COMPLEX DECUBITUS ULCER THERAPY IN A PATIENT IN CHRONIC CRITICAL CONDITION: A CASE REPORT

Yakovleva AV[1] ✉, Yakovlev AA[1], Petrova MV[1,2], Krylov KYu[3]

[1] Federal Research and Clinical Center of Intensive Care Medicine and Rehabilitology, Moscow, Russia
[2] Peoples Friendship University of Russia, Moscow, Russia
[3] Pirogov Russian National Research Medical University, Moscow, Russia

76.72% of patients admitted to the ICU of the Federal Research and Clinical Center of Intensive Care Medicine and Rehabilitology (FRCC ICMR) in a chronic critical condition (CCC) associated with various types of damage to the brain were diagnosed with decubitus ulcers (DU), or bedsores, of 3rd and/or 4th stage. 33.41% of them were planned to undergo invasive rehabilitation procedures (neurosurgical intervention) that cannot be done while the patient has DU. This report describes a complex technique used to treat a 4th-stage sacrum DU in a CCC patient that needed ventriculoperitoneal shunting. We have covered contraindications to the exclusively surgical DU closing and the successful and rapid healing of the 4th-stage sacrum DU after application of the treatment technique.

Keywords: decubitalis ulcer, pressure ulcer, surgical treatment of pressure ulcers, a complex treatment of pressure ulcers, scale of Bates-Jensen

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Compliance with ethical standards: the patient gave written informed consent to participation in the study and publication of his personal data.

✉ **Correspondence should be addressed:** Alexandra V. Yakovleva
Zelenograd 25, str. 452, Moscow, 124498; avyakovleva@fnkcrr.ru

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СЛУЧАЙ ПРИМЕНЕНИЯ КОМПЛЕКСНОГО СПОСОБА ЛЕЧЕНИЯ ДЕКУБИТАЛЬНОЙ ЯЗВЫ У ПАЦИЕНТА В ХРОНИЧЕСКОМ КРИТИЧЕСКОМ СОСТОЯНИИ

А. В. Яковлева[1] ✉, А. А. Яковлев[1], М. В. Петрова[1,2], К. Ю. Крылов[3]

[1] Федеральный научно-клинический центр реаниматологии и реабилитологии, Москва, Россия
[2] Российский университет дружбы народов, Москва, Россия
[3] Российский национальный исследовательский медицинский университет имени Н. И. Пирогова, Москва, Россия

У 76,72% пациентов, поступивших в реанимационные отделения Федерального научно-клинического центра реаниматологии и реабилитологии (ФНКЦ РР) в хроническом критическом состоянии (ХКС), обусловленном различными поражениями головного мозга, были диагностированы декубитальные язвы (ДЯ), или пролежни, 3-й и/или 4-й стадии. Из них 33,41% пациентов было необходимо плановое прохождение этапа инвазивной реабилитации (нейрохирургическое вмешательство), противопоказанием к которому служило наличие ДЯ. В работе описано применение комплексного способа лечения ДЯ крестца 4-й стадии у пациента в ХКС, которому требовалось выполнение вентрикуло-перитонеального шунтирования. Описаны противопоказания к исключительно хирургическому способу закрытия ДЯ и результаты быстрого и успешного заживления ДЯ крестца 4-й стадии путем использования комплексного способа лечения.

Ключевые слова: декубитальная язва, пролежень, хирургическое лечение пролежней, комплексное лечение пролежней, шкала Бейтс–Дженсена

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Соблюдение этических стандартов: пациент подписал информированное согласие на участие в исследовании и публикацию результатов.

✉ **Для корреспонденции:** Александра Витальевна Яковлева
г. Зеленоград, кв. 25, к. 452, г. Москва, 124498; avyakovleva@fnkcrr.ru

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Pressure ulcers, or bedsores, or decubitus ulcers (DU) are ulcerative-necrotic damage to the skin that develops in weakened bedridden patients with impaired microcirculation. Constant pressure, shear and friction forces [1] are the main causes of DU.

Pain, anti-DU procedures and extended stay in the hospital worsen the quality of life of DU patients. Pressure ulcers pave the way to chronic infection; larger bedsores can cause plasma loss with traumatic discharge and generally contribute to the premature death of patients. Therefore, any intervention aimed at DU prevention and/or treatment once such have appeared aids to reduce the cost of treatment and improve the patient's quality of life [2].

The data describing the frequency of DU occurrence in Russian medical organizations is scarce [1]; in European hospitals, the prevalence ranges from 8.3 to 23%, and in Canadian medical institutions the figure goes up to 26% [3].

