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**PLACE OF INJURIES OF ELBOW
JOINT IN THE STRUCTURE
OF PRIMARY PERMANENT DISABILITY
AMONG UKRAINIAN POPULATION**

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Key words: *elbow joint, consequences of injuries, primary permanent disability in Ukraine, population study*

Ключові слова: *ліктьовий суглоб, наслідки травм, первинна інвалідність в Україні, популяційне дослідження*

Abstract. Place of injuries of elbow joint in the structure of primary permanent disability among Ukrainian population. Naumenko L.Y., Zub T.O., Mametyev A.O. *Despite the rapid development of orthopedics consequences of elbow injuries have a significant proportion of unsatisfactory treatment results until now. Owing to comprehend the sources of disability doctors could determine drawbacks of treatment and regulate rehabilitation program for patients with elbow injuries better. The purpose of the study was to investigate the structure of primary permanent disability due to elbow injuries among the Ukrainian population. The study was made on annual reports of Regional centers of medical and social expertise and the Center of medical and social expertise of the city of Kiev for 2018. During the reporting period a disability group due to upper extremity injuries was established totally for 1 211 patients in age over 18 years, among them 195 people had consequences of elbow traumas. That caused an intensive prevalence rate of 6.22 cases per 1 million of adults. Male patients (70.8%) and patients in working age (94.9%) prevailed among people with disability. 10.8% of patients were determined as people with disability without a revision period after the primary examination on medical and social expertise commission. The causes of primary permanent disability were domestic injuries (90.8%), occupational injuries (5.0%), injuries during military service and battle injuries (2.1%) and disability since the childhood (2.1%). Structure according to disability groups showed the next distribution: 90.3% – the 3rd group, 9.2% – the 2nd group and 0.5% – the 1st group. Consequences of elbow injuries which led to primary permanent disability were caused by bone fractures (61.5%), elbow contractures and elbow ankyloses (19.0%), injuries of an ulnar nerve (8.7%), traumatic amputation at the elbow level (6.2%), forearm dislocations (3.1%), open wounds of elbow (1.0%), elbow ligaments ruptures (0.5%). Patients registered as disabled with a revision period during the first examination on commission had sufficient rehabilitation potential for restoration of elbow joint function and one of the upper limb in total.*

Реферат. Місце травм ліктьового суглоба в структурі первинної інвалідності населення України. Науменко Л.Ю., Зуб Т.О., Маметьєв А.О. *Незважаючи на бурхливий розвиток травматології та ортопедії, наслідки травм ліктьового суглоба досі мають великий відсоток незадовільних результатів лікування. Розуміння причин інвалідності допоможе визначити недоліки лікування та регулювати програму реабілітації пацієнтів з пошкодженнями ліктьового суглоба. Мета роботи – вивчити структуру первинної інвалідності внаслідок травм ліктьового суглоба серед населення України. Робота виконана за матеріалами звітів обласних центрів медико-соціальної експертизи та міського центру медико-соціальної експертизи м. Києва за 2018 рік. Загалом за звітний період первинно групу інвалідності внаслідок травм верхньої кінцівки було встановлено 1 211 особам у віці старше 18 років, серед них 195 осіб з наслідками травм ліктьового суглоба, таким чином, інтенсивний показник поширеності становив 6,22 випадка на 1 млн дорослого населення. Серед визнаних особами з інвалідністю переважали пацієнти чоловічої статі (70,8%), працездатного віку (94,9%). 10,8% пацієнтів отримали групу інвалідності без терміну переогляду. Причиною інвалідності в 90,8% була побутова травма, у 5,0% – виробнича травма, по 2,1% випало на травму, пов'язану з проходженням військової служби й захистом Батьківщини, та інвалідність з дитинства. Розподіл за групами інвалідності був таким: 90,3% – 3 група інвалідності, 9,2% – 2 група та 0,5% – 1 група. Наслідки травм ділянки ліктьового суглоба за видом травмованої структури мали такий розподіл: переломи суглобових кінців кісток (61,5%), контрактури й анкілози ліктьового суглоба (19,0%), післятравматична невропатія ліктьового нерва (8,7%), ампутації на рівні ліктьового суглоба (6,2%), вивихи передпліччя (3,1%), рани ділянки ліктьового суглоба (1%), пошкодження зв'язок ліктьового суглоба (0,5%). Пацієнти, яким групу інвалідності при первинному огляді на медико-соціальній експертній комісії встановлено з терміном переогляду, мали достатній реабілітаційний потенціал, який дозволить їм відновити функцію ліктьового суглоба та верхньої кінцівки в цілому.*

Injuries of elbow joint occupy a leading position among the upper limb traumas. Fractures of elbow region make about a third part of all fractures of upper limb, often cause to unsatisfactory results of treatment and in 18-29 % of cases injured people are recognized as disabled [1, 2]. The main reasons of that are a complex anatomy of bone and soft-tissue structures, a long period between trauma and surgery, diagnostic, tactical and technical mistakes during the surgical intervention [1], prolonged immobilization and propensity to heterotopic ossification which lead to early development of elbow stiffness [2, 3].

