

DOI 10.64108/imh.2025.3.4.20

UDC 616.314.16+616.314-77+616-036.82

PREPARATION OF THE STUMBLE FOR PROSTHESIS AT THE TRANSTIBIAL LEVEL IN THE LONG-TERM REHABILITATION PERIOD

R. R. Lukachyshyn*, I. K. Churpiy, M. V. Zelinska, Y. V. Ivasiv

Ivano-Frankivsk National Medical University, Department of Physical Therapy and Occupational Therapy, Ivano-Frankivsk. Ukraine

ORCID ID: [0009-0003-7552-5311](https://orcid.org/0009-0003-7552-5311), e-mail: Lukachyshyn_Rom@ifnmu.edu.ua

ORCID ID: [0000-0003-1735-9418](https://orcid.org/0000-0003-1735-9418), e-mail: ch.igor.if@gmail.com

ORCID ID: [0009-0008-8623-4743](https://orcid.org/0009-0008-8623-4743), e-mail: mzelinska@ifnmu.edu.ua

ORCID ID: [0009-0008-1987-0109](https://orcid.org/0009-0008-1987-0109), e-mail: ivasiv_yu@ifnmu.edu.ua

*Correspondence: R.R. Lukachyshyn, e-mail: Lukachyshyn_Rom@ifnmu.edu.ua

Abstract. Lower limb amputation is one of the most serious injuries, accompanied by significant changes in the anatomy, function, psychological state and social adaptation of a person. In the case of transtibial amputation (amputation at the level of the lower leg), the knee joint is preserved, which makes it possible to achieve a more natural gait and reduce energy expenditure during movement. With the beginning of a full-scale war in Ukraine, the number of servicemen who have undergone limb amputations has reached unprecedented proportions. According to estimates of 2023, at least 20,000 people in Ukraine, mostly military personnel, have suffered one or more amputations, while other sources cite a range from 20,000 to 50,000 Ukrainian military personnel who lost limbs as a result of hostilities.

The rationale for the study is that modern prosthetics methods, including bionic ones, require a high level of patient preparation: in terms of stump condition, muscle strength, tissue trophism, psychoemotional readiness, and balance skills. In the military context, additional complications are added to this: multiple injuries, tissue defects, post-traumatic syndromes, and the need for rapid rehabilitation to return to active life or service.

The goal is to analyze modern methods of preparing a stump for prosthetics at the transtibial level in the long-term rehabilitation period, taking into account mine-explosive injuries of military personnel in Ukraine, and to improve rehabilitation interventions by physical therapists.

The objectives of the study were:

1. To describe the anatomical and functional requirements for a stump in military patients.
2. To analyze the stages of long-term rehabilitation with an emphasis on preparation for prosthetics.

To provide evidence-based and practical recommendations for physical therapists when working with military personnel who have lost limbs.

The duration of long-term rehabilitation depends on the severity of the traumatic injury and is on average 6–12 months, with complex mine and explosive injuries it can exceed 18 months.

Conclusion.

1. Preparation of a stump for prosthetics at the transtibial level in military personnel is a complex process that requires a systematic, staged and multidisciplinary approach.

2. The main conditions for successful restoration of functional capacity are timely control of postoperative pain, prevention of contractures, adequate formation of the shape and volume of the stump, as well as gradual restoration of muscle strength and tissue tolerance to load.

3. The use of compression therapy, sensory desensitization, specialized physical exercises to strengthen muscles and balance training helps optimize the process of preparation for prosthetics.

4. The patient's psycho-emotional state has a significant impact on the results of rehabilitation, therefore it is important to involve a psychologist at all stages of the rehabilitation process.

5. Effective coordination of actions of specialists of different profiles, adherence to the principles of evidence-based medicine and individualization of therapeutic programs ensure the maximum possible restoration of functional independence and social adaptation of military personnel after amputation of the lower extremities.

Keywords: transtibial amputation, lower limb, formation of a lower limb stump, mine-blast injury, servicemen with lower limb amputations, long-term rehabilitation period.