According to the British researchers, 15 to 20% of patients in hospitals and other types of medical facilities develop bedsores. In the US, 17% of all hospitalized patients run the risk of developing pressure ulcers or already have them [1].

ICU of the Federal Research and Clinical Center of Intensive Care Medicine and Rehabilitology (FRCC ICMR) receives patients in chronic critical conditions (CCC) resulting from various damage to the brain. 76.2% of them have 3rd- and/or 4th-stage DU, localization of which varies. There are certain

peculiarities to the pathological processes (and their treatment) in such patients. A critical condition is an extreme stage of any pathology that calls for external support, full or partial, of vital body functions due to disruption of their autoregulation [4]. CCC is peculiar to ICU patients that survived the acute phase of their disease but remain dependent on intensive care procedures for a long period of time, neither dying nor recovering [5].

Having searched national and foreign databases, we failed to find any data on the frequency of DU development in CCC patients with brain injuries. Various authors report DU healing time of 1 year and longer in patients with other pathologies, following a conservative therapy combining drugs and physiological procedures [6–8]; this healing time is long enough to hinder proper care and rehabilitation of paralyzed patients [6–8]. Outside of surgery, the common approach to treating bedsores is to apply therapeutic dressings to them, like a biologically active dressing for treatment of hard-to-heal wounds [9]. Another solution is to freeze the sores with an applicator cooled down with liquid nitrogen to the temperature of –180 °C [10]. There was also developed a separate treatment technique for patients with spinal cord injuries: soft tissues on the opposite sides of the bedsore are pierced with 2 spokes running at the depth of 0.5–0.8 mm, their ends fixed and gradually brought together [11].

This report describes a complex surgery-free DU therapy technique, its application to a 4th-stage DU in a CCC brain injury patient and the resulting fast healing of the DU.

Case description

Patient D., 23 years old, was admitted to FRCC ICMR for rehabilitation.

Diagnosis: sequelae of concomitant car accident injuries (closed chest injury and contused right lung, closed fracture and displacement of the left clavicle's middle third, closed fracture and displacement of L4–L5 (right), closed fracture of pubic and sciatic bones, comminuted fracture of body and wing of the left iliac bone and right lateral sacrum masses (with displacement), open comminuted fracture and displacement of the left femur's upper third, closed fracture and displacement of the right femur's middle third, 3rd-degree trauma shock). Bleeding from acute gastric and duodenal ulcers (finished), complicated by posthypoxic encephalopathy. Post-sepsis (catheter-associated) condition. 3rd-degree DU on the right lateral malleolus, 3rd-degree DU on the left calcaneal region, 4th-degree DU on the sacrum.

Anamnesis: the patient underwent a series of reconstructive surgeries on his musculoskeletal system (11 months) before being admitted to FRCC ICMR. Postsurgery complications — massive bleeding from acute gastric and duodenal ulcers, which led to the development of posthypoxic encephalopathy and consciousness reduction to the level of coma. Further on, the patient stabilized in CCC, vegetative state. In the background, DU developed on various areas of the patient's body within the first month of hospitalization. There were two plastic surgery attempts on the sacrum DU (autologous tissue), one of them made abroad, but both, through purulent-necrotic complications, led to aggravation of the wound.

At admission, the patient's condition was regarded as severe, level of his consciousness vegetative. He was breathing through a tracheostomy cannula, feed through a gastrostoma, urinated through a catheter. We have registered a deep stage of tetraparesis with increased muscle tone (spastic type), flexion contractures of elbow, wrist, knee and ankle joints, severe protein-energy deficiency. The patient's nutritional status was as follows: height — 180 cm, weight — 51 kg, BMI — 15.74 kg/sq m, mid-arm circumference (MC) — 17.5 cm (norm — 29 cm), triceps skin fold thickness (TSFT) — 6 mm (norm — 10.5 mm), mid-arm muscle circumference (MMC) — 15.6 cm (norm — 23–25.5 cm). His Nutric score was 2 points, which is low. The results of the Laboratory studies were as follows: transferrin — 52 mg/dL (norm — 200 mg/dL), cholinesterase — 0.81 U/l, albumin — 18 g/l.

Additional examination during the first week yielded indications for the planned ventriculoperitoneal shunt (VPS) — severe hydrocephalus with periventricular edema.