An anatomical feature of the elbow joint is rather thin coat of soft tissues around the bone ends those ones provide both movements in ulnohumeral articulation and supination and pronation of the forearm.

Thereby injury of elbow can lead to significant impairment of the wrist joint and hand function.

Despite the numerous scientific papers which were dedicated to elbow injuries and methods of their treatment, the problem of permanent disability determination for these traumas was not investigated enough [2, 4]. Studying of primary permanent disability structure could help orthopedists to reveal severe injuries which caused permanent disability the most often and those ones which regarded by doctors as minor for treatment and thus are treated improperly. Also understanding of permanent disability reasons could assist in regulation of rehabilitation program for patients with elbow injuries.

The purpose of the study was to investigate the structure of primary permanent disability due to elbow injuries among the Ukrainian population.

MATERIALS AND METHODS OF RESEARCH

The study was carried out on materials of the State Institution 'Ukrainian State Scientific Institute of Medical and Social Problems of Disability'. Data were received from annual reports about disability due to upper extremity injuries of Regional centers of medical and social expertise (disability determining centers) of city of Kiev and 24 Ukrainian regions, including parts of Donetsk and Lugansk regions which subordinate to Ukraine.

The research was conducted in accordance with the principles of bioethics set out in the WMA Declaration of Helsinki – "Ethical principles for medical research involving human subjects" and "Universal Declaration on Bioethics and Human Rights" (UNESCO).

Disability connected with the elbow region was studied in deep with using separate reports of centers of medical and social expertise. Patients were distributed into groups by age (under 39 years, 40-60 years, over 60 years), by gender, by cause of disability (domestic, occupational, injuries during military service and battle injury and disability since the childhood), by disability group (the 1st, the 2nd, the 3rd), by determination of the period of review (with or without one) and also by diagnosis according to International Classification of Diseases-10. Such traumas as fractures of the distal humerus and fractures of the proximal ulna and proximal radius, dislocations of a forearm and isolated ones of a radial head, soft tissues injuries particularly contusions, wounds, tears of elbow joint ligaments, injuries of ulnar nerve, elbow crushing, traumatic amputations of the elbow and consequences of elbow injuries e.g. elbow stiffness and elbow ankylosis were referred to the elbow region injuries.

Statistical analysis was performed using methods of descriptive statistics those are implemented in the STATISTICA 6.1 software (by StatSoft Inc., SN AGAR909E415822FA). Relative values were calculated (fraction of all injuries, injuries of upper extremity and its segments those caused disability during 2018) with 95 % Confidence Interval (-2M; +2M). If the lower Confidence limit was less than 0 the Confidence Interval was found as statistically unreliable one and we did not give it after relative values. Also the intense prevalence rates of the listed injuries per 1 million of adults were calculated [5].

RESULTS AND DISCUSSION

On the 1st of January 2018 population of Ukraine was 38 486 392 people, among them 31 361 687

people were at the age over 18 years (adults) and 22 436 027 of them were at age between 18 and 60 years (working age) [6]. In our calculations we used number of adults because these people had being observed with centers of medical and social expertise.

Total number of disabling traumas (rank S and T by International Classification of Diseases-10) which led to primary permanent disability in 2018 was 13 571 cases (prevalence 432 per 1 million of adults). Among them the number of upper limb injuries was 1 211 cases (8.9 (8.4; 9.4)%) and 195 cases were related to elbow region injuries (1.4 (1.2; 1.6)% of all traumas, prevalence 6.22 per 1 million of adults). In spite of such a small proportion in the whole structure injuries of elbow region have a great social significance. Moreover they can restrict an ability to work and self-service and decrease the quality of life.