Introduction. Lower limb amputation is one of the most serious injuries, accompanied by significant changes

in the anatomy, function, psychological state and social adaptation of a person. In the case of transtibial amputation

(amputation at the level of the lower leg), the knee joint is preserved, which makes it possible to achieve a more natural gait and reduce energy expenditure during movement. At the same time, the success of prosthetics depends not only on the quality of the manufactured prosthesis, but also on the correct preparation of the stump and long-term rehabilitation. With the beginning of a full-scale war in Ukraine, the number of military personnel who have undergone limb amputations has reached unprecedented proportions. According to estimates in 2023, at least 20,000 people, mostly military personnel, have suffered one or more amputations in Ukraine [1], while other sources give a range from 20,000 to 50,000 Ukrainian military personnel who have lost limbs as a result of hostilities [2, 3]. The Ministry of Veterans Affairs of Ukraine confirms a significant increase in the number of amputations among military personnel since 2022, although the exact data remains confidential for security reasons [4].

At the same time, according to the Ministry of Social Policy, in 2025, about 37,000 Ukrainians (the vast majority of whom are combat veterans) received almost 130,000 rehabilitation devices, including prostheses, orthoses, and assistive devices [5, 6].

Such a scale of losses creates an unprecedented demand for the development of a national system of prosthetics and rehabilitation, especially at the level of the lower extremities. This creates a large-scale challenge for the physical therapy and rehabilitation system of Ukraine - it is necessary not only to provide acute treatment, but also to organize long-term preparation of the stump, adaptation to prostheses, and effective social reintegration of military personnel returning to service or civilian life after serious combat injuries.

The rationale for the research is that modern methods of prosthetics, including bionic ones, require a high level of patient preparation: in terms of the condition of the stump, muscle strength, tissue trophism, psychoemotional readiness, and balance skills. In the military context, additional complications are added to this: multiple injuries, tissue defects, post-traumatic syndromes, the need for rapid rehabilitation in order to return to active life or service. The aim is to analyze modern methods of preparing the stump for prosthetics at the transtibial level in the long-term rehabilitation period, taking into account mine-explosive injuries of the military in Ukraine, and to improve rehabilitation interventions by physical therapists.

The objectives of the study were:

1. To describe the anatomical and functional requirements for a stump in military patients.
2. To analyze the stages of long-term rehabilitation with an emphasis on preparation for prosthetics.
3. Provide evidence-based and practical recommendations for physical therapists when working with military personnel who have lost limbs.

1. Anatomical and functional requirements for a military patient's stump

The shape of the stump should ensure uniform pressure distribution while wearing the prosthesis, prevent local overload and traumatization of the skin. The optimal

shape is a conical or smoothly cylindrical shape without sharp scar formations and bone protrusions, which increases the stability and comfort of the prosthesis [7].

After mine-explosive injuries, military personnel often have complex defects of soft tissues and bone structures, which complicates the formation of a full-fledged stump, which is due to the nature of the injury. In such cases, reconstructive and plastic interventions and staged surgical treatment are necessary to create a functionally suitable stump.

In the early stages of rehabilitation, the key are edema control, prevention of contractures (especially in the knee joint), and proper care of the postoperative wound. The use of compression stockings or elastic bandaging and gradual mobilization are standards of modern rehabilitation [8].

2. To analyze the stages of long-term rehabilitation with an emphasis on preparation for prosthetics.

Rehabilitation after transtibial amputation in military personnel is a multi-stage process that includes medical, physical and psychosocial components.

Early postoperative stage (0–6 weeks).

This very first stage after amputation is critical and focuses on pain control, prevention of complications, wound healing and formation of the foundation for further rehabilitation. The duration of the period is approximately 4–6 weeks, the main task of which is to control edema and form a stump.

Reducing postoperative edema and forming a cylindrical or conical stump shape is necessary for future prosthetics. Compression therapy is used for this. This can be elastic bandaging according to a special scheme (with greater pressure on the distal part) or the use of silicone stockings (liners). Compression is applied almost 24 hours a day, removed only for hygiene and exercise. Stump care also includes gentle care of the seams and skin in accordance with medical recommendations.

The next task is to prevent contractures and maintain the amplitude of movements in the joints. At this stage, there is a high risk of developing flexion contracture of the knee and hip joints, especially with amputation below the knee. To prevent this, the limb is positioned with prevention of flexion. The patient is prohibited from sitting with the knee or hip joints bent for a long time, and from placing pillows under the stump when lying on his back. It is recommended to lie on his stomach (if possible and not painful) for 20–30 minutes several times a day to stretch the stump flexors. Passive and active exercises are performed in all accessible joints of the healthy limb and upper body.

Maintaining muscle strength (Isometric training) is one of the important tasks. To maintain muscle strength and activate neuromuscular connections, isometric muscle contractions are performed. These exercises are performed without visible movement in the joint, which is safe for the postoperative wound. The main focus is on the thigh and gluteal muscles, which are key for controlling the prosthesis.

