups increased (428.11 ± 12.31 bpm and 437.95 ± 10.81 bpm, respectively) (p <0.05). On the second day after surgery, RMSSD increased in group 1 (5.28 ± 0.7 ms) (p <0.001), while in group 2 RMSSD decreased (3.36 ± 0.35 ms) (p <0, 05). On the fourth day, positive dynamics was noted in group 1 (6.59 ± 0.65 ms) (p <0.05), and in group 2, negative dynamics of changes in RMSSD (2.73 ± 0.25 ms) (p <0.001). In group 1, on the sixth day, RMSSD decreased (5.25 ± 0.77 ms) (p <0.05), and in group 2, RMSSD decreased (3.41 ± 0.69 ms) (p <0.01), reaching the values before the operation.

CONCLUSIONS

The use of phthorothane is preferable and gives a more pronounced increase in the tone of the parasympathetic division of the ANS, in comparison with zoletil. This helps to reduce stress-related hyperactivation of the sympathetic nervous system in the postoperative period.

Keywords:

HRV, rats, septoplasty, anesthesia, ECG, ANS, stress.

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SELECTING THE OPTIMAL SURGICAL ACCESS TO THE MAXILLARY SINUS

Elena Karpischenko, Kristina Oganyan, Karina Oganyan

Department of Maxillofacial Surgery, Pavlov First Saint Petersburg State Medical University, Saint Petersburg, Russia

INTRODUCTION

Currently, there is a high prevalence of pathology of the maxillary sinus. Today, the most preferred method of surgical treatment for chronic sinusitis is endoscopic sinus surgery. However, there is still a debate about which endoscopic access to the maxillary sinus is more convenient: through the lower or middle nasal passage.

Purpose:

To choose the most optimal surgical approach using cone-beam computed tomography data.

MATERIALS AND METHODS

A retrospective analysis of 20 cone-beam computed tomograms of patients admitted to the clinic of maxillofacial surgery of the Pavlov St. Petersburg State Medical University in the last month was carried out. All patients underwent CBCT on a 3D Galileos / Galaxis tomograph, Sirona. The following measurements were taken: the distance between the lateral wall of the maxillary sinus at the level of the anterior end of the inferior turbinate and the apex of the palatine root of the 6th molar, the distance between the natural anastomosis of the maxillary sinus and the apex of the palatine root of the 6th molar. The study included male and female patients aged 18 to 64 years.

RESULTS

When analyzing the quantitative data obtained by analyzing the data of three-dimensional computed tomography, a considerable difference was found out between the two measurements. In all cases, the distance to the natural anastomosis of the maxillary sinus was estimated to be greater than the distance to the lateral wall of the maxillary sinus by an average of 10,32 mm.

CONCLUSIONS

With the location of foreign bodies and the pathological process in the distal parts of the sinus, the most optimal approach is to access the maxillary sinus through the lower nasal passage.

Keywords:

Access to the maxillary sinus, lower nasal passage, maxillary sinus, middle nasal passage

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STRESS AMONG NON-MEDICAL STUDENTS CAUSED BY COVID-19 RESTRICTIONS

Karina Galiulina[1], Oleg Avilov[2]

[1] Faculty of Medicine,
[2] Department of Public Health and Health Care, South Ural State Medical University, Chelyabinsk, Russia

INTRODUCTION

Despite the fact that studies conducted before the global outbreak of the pandemic showed that students usually experience increased levels of stress during their education and often suffer from diseases of stressful etiology it should be noted that the pandemic of coronavirus disease 2019 (COVID-19) has created conditions for the simultaneous existence of completely new multiple negative factors that could significantly affect the psychoemotional status of medical and non-medical students [Avilov, Galiulina, 2020].

Purpose:
to identify pandemic-related stress factors experienced by non-medical students of Chelyabinsk during the COVID-19 pandemic in order to determine the difference between the levels of stress among medical and non-medical students and the reasons playing imperative role in causing this difference (on the basis of our previous study).

MATERIALS AND METHODS

A total of 200 non-medical students (including both male and female) were taken for questionnaire filling. Students were asked to choose the most significant, in their opinion, stress factors, as well as to answer questions regarding the presence of anxiety, aggression and their severity. In aim to to measure the phenomenological structure of stress experience we used the PSM-25 Lemur-Tessier-Fillion scale of psychological stress (adapted by N. E. Vodop'yanova).

RESULTS AND DISCUSSION

Fear for life and health of relatives and friends, discomfort caused by disruption of plans, uncertainty regarding the duration of the COVID-19 pandemic, financial distress, decreased social activity, inconsistency of information about COVID-19, high duration of isolation, insufficient provision of medicines, medical services during the period of restrictions, the need to comply with preventive measures (wearing masks, gloves, etc.), fear of infection, boredom during restrictions were noted as significant stress factors (ranked by importance). The stress levels of non-medical students have been found to be significantly higher than those of the medical students. The factors that could be attributed to this difference were: uncertainty over duration of COVID-19 pandemic, financial problems, high duration of isolation (p value < 0,05). The percentage of students with adequate psychological adaptability (integral score of psychological stress from 0 to 100 points) amounted to 74% (n = 148), which testified to the state of psychological adaptation to stress, however, 26% of non-medical students (n=52) had an average stress level/high stress level, the state of maladjustment and mental discomfort (integral score of psychological stress was more than 155 points) was recorded. We have to point out that the scale of psychological stress (PSM-25) turned out to be insufficiently sensitive to identify differences between the psychological statuses of medical and non-medical students.

CONCLUSION

The COVID-19 pandemic has played a significant role in changing the psycho-emotional background of students in Chelyabinsk (more than a quarter of the respondents had an average or high level of stress). Denial of the impact of the most significant stress factors that that that arose during the COVID-19 pandemic (situations associated with fear for the life and health of relatives and friends, discomfort caused by disruption of plans et al.) indicates the need to continue research in the direction of searching for measures to stabilize the psychological state of students.

Keywords:
stress, stress resistance, COVID-19, students.

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STUDY OF MEDICAL SPECIALISTS' WORKING CONDITIONS IN DIAGNOSTIC RADIOLOGY DURING THE COVID-19 PANDEMIC

Alexey Knyazev, Elena Kaverina

Department of Public Health, Public Healthcare and Hygiene, Institute of Medicine, Peoples' Friendship University of Russia, Moscow, Russia

kaverina-ev@rudn.ru

INTRODUCTION

Diagnostic methods for assessing health status play a significant role in the provision of medical care to the population. About 70–80% of all diagnoses are currently established taking into account the methods of diagnostic radiology. According to T.J. Carroll (2003) and J. Herron, J.H. Reynolds (2006), there is an increase in radiological diagnostics during duty hours by 22% over a four-year period in the USA and by 85% over an eight-year period in the United Kingdom. A special role is assigned to methods of radiation examinations and especially CT during the Covid-19 pandemic. These methods are important for diagnosis, timely detection of complications and assessment of the dynamics of the course of the disease. The study aimed to evaluate the working conditions of medical specialists working in the offices and departments of diagnostic radiology in Moscow during the Covid-19 pandemic.

MATERIALS AND METHODS

The study was conducted using a questionnaire method; the survey of respondents was implemented using an electronic service in the period of September to November 2020. The study was based on the offices and departments of diagnostic radiology of outpatient clinics in the city of Moscow. 26 specialists (61.5% doctors and 38.5% nursing personnel) working in the offices and departments of diagnostic radiology took part in the survey.

RESULTS

The analysis of the composition of medical workers in offices and departments of diagnostic radiology revealed that the majority were workers aged 41–50 years (53.8%). Respondents aged under 30, 31–40, and 51 years and older were equally distributed (15.4% each). There were 84.6% of female respondents.

Employment experience in the profession of the majority of medical workers (61.6%) exceeded 10 years, and about half of the respondents (46.2%) had the highest qualification grade.

53.8% of respondents conducted 36–40 examinations per day during the study period, while 46.2% of respondents noted the duration of work with patients during the day for more than 8 hours.

The respondents highlighted the problems encountered in their work: overwork due to a shortage of personnel (38.5% of respondents), conflicts with patients (23.1%), low wages (23.1%), and 30.8% of respondents expressed low estimate of the equipment condition. There were no specialists dissatisfied with the hygienic working conditions, however, only 76.9% noted that assessment of control of individual exposure doses of personnel is performed on a regular basis in accordance with the requirements. The respondents indicated irregular monitoring, its absence, or found it difficult to answer the question (7.7%, respectively). At the same time, less than half of the respondents (46.2%) always use personal protective equipment, 23.1% of the respondents indicated that they most often try to use them, and almost every third (30.8%) noted that they do not always use the means.

