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Zastosowanie wybranych zabiegów fizjoterapeutycznych u pacjentki po pourazowym przeszczepie skóry w obrębie podudzia i stopy – opis przypadku

The use of selected physiotherapeutic procedures in a patient after post-traumatic skin transplantation in the area of the lower leg and foot - case report

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Streszczenie

Skóra jest ważnym organem zmysłu, pełni funkcję bariery ochronnej zabezpiecza nasz organizm przed czynnikami fizycznymi, chemicznymi i biologicznymi. W przypadkach rozległych urazów, powikłań pooperacyjnych czy zakażeń, może dojść do konieczności wykonania przeszczepu skóry. Ważne jest to aby pacjent po ingerencji chirurgicznej mógł jak

najszybciej wrócić do zdrowia i pełnej sprawności fizycznej. Choremu może pomóc w tym zespół specjalistów, w którym znaczące miejsce zajmuje fizjoterapeuta.

W pracy opisano przypadek pacjentki, która uległa wypadkowi komunikacyjnemu, doznała rozległych ran pourazowych i ubytku tkanek w obrębie kończyny dolnej, zaopatrzonych przeszczepem autogennym. W wyniku doznanych obrażeń pacjentka odczuwała ból i dyskomfort oraz ograniczenia w czynnościach dnia codziennego.

Po zastosowanej ingerencji kinezyterapeutycznej stan pacjentki uległ znacznej poprawie, wpływając na pozytywny aspekt zmiany jakości życia.

Słowa kluczowe: przeszczep skóry, przeszczep autogenny, fizjoterapia, kinesiotaping

Abstract

Skin is an important organ of the senses, acts as a protective barrier to protect our body against physical, chemical and biological factors. In cases of extensive injuries, postoperative complications or infections, a skin transplant may be necessary. It is important that the patient after the surgical intervention can return to health and full physical fitness as soon as possible. A team of specialists together with a physiotherapist is essential to treat the patient.

The case describes a patient who got traffic accident and suffered extensive traumatic wounds and a lower limb tissue defect that was stocked with autogenic transplant. As a result of the injuries suffered, the patient experienced pain and discomfort and reduced daily activities.

After the kinesiotherapeutic intervention, the patient's condition has improved significantly, affecting the positive aspect of changing the quality of life.

Key words: skin transplant, autogenic transplant, physiotherapy, kinesiotaping

Introduction

The skin of an adult human being constitutes around 1/10 of overall body mass. It is a protective barrier against the loss of liquids, which are important for maintaining the systemic homeostasis. Moreover, it also constitutes protection against mechanical and thermal injuries, as well as a barrier against harmful external factors such as biological and chemical pathogens. The most frequently, skin defects result from burns, varicose ulcer, diabetic foot and sharp injuries. It often evokes life-threatening situations. The history of burn treatment

and post-traumatic wound closure using skin as dressing dates back to the start of the 19th century. The first attempts had experimental character and ended in a fiasco, nevertheless, they gave birth to further search of better, more efficient methods, which are successfully used by the 21st century medicine [1,2].

The skin is build with the epidermis and the dermis. The epidermis makes a layer of cornifying stratified stratum spinosum, in which there are three types of appendages, such as hair follicles, sweat glands and sebaceous glands found in the dermis. The stratum germinativum produces keratinocytes making keratin, which keratinise and flatten in the upper layers of the epidermis and separate on its surface. Moreover, the basal layer contains melanocytes, pigment cells. The dermis contains collagen, elastic fibres and fat tissue. Owing to its build, it is a support for blood vessel, lymphatic vessels, nerves and skin appendages. A plane linking the dermis and the epidermis is wavy because of 'bulging' of the dermal papillae [2,3,4].

A wound may be defined as a disruption of continuity of body structures as a result of a penetrative or non-penetrative injury. In both cases, examination of the surface of the body only might not give a good assessment of the injuries in the deeper layers. According to the mechanism of injury, a wound can be classified as:

- Incisions/ incised wounds,
- Abrasions/grazes,
- Contused wounds,
- Scalping wounds,
- Gunshot wounds,
- Burns [2,5].

Wound healing is virtually the same in case of all soft tissue. A scar is the effect of healing process. Soft tissue healing is a three-stage process:

1. Homeostasis/ inflammation (2-3 days): inflammatory response;
2. Proliferation (about 3 weeks): migration of fibroblasts, capillary vessels ingrowth (granulation tissue), synthesis of collagen with rapid increase of the strength of the wound, wound contraction;
3. Maturation phase/ plateau (approximately 6 months): remodelling of the scar, slow final increase of durability (up to 80% of initial strength) [2,3,4].