The patient should consciously tense, for example, the quadriceps or gluteal muscles for 5–7 seconds. Recom-

mended frequency: 3–5 sets of 10 repetitions, 2–3 times a day. Exercises include tightening the buttocks (squeezing) and holding the stump in an extended position (lying on the stomach).

Examples of isometric exercises:

Gluteal squeeze: Tightening both buttocks while lying on your back.

Isometric quadriceps tension: Tightening the front of the thigh.

Isometric stump extension: Trying to press the back of the stump into the bed.

Special attention is paid to breathing exercises and sensory adaptation.

An important component is breathing exercises to improve lung ventilation and prevent postoperative complications (e.g., pneumonia, atelectasis). Initial exercises for sensory adaptation of the stump (desensitization) are also performed, which may include light touching or stroking of the stump (if the condition of the sutures allows) to prepare the nerve endings for contact with the sleeve. This is the beginning of the fight against phantom pain and increased sensitivity of the stump.

The goal of this stage: to minimize swelling, prevent the development of dangerous contractures, maintain a baseline level of muscle strength, and ensure smooth wound healing, preparing the patient for the next, more intensive stage of physical therapy.

The main tasks are pain control, prevention of complications, and formation of the correct shape of the stump.

Duration: approximately 4–6 weeks.

Methods: compression therapy (elastic bandages or silicone stockings), limb position to prevent flexion contracture of the knee joint, breathing exercises, isometric contractions of the thigh and gluteal muscles (3–5 sets of 10 repetitions, 2–3 times a day).

Goal: to reduce swelling, prevent contractures, maintain muscle strength, and begin sensory adaptation of the stump.

The intermediate stage (6–12 weeks) begins after the wound has stabilized and the swelling has decreased, and includes intensive muscle training and the formation of the stump's tolerance to load.

Duration: 1.5–2 months.

Exercises: active movements in the hip (flexion, extension, adduction, abduction, rotational movements) and knee joints (flexion, extension) using a fitness elastic band, balance exercises (standing on the supporting limb with support for the first 3 days, then holding the ball), training in an upright position, body weight transfer.

Desensitization is a technique for gradually reducing pain in the stump and increasing the stump's tolerance to touch. It is performed after the wound has healed, when the compression bandage is removed, 2–3 times a day. It starts with rubbing the scar with soft cotton balls and gradually changes the structure to a harder one – paper towel, terry towel, while the procedure should not cause pain, and it is necessary to move on to the next stage when the scar becomes tolerant to sensations [9, 10, 11].

Frequency: 5–6 days a week for up to 2 hours of

classes before and after lunch.

Goal: forming a stable supporting surface of the stump, restoring coordination and preparing for fitting the primary prosthesis.

Preparatory stage for prosthetics (3–6 months after amputation), this stage of rehabilitation is critically important for creating optimal conditions for further prosthetics and learning to walk. It covers three main areas: stump formation, intensive muscle strengthening and preparation for loads.

Formation of a stable stump volume and scar care. Primary attention is paid to reducing swelling and forming a cylindrical or conical shape of the stump, which is necessary for the correct fit of the prosthesis sleeve. Regular compression is key: elastic bandaging according to an individual scheme (with greater pressure on the distal part) or special compression covers (liners) are used. This prevents fluid accumulation and helps reduce the volume. Skin care includes desensitizing massage of the stump to reduce its sensitivity to touch and pressure, which is important for contact with the sleeve. Scar correction is performed using intensive, deep massage (transverse and longitudinal rubbing) to prevent adhesions and increase elasticity. Additionally, silicone tapes or patches are applied to the mature scar to smooth it. In case of persistent problems, surgical corrections may be necessary [12].

Intensive strength and balance training. The main task is to restore and strengthen the muscle strength necessary to control the prosthesis and stabilize the body. This includes more intensive strength training of key groups. For the lower limb, the emphasis is on the quadriceps (if the knee joint is preserved) and the gluteal muscles (gluteus maximus and gluteus medius), which are responsible for stabilizing the pelvis during the support phase. Exercises for the buttock are performed, such as Glute Bridge, lateral abduction of the stump, and isometric tension of the stump muscles. Strengthening the spinal stabilizers (core muscles) with planks and rotational stability exercises is essential as the body's center of gravity shifts. Balance training on unstable surfaces (balance cushions, mats) for the healthy leg and coordination exercises to improve overall body control and prepare for walking are also performed.

Examples of exercises for strength and balance.