CONCLUSIONS

Thus, an increase in work with patients during the working day up to 8 hours (with a standard load of 4 hours a day with a six-day working week, and 5 hours a day with a five-day working week) indicates a significant (almost by 2 times) increase in the workload on specialists in diagnostic radiology during the Covid-19 pandemic. This is due to both a shortage of personnel and an increase in demand for this type of research. It should also be noted that with significant work experience, many specialists in diagnostic radiology do not fulfill the necessary hygiene requirements to ensure the safety of medical personnel.

Keywords:
working conditions, diagnostic radiology, medical specialists, COVID-19

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ASSESSING THE PUBLIC ON PREPAREDNESS, AWARENESS AND ATTITUDE TOWARDS THE COVID-19 OUTBREAK IN SRI LANKA

Balasuriya A.L.Erandhi, Baminiwatte A.Narmada, Elena Kaverina

Department of Public Health, Healthcare and Hygiene, The Medical Institute, Peoples' Friendship University of Russia, Moscow, Russia

kaverina-ev@rudn.ru

BACKGROUND

Coronavirus disease-2019 (COVID-19) was declared a "pandemic" by the World Health Organization (WHO) in early March 2020. Globally, extraordinary measures are being taken to combat the formidable spread of the ongoing outbreak. Sri Lanka followed a unique prevention strategy. The new regulations caused major disruptions of lives and income of the Sri Lankan people. Since there is, lack of studies that focuses on awareness of the Sri Lankan public it is important to understand the efficacy levels and attitudes of the public to flatten the epidemic curve and eradicate the virus efficiently.

Purpose of the study:

To investigate the knowledge, attitudes, and practices of the general population toward COVID-19 and to analyze level of awareness and preparedness to fight against COVID-19 among the public in Sri Lanka.

MATERIALS AND METHODS

A questionnaire was composed and distributed through different social media platforms and the received data was analyzed using the software package (StatSoft Inc.), IBM SPSS Statistics v22.0.

RESULTS

Among 88 respondents the majority were female (54.5%) and 45.5 % were male. All of the participants had a good general idea on awareness and displayed considerable knowledge of the disease and showed good preparedness for the prevention and control of COVID 19. The survey also showed that the restrictions affected people in different ways but the average showed that it only affected slightly when it came to most of the measures. According to Spearmen's, there was negative correlation between age and transition of school/ universities to distant learning. (Correlation coefficient -0.426 and p= 0.000 and being unable to travel between countries (correlation coefficient -0.412, p=0.000). According to Kruskal Walls analysis we found that there was a significant difference between age and how they heard about COVID 19 for the first time.(p=0.000)/ According to Mann Whitney analysis, we found that Gender and the sources they rely on to get information had significant differences for Social media, newspapers and radio. (p= 0.002)

DISCUSSION

The majority had a good general level of awareness, preparedness and practice toward the virus. However, according to the respondents an average knowledge was detected in various aspects such as transmission of the disease, complications, most vulnerable people, preventive measures and treatment methods. People of different educational backgrounds participated in the survey. The majority are graduates and they possessed an adequate knowledge about the infection.

CONCLUSION

The preventive measures followed by the public varies according the place of stay and their occupation. There was a difference between males and females when it comes to following different preventive measures. They were also much affected due the preventive measures in various ways individually as proven by results. Even though social media plays a major role nowadays, most Sri Lankans still rely on television to get information on COVID 19. Our findings suggest that the public contribute in an appreciable way towards eradication of the virus and they are well prepared to fight against COVID 19. Health authorities and the government have done a tremendous job educating the public. Furthermore, it would be worthwhile to invest in various COVID 19 prevention efforts, including innovative strategies based on local evidences.

Keywords:

Preventive, measures, public, awareness

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A VACCINATED WORLD — WHAT'S GETTING IN THE WAY AND HOW CAN WE ACHIEVE THIS GOAL

Keturah Musonda,
Hawpage Manuli Gayathma Jayasinghe,
Elena Kaverina

Department of Public health, Healthcare and Hygiene, Institute of Medicine, Peoples' Friendship University of Russia (RUDN University), Moscow, Russia

kaverina-ev@rudn.ru

BACKGROUND

The year 2020 was characterized by the spread of the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) and the global pandemic, affecting every corner of the world and causing an array of negative effects: sickness, deaths, debt and bankruptcy. However, despite the fact, that as of today, there are approximately 19 available vaccines in the world, that have been proven to be quite safe and effective, a large part of the population is still hesitant to get vaccinated.

Purpose:

To assess public feedback, evaluate public awareness and identify the factors preventing the public from being vaccinated.

MATERIALS AND METHODS

Using google forms a retrospective survey was done with responses from 439 respondents from Asia, Africa, Europe and former soviet states. 282 females and 157 males took part in the survey with the youngest being 15 and the oldest 72 years of age. The statistical processing of data was done using IMB SPSS version 22.0.

RESULTS

Based on the responses approximately 9.8% of our respondents are vaccinated, 5.1% of Africans, 15.1% of Asians and 8.1% of Russians and former soviet state residents. 51.2% of the vaccinated respondents voluntarily got vaccinated, 27.9% due to their work involving a high risk of getting infected, 9.3% because their work required it and another 7.0% because it was recommended to them. 88.4% of the vaccinated respondents said they experienced at least one of the side effects and only 11.6% said they had no side effects. 76.7% of the vaccinated respondents expressed satisfaction with the vaccine, while 18.6% found it difficult to say and 4.7% said they regret getting vaccinated. 90.2% of the respondents are not vaccinated, 7.1% said they don't trust the government, 24.7% don't trust the vaccine, 13.9% believe there is no assurance of not getting infected even after getting vaccinated, 32.6% are worried about the side effects, 24.7% have no access to the vaccine, 9.3% have antibodies, 4.3% have medical reasons and only 17.2% plan on it and just haven't gotten to it.

DISCUSSION

The analysis depicts that the remaining 82.8% of unvaccinated respondents have no intention of getting vaccinated. This analysis shows that there is a need to better eliminate the people's worries and concerns and help to understand the need of getting vaccinated.

CONCLUSION

The main reason for this unwillingness to get vaccinated is due to people being uninformed about the safety and need to be vaccinated, to solve this there is a need to increase the amount of information reaching the public about the vaccine and the whole vaccination process. To add to achieving this aim, several pages on various social media platforms were created to help in reaching this aim.

Keywords:

Africa, Asia, awareness, COVID-19, Europe, vaccination.

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STUDY ASSESSING THE EFFECTIVENESS OF DIGITAL EDUCATION PROGRAMS

David John Esu

Department of Public Health and Healthcare, The Medical Institute, Peoples Friendship University of Russia, Moscow, Russia

INTRODUCTION

Margins between education and technologies have become progressively slimmer. Many studies in this field have been premeditated and launched by social organizations, governments, and corporate entities. Still, very few studies and approaches have attacked challenges, dilemmas and opportunities of assessments carried out in projects that combine education and innovation. So, how do we evaluate those initiatives? Which approaches could be used? What do the several appraisals understudy give insight towards?

Purpose:

Like many traditional education correspondences, online learners often have varied interests, and this could be a problem for evaluators who need to assess resources offer to users, sometimes from a wide range of education experiences.

Their complex offerings are a boon for students or teachers seeking uniform findings about efficiency. In the case of an educational Website like Coursera, as anexample, different categories of users will look up on different resources; some learners may take an online course while others could be researching or only be on the site to seek out a mentoring. Virtual schools that use several course providers present an analogous puzzle, and even a similar online course may offer differentiated learning capabilities if, for instance, learners initiate more or less contact with the course coach or obtain variable degrees of face-to-face assistance from a parent or coach. (A parallel lack of regularity can be found in most traditional settings with different teachers using variable instructional models.)

MATERIALS AND METHODS

Methodical search of the materials pertaining to the focus subject over the last decade and a half identified over a thousand empirical studies of online learning. Experts vetted these studies, identifying those which used specific criterions like -:

(a) Juxtaposed an online to a face-to-face condition,

(b) Used a rigorous study design,

(c) Stated the final student learning outcomes, and

(d) Provided acceptable material to calculate an effect size.

RESULTS

This meta-analysis established that, on an average, students learning in an online condition achieved diffidently better results when compared to those using the traditional face-to-face training method. The variance between student outcomes for both methods which was measured as the difference between statistical treatment and control means, divided by their collective standard deviation was greater in those studies looking at the difference in conditions that merged online and face-to-face instruction compared with lectures taught entirely face-to-face.

CONCLUSIONS

Though multifaceted resources can make it quite difficult for surveyors to gauge effectiveness, good judgments—especially when using multiple, harmonizing study methods can note the circumstances under which a method or resource is most likely to succeed or fall short and can produce valuable recommendations for strengthening its weak points. Researchers who are studying multifaceted resources should deliberate and identify a strategy that combines both breadth and depth.

