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A holistic approach to the problem of Rheumatoid Arthritis in geriatric patients

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Abstract

Rheumatoid arthritis is a chronic disease and belongs to the group of systemic connective tissue diseases having an autoimmune basis. The most commonly reported symptoms by patients are pain, swelling and difficulty moving the affected joints. The course of rheumatoid arthritis is different in the elderly, the onset of the disease in the elderly is more severe than in the young, and large proximal joints are primarily involved. Make a diagnosis as soon as possible and start treatment, the greater the chance of delaying disease progression and even remission, which will minimize disability. In the treatment of rheumatoid arthritis in the elderly, who often have co-morbidities and often mobility difficulties, the role of physiotherapist and nursing care is extremely important next to medical treatment. The use of kinesiotherapy allows you to increase the range of motion of the joints and maintain them in good functional condition. Physiotherapy, on the other hand, has analgesic and anti-inflammatory effects. This effect is enhanced by properly selected pharmacological treatment, carried out with the help of disease-modifying drugs, anti-inflammatory drugs, glucocorticosteroids and biological drugs.

Key words: rheumatoid arthritis, elderly people, kinesiotherapy and physical methods, pharmacological treatment, nursing care

Introduction

With the progressive aging of the population, the percentage of geriatric patients is increasing among the entire population of chronically ill people. It is no different if you consider patients with rheumatic ailments, especially those suffering from Rheumatoid Arthritis (RA). Patients over 60 years of age are characterized by the frequent occurrence of comorbidities related to cardiovascular systems, kidney dysfunctions or cancer, which may result in polypharmacy [1, 2].

In patients with RA, interdisciplinary treatment is important, and in the team working with the patient, apart from doctors, nurses and physiotherapists play an important role. Comprehensive treatment and rehabilitation of the patient is particularly important in the case of RA, because in the case of this disease, it is carried out from the beginning of the detection of the disease to the end of the patient's life [1,3]. Rehabilitation of the patient is not only a medical but also a social process. His main task is to ensure the most dignified life with a sense of social security and satisfaction. The aim of the comprehensive operation of the medical team is to restore physical and mental fitness in the widest possible spectrum and in the shortest possible time [2, 4].

Due to the unknown aetiology of RA, today's treatment does not provide permanent cure. Treatment aims to achieve full and lasting remission, a condition in which arthritis is inhibited to such an extent that it does not (or only minimally) lead to further structural damage to the joint. In spite of this, scientific achievements in recent years, especially during the last twenty years, have allowed to develop more effective methods of treatment of RA. It is based on the use of biological treatment and the use of the most modern techniques used in rehabilitation. The condition for improvement is simultaneous analgesic action, regulating muscle tone and relieving stress through the use of kinesiotherapy, physical therapy and orthopedic supplies [4, 5].

Rheumatoid arthritis

Rheumatoid arthritis is a chronic connective tissue disease. The disease is characterized by inflammatory arthritis, non-articular changes and systemic complications. Arthritis is associated primarily with pain, edema, as well as reduced mobility and morning stiffness. Progressive arthritis leads to joint surface damage, joint capsule fibrosis, contractures and even muscular atrophy. RA is usually destrict affecting the small joints of the hands and feet, but it mainly affects the younger group of patients. At an older age, the onset of the disease is more severe and the disease begins to develop in large proximal joints, primarily the knee and shoulder joints [22, 35].

The initial phase of the disease is manifested by a feeling of weakness, fatigue, loss of appetite and, consequently, loss of body weight. Radiological changes in the joints are invisible. Blood results (OB, C-reactive protein) they are often only slightly increased. As you can see the diagnosis of the disease in the initial phase is very complicated, because the symptoms may indicate many other diseases. Often, one of the characteristic symptoms is the pain and swelling of some (less often) small joints of the hands or feet. The disease most often affects the joints metacarpophalangeal, interphalangeal joints, thumb and wrist joints. Then, knee, ankle, shoulder, and toe joints, or even the cervical spine and elbow joints are occupied. A characteristic symptom of the disease is morning stiffness, where the pain is directly proportional to the stage of the disease. In non-articular rheumatoid arthritis, we may encounter muscular dystrophy, tenosynovitis and tendons, the formation of rheumatoid tumors or changes in internal organs [6].