Bridge: Lying on the back, lift the pelvis with support on the good leg and shoulders, squeezing the buttocks hard.

Hip abduction: Lying on the good side, lift the stump up to train the gluteus medius muscle (a key pelvic stabilizer).

Plank: Hold the position on the forearms and toes (or knees) to strengthen the core muscles.

Single-leg balance: Stand on the good limb, making the task more difficult by closing the eyes or standing on a soft surface.

Preparation for loads with a temporary prosthesis, this stage is transitional. The patient is taught verticalization (safe standing and sitting), transitions between objects (for example, from a chair to a bed), and elements of gait using crutches or stilts. The main focus is on training in correct

weight transfer and preparing the patient to accept load on the stump. Initially, a training (training) sleeve can be used to increase the stump's tolerance to pressure. Protective reactions (how to fall and get up safely) are practiced. The physical therapist models the movement patterns that will be performed with the prosthesis to form the correct neuromuscular memory [13, 14].

The final assessment of the patient's readiness to start permanent prosthetics includes the following criteria: complete wound healing, absence of infections, stable stump volume (confirmed by measurements) and minimal pain. In addition, the patient's motivation and his ability to independently perform the care and exercise program are important. Only after achieving all these indicators can the stage of permanent prosthetics be successfully moved on. At this stage, the selection and individual manufacture of a temporary prosthesis is carried out, and gradual getting used to wearing it is carried out.

Methods: training in standing up, sitting, moving with parallel bars, walking with partial and full load on the temporary prosthesis.

Exercises: exercises to strengthen the muscles of the hip girdle, control the center of mass, teach a step without compensatory movements.

Frequency: daily classes for 60–90 minutes under the supervision of a physical therapist.

Goal: adaptation of the stump to the prosthesis, restoration of symmetry of gait, prevention of secondary deformations.

In the process of our work, practical recommendations were formed for physical therapists when working with amputees who received mine-explosive trauma to the lower extremities.

Physical therapy after transtibial amputation is aimed at reducing postoperative complications, preparing for prosthetics and restoring the functional independence of the serviceman.

In the early postoperative period, the priority is to control pain and swelling, prevent contractures and form the correct posture of the limb. Light extension in the knee joint, elastic bandaging or silicone sleeves, early activation, breathing exercises and pain control are recommended.

The formation and care of the stump includes massage to improve blood circulation, gradual compression, hygienic care and sensory desensitization to reduce hypersensitivity. This provides optimal conditions for future prosthetics.

At the stage of preparation for prosthetics, the main attention is paid to strengthening the quadriceps, gluteal and abdominal muscles, training in balance, coordination and correct posture to prevent secondary deformities.

It is important to take into account the psychological aspect of rehabilitation. The support of a psychologist, participation in support groups and work with an occupational therapist contribute to adaptation to changes and

restoration of motivation.

After prosthetics, it is necessary to conduct gait training, endurance control and prevention of overload of the healthy limb, as well as regularly check the condition of the stump skin and the conformity of the prosthesis.

The duration of long-term rehabilitation depends on the severity of the traumatic injury and is on average 6–12 months, and in case of complex mine-explosive injuries it can exceed 18 months.

A comprehensive, evidence-based approach ensures effective rehabilitation, the return of the serviceman to active life and improvement of the quality of his functional adaptation.

Conclusion.

1. Preparation of the stump for prosthetics at the transtibial level in military personnel is a complex process that requires a systematic, staged and multidisciplinary approach.

2. The main conditions for successful restoration of functional capacity are timely control of postoperative pain, prevention of contractures, adequate formation of the shape and volume of the stump, as well as the gradual restoration of muscle strength and tissue tolerance to load.

3. The use of compression therapy, sensory desensitization, specialized physical exercises to strengthen muscles and balance training helps optimize the process of preparation for prosthetics.

4. The psychoemotional state of the patient has a significant impact on the results of rehabilitation, therefore it is important to involve a psychologist at all stages of the rehabilitation process.

5. Effective coordination of actions of specialists of various profiles, adherence to the principles of evidence-based medicine, and individualization of therapeutic programs ensure the maximum possible restoration of functional independence and social adaptation of military personnel after amputation of the lower extremities.

Prospects for further research. Develop and improve methods of working with lower limb stumps to prepare for prosthetics.

Conflict of interest. The authors declare that they have no conflict of interest in relation to this study, including financial, personal, authorship, or any other conflict that could affect the research and its results presented in this article.