Keywords:

technology, education, study meta-analysis, online learning

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PROVIDING NOVEL DIAGNOSTIC TOOLS FOR PRIMARY PEDIATRIC AND ADULT CNS MALIGNANCIES WITH MACHINE LEARNING BASED WORKFLOWS

Vasilii Khammad[1,2], Natalia Kharchenko[1], Jose Javier Otero[2], Gadzhimurad Zapirov[1], Yolanda Cabello Izquierdo[2], Francisco Garagorry[2]

[1] Peoples' Friendship University of Russia, Moscow, Russia;
[2] James Cancer Hospital and Solove Research Institute, Columbus, Ohio, USA

INTRODUCTION

Primary Central Nervous System malignancies consist of various groups of tumors with a wide range of morphologies, molecular alterations, and clinical behaviors. Under the current World Health Organization (WHO) classification of CNS tumors, integration of histomorphology and molecular data is critical for diagnosis and directly impacts prognosis and treatment-related approaches. However, in Russia, US and worldwide scarce resources are available to perform all the required tests routinely.

Aim:

Our long-term goal was to improve and standardize testing and diagnoses for brain tumor patients worldwide by validating new diagnostic workflows with implementation of digital imaging, immunohistochemical tests, open-source computing platforms and machine learning algorithms. We focused on improving diagnostic capabilities for primary CNS tumors with a particular emphasis on resource-poor diagnostic scenarios.

METHODS

Our working group has reviewed all cases available at the Ohio State University's digital pathology archive from 2013 to present. Fully digital workflows in neuropathology at James Cancer Hospital enabled us to quickly obtain and review data on over 500 brain biopsies. Retrospective analysis was used as a ground truth upon which to validate our predictive model generated in activity. The cases were re-reviewed by board-certified neuropathologists and features annotated for insertion to the models generated in R Studio. We used modern, innovative approaches to augment our diagnostic workflow, including correlation of radiographic and neuropathological data to evaluate tumor heterogeneity and implementing deep learning models to augment histopathological interpretation in whole slide imaging.

RESULTS

We completed the large meta-analysis study by incorporating data from all primary brain cancers classified by the WHO Classification of CNS tumors. The data from this meta-analysis was successfully used to generate a population model of all primary CNS tumors (pediatric and adult cases). For each model, we chose machine learning algorithms that do not require strong data assumptions. Models trained with decision tree algorithms (randomForest, XGBoost and C5.0) showed high overall accuracy in predicting diagnoses of our models (93%, 74% and 87% respectively) even in the absence of IHC and molecular data. Importantly, despite the obvious value in further clinical decisions, the inclusion of all molecular data (BRAFV600E, FISH codeletion 1p19q, EGFR amplification, MGMT status and etc.) did little to contribute to distinguishing between different primary CNS malignancies in our study. All our generated models allowed to establish clinical diagnosis for primary brain lesions using just basic clinical data (age, gender, tumor location), ki67 levels and distinct features of histological architecture with high accuracy.

CONCLUSIONS

Molecular data managed to slightly improve the accuracy of our prediction models only by approximately 5–6% compared to data on ki67 alone (37%), suggesting that the proliferation markers should be considered as a more reliable tool for accurate staging and morphological evaluation of CNS tumors. Each of the described above algorithms can be implemented into clinical practice and serve as a reliable second opinion in resource-strained settings.

Keywords:

primary CNS malignancies, neuropathology, ki67 level, machine learning algorithms, diagnostic workflows

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ULTRA-LOW DOSE ESTRADIOL PLUS DYDROGESTERONE TO PREVENT THE DEVELOPMENT OF ATHEROSCLEROSIS IN POSTMENOPAUSE

Olga Parfenova[1], Maria Bubnova[2], Vladimir Khanykin[3], Nikolai Stuklov[1]

[1] The Medical Institute, Department of therapy with courses of endocrinology, haematology and clinical laboratory diagnosis, Peoples Friendship University of Russia (RUDN University), Moscow;
[2] Sechenov First Moscow State Medical University Moscow;
[3] Student Scientific Society named after L.I. Falin, A.I. Evdokimov Moscow State University of Medicine and Dentistry, Moscow, Russia

BACKGROUND

Active development of the "anti-aging medicine," attempts to slow down biological (including vascular) aging led to the creation of new pharmaceuticals including menopausal hormone therapy. The vascular wall protective mechanism of the hormones is not completely clear, but it was shown that natural estrogens are able to improve antithrombogenic activity of the vascular wall. There are publications indicating that standard and low-dose estrogen may restore the impaired antithrombogenic potential of the vascular wall, provided its initial reduction does not exceed 20%. The issue of the role and possibilities of correction of the antithrombogenic activity of the vascular wall with ultra-low dose estradiol remained unresolved.

Purpose of the Study:

To investigate the efficacy of ultra-low dose estrogen plus dydrogesterone to reduce relative risk of reduction of the antithrombogenic activity of the vascular wall.

MATERIALS AND METHODS

As a "clinical model" for the study of this issue, we formed 2 groups of patients: in the study group patients received ultra-low dose estradiol plus dydrogesterone, subjects from the control group received beta-alanine. Green Climacteric Scale was used to evaluate the quality of life of the patients. Antithrombotic vascular wall activities were determined according to M.V. Baluda method [1].

RESULTS

Menopausal hormonal therapy is an approved method for the correction of disorders in females with climacteric syndrome. The quality of life reflected by Green Scale points improved considerably following MHT application. Three-year follow-up showed a decrease in antithrombogenic activity of the vascular wall in control subjects after 2 and 3 years of follow-up according to the M.V. Baluda's test versus subjects treated with ultra-low dose estrogen plus dydrogesterone

The decrease of the relative risk of reduction of the antithrombogenic activity of the vascular wall with the use of ultra-low dose estrogen plus dydrogesterone during the first two years was 2.3 times, and during the 3 years of follow-up — 3.8 times versus control.

CONCLUSION

Vascular wall endothelium has estradiol receptors, so menopausal hormone therapy can induce and activate the synthesis of antithrombogenic vascular wall activity factors on a cellular level. Prescribing only ultra-low dose estradiol plus dydrogesterone for patients with normal antithrombogenic activity of the vessel wall at baseline reliably lowers the risk of long-term reduction of antithrombogenic potential of the vascular wall and prevents the development of initial stages of atherosclerosis.

Keywords:

atherosclerosis, postmenopause, anti-aging medicine, menopausal hormone therapy.

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RHEUMATOID FOREFOOT RECONSTRUCTION FOLLOWING HOFFMANN-CLAYTON PROCEDURE WITH PLANTAR APPROACH — A 5-YEAR FOLLOW-UP

***Abdul Basith Shahul Hameed*[1], *Levon Makinyan*[2], *Fadi Aude*[3], *Kurban Shindiev*[4], *Wessam Zaalan*[1]**

[1] *Department of Traumatology and Orthopedics,*
[2] *Department of Traumatology and Orthopedics, Peoples' Friendship University of Russia, Moscow; Orthopedic Department № 2, City Clinical Hospital № 13, Moscow;*
[3] *City Clinical Hospital № 31, Moscow;*
[4] *Department of Traumatology and Orthopedics at Peoples' Friendship University of Russia, Moscow, Russia*

BACKGROUND

Rheumatoid arthritis (RA) can cause significant forefoot disorders. Despite major improvements in drug therapy the inflammatory process can lead to severe joints destruction, causing substantial deformities, particularly if the drug therapy fails. Thus, patients with RA and a failure of antirheumatism medication (disease-modifying antirheumatic drugs [DMARDs]) can have a significant forefoot deformity with pain, and loss of mobility and function. Such patients will likely need to wear orthopedic shoes and in severe cases will require surgical treatment.

The purpose of the study:

To analyze the outcomes of surgical forefoot correction per Hoffmann-Clayton, which involves resection of the metatarsal heads of lesser toes through transverse-plantar approach.

MATERIALS AND METHODS

This retrospective study used patient-based questionnaires to analyze the revision rate, pain, use of orthoses, walking ability, forefoot function, and patient satisfaction of patients with RA who had undergone a complete forefoot correction of II to V metatarsophalangeal (MTP) joints according to Hoffmann-Clayton procedure and arthrodesis of 1st MTP joint. The study included 28 patients (50 feet) aged around 45 ± 4.5 years.

RESULTS

The data collected showed that 17 reoperations were performed on 12 of the patients. Deformity relapses were often documented for the hallux valgus. More than 60% of the patients were able to wear conventional shoes. The distances the participants were able to walk were significantly increased by wearing shoes when compared with walking barefoot ($P < .01$).