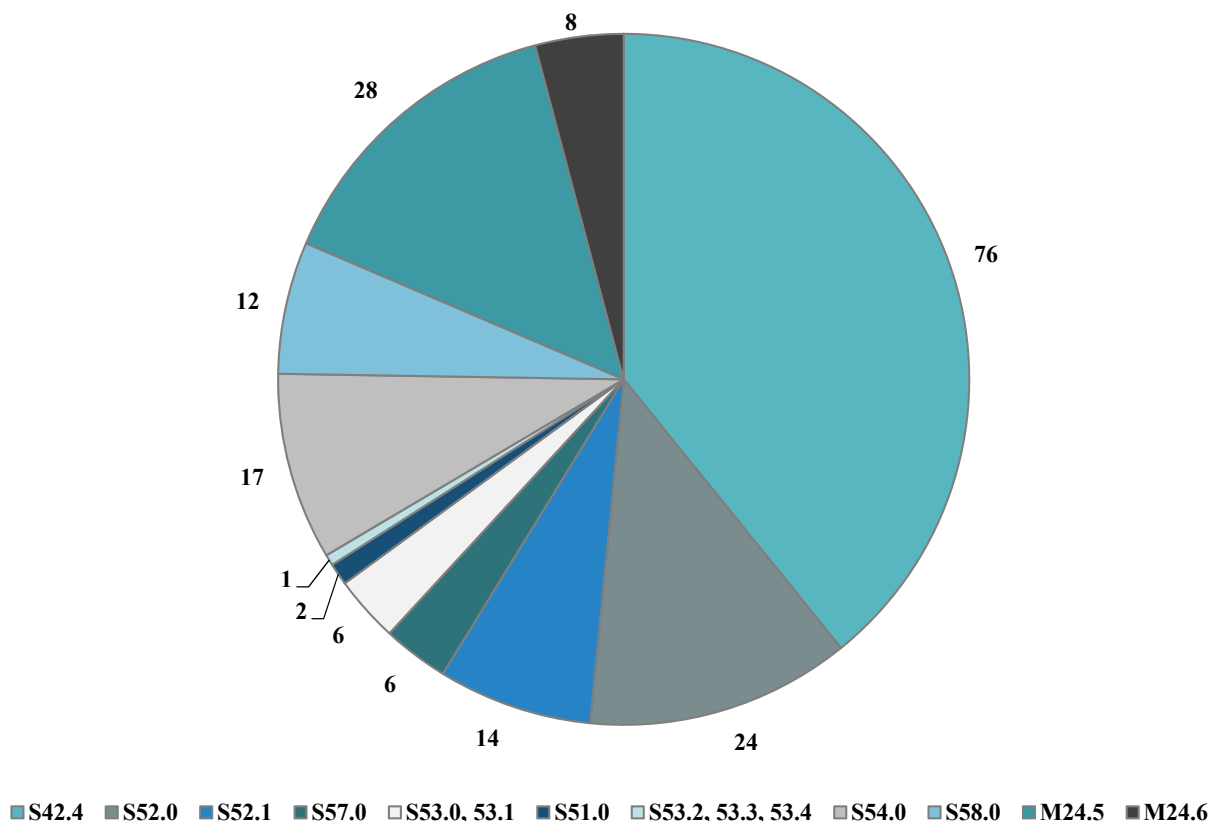
Among 195 patients there were 138 (70.8 (64.3; 77.3)%) male patients which is common for all injuries of the upper limb [7]. In 2018 a proportion of working age people with disability was 94.9 (91.7; 98.1)%, also proportion of people aged under 39 years was 30.2 (23.6; 36.8)%. 10.8 (6.4; 15.2)% of patients were registered as primary permanent disabled without a review period because they had irreversible changes of anatomy or function of elbow joint. The causes of primary permanent disability were domestic injuries (90.8 (86.7; 94.9)%), occupational injuries (5.0 (1.9; 8.1)%), injuries during military service and battle injuries (2.1 (0.1; 4.2)%) and disability since the childhood (2.1 (0.1; 4.2)%). Distribution according to disability groups had the following form: 90.3 (86.1; 94.5)% – the 3rd group, 9.2 (5.1; 13.3)% – the 2nd group and 0.5% – the 1st group of disability. Prevalence of the 3rd disability group could be explained by the unilateral elbow lesion which leads to moderate restriction of vital activity [8]. The 2nd disability group is caused by bone non-unions which included the elbow injury and other organic lesions in cases when their combination resulted in the severe restriction of vital activity [7].

Distribution in the group according to a clinical diagnosis is worth considering separately (Figure).

Consequences of bone fractures in the elbow region took 61.5 (54.5; 68.5) % (120 cases, prevalence 3.82 per 1 million of adults) in the structure of primary permanent disability. 37.9 (31.0; 44.8)% of them were presented by fractures of distal region of humerus (S42.4), 13.3 (8.4; 18.2)% – by fractures of upper region of ulna (S52.0), 7.2 (3.5; 10.9)% – by fractures of proximal region of radius (S52.1) and 3.1 (0.6; 5.6)% – by crushing injuries of elbow (S57.0). Proportion of elbow fractures in the structure of humeral and forearm fractures was calculated.

Fractures of the distal region of humerus made up 33.2 (26.9; 39.5)% of all humeral fractures (74 among 223 cases) and proximal forearm fractures – 38.5 (29.0; 48.0)% of all forearm ones (40 among 104 cases). Concerning crushing injuries of the elbow (S57.0), proportion of these injuries made up 85.7 (59.2; 112.2)% of all upper limb crushing in

2018 in Ukraine (6 of 7 cases). Totally 30.6 (25.9; 35.3)% (120 of 392) of upper limb fractures were presented by the elbow region fractures. These calculations evidenced that bone fractures in the elbow region took the leading position among the disabling injuries of the upper limb.