Financing. The study was conducted without financial support.

Author contributions: R.R. Lukachyshyn a) conception and design; c) provision of materials for the study; d) collection and synthesis of data; e) analysis and interpretation of results; M.V. Zelinska f) writing of the manuscript; I.K. Churpiy b) administrative support; Y.V. Ivasiv g) editing of the manuscript.

All authors have read and agreed with the published version of the manuscript.

References:

1. Rubryka. (2023). Over 20,000 Ukrainians have undergone at least one amputation since the beginning of Russia's full-scale war - Ukrainian Solutions Media
2. Stanislav Pohorilov. Scale Of Amputations In Ukraine Reaches Wwi Level – Wsj.(2023). Ukrainska Pravda (Scale of amputation in Ukraine reaches WWI level – WSJ, URL: <https://www.pravda.com.ua/eng/news/2023/08/01/7413800/>)
3. Lauren Baillie, Ena Dion, Philippe Leroux-Martin, Ian Platz, William B. Taylor, and Calin Trenkov-Wermuth.(2024). *The Future of the Security Sector in Ukraine*, US Institute of Peace.
4. Interfax-Ukraine.(2025). Blyzko 37 tys. ukraintsiv u 2025r otrymaly maizhe 130 tys. zasobiv reabilitatsi– Minsotspolityky- Interfaks-Ukraine
5. Ministerstvo sotsialnoi polityky, simi ta yednosti Ukrainy.(2025). U 2025 rotsi vzhe vydano ponad 90 tysyach zasobiv reabilitatsii na sumu bilsh yak 1 miliard hryven– Minsotspolityky, URL: https://www.msp.gov.ua/press-center/news/u-2025-rotsi-vzhe-vydano-ponad-90-tysyach-zasobiv-reabilitatsiyi-na-sumu-bilsh-yak-1-milyard-hryven?utm_source=chatgpt.com
6. Ministerstvo u spravakh veteraniv Ukrainy. (2025). Analitychna informatsiia za danymy Ministerstva u spravakh veteraniv Ukrainy URL: https://data.mva.gov.ua/?utm_source=chatgpt.com
7. ReliefWeb. (2024). *Wounded by war; Ukrainians living with amputations find new purpose — prosthetists, advocates.*
8. Ministerstvo okhorony zdorovia. (2024). Reabilitat-siia patsiientiv pislia amputatsii. URL: https://moz.gov.ua/uk/reabilitaciya-pacyentiv-pislya-amputatsiy-i?utm_source=chatgpt.com
9. ProtezHub. (2023). Yak pidhotuvaty kuksu do protezuvannia?
10. Choo YJ, Kim YK, Seo Y, Kim H, & Hwang JH. (2022). Amputation stump management: A narrative review. *Annals of Rehabilitation Medicine*, 46(3), 153–165. <https://doi.org/10.5535/arm.22014>
11. Bezradnii VV. (2025). Zastosuvannia metodiv fizychnoi terapii v reabilitatsii pislia amputatsii nyzhnoi kintsivky. Pratsi NTUU «KPI im. I. Sikorskoho». <https://ela.kpi.ua/items/77ba5cbe-a6ef-44b3-b582-4e37aa4f8b42>
12. Humanity & Inclusion. (2024). Rannia reabilitatsiia patsiientiv pislia amputatsii. Metodychnyi klinichniy posibnyk. https://www.hi.org/sn/uploads/Humanity-Inclusion-Clinical-Handbook-Ukraine-FINAL_March2024.pdf
13. Stelmakh, H. O., Bakaliuk, T. H., Makarchuk, N. R., & Ptashnik, A. B. (2024). Trenuvannia balansu pid chas protezuvannia nyzhnoi kintsivky. *Zdobutky klinichnoi i eksperymentalnoi medytsyny*, (2), 122–127. <https://doi.org/10.11603/1811-2471.2024.v.i2.14729>
14. Zade, R., Shende, G., Gaidhane, P., & Deshpande, S. (2021). Pre-prosthetic rehabilitation in post-operative transtibial amputation patient: A case report. *Journal of Pharmaceutical Research International*, 33(43B), 134–139. <https://doi.org/10.9734/jpri/2021/v33i43B32502>

УДК 616.314.16+616.314-77+616-036.82

ПІДГОТОВКА КУКСИ ДО ПРОТЕЗУВАННЯ НА ТРАНСТІБІАЛЬНОМУ РІВНІ В ДОВГОТРИВАЛОМУ ПЕРІОДІ РЕАБІЛІТАЦІЇ

Р. Р. Лукачишин*, І. К. Чурпій, М. В. Зелінська, Ю. В. Івасів

Івано-Франківський національний медичний університет, кафедра фізичної терапії та ерготерапії, м. Івано-Франківськ, Україна