DISCUSSION

With an average follow-up time of 5 years, this study of forefoot reconstructions per Hoffmann-Clayton is useful follow-up study of its kind. The main surgical aim of the Hoffmann-Clayton procedure for RA-associated forefoot disorder is pain reduction, regaining the ability to use conventional shoe wear, and maintaining the forefoot function. Although joint protection and/or maintaining interventions are now more frequently successful after the introduction of DMARD therapy, the metatarsal head resection of the lesser toes II to V remains the gold standard therapy for the severely deformed rheumatoid forefoot.

CONCLUSION

While forefoot function remained difficult to assess, the majority of patients were able to use conventional shoes. This long-term follow-up study of patient-reported questionnaires completed more than 5 years after the Hoffmann-Clayton procedure showed that more than 80% of the patients remained satisfied with the outcome.

Keywords:

foot, foot function, forefoot surgery, hallux valgus, rheumatoid foot

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SUBJECTIVE AND CLINICAL OUTCOMES OF SURGICAL APPROACHES IN CORRECTION OF RHEUMATOID FOREFOOT DEFORMITIES

***Abdul Basith Shahul Hameed*[1], *Levon Makinyan*[2], *Georgii Airapetov*[3], *Fadi Aude*[4], *Kurban Shindiev*[1], *Wessam Zaalan*[1]**

[1] Department of Traumatology and Orthopedics, Peoples' Friendship University of Russia, Moscow;
[2] Department of Traumatology and Orthopedics, Peoples' Friendship University of Russia, Moscow; City Clinical Hospital № 13, Moscow;
[3] Department of Traumatology and Orthopedics, Stavropol State Medical University, Stavropol;
[4] City Clinical Hospital № 31, Moscow, Russia

BACKGROUND

Hoffmann-Clayton procedures appears to be promising surgical treatment in severe rheumatoid forefoot deformities. It has been reported that 80% to 90% of foot deformities in adults are due to rheumatoid arthritis. Despite of various surgical approaches, early functional and cosmetic results have been the greatest concern among patients. Thus, optimal surgical approach in correction of severe rheumatoid forefoot deformities is of vital importance for better subjective and clinical results.

MATERIALS AND METHODS

Clinical study was conducted on 56 painful chronic rheumatoid foot who were treated by arthrodesis of 1st metatarsophalangeal (MTP) and lesser metatarsal head resections. They were divided into 2 groups based on surgical approach in lesser metatarsal head resections. 1st group had 25 feet with dorsal approach (Clayton) and 2nd group — 31 feet with plantar approach (Hoffmann).

RESULTS

Subjective and clinical outcomes were evaluated in both groups. The mean post-operative AOFAS scores were 67.82 (range: 32–82) and mean post-operative Foot Function Index (FFI) was 0.51 (range: 0.23 to 0.63) in both groups. Eighty seven percent (48/56 feet) reported early pain relief, improved cosmetic appearance, and improved footwear comfort in Hoffmann group. The mean hallux valgus angles improved from 37° to 15° and the 1st intermetatarsal angle from 17° to 8° in both groups. Four feet had non-union of the 1st MTP joint arthrodesis and three among them were re-operated.

CONCLUSION

Hoffmann and Clayton procedures are optimal methods for excision arthroplasty of lesser metatarsal heads. However, Hoffmann (plantar approach) serves to be more convenient resulting in early recovery, adequate functional stability, rehabilitation and better cosmetic results.

Keywords:

Hoffmann-clayton, rheumatoid foot, hallux valgus, metatarsalgia, excision arthroplasty, arthrodesis

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PROSPECTIVE COMPARATIVE STUDY BETWEEN USING SELF-GRIPPING MESHES AND SUTURED MESHES DURING OPEN INGUINAL HERNIOPLASTY

Mekhaeel Shehata Fakhry Mekhaeel, Andrey Protasov, Ilgar Guseinov✉

The Medical Institute, I.D. Kirpatovsky Department of Operative Surgery and Clinical Anatomy, Peoples' Friendship University of Russia, Moscow, Russia

✉ *ilgar.guseynov@science4health.org*

BACKGROUND

Tension free hernia repair which described firstly by Lichtenstein [1, 2] is the golden standard technique for open inguinal hernioplasty because this approach has a significantly less recurrence rate of 0.3% to 2.2% in comparison to 4.4% to 17% for classic herniorrhaphies. [3, 4] In this procedure, the surgeon reduces the hernia sac, inserts a prosthetic mesh to strengthen the inguinal canal, and fixates it with sutures to the pubic tubercle and inguinal ligament. [1] While there is a difference in applying the same procedure by various methods. our study was designed to acknowledge the results of the difference between both methods in practice. Prospective clinical trial has been used to compare and evaluate two different fixation methods during open inguinal hernia repair by Lichtenstein.

The purpose of this study is to compare between sutured and sutureless methods in mesh fixation for open inguinal hernia repair by Lichtenstein technique.

MATERIALS AND METHODS

We conducted this clinical trial at the clinical federal hospital№ 85, Moscow upon 100 patients with prospective study for patients operated by our team. Patients were divided into 2 groups: group A -patients operated by Lichtenstein technique using self-gripping meshes and group B- patients were operated by Lichtenstein technique with fixation of the mesh by sutures.

In the first group the average of age was 54.6 years, for 46 male patients and 4 female patients. From them 34 patients with diagnosis left sided inguinal hernia and 16 of them with right sided inguinal hernia. The average time of operation in this group was 28.1 minutes with average of hospital stay 4.6 days. While in the second group median age was 54.2 years, for 47 male patients and 3 female patients. from them 28 patients with diagnosis left sided inguinal hernia and 22 patients with diagnosis right sided inguinal hernia. The average time of operation in this group was 46.4 minutes with average of hospital stay 4.6 days Postoperatively.

RESULTS

In group A we found in post-operative period 4 patients with post-operative pain which was resistant to analgesics and all other patients of this group the pain decreased gradually with the NSAIDs. While in group B we found in post-operative period 44 patients with post-operative pain resisting for analgesics and others the pain decreased gradually with the help of NSAIDs. Follow up after 6 months. In group A — all patients were satisfactory without any complications. without any recurrence. While in group B we found chronic pain in 5 patients, seroma in 2 patients and 43 patients without any other complication and also without recurrences. Using self-fixing meshes significantly reduces the time of operation and postoperative pain with approximately reducing complications within 6 months in comparison with sutured mesh during open inguinal hernioplasty by Lichtenstein. The hospital stay in both groups is remaining the same.

CONCLUSION

Using self-fixing mesh is optimal choice when compared to sutured mesh and this can result in using it as a modification of Lichtenstein technique which will get to our main target of improving the life quality of patient.

Keywords:

Inguinal hernia, fixation, open inguinal hernia repair, self-gripping mesh, sutured mesh.

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MULTIPLE MILIARY OSTEOMA CUTIS: CLINICAL CASE

Kseniia Vasileva, Elena Snarskaya

T1International School "Medicine of Future",Sechenov First Moscow State Medical University, Moscow, Russia

BACKGROUND

Osteoma cutis (OC) is a fairly rare benign skin disease characterised by the formation of bone tissue in the structure of the dermis and/or subcutaneous fat (Limaiem and Sergent, 2020; Duarte et al., 2018). Osteoma is a tumor-like formation with smoothed contours, a half to one cm in size, consisting of clusters of spongy or compact bone matter with a thin intermediate fibrovascular stroma (Pinzón-Osorio et al., 2020). Osteoma can occur de novo or develop because of the background of trauma, neoplastic or inflammatory diseases (Sánchez, 2017). OC occurs in 14% of cases in the structure of all variants of skin ossification (Limaiem and Sergent, 2020). More often women are ill with a peak incidence at 20-30 years old, and it can occur in children (Kaliyadan et al., 2019; Kim et al., 2017).

Purpose of the Study:

It is necessary to draw attention of dermatovenerologists and cosmetologists to the possibilities of diagnosis and differential diagnosis of osteomas cutis.

MATERIALS AND METHODS

A 56-year old man was admitted to the Clinic of Skin and Venereal Diseases named after V. A. Rakhmanov. For a year and a half, it had been noted the appearance of small dense elements on the skin of the chest, back, and face. Subjectively, they did not bother. In the anamnesis there was acne vulgaris.

Status localis: rashes are multiple in nature, which are small papules ranging in size from 0.1 to 0.5 mm, with a predominant localization on the skin of the face, in the frontotemporal region, as well as on the skin of the chest and the upper back (Fig. 1). Papules are whitish in colour, that do not merge with each other, when palpating they are dense and painless. The total number of elements reaches 67.