Rheumatoid arthritis is characterized by Steinbrocker with four clinical periods:

1. early period (pain, swelling, swelling in the outline of the joints, morning stiffness, light osteoporosis),
2. moderate changes (periarticular lesions, mainly interosseous muscle wasting, limited mobility in X-ray image, visible osteoporosis, subchondral bone destruction + all symptoms from period 1.),
3. advanced changes (damage to joint structures, intensified all the above symptoms, clear changes in the X-ray image),
4. end stage (all of the above symptoms, appearance of fibrous adhesions and stiffness of the joints) [8, 9].

Laboratory diagnosis of RA

Diagnosis of RA is based on the ACR (American Collegium of Rheumatology) and EULAR (European League Against Rheumatism) classification. The following four categories belong to these criteria: I. localization of inflammation, II. indicators of inflammation, such as the CRP (C-reactive) protein and OB (Biernacki's reaction), III. serological tests and IV. duration of disease symptoms [10]. According to the ACR and EULAR classification, four laboratory tests can be distinguished: OB, CRP protein, rheumatoid factor in the IgM class and anti-CCP. The presence of rheumatoid factor (RF) in the IgM class occurs in about 75-85% of people with RA and correlates with the severity of the disease in the case of already diagnosed RA and is also a prognostic factor [11]. Anti-CCP (antibodies directed against the citrullinated peptide) are detectable in the early stages of the inflammatory process involving the synovium of joints and are detected in patients with RA [12, 13].

In clinical practice, imaging techniques such as DEXA densitometry or QUS quantitative ultrasound are used to assess bone metabolic disorders, which allows you to specify bone mineral density (BMD) and microarchitecture, and thus bone mineral content and bone fragility [14]. Determination of biochemical indicators of bone remodeling provides important information that complements the results of bone mineral density (BMD) measurements. Bone mineral density, as a resultant of peak bone mass, determines the risk of skeletal threats over the years, while bone remodeling indices reflect the current metabolic state of the whole skeleton [15].

The new application of biochemical indicators of bone turnover is their use to understand the mechanism of action of new therapies (drugs) on bone tissue. The indicators of bone formation are:

- bone alkaline phosphatase (BAP) which is synthesized by osteoblasts, examined by electrophoresis, precipitation, EIA (Enzyme Immunoassays) or ELISA (Enzyme-Linked Immunosorbent Assay), and the material for testing is serum [12, 16];

-osteocalcin (OC), which is classified by osteoblasts (there are many immunoreactive forms in the blood), is tested by means of RIA (Radio Immuno Assay), CLIA (Chemiluminescence immunoassays), ELISA and the material for testing is serum;

-N-terminal pro-collagen propeptide I (PINP) and C-terminal pro-collagen propeptide I (PICP) are augmented by proliferating osteoblasts and fibroblasts, tested by means of RIA, ELISA and the material to be tested is serum;

The -C-terminal telopeptide of type I collagen (CTx) is synthesized by the type I collagen-containing tissues, examined by means of RIA, ELISA, and the material to be tested is urine (CTx α / β) and serum (CTx α);

The N-terminal collagen type I (NTx) telopeptide is synthesized by type I collagen-containing tissues, tested with RIA, ELISA, CLIA, and the material to be tested is urine or serum;

- Doxypyridinoline (DPD) synthesized by bone and dentin (not present in collagen of cartilage and skin, and released only from the mature form of collagen type I), tested by HPLC (high-performance liquid chromatography), ELISA, CLIA, material for the test is urine or serum;
- pyridinium (PYD) synthesized by bones, cartilage, tendons and blood vessels (mainly in cartilage and bone collagen, and released only from the mature type I collagen), tested by HPLC and ELISA, and urine or serum;
- C-terminal pro-collagen type I (ICTP) propeptide, which is derived from bone and skin, is tested with RIA and the material to be tested is serum;
- medium-chain or long-chain osteocalcin friability which is derived from bone, is tested by means of ELISA and the material to be tested is urine;
- Renewaried acid phosphatase is derived from bone and blood, examined by colorimetry, RIA, ELISA, and plasma or serum for analysis;
- cathepsin K which is derived from osteoclasts, is tested by ELISA and the material to be tested is plasma or serum.

