Osteo-articular diseases have significant presence among general population. Osteo-articular disorders can be caused by disease or by trauma. There are many osteo-articular diseases which have influence on general state of the organism and on other present diseases in a various level. The influence appears by increasing risk of main disease complications, limited movement complicates postoperative treatment of main disease and medicament therapy of osteo-articular disease sometimes modifies perioperative therapy of main disease. Trauma as comorbidity needs urgent care and, in the same time, it is a huge complication for the injured’s condition. Osteo-articular trauma healing usually lasts several weeks, so it prolongs the healing of intercurrent surgical disease. Osteo-articular changes as comorbidity during the acute surgical disease healing need proper preoperative preparing. With the aim to minimise perioperative morbidity and mortality.

Key words: comorbidity, osteo-articular, preoperative preparing, surgery.

INTRODUCTION

Comorbidity has a negative influence on patient’s preoperative condition, on post-operative period, on total recovery and on general health condition1. Generally, more parallel diseases lead to worse health condition and have negative influence on main disease healing2. Osteo-articular diseases have a significant presence among the general population, especially among older people, as a part of an involutive period. Osteo-articular disorders can be caused by disease or by trauma. Presence of disease can be sui generis, can be caused by various ethiological factors (infective, degenerative, tumors etc.) or they may appear as a consequence of injury. Surgical treatment is often the only effective healing and many serious conditions demand urgent surgical treatment. So it is important to view comorbidity through conditions in which surgical operation will be done, through interaction with main disease and through every present disease and their mutual influence. The level of present diseases and their mutual influence make together the specificity of patient’s condition. Some osteo-articular diseases can be important for other diseases healing in many ways. Limited movement of some parts of the spine or extremity caused by contracture, paralise, defect or amputation can have influence on vain-line application (amputation, scars after burns, elbow contracture), intubation application by M. Bechterew, spinal anesthesia application at scoliosis and at various deformities of lumbal spine postoperatively. Osteo-articular diseases can have influence on condition and recovery. The movement ability depends on muscular power, joint mobility and extremities, which is important after every operation. For example, disability to move caused by contracture or by joint anchylosis (total stiffness of the joint) is contraindication for tendon reconstruction if it does not include joint mobility establishing. Logical order is to reach the passive joint mobility and then to reconstructive the tendon. The lumbal spine diseases among over 80 years old population which had an operative treatment implicate the significant increase of complications and mortality. Patients who have three present comorbidities have 20 times bigger mortality risk. The other important factors of postoperative complications among these patients are the fusion level of vertebra substances, blood loss, operation duration and the number of days spent in the intensive care unit3.

OSTEO-ARTICULAR DISEASES

Osteo-articular diseases appear as comorbidity by the most various diseases, but it is possible to have several osteo-articular diseases in the same time. Very often backache, by 34% of adult population can be related with musculo-skeletal disorders, such as rheumatoid arthritis, osteo-
oarthritis and osteoporosis. Ankle pain by patients who have osteoarthrosis on ankle has significant, linear connection with number of musculo-skeletal diseases. Presence of osteo-articular implants is a condition of osteo-articular system after the end of disease treatment and they have influence in diagnostic and in other diseases healing. Various metal implants, such as prosthetic joint implantation and systems for bone fixation are very common and they are difficulty for MR and CT diagnostic.

Osteo-articular diseases classification: congenital anomalies, dysplasia, osteochondrosis, neuromuscular disorders, inflammatory diseases, degenerative diseases, tumors, metabolic diseases, arthropaty.

Congenital anomalies of osteo-articular are numerous, showing big difference in damage, from minor to very complex damage. Anomalies on extremities are often easier to notice. They are classified as isolated anomalies, anomalies among malformation syndroms and anomalies among generalised skeletal dysplasias. As comorbidity, they sometimes point to other organic damage or they are isolated. Congenital heart diseases by children are followed by many other disorders as comorbidity. Orthopaedic diseases are present in 11.6% and among them scoliosis are the most frequent.

Dysplasia are skeletal development disorders. They are shown by insufficient and unproportional development of skeleton and by deformities. They are numerous and they can be epiphysare, metaphysare, diaphysare and primar metabolic abnormalities of Ca, P and carbohydrates.