RESULTS

In the biochemical analysis of the blood, there is an increased content of calcium five point three mmol/l. Urine analysis is without features. X-ray examination of the lungs-calcifications has not been detected. Treatment: the patient underwent curettage and the whitish-yellowish formations were removed that were partially exposed when opening the papules.

Fig. 1. *Patient K, 56 years old. Frontotemporal osteomas*

Pathomorphological conclusion: the picture is characterized by the presence of bone processes in the dermis, with pronounced calcification, as well as dense eosinophilic deposits in the subcutaneous tissue, single processes pierce the epidermis, there are single osteoblasts and osteoclasts. The soft tissue spaces between the bony trabeculae contain several centrally located small vessels, there is a connective tissue matrix with single adipocytes.

CONCLUSIONS

The diagnosis — Multiple miliary osteomas cutis. The presented clinical case of OC is of considerable interest, because this disease is rare, and we have not found any descriptions of such cases in the Russian literature available to us. OC includes extra-skeletal ossification, which is limited to the dermis and subcutaneous tissues, but given the long and painless nature of the development and course of the disease, many patients do not seem to go to specialized medical institutions (Kodo et al., 2019). However, one of the most likely versions of the pathoetiology of the disease suggests that the mechanism of osteoblastic metaplasia is at the heart of the development of osteomas of the skin, and therefore treats this pathology with great attention (Niebel et al., 2020; Danset et al., 2019).

Keywords:

osteoma cutis; primary osteoma; secondary osteoma; ossification; GNAS1; clinical case

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A RARE CASE OF PARANEOPLASTIC SYNDROME: VANISHING BILE DUCTS IN A KID WITH HODGKIN LYMPHOMA

Lyubov Smirnova, Lyubov Shakhgildyan

Pirogov Russian National Research Medical University, Moscow, Russiaa

BACKGROUND

The incidence of liver involvement in patients with Hodgkin lymphoma (HL) is about 50%. Cholestasis in HL can be caused by direct intrahepatic damage to the liver parenchyma or bile duct epithelium by tumor cells, as well as extrahepatic obstruction of the biliary tract by enlarged lymph nodes (LN). In addition, in a small number of patients intrahepatic cholestasis is caused by paraneoplastic syndrome.

Purpose:

This clinical case demonstrates an example of hyperbilirubinemia as a rare manifestation of paraneoplastic syndrome in children.

MATERIALS AND METHODS

In autumn 2016 a 15-year-old girl noticed an enlarged right supraclavicular LN. A dynamic monitoring was recommended. In spring 2017 she was first hospitalized with jaundice: total bilirubin (TB) was 500 μmol/L, transaminases — 300 IU/L. In April the diagnosis of liver fibrosis of unclear etiology was made with no improvement on subsequent hepatotropic therapy. In June the subclavicular LN continued to enlarge and the biopsy showed HL (histologically nodular sclerosis type 2). According to the results of sonography and PET/CT subclavicular (5×5 cm conglomerate), mediastinal (7,5×5,5 cm conglomerate) LN and lung tissue were involved. So, the diagnosis of IV EB stage of HL was made. On abdominal ultrasound the liver was mildly enlarged with hyperechoic, finely grained parenchyma; portal vein and bile ducts were normal. The patient was transferred to Institute of Pediatric Oncology. On admission she had severe intoxication and skin itch, bronze-colored skin and icteric mucosa and sclera, liver was 2 cm below the costal margin, BMI=14,7 kg/m^2. Lab results were: Hb 107 mg/L, WBC 19×10^9/L, PLT 531×10^9/L, TB 302 μmol/L, alkaline phosphatase 714 IU/L, ALT and AST — 150 IU/L, LDH 398 IU/L. It was considered that liver was affected by paraneoplastic syndrome — vanishing bile ducts syndrome.

RESULTS

The patient underwent 3 courses of chemotherapy and 2 courses of radiotherapy. Although none of the courses were completed due to developed complications, the excellent effect of the treatment was achieved: enlarged LN were not detected on imaging in any site. But the liver function tests worsened: TB was 628 μmol/L, GGT was 20 times elevated, transaminases — by 10 times.

Due to the full effect of the treatment of HL but persisting irreversible changes caused by paraneoplastic syndrome the liver transplant from mother was performed. Pathology confirmed vanishing bile duct syndrome: prolonged intrahepatic cholestasis, dystrophy and desquamation of the epithelium of small bile ducts. After surgery hyperbilirubinemia recurred that was stopped by methylprednisolone, IV immunoglobulin and a single administration of rituximab. As a result of the treatment complete normalization of biochemical parameters was achieved, complete remission of HL remained.

CONCLUSIONS

In case of prompt removal of causative factor bile ducts are capable of regeneration. However, in this case there was a severe damage to the bile ducts which led to irreversible liver damage and refractory hyperbilirubinemia, which persisted even after a complete remission of the malignant process. It must be remembered that jaundice in HL can be one of the manifestations of paraneoplastic autoimmune process that leads to damage of the epithelium of the intrahepatic bile ducts (especially when there is no tumor tissue seen on imaging).

Keywords:

chemotherapy, idiopathic cholestasis, liver transplantation

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COMPLEX DIAGNOSIS OF MALE INFERTILITY

Rebeka Hakobova, Nina Kulchenko✉

Department of Human Anatomy, the Medical Institute at the Peoples' Friendship University of Russia (RUDN University), Moscow, Russia

✉ *kle-kni@mail.ru*

BACKGROUND

Exclusively male infertility factor accounts for 30% of cases, but in total with a combination of female and male factors — 50%. Modern andrologists use diagnostics of blood hormones that regulate spermatogenesis as marker of male reproductive potential. The most severe form of male infertility is azoospermia, which is observed in 10–15%, and the only diagnostic method is a testicular biopsy. Due to the polyetiological nature of male infertility types, it's now necessary to search for general markers, the measurement of which would allow to determine the management strategy of patients with impaired fertility and to assess the prospects of ART programs in such patients.

Purpose of the Study:

To estimate the specificity of spermatogenesis markers in infertile men.

MATERIALS AND METHODS

All patients (n=74) were examined for spermograms, sex hormone levels, FSH, LH, inhibin B, testosterone), and scrotal ultrasound. Examinations were conducted to exclude obstructive azoospermia in the observed men. All patients underwent physical examinations, observation of androgen-dependent areas, palpation and assessment of testicular volume, karyotyping.

Testicular biopsy samples were stained by hematoxylin and eosin, and was performed immunohistochemical study to determine inhibin B. Exclusion criteria: obstructive infertility, inflammatory diseases of reproductive organs, testicular tumors, varicocele, hydrocele. Statistical processing of the material was carried out using EXCEL spreadsheets and the STATISTICA 8.0 program. The differences were considered significant at $p<0.05$.

RESULTS

According to the spermogram data all patients were divided into three groups: with azoospermia (I) (n=11;15%), severe oligozoospermia (II)(n=16; 20%), oligozoospermia(III)(n=47;65%). LH and testosterone indicators didn't show significant difference among patients ($p>0.05$). FSH level in group I was 213 miu/ml, II — 16+2 miu/ml, III — 5+2 miu/ml, in control group — 6+1,8. Inhibin B level in group I was 48+7 nmol/l, II — 67+11nmol/l, III — 120+14 nmol/l, control group — 134+12nmol/l. The difference between the groups was statistically significant ($p<0.001$). Inhibin B specificity in terms of spermatogenesis preservation was 82%, FSH — 78%. Since serum inhibin B was the most effective, we've evaluated it's level in the testicular tissue. During our study it has been established that tissue inhibin B shows 88% specificity.

DISCUSSION

According to the latest data, sperm disorders occur in every second case in the structure of infertility of couples. Therefore, it's important to recognize predictors of sperm disorders. Most foreign and Russian data consider FSH and LH to be predictors of spermatogenesis disorders. Our study showed that LH and serum testosterone are unreliable factors in the complex diagnosis of sperm pathology. On the other hand, our data demonstrate the high efficiency of FSH and inhibits B in terms of spermatogenesis preservation in patients with severe ejaculate pathology.

CONCLUSIONS

Taking into account the high specificity of serum and tissue inhibin B in terms of spermatogenesis preservation, this indicator can be used as a predictor of man's reproductive potential. Since the difference in specificity between tissue and serum inhibin B is not much, an assessment of the serum inhibin B level can be used as a screening of the male reproductive potential during the first stages of diagnosis.

Keywords:

male infertility, inhibin B, follicle stimulating hormone (FSH), testicular biopsy.