The clinical value of bone remodeling factors is limited by the problem of their proper use and proper interpretation of results (age, sex), as well as problems related to the sampling and the method of determination. The advantage of determining bone turnover rates over BMD measurement are very rapidly changing values in pathological states (metabolic bone diseases), as a result of immobilization and after treatment [12].

Epidemiology

The incidence of RA varies depending on the population and ranges from 0.5% to 1.5%. A higher frequency of cases is noticeable in North America and North Europe. In Poland, the incidence rate is estimated at 1% of the population. The highest number of cases falls on the 4-5 decade of life. The problem of RA often affects women who are sick 2-3 times more often than men. Rheumatoid arthritis often contributes to disability [7,17]. It is estimated that in 30% of people with disabilities in the UK the cause of disability was RA and in Australia - 32% [16]. Rheumatoid arthritis is associated with the presence of the HLA-DR4 antigen of the histocompatibility complex, whose presence may increase the risk of disease in the family [18, 19]. It has been shown that smoking increases the risk of RA three times, especially in men and people with a positive rheumatoid factor. The degree of loss of fitness increases with the duration of the disease [21].

Kinesitherapy in rheumatoid arthritis

Kinesitherapy is one of the most important parts of rehabilitation. Achieving the effectiveness of therapy is determined primarily by the individual selection of exercises and their systematic exercise, but it is also important to start the therapeutic process early before the process of fixed deformities in the motor system. The start of the improvement process allows to maintain the joints and muscles in a very good functional condition. An extremely important element of kinesitherapy is controlling compensatory processes that may result in the appearance of overloading and deformation [22].

The guidelines presented by the panel Ottawski inform that a functional role in the improvement should be played by functional kinesiotherapy, the aim of which is to restore movement patterns that are closest to physiology. The activation of appropriate compensation mechanisms is conditioned by the early initiation of proper movement training. In conclusion, it can be said that the role of the therapist is to choose appropriate exercises that will contribute to the patient's independence without causing traumatization of tissues [22].

Due to the immunological basis of inflammation in rheumatic diseases, the improvement procedure differs significantly from the treatment of standard motor organ diseases. The kinesiotherapy tasks are focused primarily on the nourishment of joint cartilage

and increasing the range of movements. For this purpose, the therapist recommends passive exercise, self-assisted, active, free, relieved, and also with resistance. An important element is also the elimination of contractures, where mobilizations using manual techniques and extracts are used. In rheumatoid arthritis, attention is also paid to restoring normal muscle work through isometric exercises, resistance exercises and water exercises [23].

Kinesitherapy methods

Currently, physiotherapeutic techniques are used, such as stretching, manual therapy techniques, soft tissue techniques (trigger point therapy, muscle straps, fascia techniques), as well as proprioceptive neuromuscular facilitation (PNF) [23]. Physiotherapists often benefit from proprioceptive neuromuscular facilitation, through the use of compression techniques, stretching, optimally adapted resistance, it improves the functioning of joints and neuromuscular coordination, develops muscular fitness and endurance [24].

Physical methods

In the comprehensive treatment of people with RA, it is crucial to use a therapy consisting of physiotherapy (massage, kinesitherapy, physical therapy) and pharmacotherapy. The main goal of physical therapy is to support properly selected pharmacological treatment and treatment of movement by analgesic and anti-inflammatory effects. This contributes to inhibition, control of the development of the disease course and reduction of patient's pain. Geriatric patients belong to the group that complains about the strongest pain in the course of RA. This is mainly due to the duration of the disease and other comorbidities [25, 26].

