MINISTRY OF HEALTH OF UKRAINE

O.O. BOHOMOLETS NATIONAL MEDICAL UNIVERSITY

Foot deformities:
Flat feet, valgus deviation of the first finger of foot, hammer toe
Classification, clinic, diagnostics and treatment.

WORKBOOK

for independent work of the 5th year students
educational discipline "Traumatology and Orthopedics"
directions "Medicine"
specialty "Curative care"
Department of Traumatology and Orthopedics

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Introduction

One of the effective means of organizing an independent work of students on topics of disciplines assigned for independent study is the work of a student with his/her workbook. Work with the workbook should begin with the acquaintance with the key issues on the topic. The next step includes the acquaintance with the list of sources from which the student can find the answers to the posed questions. For more deep study of the problem students can visit professional websites.

Having become acquainted with the theory, the student needs to assess his/her degree of mastering the material. In this regard, he/she resolves the proposed tasks; answers test questions on the topic. Students should pay particular attention in preparing for classes to the required minimum of practical skills to be mastered. In the relevant sections of textbooks, manuals, he must glean the information that he needs for mastering further practical skills.

Arrangement of independent work with the use of workbook is conducted as follows: tutor provides the workbook to a student in digital format (to be downloaded from website of the Department), or in printed version; later the students do the tasks at their extra-curricular time, whereupon the tutor checks and assesses them **at the initial stage of practical classes.**

Criteria for assessing the tasks in the workbook

Each task requires a separate approach when assessing the quality of its implementation under particular criteria. And yet, with a 5-point evaluation ranking for each type of tasks, one should observe the general didactic criteria, namely:

"5" is graded when the student:

1. Executed the work w/o errors and deficiencies.
2. maximum one deficiency.

"4" is graded when the student executed the work in full but made:

1. maximum one gross error and one deficiency.
2. maximum two deficiencies.

"4" is graded when the student executed at least one half of a work correctly or made:

1. maximum two gross errors or one gross and one mild errors and one deficiency.
2. maximum two mild errors or one mild error and three deficiencies.
3. In the lack of errors but when four or five deficiencies are available.

"2" is graded when the student made:

1. number of errors (deficiencies) exceeding the limit when grade "3" could be applied.

2. In case less than half of work is completed.
3. Failed to start the work.

Theme for student self-study

Flat feet, valgus deviation of the first finger of foot, hammer toe Classification, clinic, diagnostics and treatment.

The overall goal: to study the causes of acquired and congenital foot diseases, obtain the methods of differential diagnosis, methods of treatment and prevention.

Purpose (learning objectives):

1. Learn the structure and causes of the most common deformities of feet.

2. Obtain the clinical anatomy and biomechanics of the foot, and phylogenetic, ontogenetich features of the structure and development of the foot.

3. Learn the classification of acquired and congenital diseases of the feet.

4. To study the etiopathogenesis of congenital and acquired foot diseases.

5. To obtain differential diagnostics of congenital and acquired foot diseases.

6. Be able to justify the indications for conservative and operative treatment methods.

7. To be able to interpret radiographs in congenital and acquired foot diseases .

8. To learn the basics of prevention, medical and social rehabilitation.

9. To know the timing of temporary disability after conservative and surgical treatment of congenital and acquired foot diseases.

The student should know:

1. Definition of the concept of "flat foot".

2. Definition of the concept «Hammer toe».

3. Definition of nosology « hallux valgus »,« hallux varus »,« hallux rigidus »,« pes eqinovarus ».

4. Classification of flat feet in degrees.

5. Methods of diagnostics of a flat foot: podography , plantography , plantodinamometry .

6. Principles of prevention, conservative and surgical treatment of foot deformities, indications and contraindications of their use.

The student should be able to:

1. Analyze a typical clinical picture of foot deformities.

2. Analyze X-ray images, provide angulometry.

3. Justify the most effective way of treatment.

4. To conduct differential diagnostics for various types of deformities of the feet .

Basic terms and a block of information on the topic.