Description of the sacrum DU: area — 114 sq cm (planimetry data); complete skin necrosis and extensive damage to the underlying tissue; well-defined fibrous cicatrizing edges; 3 cm deep pocket along the lower edge; at the bottom of the ulcer — fragments of bone tissue, loose yellow substance covering the area of about 79% of the wound surface; the wound is wet, with yellow exudate evenly distributed over it. The tissue around the DU was pale gray, there was an ulcerated edema with pseudinoma up to 2 cm around the wound; the granulation tissue was dull, it was found at the bottom, covered about 17% of the total DU surface; there were no signs of epithelialization. The Bates–Jensen assessment tool score was 51 points.

This kind of DU prevented the planned VPS and thus needed to be healed as quickly as possible. The patient's medical history and somatic status ruled out radical surgery.

It was decided to apply the patented DU treatment technique [12]. The ulcer was mechanically cleaned daily even if the necrosis area was less than 1 sq cm, followed by laser therapy: 904 nm, four 18 W LEDs, pulse frequency — 2–5000 Hz, maximum average power — 4 • 13.5 mW, load — 3.5 J/sq cm, 1.12 minutes at each point (Combi 400 V system, GymnaUniphy; Belgium–Germany). We have selected six exposure points along the wound's edge and three points along the wound's vertical diameter. After the procedures the wound was covered with an Atrauman dressing. The nutritionist controlled the patient's nutrition (quality and quantity) and adjusted it depending on the anthropometric parameters and laboratory test results. To assess the DU healing dynamics, we used the S.Y.R. scale, a derivative of Bates–Jensen assessment tool. The scale's Y axis is for Bates–Jensen points (increment — 5 points), its X axis is for time (increment — 7 days). The points were put on the graph once every 7 days (Fig. 1).

Seven days of therapy yielded positive results and dynamics: the DU area shrunk to 86 sq cm, the wound's edges grew clearer, the pocket closed, the necrotic tissue patches turned white-gray, viscous, their area decreased to 37% of the total DU area. The exudate became serous and hemorrhagic. Scar tissue formed along the wound's edges; there appeared the signs of epithelialization. The edema around the DU grew smaller, ulceration healed (Fig. 2). Bates-Jensen score — 40 points. It was decided to not change the dressing material composition since the signs of active infection in the DU persisted.

Fourteen days of therapy decreased the DU to 39 sq cm, and the necrotic tissue's area shrunk to no more than 13% of the wound's area. The amount of exudate decreased significantly, down to complete absence of free-flowing exudate. Bates–Jensen score — 36 points. Given the significantly reduced exudation and infection arrest, it was decided to apply Branolind dressing to the wound after procedures.

After 28 days of therapy, the DU area was 23 sq cm, its bottom lined with granulations, edge undergoing active epithelialization. The wound was wet and without free-flowing exudate and edema; the tissue around the wound was pale

pink. Dense scar tissue lined its edge (Fig. 3). Bates–Jensen score — 26 points.

After 35 days of therapy, the DU area was 8 sq cm, its bottom lined with massive granulations, edge undergoing active epithelialization (67% of the total DU area). Bates–Jensen score — 23 points.

The DU was completely cicatrized on the 46th day of therapy (Fig. 4). Bates-Jensen score — 13 points (healed). The patient's nutritional status: weight — 55 kg, BMI — 16.98 kg/sq m, MC — 18.5 cm, TSFT — 6 mm, MMC — 16.6 cm. Nutric score — 3 points (low); transferrin — 173 mg/dl, cholinesterase — 2.66 U/l, albumin — 32 g/l.

The patient received the VPS, with no purulent-septic complications expected immediately after surgery and later. The rehabilitation program was completed with pool activities and extra therapeutic exercises through reduction of the spastic component.

Case discussion

The characteristics of the patient's DU implied that the only treatment option available was surgery. However, his physical condition and medical history suggested that such an operation would likely bring wound complications and delay healing.

Compared to conservative treatment, radical surgery is a fast remedy, but the likelihood of postoperative complications in such a case directly depends on the somatic condition of the patient at the time of surgery. In our experience, DU closing surgery in a brain-injury CCC patient is almost never a success, since such patient's somatic condition is significantly different from the "ideal" needed for planned operations. We believe that the risk of postoperative complications in such patients is extremely high when closing the DU surgically. Many of such patients are incapable of restoring self-movement capabilities to a sufficient level within a relatively short period of time, which means that time and quality of DU contact with surfaces are defined solely by standard anti-decubital measures. Therefore, we consider it inappropriate and unsafe to close DU in such patients solely by surgical methods.