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THE WAY TO IMPROVE THE FUNCTIONAL PROPERTIES OF MESH IMPLANTS FOR HERNIA REPAIR

Zeinab Gasanbekova[1]✉, Ilmutdin Abdulagatov[2], Magomed Khamidov[1], Razin Ragimov[1], Naida Abdullaeva[1]

[1] Dagestan State Medical University, Makhachkala, Republic of Dagestan, Russia
[2] Dagestan State University, Makhachkala, Republic of Dagestan, Russia Russia

✉ *zaygsb@gmail.com*

BACKGROUND

As you know, the use of meshes is a standard procedure in hernia repair surgery. About 20 million hernioplasty operations are performed annually in the world, ⅔ of which are performed using various hernial nets [1]. Implant-associated infections resulting from biofilm formation have become a common problem as the injected foreign material is an ideal medium for bacterial colonization [2, 3]. Unfortunately, systemic antibiotics have not been shown to provide effective treatment for implant infections. The functionalization of the antibacterial surface is the most effective way to reduce infections associated with the implant [4].

The main goal of the study is to use nanotechnological approaches for the prevention and treatment of infections associated with mesh on polypropylene hernial mesh.

MATERIALS AND METHODS

In this project, we aimed to develop new multilayer nanomaterials such as vanadium-doped TiO2 nanofilms for covering hernial mesh with antibacterial properties based on the Atomic Layer Deposition (ALD) method. ALD is a nanocoating method that allows you to create an absolutely uniform film on the surface of the material, with the formation of nanoroughness, which prevents the adhesion of microorganisms. Particular attention was paid to the TiO_2 nanocoating doped with vanadium (V) [5–8]. Doping with vanadium is a promising strategy for increasing the antibacterial activity of TiO_2 in visible light [9, 10]. The mesh samples were placed in the ALD reactor chamber. Thin Al_2O_3 films were deposited on polypropylene hernial mesh substrates using $Al(CH_3)_3$ and H_2O, then TiO_2 and V_2O_5 were grown on an Al_2O_3 layer using $TiCl_4$, $VOCl_3$, and H_2O as ALD precursors, and N_2 served as a purge gas. Thin TiO_2 films doped with vanadium were grown at a temperature of 85–95° C. A total of 250 cycles were performed (100 cycles for Al_2O_3 and 150 supercycles for TiO_2 / V_2O_5 films), corresponding to a 38 nm film (Al_2O_3 + TiO_2 / V_2O_5). All samples were sonicated in 70% ethanol followed by UV irradiation (30 minutes) for animal biological experiments.

EXPERIMENT

To determine the properties of the new Al_2O_3 + TiO_2 / V_2O_5 coating, the meshes were tested on animals. In the present study, 5 rabbits (4 months old, weighing 2.5–3.0 kg) and 10 rats were used. After 7, 14, 30 and 60 days, the hernial meshes with the surrounding soft tissues were removed and fixed for histological studies. We compared the inflammatory responses in serum and tissue as well as collagen deposition caused by uncoated polypropylene meshes with added vanadium coated with TiO_2.

RESULTS

As shown by the results of the study of the meshes removed from the organisms, the samples with the applied coatings did not cause inflammatory reactions from the tissues, in contrast to the control samples. Rejection reactions of the material were also not observed.

DISCUSSIONS

The study made it possible to determine the most optimal composition of the coating. To date, it is necessary to develop a universal thickness of the applied coating so that it can perform its functions to the maximum without harm to the body.

Conclusions. As a result of the study, was developed a universal nanocoating Al_2O_3 + TiO_2 / V_2O_5, which has the most pronounced antibacterial and biocompatible properties.

Keywords: hernia, surgical mesh, coating, antibacterial.

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COMPARISON OF SENSITIVITY AND SPECIFICITY OF RADIOLOGICAL AND ULTRASOUND DIAGNOSTIC METHODS

Girindu Hewathanthirige, Olga Zorya

The Medical Institute, Department of Internal Diseases with the course of Cardiology and Functional Diagnostics named after Academician V.S. Moiseev, Peoples' Friendship University of Russia (RUDN University), Moscow, Russia

BACKGROUND

Diagnosis of pneumonia (PN) in patients with chronic heart failure CHF using routine radiography is difficult due to the lung congestion (LC) and age-related anatomical and physiological anomalies. Chest computed tomography (CT) is very accurate but at the same time an expensive and not always available method. It is also limited because of radiation exposure. Lung ultrasound scan (LUS) demonstrates high sensitivity and specificity in the diagnosis of PN and LC, but there is currently no data on its significance in patients with both PN and CHF.

Purpose of the Study:

To compare the sensitivity and specificity of radiological, ultrasound diagnostic methods and characterize the changes detected by ultrasound of the lungs in PN and CHF.

MATERIALS AND METHODS

The study included hospitalized adult patients with previously diagnosed CHF, from Jan. 2018 to Nov. 2019 with the presence of symptoms and signs that make it possible to suspect PN in the patient at the time of admission and during hospitalization. PN was diagnosed using multi-spiral computed tomography. On all the patients we have done chest X-ray (CXR) and LUS according to BLUE (Bedside lung ultrasound in an emergency) protocol. As the LUS profiles, in which the changes characteristic of PN were verified, we used PLAPS (postero-lateral alveolar and/or pleural syndrome) — consolidation in the postero-lateral parts of the lung, C — consolidation is localized in the anterior parts of the chest and/or in the apex area, A/B — multiple B lines are visualized on one side, over the affected area of the lung, B' — multiple B-lines there is no sign of lung sliding. LC was verified by identifying the profile B+ — multiple B-lines visualized bilaterally and lung sliding sign is present).

RESULTS

The study included 91 hospitalized adult patients, female — 46 (50.5%) male 45(49.5%), with previously diagnosed CHF. According to chest CT, out of them 61(67.0%) patients were diagnosed with PN (female-24 (39.3%) male 37 (60.7%), median age 73 (67; 82)), 30(33.0%) without PN (female — 22 (73.4%) male 37(71.0%), median age 83 (76; 89)). In the group with PN, signs of PN were found in 56 (92.0%) patients, the following profiles were identified: PLAPS — 7 (11.5%), B' — 2 (3.3%), PLAPS and B' — 6 (9.8%), PLAPS and B+ — 41. (67.2%). Signs of PN were not detected in 5 (8.2%), and were represented by the profile B+. In the group without PN revealed signs of LC (profile B+) — 21(70.0%) patients and PN was excluded in 24(80.0%) patients. The sensitivity and specificity of LUS for the detection of PN against the background of CHF were 92.0% and 80.0%, respectively. According to the CXR, in the group with PN, signs of PN were detected in 41 (67.2%) patients, in the group without PN, signs of the absence of PN were detected in 17 (56.7%) patients. Hence sensitivity and specificity were 67.2% and 56.7%, respectively.

CONCLUSIONS

The sensitivity and specificity of LUS in the verification of PN in patients with CHF exceed CXR. The most common ultrasound pattern in the PN group was a combination of postero-lateral consolidation profile (PLAPS) and multiple bilateral B-lines (B+).

Keywords

Pneumonia, Chronic Heart Failure, Diagnosing, Ultrasound

Acknowledgments

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THE PREVALENCE OF ACUTE KIDNEY INJURY IN PATIENTS HOSPITALIZED WITH COVID-19

Tapiwa Mubayazvamba✉, Yulia Khruleva, Elena Troitskaya, M. Efremovtseva, Zhanna Kobalava

The Medical Institute, Department of Internal Diseases, Peoples' Friendship University of Russia (RUDN University), Moscow, Russia

✉ *tmubayazvamba@gmail.com*

BACKGROUND

The mortality of hospitalized patients with coronavirus disease-2019 (COVID-19) is attributed to respiratory failure, frequently combined with multiorgan dysfunctions. Amoung the organs which are severely affected with covid-19 infection are the kidneys and this can significantly affect the outcomes of the disease.

Purpose:

To investigate the incidence of acute kidney injury (AKI) and its contribution to the COVID-19 severity and outcomes.

MATERIALS AND METHODS

A retrospective analysis of the register of hospitalized patients with COVID-19 was performed. COVID-19 was defined as the laboratory-confirmed infection and presence of the typical computer tomography (CT) picture. We excluded patients with single serum creatinine measurement during hospitalization, length of stay less than 48 hours and re-hospitalization. AKI definition was based on KDIGO 2012 criteria. Patients admitted to the hospital with AKI were identified as having community-acquired AKI (CA-AKI), patients with AKI development during hospitalization were identified as having hospital-acquired AKI (HA-AKI). A P value < 0.05 was considered statistically significant.

RESULTS

We included 432 patients (age 64 [52; 73] years, 53% males, obesity 50%, arterial hypertension 66.9%, diabetes mellitus 24.7%, chronic kidney disease 6%, mean Charlson index 3 [1; 5]). 25% of patients were hospitalized in the intensive care unit (ICU), 64 (14.8%) were treated with mechanical ventilation (MV). The mean length of stay was 11[9; 14] days and in the ICU was 4 [2; 7] days.