Term	Definition
Flat foot (pes planus)	Change of the shape of the arches of the foot, is accompanied by the loss of its amortizing (spring) functions. Various forms of flatfoot affects about 45% of all adults. Flat foot is a foot deformity characterized by fixed compaction of the longitudinal arch, valgization of the posterior part and abduction of the anterior part . The longitudinal flatfoot has three degrees of deformation: I degree - fatigue of legs and pain in the calf after a long walk; II degree - pain syndrome, there are signs of deformation of the foot; III degree - pronounced flat feet: deformation of foot with expansion and pronation of middle and posterior section, the anterior part lateralized and with attitude to posterior is supinated. In bilateral flatfoot anterior parts of foot turned aside. The walk is awkward, running is difficult. Quite often the longitudinal flatfoot is combined with the flattening of the transverse arch of the foot, then a longitudinal-transverse flatfoot is formed. There are congenital (extremely rare) and acquired flat feet. Acquired flatfoot is divided into static , rachitic, traumatic and paralytic. The most common is static flat feet (40-50% of the adult population). Static flat feet develop due to chronic overload of feet, leads to weakening of muscle strength and stretching of ligamentous apparatus of the foot joints , resulting in a flattenedlongitudinal arch of the foot. Often occurs in persons performing work associated with long-term standing or lifting and carrying loads . Factors in the onset and progression are growth

	acceleration, obesity, pregnancy, decreased strength of foot muscles due to aging. Clinic. The pain is felt after loading in various parts of the foot, in the calf muscles, knee and hip, in the lower back. Diagnostics. To determine the degree of flatfoot provides plantography, podometry and X-ray. Plantography - is a process of obtaining the foot prin. Acquired plantogram is separated by a straight line passing through the center of the five and between bases of the phalanges of the third and fourth fingers. When the normal foot is painted over, the part in the middle section does not extend beyond the line. Friedlane 's podometry. The height of the foot is measured (the distance from the floor to the upper surface of the rook of the spinal cord), the length of the foot (from the tip of the 1st to the back of the foot). The height of the foot is multiplied by 100 and is divided by the length of the foot. Index is developed, which normally is 31-29, with flat feet - 29 -27, less than 25 - with severe flatfoot. X-ray of the foot bones is recommended when load - standing. On the profile X-ray, two line are drawn: one from the middle of the lower surface of the scaphoid to the fulcrum of the calcaneus , the second from the same point to the lower surface of the I metatarsal head. Normally, an angle of 120 ° is obtained, the height of the arch is 39-37 mm . I degree of flatfoot = angle is 140 °, the height of the arch is less than 35 mm, II st. - 150-155 °, the height of the arch is 25 mm III st. - 170 °, arch height less than 25 mm. Treatment of foot deformities begins with the prevention of flat feet in children recommended dosaged physical exercises, preventing excessive overload, wearing rational shoes. At I st. conservative therapy is carried out - special gymnastics, warm baths, massage, arch supports, at II st. - deformation correction, individual insoles, shoes, massage, exercise therapy, myostimulation; at III degree - treatment is the same, as at II item, and also operative treatment is provided. Surgery is performed on soft tissues or on the bone- joint apparatus of the foot. With flat feet of II-III degree, deformation of the foot is eliminated by modeling correction, but it quickly returns to its former position, and then the operation on soft tissues is performed . The plaster cast to the middle of the thigh

	is applied for 4-5 weeks . After therapeutic physical training and massage, it is mandatory to wear instep or orthopedic shoes. When the bone form of static flat feet (flat- valgus foot), a wedge resection of the foot bones in the region of the apex of the arch (the base of the wedge is facing downwards) . After the wedge resections of the foot bones , its deformation is eliminated, the tendon of the long fibular muscle is transplanted to the inner edge of the foot. If necessary closed Z-shaped achillotomy added. The cast is applied for 6-8 weeks.Required wearing of orthopedic shoes.
"Hallux valgus" (HV)	The valgus deviation (deformation) of the first toe of the foot, as a rule, develops as a result of static overload of the forefoot and is a consequence of transverse flattening (transverse spread of the foot). More often this disease occurs in women, about 20 times more often than in men . Provoking factors are considered hereditary weakness of connective tissue (its characteristics are hypermobility of joints, varicose veins, accomodation - myopia, certain types of spinal deformity, etc.) However, the main factors which contribute to the development of flatfoot and hallux valgus finger is overweight, long walking on high cuffs , in tight shoes, in shoes with narrow noses, in shoes not in size, long static loads . Almost always HV combinyd with spreading of anterior part of the foot, with significant deviations, one finds hammer toe (2 finger). Painful deformities of the fingers and an increase in the latitudinal dimensions of the foot cause the patient to use shoes, bigger by 2-3 sizes. In orthopedic examination in half times you can show unmentioned genu valgum , recurrence in the knee or scoliosis. HV is typical for women, asharp progression of deformation is noted after 35 to 40 years. There is also a youth hallux valgus , deformation is congenital and progresses during puberty. In these cases hallux valgus is one of the manifestations of a systemic disease of the skeleton or neuromuscularsystem. Causes and pathogenesis are unknown. There are many theories of development of valgus deviation of the 1st finger. DIAGNOSTICS. This disease is classified according to the age at which it first appeared, and also depending on the degree (severity) of the deformation that distinguish III degrees. They are determined on the basis of the analysis of X-ray with the top in