Physiotherapeutic methods that, according to research, bring the best results in eliminating pain are: thermotherapy (local cryotherapy), magnetotherapy, ultrasound, laser biostimulation and TENS electrostimulation. According to the study [25] after the two-week treatment period, analgesic effects of physiotherapeutic treatments were observed in all patients participating in the study. The morning stiffness, whose length before the test was 1 hour and 35 minutes, shortened its time and amounted to an average of 42 minutes. In addition, as a result of the impact of physical treatments, there is a reduction in joint swelling, which significantly improves the daily functioning of patients. According to Janiszewski et al., physical impact causes a secondary increase in muscle strength and improvement of muscular economics [26].

In a study conducted by R. Skalska-Izdebska et al. [25], ultrasound therapy caused a decrease in pain in 92% of the patients. The action of the ultrasonic wave was confirmed in the literature by Konrad regarding the treatment of "rheumatoid hands", in which the best parameters of the treatments were: intensity 0.5-1.2 W / cm² and frequency 800 Hz. The low frequency magnetic field at frequencies of 5-50 Hz and 10 Hz intensity resulted in reduction of symptoms in 70% of patients participating in the study. The Dortch and Johnson publications confirm the analgesic effect of this procedure. The electrostimulation recommended in the course of RA includes TENS and DD. Mika and Nowotny recommend the use of a sequence of diadynamic currents for analgesic purposes: DF-2 min, CP-3 min, LP-3 min [25, 26].

Cryotherapy, according to the study, is considered by patients with RA as the subjectively the most effective physiotherapeutic method in pain relief. The study [2] reported a reduction in pain in 86% of patients, indicating a therapeutic effect to reduce the sensation of pain. The positive effect of cryotherapy has been demonstrated in the literature by Miller, Michalik and Zagrobelny. They proved that this treatment has the effect of reducing pain and increasing blood flow through the skin and internal organs [27, 28].

Physiotherapy in geriatric patients is an important element in the treatment of RA due to its analgesic and anti-edematous action. The key is individual adjustment of doses and time of the treatment, individually tailored to the patient's ailments and condition. In addition, when choosing treatments, pay attention to contraindications that may occur when planning physical therapy for the elderly [29].

Orthopedic supplies in RA

The most commonly type of orthopedic supplies used in the conservative treatment of RA are orthoses and auxiliaries. The main purpose of using orthoses is prevention and treatment of deformity, joint stabilization, relief, pain reduction and prevention of contractures. On the other hand, auxiliary means usually serve to facilitate movement and prevent falls [3].

Spine orthoses can be divided due to the functions they are supposed to meet. There are stabilizing, relieving, immobilizing, corrective and functional corrective orthoses. A special case of supplies used by RA patients is orthosis of the hand. Two types of such devices are mentioned: resting and functional. At rest, they serve the passive support of the hand, immobilizing the wrist and wrist joint in the neutral position. The functional task is to mobilize the hand and fingers for movement. In addition, RA patients often use mobility devices, such as crutches, walking sticks or walkers [10]. There are three types of crutches: elbow, axillary and crutches for rheumatics. Selection of crutches should take into account the degree of joint damage. Elbow crutches are usually the first choice in the early stages of the disease when there is still the possibility of additional load on the joints of the upper limbs, when it is not possible, axillary crutches are recommended. Patients use orthopedic beds and special accessories to facilitate daily activities, such as cutlery with a thickened grip, a device for loosening bottles or buckets [29]. Foot deformities with which patients with RA often face require careful selection of footwear and the use of specialist insoles tailored to the patient's needs.

Pharmacological treatment in RA

The most important issue in the treatment of RA is rapid diagnosis. This allows you to obtain a time when you can choose an effective, individual treatment tailored to the patient's needs. There is a growing chance of getting remission and improving the patient's state of health. [30]. The most beneficial for the patient is to start treatment for a maximum of 6 months from the diagnosis made. The sooner the therapy is started, the greater the chance of reducing the symptoms of RA and the remission of this disease. Early supply of drugs delays the development of a full-blown disease. This prevents damage to the joints and resulting disability. Disease-modifying anti-rheumatic drugs (DMARD) or combination therapy with high escalation should be used to achieve suppression of the disease [31]. Each patient may react differently to the treatment. It depends on the severity of the disease, genetic factors and other individual variations. Genetic factors are of particular importance in the selection of therapy. Despite the developed methods of treatment of RAs, the selection of personalized therapy is based on the trial and error method [32].