Reducing the bedsore healing time is crucial for the overall rehabilitation of many brain-injury CCC patients. The patented complex DU therapy method [9] allowed healing the DU within a short period of time and, consequently, performing the planned neurosurgical intervention.

In CCC patients, it is necessary to accurately measure the scale of the surgery against the patient's indicators and to take into account all the circumstances, i.e. not only the possibility to prepare the wound for surgery but also the consequent rehabilitation forecasts, short and long-term.

CONCLUSIONS

The improvement of conservative treatment and its combination with modern surgical and physical therapies allow significant reduction of DU healing time in brain-injury CCC patients while excluding the risks associated with single-step surgery. The patented method is an effective option of DU treatment in brain-injury CCC patients when there are contraindications to its single-step surgical closure.

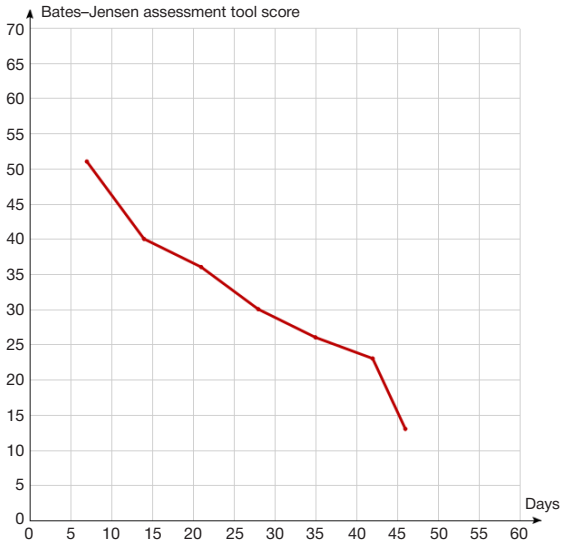

Fig. 1. S.Y.R graphic model

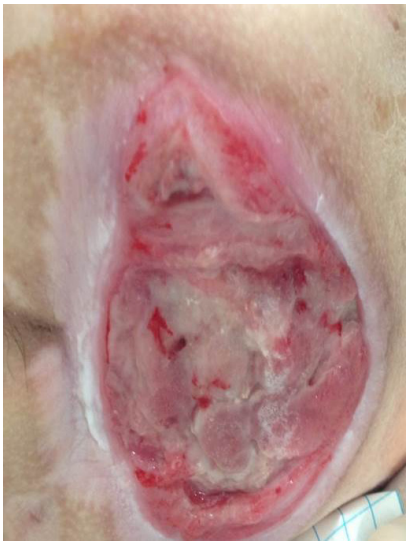

Fig. 2. Sacrum decubitus ulcer, 7th day of treatment

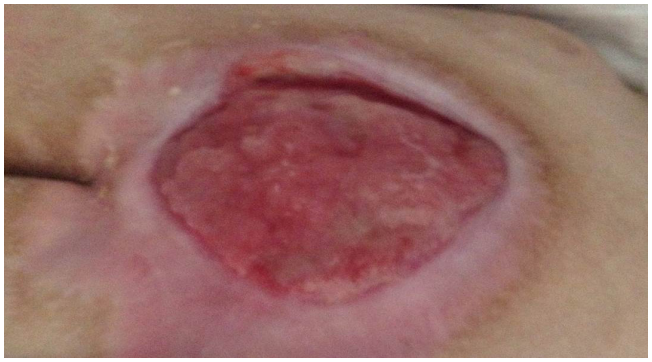

Fig. 3. Sacrum decubitus ulcer, 28th day of treatment

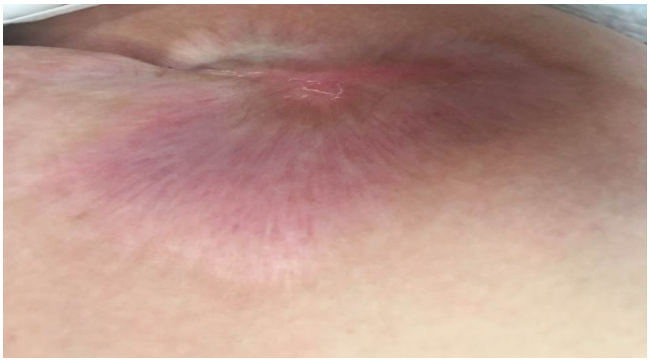

Fig. 4. Sacrum decubitus ulcer, 46th day of treatment

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