	the load . The act of treatment is selected for each particular patient only after a detailed clinical, laboratory and radiological examination. The choice of conservative or surgical treatment depends on a number of factors: sex , age, degree of deformity, the severity of degenerative-dystrophic changes in the metatarso- phalangeal joint and other joints of the experiment, pain syndrome and inflammation, and the vascular and trophic disorders of the lower limbs, the character of work, etc. TREATMENT. Conservative treatment usually does not provide for the elimination of deformation, and is aimed at preventing its progression, prevention or treatment of inflammatory and degenerative processes in the first metatarsophalangeal joint, correction of flat feet with usage of individual orthopedic insoles and shoes, improved blood circulation and maintenance of muscle tonus in the experiments and shin count of massage, exercise therapy, water and physiotherapy procedures. With regard to surgical treatment, it is important to note the following: in a number of screening studies it has been shown that when primary treatment with the goal and the desire of patients to perform surgery on hallux valgus after a detailed examination, a valid surgery has been shown in only 20% -25%. Today there are more than 200 different methods of surgical interventions of HV. A number of them have only historical significance, but not less than 15-20 are actively used by surgeons . In the selection of the procedure of operation, as mentioned above, is determined by a significant number of factors. Totatl characterisation to the methods of operative treatment of hallux valgus, it should be noted that they are divided into an intervention just on soft tissues (joint capsule, muscle tendons, ligamentous apparatus , etc.), as well as soft tissue interventions along with corrective osteotomy of the foot bones that are aimed at correcting the position of the bones of the foot, biomechanical axis of joints and prevention of recurrence of deformity. Osteotomy are divided into proximal and distal. A variant of the distal osteotomy presented by chevron osteotomy, in some cases, the procedure effectively allows to sufficiently remove deformation and to restore the biomechanics of the deformed foot. Very important is postoperative rehabilitation, compliance with doctor's recommendations, wearing special or individual orthopedic footwear, orthopedic insoles, exercise

	therapy, etc.
Plantography	Plantography is a technique for obtaining from feet prints in the posture of a natural human standing on a special instrument - planograph -with their subsequent interpretation, preparation of conclusions and appropriate recommendations.
Hallux varus	Hallux varus - deformation of 1 finger , inverse to hallux valgus. Almost always hallux varus is about the complication after surgicaltreatment BB1 P. In addition to cosmetic defect patients are concerned about pain and inconvenience when using shoes.
Hallux rigiduss limitus	Hallux rigidus s. limitus . Contracture 1 of the matatarsophalangeal joint in neutral position. Disease is initiated in adulthood when trauma of the dorsal part of the articular surface of the head and metatarsal bone.Another reason is the aseptic necrosis of the metatarsus head 1 as a manifestation of decompensation in metatarsus primus elevatus , pronated foot with too long metatarsal bone. With the passage of time develops deforming arthrosis with formation of osteophytes in dorsal surface of the head.
Hallux flexus	Hallux flexus . In most cases, the flexural contracture and of the flattened joint is a consequence of hallux rigidus
Hammer toe	Hammer toe is called the pathological flexion of the fingers in the proximal interphalangeal joint. Deformation can be flexible or fixed, with a prolonged anamnesis of the metatarsophalangeal joint takes a stable extension position. Distal metatarsophalangeal remains unchanged, although in some cases can develop flexive of extensive contracture. Etiology is unknown, most often affects the 2 finger , often in combination with a valgus deviation of the 1 toe. Clinical manifestations of the disease are in the form of deformation, three painful points with the formation in their projection of corns - dorsal surface proximal interphalangeal joint, under the edge of the nail plate, under the head of metatarsal bone.
Mallet toe	Mallet toe is characterized by flexural contractures in the distal interphalangeal joint without or in combination with flexive contracture of the proximal interphalangeal joint. The cause of the mallet toe is unknown, most often affects 2 fingers. On feet with normal sensitivity, a characteristic complication is the development of the horny build-up under the nail plate.
Claw toes	Claw-like deformation of the fingers (clawtoes) . Loss of the active function of the interosseous muscles of foot leads to the

	formation of claw-like deformations.