The basic drugs used to treat RA can be divided into: disease-modifying, biological, non-steroidal anti-inflammatory drugs and glucocorticosteroids. Key therapeutic agents are disease-modifying drugs, which aim to reduce synovitis and systemic inflammation. In addition, they improve joint function. The most commonly used disease modifying drug is Methotrexat, which can be combined with other drugs of this type, e.g. eflunomide, sulfasalazine, anti-malarial drugs and gold salts [33, 34]. Other groups of drugs used in the treatment of RA are glucocorticosteroids, e.g. prednisolone, methylprednisolone and NSAIDs, their main task is to reduce inflammation and alleviate pain. These drugs should be used for a short time and only in the acute phase of the disease, because they affect the functioning of many organs and the

immune system [36]. In the absence of improvement in the treatment of RA with standard disease-modifying drugs, a biological drug is additionally included. Biological drugs also modify the course of the disease. Biological agents include monoclonal antibodies and receptors that result from genetic modification. They are used to block cytokines that stimulate inflammatory factors, and work at different levels. One of the major cytokines that is associated with the inflammatory process is tumor necrosis factor α (TNF- α). The main biological drugs used in RA are: adalimumab, anakinra, etanercept, golimumab, infliximab, tocilizumab, abatacept, and rituximab. Combination therapy with two or more DMARDs is more effective than a single drug. When used in combination therapy, especially in the elderly, side effects may increase more [33, 35, 37].

Pharmacotherapy of RA in elderly people is often difficult due to concomitant diseases and involution changes, which affects the absorption, metabolism and elimination of the drug. Older people are advised to use lower doses of medication, especially since the same therapeutic effect will be achieved. In patients between 65 and 75 years of age the dose should be reduced by 10% between 75 and 85 years of age by 20%, and in patients over 85 years old by 30% [35].

Nursing care for a patient with Rheumatoid Arthritis

Rheumatoid Arthritis is a disease that dramatically changes the quality of everyday life of people struggling with this disorder. Patients must learn how to deal with pain and limitations in terms of movements. The progress of the disease often prevents the patient from continuing his professional activity. In addition, patients with RA also suffer from mental disorders such as depression. Due to a number of problems that RA people have to deal with on a daily basis, comprehensive and professional nursing care is necessary to improve the quality of life of these patients [38].

One of the most important factors hindering everyday functioning of people with RA is chronic pain. It is caused by morning stiffness, swelling and joint deformities. Nursing care in this aspect over the patient should focus on the daily assessment of the severity and location of pain in the patient. This is possible through the use of NRS and VAS scales, as well as observation of nonverbal gestures on the part of the patient, which may suggest an increase in pain (muscle tension, facial grimace). It is also important to educate the patient about the use of warm compresses and baths, which belong to nonpharmacological methods of reducing pain. In addition, nursing staff should also monitor symptoms such as sleep disturbances, lack of appetite, significant mood depression, and fast fatigue in patients with RA. These symptoms are often a consequence of increased pain in the patient [39, 40].

Another problem of patients with RA, which requires help from nursing staff, is the self-care deficit, which is caused by a decrease in muscle strength and joint deformity. Support should then be provided to the patient, which will be adequate to the degree of this deficit. In the case when the patient is in a difficult position to change position, move, assist the patient in these activities, use auxiliary equipment such as sticks, crutches, balconies, trolley during the patient's movement. It is also important to properly motivate the patient to perform everyday activities as much as he / she can. Educating both the patient and his family about the adaptation of the apartment to the patient's needs. Providing tips on the organization of everyday life, to perform activities that require more physical activity while the action of painkillers will be greatest [39].