After the suturing of the wound, transplantation, the skin requires a proper care with the use of medicinal and hygiene products. After a complete healing of wounds, in order to

support the right trophism and mobility of healed transplanted tissue, crucial is the application of physiotherapeutic treatments.

Applying the right classical massage techniques is one of the methods. It is necessary to wait approximately 3 weeks after the surgery for the scar to heal. The pain of a scar and the area around it might appear occasionally. They could be caused by changes in the healing tissues, neuralgic pains inducted by the nerves retraction into scar tissue or blood circulation disorders of the area. After 3 weeks, the remodelling stage starts to dominate and the durability of the wound is 20% of the normal skin, however, after a period of 3 moths it will be 80%. It is connected with the scar remodelling, which may take up to 12 months, and might never reach the durability of the normal skin [2,3,4].

It is possible to apply the classical massage techniques after the wound is completely healed and the sutures are removed owing since it is an effective treatment to soften the scars and support a correct remodelling of the tissues. In order to do the massage of the scars one can either use various lubricants or precede without them, nevertheless, attention must be always paid to the condition of the skin not to interrupted continuity of the skin. After the skin massage, it is recommended rubbing in the preparations that enhance softening of the scar [5,6].

The patients, who have scars/ adhesions as a result of surgical treatment, are in need of implementing an individual plan of kinesiotherapeutic exercises.

The restoration of functions, which were lost as result of the surgical treatment and the newly formed scar, is the aim of the therapy.

The laser therapy is the most frequently applied treatment out of the range of the physiotherapy treatment owing to the fact that it accelerates the regeneration of damaged tissues and improves healing of the wounds.

Case report

The patient was admitted to Department of Rehabilitation of Antoni Jurasz University Hospital No. 1 in Bydgoszcz for rehabilitation after the road traffic accident, which she had been run over on a pedestrian crossing. On the admission day she walked on two crutches, was self-dependant in everyday activities and required restriction of workout intensity cause of fatigability and pain. On the basis of imaging examination the patient was diagnosed with numerous fractures of pelvis bone, which were dressed, the fracture of medial process of tibia in the right lower limb. The patient suffered a massive injury and loss of tissues in the right

shank that were treated with autologous transplant. On the day of therapy, the scar was healed, without exudates and breaks in the tissue continuity (Figure 1).

Figure 1. The picture of the patient's lower limb on the first day of the therapy

On physical examination revealed limited mobility range (the measurement done with goniometer):

- The right knee joint: passive and active flexion - 80°,
- The right ankle joint: limited passive and active mobility range – dorsiflexion - 5°, plantar flexion.

In the area of right crus and foot, lymphoedema appeared. The circumference measured at the level of ankle joints was 28 centimeters and the circumference of metatarsum at the level of cuboid bone – 24 centimeters . During examinations there was observed the lack of mobility (shiftability) of the transplanted tissues and of the scar boundary, disorder of the scar's trophics, numerous scar's thickenings and finally hyperaesthesia of the whole area of scarring evoking the sensations of pain, burning and pulling. The patient represented a disrupted gait pattern stemming from the structural constraints and the pain appearing in the right leg in spite of relieving pressure with the crutches. Disrupted were both stance and swing phases. Neither the foot propulsion nor interchangeability nor trunk rotations were observed while was walking.

The treatment and therapy

The patient underwent the physiotherapy treatments five days a week for the period of a month. She was subjected to the scar massage in the area of the scar boundary, the whole area of transplanted skin and the autologous transplant's area. Techniques with the use of lubricants, such as natural coconut and almond oils, were applied during the treatment. Fabrics of various textures were used for the sensory stimulation.

During the first period, a massage of the scar area was done, in order to soften and relax skin and subcutaneous tissue. The massage was done concurrently and centripetal; what is more, the stroking and rubbing techniques were applied flat right on the surface of the scar. After a few initial massages, rubbing of the scar itself was commenced and gradually kneading of the area of the scar boundary and its whole surface was introduced. After the proper softening of the scar and analgia, the tissue mobilisation through gripping it between thumb and index finger and lifting began. Holding the scar this way, it was rubbed in circular motion, and then breaking them up by moving hands in the opposite directions. When the scar and its surrounding were well massaged, it was possible to do rolling, which is moving a skin fold held between thumbs and index fingers through the centre of the scar from both ends. It is important to observer the reaction of the skin to the interference and to take the patient's feelings into consideration [7,8,9].