Osteochondrosis are disorders of chondrogenesis and osteogenesis by bone with previous normal growth. Their cause is unknown and they are temporary. They can appear on spine M. Scheuermann, on upper and on lower extremities (M. Legg-Calve-Perthes).

Methabolic skeleton diseases are related to hormone circulation, vitamin, mineral and other materia circulation disorders. Laboratory results of blood and other body fluids can show changed levels. That is why the main disease and laboratory analysis should be discussed in context of possible comorbidity.

Neuromuscular disorders are neurological diseases with musculo-skeletal system damages. Relation between neurological diseases and osteo-articular changes is often. Neuropathies of peripheral nerves with various causes can be followed by compressive disturbances of osteo-fibrosis structures. Differential diagnosis and separating the causes in these cases can be difficult. Great number of neurological diseases are followed by disorders of musculo-skeletal system: neuromuscular diseases (progressive muscular dystrophy, myotonic dystrophy, multiple sclerosis, M. Charcot-Marie-Tooth, myasthenia gravis), diseases and injuries of peripheral nerves and medulla spinalis. Beside damages of central and peripheral nerve system, neurological diseases are followed by muscular function and mobility damages and by various deformities. Basically, they can be genetic and metabolic disorders, infections, compression processes. The information about some disfunction of locomotory system should be considered solidly.

Inflammatory diseases, by ethology, are classified on infections caused by biological agents, inflammation caused by autoimmune response and caused by other matheria in joints and bones. The most common are bacterial osteomyelit in acute and chronic form. Acute osteomyelit is more often between children and chronic between adult, related to trauma or surgical treatment. By patients with bone and joint implantations infection appears in 1-8%. Typical the clinical picture of osteo-articular chronic infection includes presence of fistula with permanent or temporary secreration. Through exacerbation, this form can transform itself to subacute form. There are also low grade osteo-articular infections, with poor clinical and laboratory findings. Because of that, they may not be recovered for a long time or they can be shown as implant relaxation or migration by noninfective cause. Low grade infection with poor clinical findings can have an influence as comorbidity in particular conditions. When operating procedure with implantation or with insufficiency of immune response is planned, the possibility of operating site infection should be considered. After several weeks and months implant radiographies show bone resorption at the point of bone and implant contact. Larbatorical parameters of inflammation or just some of them are slightly higher.

Chronic bacterial infections of osteo-articular are conditions which reflect on organism state, which are shown in laboratorical parameters Se, Le, CRP, fibrinogen and which significally effect on main disease healing, especially if operative treatment is needed. Because of the obvious and clinically shown bacterial disease, there is a risk of infection in operated area during the whole preoperative period. That is why additional antibacterial protection by antibiogram is necessary. The choice of antibiotic should consider the sensitivity of present bacteria, functional state of host’s organism and possible interaction of medicaments, so the medicaments should be applied. There is additional difficulty with these patients-often resistance of present microorganisms and need for bigger doses and giving two or three antibiotics at the same time.

Rheumatoid Arthritis (RA) is, above all, a chronic, progressive, destructive, systemic inflammatory disease of joints, but it can apper on other tissues of locomotory system, too, and on other organs. In western countries presence of RA is about 10% and it is three times more common among women. As comorbidity, it has importance because of the chronic stream, patient’s need for permanent medication and systemic damages (arthrytis, myocardiopathy, sensomotoric neuropathy, lung infiltration and noduses). Cervical diseases can endanger trachea intubation. Problems can be caused by immobility of some parts of cervical spine and (seldom) by extreme mobility or weakness of the bone. Cervical RA can cause significant destabilization of every segment of cervical spine, especially on the most mobile parts. Bone tissue and joints reduction sometimes can cause greater mobility, subluxation, dislocation and luxation. Luxation can be either atlanto-occipital or intervertebral. This is why the information about cervical disorders and diseases are important as
an alarming comorbidity which preoperatively may need additional cervical diagnostic (Rtg in two projections) and which perioperatively can have influence on anesthesya type and may demand special care of head and neck (positioning, immobilisation). Ankylosis of the whole cervical at M. Bechterew’s, Spondylitis anchylosing makes patient’s intubation difficult. Limited mobility of temporomandibular joint can cause limited mouth opening, which is important for intubation. Fiberoptic method of intubation can be helpful for exceeding these difficulties.