Rheumatoid arthritis often occurs in people over 60 years of age. In the case of caring for such a patient with RA, it is also important to observe complications related to pharmacological treatment. Older people who usually suffer from additional illnesses, such as diabetes, hypertension, require more urgent supervision from nurses or carers. It is necessary to educate the patient as well as his family about the side effects of medications that the

patient is taking, and the appropriate doses, the hours of taking medication. It is also important to develop a habit of controlling the basic vital parameters - blood pressure, heart rate, blood glucose and their proper recording. In addition, nursing staff should encourage physical activity to the extent appropriate to their current state so that they can maintain their fitness and independence for as long as possible [39].

Conclusions

Rheumatoid arthritis is one of the most complex autoimmune diseases that affects cartilage and bone tissue, causing systemic changes. Elderly patients are one of the most vulnerable groups for RA. The consequence of this disease may be joint deformities that cause disability or even death. Patients with RA should be treated interdisciplinary, due to the fact that this disease is not only physically but also mentally. In the diagnosis of RA, studies of rheumatoid factor in the IgM class, anti-CCP and CRP (C-reactive) concentration and ESR is used.

Kinesitherapy and physical therapy play an important role in the effective treatment of RA. Kinesitherapy affects the maintenance of joints and muscles in a very good functional condition. Her tasks include nutrition of joint cartilage and increasing the range of motion. To achieve the intended effects, kinesitherapy exercises must be individually selected for the patient, and the patient should perform them systematically. In addition to kinesitherapy, physiotherapy is extremely important, which through analgesic and anti-inflammatory effects, which contributes to the inhibition and control of the disease and supports properly selected pharmacological treatment. Thermotherapy, magnetotherapy, ultrasounds, cryotherapy, laser biostimulation and TENS electrostimulation are considered the most effective methods of physical therapy.

The use of orthoses by people with RA can be used to prevent and treat distortion, by stabilizing joints, relieving stress, reducing pain, which is most often reported by geriatric patients or the prevention of contractures.

In the treatment of RA, the most commonly used disease-modifying drugs, the operator of which is Methotrexat, combining with painkillers. Unfortunately, this treatment does not achieve the desired effect in all patients. In recent years, treatment options for RA patients have increased, treatment of rheumatic diseases has revolutionized biological drugs. However, due to possible side effects, it cannot be used for all patients, special attention should be paid to the elderly.

Bibliography

1. Książpolska-Orłowska K., „Postępowanie rehabilitacyjne w reumatologii” *Reumatologia* 2012; 50, 2: 181–184.
2. Smoleńska Ż., Zdrojewski Z., „Odmienności w przebiegu chorób reumatycznych u osób w podeszłym wieku” *Gerontologia Polska* tom 18, nr 4, 169–175.
3. Paprocka Borowicz M., Zawadzki M., *Fizjoterapia w chorobach układu ruchu* Górnicki Wydawnictwo Medyczne Wrocław 2007, 77-91.
4. van der Heijde D, Klareskog L, Landewe´ R, Bruyn GAW, Cantagrel A, et al. Disease remission and sustained halting of radiographic progression with combination etanercept and methotrexate in patients with rheumatoid arthritis. *Arthritis and rheumatism* 56: 3928–3939.2007 doi:10.1002/art.23141.
5. Książpolska-Orłowska K., *Fizjoterapia w Reumatologii PZWL* 2010, 71-75.
6. Jura-Półtorak, A., & Olczyk, K. (2011). Diagnostyka i ocena aktywności reumatoidalnego zapalenia stawów. *Journal of LaboratoryDiagnostics*, (4), 431-438.
7. Jura-Półtorak A., Olczyk K.: Diagnostyka i ocena aktywności reumatoidalnego zapalenia stawów. *Diagnostyka laboratoryjna - Journal of Laboratory Diagnostics* 2011, 47 (4): 431-438.