The AKI incidence was 25.7% in whole register. 63.6% of patients with AKI had CA-AKI, 36.4% — HA-AKI. AKI of the 1st, 2nd and 3rd stages was observed in 59%, 23% and 18% of patients with AKI, respectively. Patients with the AKI development had more severe lung injury (43% vs 26% with 50–75% and 12% vs 4% with 75–90% lung injury in subgroups with and without AKI respectively, p<0.0001), higher Charlson index (4 [3; 5 vs 2 [1; 4], p<0.0001), longer length of stay (12 [8; 16]vs (11 [9; 14], p<0.001), more frequently were treated with MV (38% vs 7.5%, p<0.001). ICU patients compared with non-ICU more common had AKI (50% vs 17.5%, p<0.0001), more severe course of AKI (42% vs 75% — the 1st stage, 36% vs 11% — the 2nd and 22% vs 14% — the 3rd stage, p=0.002). The majority of cases of HA-AKI were observed among patients in ICU (23.5% vs 4.6%, p=0.012) and were correlated with mechanical ventilation 33% vs 5% (p<0.0001). In-hospital mortality was 19.8%, among patients in the ICU — 56%. Incidence of AKI was 16.2% among survivals, 63.5% — among died (p<0.0001). The development of AKI was predictor of in-hospital mortality (OR 8.99, 95% CI 5.14-15.76, p<0.0001).

CONCLUSIONS

AKI is common among patients hospitalized with COVID-19 and is associated with severity of disease and adverse outcomes in this population. Applying preventative measures against the development of acute kidney injury could improve prognosis.

Keywords

Acute kidney injury, COVID -19, in-hospital mortality.

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NEW TECHNIQUES FOR PHARMACOPOEIA QUALITY CONTROL OF MANGIFERIN SUBSTANCE

Vladimir Tumasov, Joseph Nyambose, Elena Uspenskaya, Maria Morozova✉

Department of pharmaceutical and toxicological chemistry, Peoples Friendship University of Russia (RUDN University), Moscow, Russia

✉ *gor-mariya@yandex.ru*

BACKGROUND

Mangiferin is naturally occurring glucosylxanthone with many pharmacological activities: antioxidant, anti-inflammatory, anti-virus, anti-tumor, anti-radiation, antibacterial, hypoglycemic, lowering blood uric acid, protecting the liver and choleretic, immune regulation (Naraki et al., 2020). Mangiferin has a wide range of plant sources, but its poor solubility and bioavailability limit its clinical use (Acosta et al., 2016). According to recent research five polymorphs of anhydrous and hydrate mangiferin with different biopharmaceutical properties had been screened and prepared. One of them (amorphous form V) is obtained by mechanical milling and presents the dominant polymorph for the development of innovative pharmaceuticals (Yang et al., 2020). Worldwide mangiferin is only used as a component in several traditional Chinese medicines to treat respiratory diseases, but in Russia this substance is registered in the public register of drugs to treat herpes viral infections. So, there is no article on this substance in the world's leading pharmacopoeias. The existing regulatory methods for quality control of mangiferin in Russia do not include assessment of polymorphism or optical activity and in whole are limited by the low solubility of the substance in water.

Purpose of the Study:

To assess the quality of sample of mangiferin substance in accordance with the requirements of the company's pharmacopoeial monograph (All-Russian Scientific Research Institute of Medicinal and Aromatic Plants), as well as to investigate new characteristics of this compound as potentially new pharmacopoeial criteria for its quality control.

MATERIALS AND METHODS

A Zetasizer Nano ZSP (Malvern, UK) based on dynamic light scattering was used to measure the size of particles in the aqueous solutions of mangiferin from 0.1 nm to 10.000 nm. UV spectra were recorded using an Agilent Cary 60 Spectrometer, USA. IR spectra in transmission mode were obtained with FTIR spectrophotometer Agilent Cary 630 (USA), range 4000 – 750 cm^{-1}. NIR spectra were recorded using MPA FT NIR Analyzer (Bruker, Germany). Measurement of the angle of rotation of plane polarized light (λ=589 nm) was carried out with an automatic polarimeter Atago POL-1/2 (Japan). The Agilent Cary Eclipse fluorescence spectrophotometer was used to record fluorescence spectra of mangiferin solution.

RESULTS

As a result of the study, the identity of mangiferin substance was proved by IR and UV spectroscopy. The IR spectrum completely coincided in the position of the absorption bands with the spectrum presented in the monograph of the enterprise. Spectral characteristics in the middle (Fig. 1) and near infrared region of the initial substance and mangiferin after recrystallization from a water-acetone mixture showed no significant difference. In the UV spectrum (0.0008%, acetone-water mixture 1:1) the minimum and maximum absorption were found at 339 and 369 nm, respectively. For the first time the absorbance (Fig. 2) and fluorescence spectra for 0.002% mangiferin aqueous solution were obtained. Excitation at 406 nm led to the appearance of maximum at 550 nm, and excitation at 350 nm led to fluorescent peak at 700 nm (Fig. 3). The specific rotation of a 0.5% solution of the substance in a mixture of water-acetone 1:1 turned out to be 30.33±0.75 (n=5).

CONCLUSIONS

The work presents results of the analysis of a sample of mangiferin substance in accordance with pharmacopoeial standards: the solubility in an acetone-water mixture and in water was assessed; identification was carried out using the method of IR and UV spectrometry and Shinoda test. New characteristics of mangiferin that can serve as criteria for the identity of a substance have been firstly investigated — the value of specific rotation (0.5% solution in water-acetone mixture 1:1) was established, absorption and fluorescence spectra for aqueous solution of substance were obtained.

Keywords:
mangiferin, quality control, polarimetry, spectral analysis.

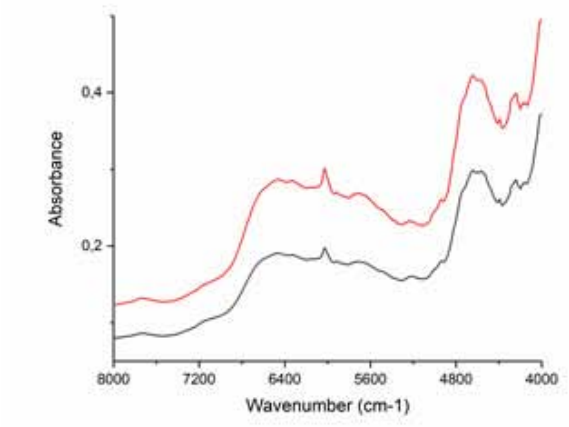

Fig. 1. *Near infrared absorption spectrum of mangiferin substance (black - initial substance, red - after recrystallization)*

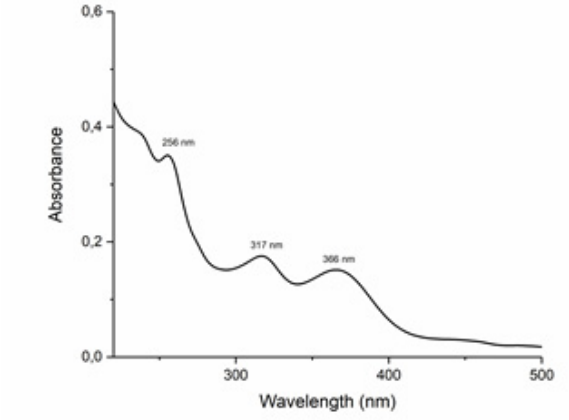

Fig. 2. *Absorption spectrum of an aqueous solution of mangiferin (0.002%) in the ultraviolet region*

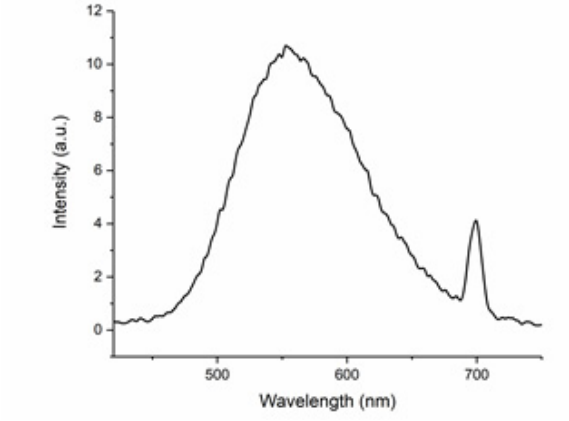

Fig. 3. *Fluorescence spectrum of an aqueous solution of mangiferin (0.002%), with excitation at 350 nm*

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PHARMACOTHERAPY FOR COVID-19: COMPARATIVE EFFICACY ANALYSIS BASED ON LITERATURE REVIEW

Ravoori Priyamsha Lahana✉

The Medical Institute, Department of General and Clinical Pharmacology, RUDN University

✉ *lahana2000@gmail.com*

BACKGROUND

Pharmacotherapy for COVID-19 patients is still a great challenge for the world healthcare systems. Though a variety of antivirals and antibacterials were used, only a few of them resulted in outcomes improvement. The list of FDA approved drugs against COVID-19 includes Azithromycin, Doxycycline, Remdesivir, Dexamethasone and Methylprednisolone, Hydroxychloroquine, Favipiravir, Tocilizumab, so we performed a review of available results of published randomized clinical trials to make comparative analysis of efficacy of drugs.