Degenerative Osteo-Articular Diseases are changes which are caused by ageing. Most frequently, chondro ageing are clinically manifested as osteoarthrosis. Characteristics manifestations are joint changes, chondral damages, osteophytes appearance, appearance of subchondral arthrosis and cysts. Patients have painful, limited moves. Osteoarthrosis is very often as comorbidity, especially among older population which grows. Patients take medications often or permanently and alarthritisplasty (especially hip and knee) is often. Osteoarthrosis often appears together with obesity. Increased BMI for 2 units (5kg) increases risk of knee osteoarthrosis for 36%\(^1\)\(^1\). Primar hip alarthritisplasty at overweight people often causes infection as complications. Obesity appears as an independent factor for complications by itself, no matter if there is other comorbidity\(^1\).\(^2\)

Arthropaties are big joints and spine damages, often with deformities and destruction of various etiology. Characteristics are cartilage ruining and subchondral bone growing followed by egzostosis and corpore libera appearance. Neuropathic diseases most often appear with movable and painless joints, despite of present destruction. The opposite, haemophilia includes poor mobility and painful joints. Neuropathic arthropaties are most common at diabetes. Neuropathic joints develop in 10-15% of diabetes patients, most frequently on metatarsal and tarsal joints and on ankle.

Locomotory sistem tumors can be benign and malignant and further they can be primar or secundar. Primary loco- motory tumors are rare and secundary are more common, so the secundary locomotory tumors have bigger importance as comorbidity. Metastatic locomotory tumors sometimes are noticed for the first time when there is a pathological fracture which shows the main disease activity after many years of hidden existence. Intramedulary fixation stabilise pathological fractures whenever it is possible\(^1\)\(^3\).

SECONDARY DISEASES OF OSTEO-ARTICULAR

Osteo-articular diseases which are the consequences of diseases of other organic systems are often. Usually, osteo-articular changes appear in developed stadium of disease, after longer period of disease or as a consequence of disease which is primary not osteo-articular.

Integrity of skin and soft tissues, but also the integrity of the whole body is important for the patient’s complete condition, especially for planned operative procedure. Existence of wounds, ulcerations and decubites can be comorbidity by itself, but most frequently is the complica-
is not too complicated and other disease endangers patient’s life, more rationally approach is to do just the necessary things and to delay the complete reconstruction for later.

Traumatic conditions which are important as comorbidity are bone fractures and wounds. They can appear as comorbidity separately or together. Bone fractures and wounds which are caused by trauma are acute conditions which need pre-hospital healing just as hospital healing and less complicated cases it can be treated non-hospital. Pre-hospital healing of locomotory system injuries, independent of healing of systemic trauma effects includes: hemostasys, wound dressing, immobilization and elevation of injured extremity. The diagnostic and the therapy are important to be done after injuring. The presence of other injuries and diseases need healing by type and kind of disease and injury and by the level in which the problem appears. Osteo-articular injuries can be isolated, multiplicated, complexive, on several bones or parts of osteo-articular. They can include several tissues, organs and organic systems.

**Injury treatment by level of complicity**

Closed fractures:
- bone fracture without dislocation: immobilisation, extremity elevation and relaxation is enough.
- bone fracture with dislocation: reposition and immobilization if it is possible. If not, operative treatment or skeletal traction. If main disease or injury disables operative treatment, traction or immobilization by splint could be done and treatment could be delayed.

Luxation: reposition, immobilization, relaxing and circulation observing.

Wounds without functional disturbance of extremity: surgical treatment of the wound, suture, immobilization (possible).

Open fractures: surgical treatment of the wound, exterior fixation or immobilization or skeletal traction.

Complexive wounds: they spread over various anatomical structures which are important for extremity function or for injured persone’s life (magistral blood vessels): surgical procedure is urgent.

1. surgical procedure could be complete reconstruction of injured structures
2. urgent treatment of injured structures to avoid the possible complications. Surgery includes surgical treatment of the wound, suture and ligature of large blood vessel, exterior fixation of bone fracture or amputation.
3. if there are no conditions for reconstruction because of the local damage or danger for patient’s life, amputation should be done.