Literature.

Basic:

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2. Sklyarenko E.T. Traumatology and orthopedics . - To . : Health , 2005 328p.

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4. Bitchuk D.D., Istomin A.G., Khimenko M.F. Maryuhnich S.A . Traumatology and orthopedics. Collection of test tasks for non-auditing preparation of students for licensed ispirations Step-2. - Kharkov : KDMU, NTU "KPI", 2004. - 224p.

5. Buryanov A.A., Skliarenko E.T., Voloshin O.I. , Zadnichenko M.A., Kvasha VP, Grek V.P. Traumatology and orthopedics . Guide for practical classes. Kiev . Book a- plus.

Additionally:

1. Olexa A.P. Traumatology and orthopedics. -K . : Highschool, 1999.-511s.

2. Trubnikov V.F. Diseases and trauma of the musculoskeletal system . - To . : Health , 1984. - 328s.

3. Ankin L.N. Practice of osteosynthesis and prosthetics . Kiev , 1994. - 304s.

4. Trubnikov V.F., Istomin G.N. First medical aid for victims with traffic accidents. Kharkiv: Osnova, 1991-121c.

Assignments for the independent work of the topic (to be answered in written)

1. Patient in childhood suffered from an infectious disease. For a long time patient could not walk. Since time, the resistance of the lower limbs has partially recovered. When examined, pronounced hypotrophy of the soft tissues of the left thigh and lower leg, active plantar flexion of the foot is impossible. The front part of the foot does not participate under load, the angle between the axis of the shank and foot is 60 degrees. The heel seems enlarged due to thickening of soft tissues

and skin. When walking, the load is only on the heel, the homogeneity of its surface.

1. What disease has the patient suffered?

2. What is the name of the deformation of the foot?

3. What causes deformation?

4. Treatment plan.

2. A patient of 40 years complains of pains in the feet, which are intensified in the evening . On examination: the front parts of the feet are open, the first fingers are deflected laterally to 45 degrees, the metatarsal bones are inclined to the plantar side, deformed, on the plantar surface of the feet at the level of the heads, painful calluses, hammer toe (II-V), on the back surface of the interphalangeal joints of the callus.

1. What is your clinical diagnosis of the disease?

2. The causes of the formation of deformities of the feet.

3. Treatment plan

3. A patient of 35 years complains of pain in the area of feet, legs , rapid fatigue of legs, inability to wear ordinary shoes. On examination: the longitudinal dimensions of the feet are shortened, the vaults are recessed, the forefoot of the feet are opened. heads of metatarsal bones rejected plantar side, I-IV fingers in position under the dislocation in the rear, flexed in interphalageal joints to 90*. Calluses on the plantar surface.

1. Describe the deformation of the feet, the reasons for its occurrence.

2. Justify the treatment plan.

Tests

1. What anatomical structures are included in the Chopar joint ?

A. Subtalar joint.

B. Talus-navicular joint

S. Calcaneal-cuboid joint

D. Scaphoid-wedge joints I, II, III

E. Cuboid-metatarsal joints IV, V

2. What structures forms the Lisfranc joint ?

A. Subtalar joint.

B. talus-navicular joint

S. Calcaneal-cuboid joint

D. Scaphoid-wedge joints I, II, III

E. cuboid- metatarsal IV, V

3. How many degrees of flatfoot are isolated?

A. 2

B. 3

C 4

D. 5

4. The height of the longitudinal arch of the foot with flat feet III st. is?

A. 15-25 mm

B. 39-37 mm

C. 35-25 mm

D. 45-40 mm

5. With flat feet of the second degree, a metatarsal-navicular-calcaneal angle is:

A. 120-139

B. 140-149

P. 150-169

D. 170-180

E. 180-200

6. Surgical treatment of flat feet is shown when the metatarsal-navicular-calcaneal angle

is:

A. 120-139

B. 140-149

P. 150-169

D. 170-180

E. 180-200

7. The arch of the feet are formed at the age of:

A. 6 months.

B. 2 years

C. From the age of 7

D. 15 years