Structure of primary permanent disability because of elbow region injuries according to a clinical diagnosis by International Classification of Diseases-10 in medical documentation of medical and social expertise commissions: S42.4 – fracture of distal region of humerus; S52.0 – fracture of proximal region of ulna, S52.1 – fracture of upper region of radius; S57.0 – crushing injury of elbow; S 53.0 – dislocation of radial head, S 53.1 – dislocation of elbow unspecified; S51.0 – open wound of elbow; S53.2 - traumatic rupture of radial collateral ligament, S53.3 – traumatic rupture of ulnar collateral ligament, S53.4 – sprain and strain of elbow; S54.0 – injury of ulnar nerve at the forearm level; S58.0 – traumatic amputation at the elbow level; M24.5 – contracture of joint; M24.6 – ankylosis of joint

On the other hand our study proved that soft tissues injuries also can be disabling. In particular during 2018 dislocation of radial head and dislocation of elbow (S53.0 and S 53.1) led to primary permanent disability in 3.1 (0.6; 5.6)% of cases, open wounds of the elbow (S51.0) – in 1.0%, traumatic ruptures of elbow ligaments (S53.2, S53.3, S 53.4) – in 0.5%.

In 17 cases (8.7 (4.7; 12.7)% prevalence 0.54 per 1 million of adults) of injuries of ulnar nerve (S54.0) were the cause of primary disability. Ulnar neuropathy leads to restriction of hand function due to

excluding interosseus muscles, lumbrical muscles and thumb adductor function and in such a way decreases possibility of hand grips and restricted pinching and holding of things between tips of the thumb and II-V fingers [9].

Traumatic amputations at the elbow level (S58.0, prevalence 0.38 per 1 million of adults) were determined in 12 cases (6.2 (2.7; 9.7)%). The feature of such injuries was a structure of distal humerus region of the anatomical widening at the place of condyle which determined a club-shaped form of a stump. So,

as all prostheses had a so called “dead zone” necessary for placement of prosthetic modules [10, 11] exarticulation of the forearm was not likely to make if someone wanted to have an amputation stump adapted well for cosmetic or functional prosthetics. Patients after traumatic amputation at the elbow level usually need reconstructive surgery of stumps in the future if the formation of the functional adapted stump was impossible during the primary care after injury [12].

Elbow contractures (28 cases, 14.4 (9.4; 19.4)%, prevalence 0.92 per 1 million of adults) (M24.5) and elbow ankyloses (9 cases, 4.6 (1.6; 7.6)%, prevalence 0.29 per 1 million of adults) (M24.6) in perverse position were the reasons of disability determination in the distant period after elbow injury. One of the cause of such conditions was heterotopic ossifications [13].

According to the findings the typical patient first registered to be disabled due to the consequences of elbow region injury has the following features: male person of working age with an unilateral bone fracture or some consequence of elbow injury in distant period which led to elbow contracture or elbow ankylosis in perverse position.

Furthermore every 10th person with registered permanent disability has irreversible changes of anatomy or function of elbow by the moment of the first examination in Medical and Social Expertise Commission. Thus these patients were determined as the disabled people without a revision period. On the other hand 9 of 10 people require active medical rehabilitation, particularly for physiotherapy (electrical procedures, exercises) and occupational therapy to improve function or to adapt to restricted range of movement in the elbow joint [4].

CONCLUSIONS

1. In Ukraine in 2018 195 people were primary registered as people with disability due to consequences of elbow injuries (prevalence 6.22 per 1 million of adults).

2. The typical patient was working-age male person with a unilateral injury in the main due to a fracture of bones those formed the elbow joint.

3. Consequences of elbow injuries which led to primary permanent disability have the following distribution: bone fractures – 61.5 (54.5; 68.5)%, elbow contractures and elbow ankyloses – 19.0 (13.4; 24.6)%, injuries of ulnar nerve – 8.7 (4.7; 12.7)%, traumatic amputation at the elbow level – 6.2 (2.7; 9.7)%, forearm dislocations – 3.1 (0.6; 5.6)%, open wounds of elbow – 1.0%, elbow ligaments ruptures – 0.5%.

4. 9 of 10 people primary registered as people with disability due to consequences of elbow injuries have sufficient rehabilitation potential for restoration of elbow anatomy and function and require active medical, social and labor rehabilitation and support both of from their families and medical staff.

Contributors:

Naumenko L.Y. – conceptualization, methodology, supervision, validation, project administration, writing – review & editing;

Zub T.O. – formal analysis, software, investigation, resources, data curation, writing – original draft, review & editing;

Mametyev A.O. – resources, data curation, writing – original draft.

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