ORCID ID: [0009-0003-7552-5311](https://orcid.org/0009-0003-7552-5311), e-mail: Lukachyshyn_Rom@ifnmu.edu.ua

ORCID ID: [0000-0003-1735-9418](https://orcid.org/0000-0003-1735-9418), e-mail: ch.igor.if@gmail.com

ORCID ID: [0009-0008-8623-4743](https://orcid.org/0009-0008-8623-4743), e-mail: mzelinska@ifnmu.edu.ua

ORCID ID: [0009-0008-1987-0109](https://orcid.org/0009-0008-1987-0109), e-mail: ivasiv_yu@ifnmu.edu.ua

*Кореспондуючі автори: Р.Р. Лукачишин, e-mail: Lukachyshyn_Rom@ifnmu.edu.ua

Резюме. Ампутація нижньої кінцівки — одна з найсерйозніших травм, що супроводжується суттєвими змінами в анатомії, функції, психологічному стані та соціальній адаптації людини. У випадку транстібіальної ампутації (ампутації на рівні гомілки) зберігається колінний суглоб, що дає можливість досягти більш природної ходи та зменшити енергетичні витрати під час руху. З початком повномасштабної війни в Україні кількість військовослужбовців, які зазнали ампутацій кінцівок, досягла безпрецедентних масштабів. За оцінками 2023 року, в Україні щонайменше 20 000 осіб, переважно військових, перенесли одну чи кілька ампутацій, тоді як інші джерела наводять діапазон від 20 000 до 50 000 українських військових, які втратили кінцівки внаслідок бойових дій.

Обґрунтування дослідження полягає в тому, що сучасні методи протезування, включно з біонічними, вимагають високого рівня підготовки пацієнта: з точки зору стану кукси, м'язової сили, трофіки тканин, психоемоційної готовності, балансних навичок. У військовому контексті до цього приєднуються додаткові ускладнення: множинні травми, дефекти тканин, посттравматичні синдроми, необхідність швидкої реабілітації задля повернення до активного життя або служби.

Мета проаналізувати сучасні методи підготовки кукси до протезування на транстібіальному рівні в довготривалому періоді реабілітації, з урахуванням мінно-вибухових травм військових в Україні, та удосконалити реабілітаційні втручання фізичних терапевтів.

Для досягнення мети дослідження були поставлені такі **завдання**:

Описати анатомо-функціональні вимоги до кукси у військових пацієнтів.

Проаналізувати етапи довготривалої реабілітації з акцентом на підготовку до протезування.

Надати доказові та практичні рекомендації для фізичних терапевтів при роботі з військовими які втратили кінцівки.

Тривалість довготривалої реабілітації залежить від тяжкості травматичного ушкодження і в середньому становить 6–12 місяців, при складних мінно-вибухових пораненнях може перевищувати 18 місяців.

Висновок.

1. Підготовка кукси до протезування на транстібіальному рівні у військовослужбовців є комплексним процесом, який потребує системного, етапного та мультидисциплінарного підходу.

2. Основними умовами успішного відновлення функціональної спроможності є своєчасний контроль післяопераційного болю, профілактика контрактур, адекватне формування форми та об'єму кукси, а також поступове відновлення м'язової сили й толерантності тканин до навантаження.

3. Застосування компресійної терапії, сенсорної десенсибілізації, спеціалізованих фізичних вправ для зміцнення м'язів та тренування рівноваги сприяє оптимізації процесу підготовки до протезування.

4. Значний вплив на результати реабілітації має психоемоційний стан пацієнта, тому важливим є залучення психолога на всіх етапах реабілітаційного процесу.

5. Ефективна координація дій фахівців різних профілів, дотримання принципів доказової медицини та індивідуалізація терапевтичних програм забезпечують максимально можливе відновлення функціональної незалежності та соціальної адаптації військових після ампутації нижніх кінцівок.

Ключові слова: транстібіальна ампутація, нижня кінцівка, формування кукси нижньої кінцівки, мінно-вибухова травма, військовослужбовці з ампутаціями нижніх кінцівок, довготривалий період реабілітації.

Стаття надійшла в редакцію 20.11.2025 р.

Стаття прийнята до видання 20.12.2025 р.