8. Pincus T. The American College of Rheumatology (ACR) (2005). Core data set and derivative "patient only" indices to assess rheumatoid arthritis. *Clin Exp Rheumatol*, (23), 109-113.
9. Wisłowska M, Kalińska I, Olczyk-Kwiecień B. (2006) Stare i nowe metody oceny aktywności choroby, stopnia uszkodzenia tkanek i utraty funkcji w reumatoidalnym zapaleniu stawów. *Prob Lek*, (45): 52-56.
10. Filipowicz-Sosnowska A, Przygodzka M. "Diagnostyka wczesnego reumatoidalnego zapalenia stawów (rzs) w świetle współczesnych danych." *Przewodnik Lekarza/Guide for GPs 4.4* (2001): 12-18.
11. Jura-Półtorak A, Olczyk K. "Diagnostyka i ocena aktywności reumatoidalnego zapalenia stawów." *Journal of LaboratoryDiagnostics 4* (2011): 431-438.
12. Odrowąż-Sypniewska G, Nowacki W. "Zastosowania kliniczne oznaczania biomarkerów przebudowy kości. Nowe zalecenia Grupy Roboczej Międzynarodowej Fundacji Osteoporozy-Międzynarodowej Federacji Chemii Klinicznej ds. Standaryzacji w zakresie Markerów Przebudowy Kości." *Diagn Lab 47* (2011): 219-222.
13. Jura-Półtorak A, Olczyk K. Farmakoterapia reumatoidalnego zapalenia stawów. *Farm Przegl Nauk 2010; 12*: 60-66
14. Pincus T, Sokka T. Laboratory tests to assess patients with rheumatoid arthritis: advantages and limitations. *Rheum Dis Clin North Am 2009; 35*: 731-734.
15. Kuligowska M, Odrowąż-Sypniewska G. Nowe standardy laboratoryjne w diagnostyce i monitorowaniu progresji zmian kostno-stawowych w reumatoidalnym zapaleniu stawów. *Voice 2007; 2*: 14-19
16. Aleksander J. Owczarek, Rafał Michalik, Przemysław Kotyla, Eugeniusz J. Kucharz, The effects of clinical, epidemiological and economic aspects of changes in classification criteria of selected rheumatic diseases. *Reumatologia 2014; 52, 2*: 136–141
17. Tłustochowicz W, Brzosko M, Filipowicz-Sosnowska A i wsp. 34. Stanowisko Zespołu Ekspertów Konsultanta Krajowego ds. Reumatologii w sprawie diagnostyki i terapii reumatoidalnego zapalenia stawów. *Reumatologia 2008; 46*: 111-114.
18. Silman AJ, MacGregor AJ, Thomson W, et al. Twin concordance rates for rheumatoid arthritis: results from a nationwide study. *Br J Rheumatol 1993; 32*: 903-907.
19. Bellamy N, Duffy D, Martin N, Mathews J. Rheumatoid arthritis in twins: a study of aetiopathogenesis based on the Australian Twin Registry. *Ann Rheum Dis 1992; 5*: 588-593
20. Sugiyama D, Nishimura K, Tamaki K, et al. Impact of smoking as a risk factor for developing rheumatoid arthritis: a meta-analysis of observational studies. *Ann Rheum Dis 2010; 69*: 70-81.
21. Lo Monaco A, Bruschi M, La Corte R, et al. Epidemiology of systemic sclerosis in a district of northern Italy. *Clin Exp Rheumatol 2011; 29* (2 Suppl 65): S10-S14.
22. Przedborska A., Nitera-Kowalik A., Misztal M., Pruszyńska M., Krzepakowska E., Raczkowski J.W., Wpływ treningu funkcjonalnego na sprawność ręki reumatoidalnej u pacjentów leczonych w warunkach uzdrowiskowych., *Acta Balneol, TOM LVIII, Nr 2(144); 2016:118-123*
23. Księżopolska-Orłowska K., Postępowanie rehabilitacyjne w reumatologii, *Reumatologia 2012; 50, 2*: 181–184,
24. Zagłoba-Kaszuba A., Analiza mechanizmu działania wybranych wzorców terapii proprioceptywnego ułatwiania nerwowo-mięśniowego za pomocą metod neurofizjologii klinicznej, Uniwersytet Medyczny im. Karola Marcinkowskiego w Poznaniu. Zakład Patofizjologii Narządu Ruchu Wydział Lekarski I, Poznań 2012
25. Skalska-Izdebska R., Fatyga P., Goraj-Szczypiorska B., Kurach A., Pałka T. "Ocena skuteczności fizykoterapii w leczeniu reumatoidalnego zapalenia stawów" *Young Sport Science of Ukraine 2012; 3*: 205-215.