Complexive extremity injuries and injuries of other organic systems make order of surgical interventions. Bleeding blockade is primar and ultimative. Reconstruction of blood vessel should be done after hemostasys, surgical treatment of the wound and fracture stabilization, more often by exterior fixation. Dislocated fractures of pelvis ring should be stabilized after exploration of abdominal organs if there is need for it.

Imobilization of extremities and immobility of patients who have osteo-articular diseases have big importance in preoperative preparing and in whole preoperative period, viewing from aspect of possible thromboembolic complications. Thromboembolic disease is one of the most explored problems in last few decades. Numerous risks are differentiated and some of the most important are related to osteo-articular system. As a special favor factors are limited movement or immobility, injuries and conditions after injuries, especially of the lower extremities and pelvis, spinal cord damages and postoperatively at arthroplasty of hip or knee or other bigger surgical procedures on lower extremities, pelvis and spine. Pathophysiological cause of thromboembolic disease related to osteo-articular system is slowing down the vain circulation because of the lack of movement (injury, operation, limited mobility and immobility).

Another cause is damage of blood vessel wall caused by injury, various intraoperative manipulation and possible disturbance of of blood chemism by trauma (shock) or intraoperatively. Medicamental prophylactic therapy of thromboembolic disease is recommended just as physical preventive procedures. Giving the low-molecular heparin is common, having on mind all factors of risk. Physical ways are elastic socks, elevation of extremity over the level of the heart, isometric contractions of musculature, intermittent pneumatic compression, careful intraoperative manipulation, postoperative exercises and movement. Patients who are unable to move because of the osteo-articular trauma, who are surgically treated because of non-orthopaedic cause, are exposed to bigger risk of thromboembolic disease. The cause is the fact that pelvis and low-extremity injuries are the risk by themselves and so is the planned operative procedure, in way which extensivity and duration of surgical treatment make a risk. Extensive surgical procedure, longer duration of operation and manipulation with tissues (traction, squeezing, twisting) make the risk of thromboembolic complications. Postoperatively, isometric exercises of lower extremity or movement of free joints is useful. Possible trauma complication as comorbidity and consecutive mobility, is decubitus appearance by patients with great disorders of metabolism, unconscious condition, plegia or who are in a deep senium.

By elderly patients trauma has a great influence on morbidity and comorbidity. Hip fractures, fractures of femoral neck, intertrochanter and subtrochanter fractures are typical. Older people with hip fracture, who are operated immediately after the injury in 30-50% develop changes of cognitive function. The leading opinion is that these patients should be operated in period of the first three days so the recovery can be more successful. Comorbidity is the main factor for survival of this patients. The level of mortality during the hospitalisation is 4%, 16% in first 4 months and 38% in 24 months. The positive predictive signs are ASA score and cognitive disfunction. Patients over 60 years who are operated because of the hip fracture have mortality risk of 9.6% in first 30 days and risk of 33% in first year. Three or more preoperatively comorbidities are significantly bigger risk of mortality. The most
common complications are heart weakness and lung infection. Fractures of the hip area at older patients are the great risk of mortality, even despite the right timed surgical treatment. This is typical and often trauma by older people and there are many informations about possible complications. There is analogy with other diseases in which lower extremity fractures appears as comorbidity.

**MEDICATION OF CHRONICAL OSTEO-ARTICULAR DISEASES**

It includes applying of analgetic, anti inflammatory, anticoagulative, immunosuppressive and antibiotic therapy. Chronic therapy by patients with osteo-articular changes should considere possible interaction with perioperative medication.

NSAID analgetic therapy should be stopped 5-7 days before the surgical procedure to prevent bigger or prolonged intraoperative bleeding. By earlier opinion, NSAID, especially salicylates should be stopped 2-3 weeks before the operation, but it has changed. Lately, there are opinion that NSAID therapy should be stopped about 7 days before the operation. Aspyrine could cause greater bleeding because of antiaggregation effect, so its stopping 5 days before the operation is recommended. It is not necessary with COX-II inhibitors.

Immunosuppressive therapy (sulphosalazine, methotrexate) have influence on increasing risk of infection and slow wound healing, so it is recommended in perioperative period, 1-2 weeks before the operation and 1-2 weeks after the operation to exclude methotrexate and other immunosuppressives. This medicaments are useful at osteo-articular diseases which, basically, have auto immune mechanisms for disease appearance (rheumatoid arthritis, re-active arthritis, psorhiastic arthritis). Giving sulphosalazine together with anti bacterial therapy could reduce the sulphosalazine conversion in its active metabolites. Methotrexate is generally contraindicated with bigger doses of NSAID.