The therapy uses the following massage techniques:

1. Stroking, is the elastic deformation of the epidermis and dermis. When stroking, the hand should be tightly adhered to the body with equally uniform pressure. Depending on the area of the massed part of the body, one or both hands can be stroked with the entire palm, dorsal hand,dorsal side of the first and second series of phalanges, a clenched fist, the ball of the thumb or hypothenar eminence little finger, whole, palm surface of the thumb, the fingertip of individual fingers or several fingers . Because of the strength can be divided into soft and strong strokes, and because of the depth of the massage stands out stroking superficial and deep. Depending on the direction of massage, stroking can be divided into oblong, transverse and circular. The stroking is done at a rate of about 25 movements per minute.
2. Grinding technique - it is stronger and more energetic than stroking the execution of semicircular, circular movements on the massed body. Depending on the area and the area massaged grinding is usually performed one or both hands: the entire palmar side of the hand, the ball of your thumb or finger, hypothenar eminence little finger, the fingertip of individual fingers or several fingers. Because of its construction, spiral and circular grinding are distinguished. Because of the direction of massage they are divided into longitudinal, transverse and circular, and depending on the grinding force we distinguish superficial and deep. Grinding is carried out at a rate of 60-100 movements per minute.

3. Scar Lifting Technique-we use tissue preparation before using the above mentioned techniques. We make them as follows: the tissues inside the scar between the thumbs and the pointers we tear them off the tissue substrate.
4. The technique of "breaking" the scar - we use tissue preparation before using the above mentioned techniques. Depending on the area of the massed part of the body we can break through the thumb, hand palm, and fingers II-V [8,9,10].

Because of disturbances of the lymph circulation, the patient underwent lymphatic drainage distally and lymphatic kinesiotaping techniques were applied. The interference reduced swelling and at the same time it increased the mobility range of the individual joints. It also improved the skin trophics (Fig. 2).

Figure 2. Lymphatic kinesiotaping techniques applied in case of the patient

Due to the osteoarticular joints' injuries and the limited movement of flexion of the right knee and ankle joints, besides the detailed work on the scar, the following treatments were used during the rehabilitation of the patients: the cross-fibre massage according to Cyriax method of the knee joint's area, mobilisation of the kneecap and isometric exercises - active free, sensomotoric in high and low positions, gait re-education, stairs training.

After the end of the treatment kinesiotherapeutic, changes in the mobility ranges were both observed and measured with a goniometer:

- The right knee joint: active flexion - 100° and passive flexion - 80°,
- The right ankle joint: dorsiflexion: active - 10°, passive - 10° and plantar flexion: active - 10°, passive - 15°.

The circumferences measured with a measuring tape decreased and they were: at the level of ankle joints was 24 centimeters and the circumference of metatarsum at the level of cuboid bone – 21 centimeters.

Summary

The patient was feeling much better after the treatment series since the pain she felt in her right lower limb eased both while activity and rest. The mobility range in the limb changed, which in consequence, influenced the quality of gait, its fluency and fractionation in sequence of putting the load on and shifting lower limbs. The patient started walking with only one crutch and was able to go up and down the stairs to the second floor without resting and feeling pain. Her comfort related to wearing shoes improved because of significant reduction of swelling.

Bibliography

1. Braye F., Pascal P., Bertin-Maghit M., Colpart J.J., Tissot E., Damour O. Advantages of using a bank of allogenic keratinocytes for the rapid covera-ge of extensive and deep second-degree buras. Med Biol Eng Comput 2000; 2(38):248-252.
2. Garden O.J., Bradbury A.W., Forsythe J.L.R., Parks R.W. Chirurgia ISBN: 978-83-65195-04-3: 315-338.
3. Nguyen D.Q., Potokar T.S., Price P. An objective long-term evaluation of Integra (a dermal skin substitute) and split thickness skin grafts, in acute burns and reconstructive surgery. Burns 2010; 36:23-28.
4. Zieliński T., Witmanowski H., Lewandowicz E., Łuczkowska M., Kruk-Jeromin J. Blizny przerostowe i keloidy. Część II. Zapobieganie i leczenie. Postępy Dermatologii i Alergologii 2008; 3:116-124.
5. Martini M.C. Kosmetologia i farmakologia skóry, Warszawa 2006.
6. Monaco J.L., Lawrence W.T. Acute wound healing: An overview. Clinics in Plastic Surgery 2003; 30:1-12.
7. Cieślik K. Wybrane zagadnienia leczenia chorego oparzonego w oddziale specjalistycznym. Twój Magazyn Medyczny 3(8):80-85.
8. Magiera L. Leksykon masażu i terminów komplementarnych. BIO -STYL, Kraków 2001.
9. Kochański M. Techniki masażu leczniczego. Markmed-Rehabilitacja, Ostrowiec Świętokrzyski 2012.
10. Prochowicz Z. Podstawy masażu leczniczego. Wyd. 5 PZWL, Warszawa 2013.
11. Gwardzik M. Masaż. Teoria i praktyka. Wydawnictwo ESAN, Warszawa 2016.