Purpose:

To conduct comparative evaluation of efficacy and safety of FDA-approved agents to treat COVID-19 based on the review of available published data.

Materials and Methods: The review of the data of clinical trials from published articles dedicated to the FDA approved drugs for treatment of COVID-19: Azithromycin, Doxycycline, Remdesivir, Dexamethasone and Methylprednisolone, Hydroxychloroquine, Favipiravir, Tocilizumab

RESULTS

The final report on Remdesivir (Beiges et al, 2020) revealed that 200 mg loading dose followed by 100 mg for next 9 days by 541 patients out of 1062 showed recovery rate within 10 days compared with Favipiravir at dose 1600 mg followed by 600 mg for next days in 48 patients out of 96 patients, showed the mean duration of hospital stay at 13.29 ± 5.86 days (results of multi-center randomized trial, Dabbous HM et al, 2021). Hydroxychloroquine observational research in 2021 with 97 patients showed hospitalization/mortality ratio compared with placebo 21.6% vs 31.4%, compared with the results of the RECOVERY trial (1542 patients) showed mortality ratio vs placebo as 25.7% vs 23.5%. PRINCIPLE trial: 80% of azithromycin group revealed recovery in 28 days compared with 77% in usual care group. Ivermectin plus doxycycline in 200 patients showed recovery rate within 12 days for 77% compared with 62,8% in placebo group (clinical trial NCT04523831). Drugs used against acute respiratory distress syndrome (ARDS) showed results as follows, methylprednisolone resulted in composite primary end-point (admission to ICU, need for invasive mechanical ventilation, or all-cause death by day 28) as 22.9% compared with 44.4% in non-methylprednisolone group (clinical trial NCT04323592). RECOVERY trial data on mortality with dexamethasone compared with no exposure patients resulted in 29.3% vs 41.4%. Tocilizumab showed mortality rate 7% compared with 20% in the standard care group (Guaraldi G et al, 2020).

CONCLUSIONS

Remdesivir and favipiravir had promising results, though not high rates of efficacy. Hydroxychloroquine did not affect the hospital stay. For treatment and prophylaxis of serious conditions such as bacterial superinfection, azithromycin resulted in light improvement, and doxycycline showed efficacy which is used in less risk groups as there is antimicrobial resistance against azithromycin. ARDS can be treated efficiently by dexamethasone during mechanical ventilation. Cytokine storm can be treated efficiently by tocilizumab.

Keywords:

COVID-19, Azithromycin, Doxycycline, Remdesivir, Dexamethasone, Methylprednisolone, Hydroxychloroquine, Favipiravir, Tocilizumab

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SYNTHESIS AND ANTIMICROBIAL ACTIVITY OF SOME NOVEL THIETAN-CONTAINING PYRIMIDINYLACETOHYDRAZIDE DERIVATIVES

Alina Shumadalova*, *Yulia Vinogradova*, *Alexander Melnikov*, *Svetlana Meshcheryakova

Department of General Chemistry, Bashkir State Medical University, Ufa, Russia

shumadalova@gmail.com

BACKGROUND

Antibiotic resistance is a worldwide problem. An emergence of new infections, a genetic transformation of known pathogens becomes a big challenge to the medical community. Many antimicrobial substances contain in their structure hydrazide, sulfur-containing fragments (Meshcheryakova et al., 2017), therefore it seems promising to use the pyrimidines as base objects for the synthesizing new biologically active substances.

Purpose of the Study:

To synthesize some novel acyl derivatives based on 2-[6-methyl-4-(thietan-3-yloxy) pyrimidine-2-ylthio]acetohydrazide and to investigate the antimicrobial activity of the synthesized compounds.

MATERIALS AND METHODS

Melting points were determined by open capillary method and are uncorrected. The IR spectra (in KBr pellets) were recorded on an InfraLUM FT-02 spectrophotometer. 1H NMR spectra were recorded on a Bruker AM-300 spectrometer using TMS as an internal standard. The purity of the compounds was checked by thin layer chromatography (TLC) on plate «Sorbfil» using ethyl acetate.

As starting compounds we have used 2-[6-methyl-4-(thietan-3-yloxy)pyrimidine-2-ylthio]acetohydrazide. Antimicrobial and antifungal activities of the compounds 1-6 were assayed using the agar diffusion and the twofold broth (pH 7.2–7.4) dilution methods (Mironov et al, 2012). Gram positive (*Staphylococcus aureus*) and gram negative (*Escherichia coli*, *Proteus vulgaris*, *Klebsiella pneumonia*, *Enterobacter aerogenes* and *Pseudomonas aeruginosa*) and lower fungi *Candida albicans* bacteria were used as test organisms. Ceftriaxone was used as reference drug

RESULTS

Treatment of 2-[6-methyl-4-(thietan-3-yloxy) pyrimidine-2-ylthio]acetohydrazide with acetic, propionic, maleic, succinic anhydrides in an inert solvent 1,4-dioxane at room temperature, with benzoyl chloride in a 1,4-dioxane medium during boiling in the presence of a 1.1-fold excess of triethylamine afforded the corresponding N,N'-diacylderivatives 2-6 (Fig. 1).

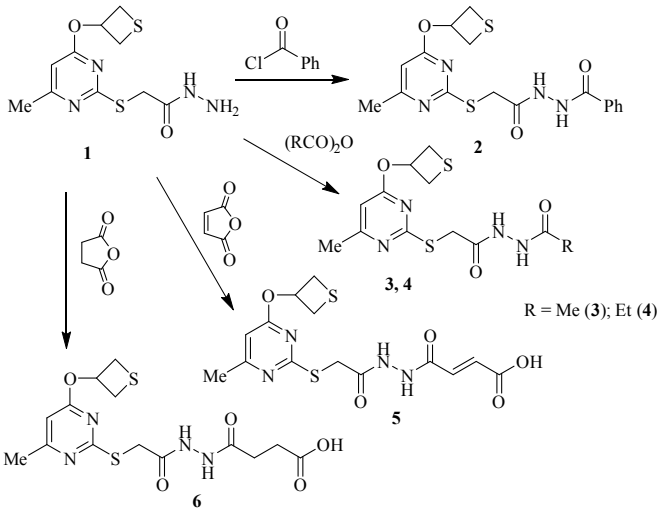

***Fig. 1.** Synthesis of thietan containing pyrimidinylacetohydrazide derivatives*

The formation of diacylderivatives is confirmed by 1H NMR spectra, in which signals of protons O-thietane fragment, methyl group, the proton in the fifth position of the pyrimidine ring are appeared.

As a result of researches it is established that benzoic, acetic, maleic acids residues in compounds 2, 3, 5 increase the activity in relation to St. aureus, P. vulgaris. Propionic acid residue in compound 4 increases the activity in relation to *E. coli*.

Minimum inhibitory concentration values are given in Table 1.

The investigation of antibacterial screening data revealed that the compound 5 showed good inhibition towards all tested gram-positive and gram-negative

Table 1. *Antimicrobial activity expressed as MIC (μg/ml)*

Compounds	MIC, mcg/mL						
	St. aureus	E. coli	P. vulgaris	K. pneumoniae	Ent. aerogenes	Ps. aeruginosa	C. albicans
1	50	0.5	5	0.05	0.05	0.05	0.05
2	5	0.5	0.5	0.05	0.05	5	0.5
3	5	0.5	0.5	0.05	0.05	0.05	0.5
4	50	0.05	5	5	0.5	0.05	0.5
5	5	0.5	0.05	0.05	0.05	0.5	0.05
6	5	0.5	0.5	0.5	0.05	5	0.5
Ceftriaxone	0.5	0.5	0.05	0.05	0.05	0.05	0.05

bacteria and lower fungi C. albicans at 0.5 μg/ml concentrations (Table 1).

CONCLUSION

1) Based on the activity of these compounds, we can propose structure-activity relationship.

2) Acyl derivatives based on 2-[6-methyl-4-(thietan-3-yloxy)pyrimidine-2-ylthio]acetohydrazide are promising for further in-depth research as potentially biologically active compounds

Keywords

pyrimidine, hydrazide, thietan, antimicrobial.