Glucocorticoides are often applied medicaments in orthopaedic diseases (rheumatoid arthritis, bursitis, tenosynovitis, lumboishialgia etc.). Synthetic derivates of glucocorticoides could be given to patients in one single dose, interminent or for a longer period of time. Every glucocorticoid therapy during previous period of one year requires supplementation of glucocorticoides during the preoperative period because of the perioperative stress. Unwanted effect of glucocorticoides is significant, especially when therapy is prolonged. Unwanted influence on bones appears as osteoporosis and possible stress-fractures caused by insufficiency of the bone. Corticoides can disturb tissue regeneration, so the postoperative taking of corticoides is not recommended.

Patients with orthopaedic comorbidity take antibiotics in cases of soft tissue infection, infection of bones and joints and also, profilactically, in cases of traumatic wounds and open fractures. Patients with artificial joint implants are under risk of hematogenic infection of joint replacements if some other infection exists in organism. If there are implants in organism, all acute infection should be intensively healed, just as chronic infections anywhere in organism. If there is trauma which includes one or more wounds and open fractures, antibiotics are given profilatically. When patients with osteo-articular trauma are operated, no matter if there are wounds or not, antibiotics are given perioperatively in aim of profilaxis. Antibiotic appliance should be considered from the aspect of influence on cause of the infection, interraction on other antibiotics and other medicaments and from the aspect of influence on other organs. For example, aminoglycosides accentuate and prolong the effect of muscle relaxants.

Thromboprofilatic therapy is a common part of therapy in ortopaedic patients who are immobile because of disease, operation or injury of osteo-articular system. Factors of risk are considered and they determine the therapy. Low molecular weight heparin, vitamin K antagonists, non-fractional heparin, Acetyl salicylate acid and new oral inhibitors of coagulation factors, dabigatran etexilate and rivaroxaban are available. Low molecular weight heparin giving starts at the beginning of therapy and on operation day and should be turned off perioperatively during the 24 hour period. It continues postoperatively to the 35th day. New oral inhibitors of coagulation factors should be given once a day and do not recquire laboratorical screening, which is a significant advantage.

**CONCLUSION**

Trauma appears as an acute state, and complications and consequences appear as a chronic state. Most of the osteo-articular diseases are often between general populati-on, especially among older people and trauma is more often among young people, comparing to degenerative diseases. Because of their chronical stream, osteo-articular diseases are more often as comorbidity. The importance of these states as comorbidity shows up as influence on whole organism’s state, as influence on main disease and perioperative medication.

**SUMMARY**

**BOLESTI KOŠTANO - ZGLOBNOG SISTEMA KAO KOMORBIDITET U NEORTOPEDSKOJ HIRURGIJII**

Oboljenja koštano-zglobnog sistema (KZS) su u značajnoj meri prisutna u opštoj populaciji. Pored određuju funkcije koštano-zglobnog sistema u njihova javljanja zbog oboljenja ili traume. Brojna su oboljenja KZS koja u različitom stepenu utiču na ukupno stanje organizma, ali i na druga prisutna oboljenja. Uticaj se ispoljava većim rizik za nastanak komplikacija aktuelnog hirurškog oboljenja, ograničena kožnoentricnost dodatno komplikuje postoperativni tok aktuelnog hirurškog oboljenja, a i medicamen-tozna terapija koštano-zglobnog oboljenja nekad modifi-kuje postoperativnu terapiju osnovne bolesti. Trauma kao komorbidity, zahteva često neodložno zbrinjavanje, a istovremeno dodatno veoma komplikuje stanje povredjenog. Lečenje traume KZS najčešće traje više nedelja, te je tako i uticaj na lečenje interkurentnog hirurškog oboljenja prolongiran. Promene na KZS kao komorbidity u toku lečenja akutnog hirurškog oboljenja iziskuju adekvatni
preoperativnu pripremu, kako bi perioperativni morbidiitet i mortalitet bili minimizirani.

Ključne reči: komorbiditet, koštano-zglobni sistem, preoperativna priprema, hirurgija

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