26. Krawczyk-Wasilewska A., Kuncewicz E., Sobieska M., Samborski W. "Ocena skuteczności fizykoterapii w uśmierzaniu bólu towarzyszącego reumatoidalnemu zapaleniu stawów" *Chirurgia Narządów Ruchu i Ortopedia Polska* 2009; 74, 6:361-366.
27. Istrati J., Głuszko P., Suszko R., Iwaniec T. "Krioterapia ogólnoustrojowa zmniejsza aktywność fibrynolityczną krwi u chorych na reumatoidalne zapalenie stawów" *Reumatologia* 2010; 48, 3: 171-176.
28. Juszcak K., Skotarczak A., Wojtyła-Buciora P., Wojtyła A., Klimberg A. "Wpływ krioterapii ogólnoustrojowej na jakość życia chorych na reumatoidalne zapalenie stawów" *Hygeia Public Health* 2018; 53, 2: 193-198.
29. Golus A., Abramczyk A., Pietsch J., Chłystek J., Łakomski M. "Rehabilitation in rheumatoid arthritis" *Journal of Education, Health and Sport*. 2018; 8,9:1095-1104
30. Burmester GR, Pope JE Novel treatment strategies in rheumatoid arthritis. *Lancet*. 2017 Jun 10;389(10086):2338-2348.
31. Demoruelle MK, Deane KD Treatment strategies in early rheumatoid arthritis and prevention of rheumatoid arthritis *Curr Rheumatol Rep*. 2012 Oct;14(5):472-80
32. Bluett J, Barton A Precision Medicine in Rheumatoid Arthritis. *Rheum Dis Clin North Am*. 2017 Aug;43(3):377-387.
33. Tatara T., Snakowska P., Rola diety w reumatoidalnym zapaleniu stawów - przegląd systematyczny badań. *Med Rodz* 2015; 2(18): 70-78.
34. Scott D, Wolfe F, Huizinga TW, Rheumatoid Arthritis. *Lancet* 2010, Sep 25; 376 (9746); 1094-108.
35. Smoleńska Ż., Zdrojewski Z.: Odmienności w przebiegu chorób reumatycznych u osób w podeszłym wieku. *Gerontologia Polska* 2010, tom 18, nr 4, 169-175
36. Wasserman A.M.: Rozpoznanie i postępowanie w reumatoidalnym zapaleniu stawów. *Lekarz Rodzinny* 2012, 1
37. Pawlak-Buś K., Dudziec E., Leszczyński P.:Klasyczne leczenie modyfikujące oraz leczenie biologiczne a ryzyko rozwoju nowotworów w reumatologii. *Forum reumatologiczne* 2016, tom 2, 32-38.
38. Staszkiwicz, M., Nawalana, A., Wróbel, A., Majda, A. OCENA SKUTECZNOŚCI OPIEKI OTRZYMYWANEJ OD PIELEŃNIAREK I NIEPROFESJONALNYCH OPIEKUNÓW DOKONANA PRZEZ CHORYCH NA REUMATOIDALNE ZAPALENIE STAWÓW. *PIELEŃNIARSTWO POLSKIE POLISH NURSING*, 2017, 28-33.
39. Marzec, I., Budnik, M., Balcerak, D., Galikowska, A., Ziegler, A., & Olszewska, M. (2016). Wybrane aspekty opieki pielęgniarskiej w opiece nad pacjentem z Reumatoidalnym zapaleniem stawów= Selected aspects of nursing care of patients with Rheumatoid arthritis. *Journal of Education, Health and Sport*, 6(9), 345-356.
40. Kadłubowska, M., Kózka, M., Bąk, E., Fraś, M., & Kudłacik, B. (2015). Zachowania zdrowotne jako determinanta strategii radzenia sobie z bólem chorych z reumatoidalnym zapaleniem stawów. *Probl. Hig. Epidemiol*, 96(1), 175-180.