

# ORIGINAL PAPERS

## EVALUATION OF EARLY SURGICAL TREATMENT RESULTS CONSIDERING VENOUS LEG ULCERS

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Lower leg ulcers are characterized by a chronic and recurrent course, being considered as a difficult therapeutic problem. Based on epidemiological data chronic ulcers concern 0.2 to 2% of the Western European population. The above-mentioned problem affects women more often than men, and increases with age. Treatment and recurrence prevention methods remain under discussion and research.

**The aim of the study** was to evaluate the early surgical treatment results of venous leg ulcers at the Department of Traumatology and Emergency Medicine, Medical University of Lublin.

**Material and methods.** We evaluated patients hospitalized at the Department of Traumatology and Emergency Medicine, Medical University of Lublin during the period between 2009-2014. Inclusion criteria were as follows: venous leg ulceration, full documentation. The study group comprised 62 patients subjected to treatment for leg ulcerations, including 35 women and 27 men, aged between 30 and 94 years. The treatment method included the excision of the ulcers with the deep fascia, and the implantation of the mesh graft (thickness of skin) directly into the exposed muscle.

**Results.** Amongst patients evaluated at discharge, the healing of the transplant was as follows: in case of 44 patients 90-100%, in 8 patients – 75-89%, in 5 patients 50-74% and in 5 patients less than 50%. The predominating bacteria collected from ulceration samples was *Pseudomonas aeruginosa* (32%) and *Staphylococcus aureus* (35%).

**Conclusions.** The patient outcome shows that surgery is an effective method considering treatment of venous leg ulcers. Earlier qualification for this type of surgery will improve patient outcome.

**Key words:** leg ulcers, skin graft

Leg ulcers is one of the most difficult therapeutic problems of modern medicine. Despite the use of modern treatment methods, both conservative and surgical, recurrence is very common, and treatment long-lasting, painful, and expensive. The above-mentioned constitutes 1-2% of the financial budget allocated to the Ministry of Health in countries of western Europe and the United States. Additionally, it is estimated that in 1-2% of the population there will be at least one episode of lower leg venous ulceration, which indicates the actuality of the problem and shows the need for the search of novel solutions in these patients (1, 2).

Considering the London population, ulcerations coexist with venous thromboembolism, arterial insufficiency, lymphatic edema, rheumatoid arthritis, and diabetes mellitus (3). In Poland, the situation is similar, which significantly influences poor prognosis (4).

The etiology of leg ulcers is usually associated with disorders of chronic venous insufficiency.

Theories considering the development of venous ulcerations are based on macro- and microcirculation changes. The definition presented by Mackiewicz, defines chronic venous disease as a permanent disorder of venous blood outflow from the lower limbs, considering

all factors leading to the mentioned pathology (5).

Changes in microcirculation lead to an increase of venous pressure, which results in impaired blood outflow. This may be caused by weakening of muscular function, deep venous thrombosis, reduced venous capacity, occlusion of collecting veins, and valvar insufficiency (6).

Ulcers may also result as outcome of various arterial disorders (i.e. arteriosclerosis, thromboangiitis obliterans, peripheral aneurysms, arterial injuries, hypertension, arterial dysplasia) (7).

The aim of the study was to determine early surgical treatment results considering venous ulcers, using skin grafts of intermediate thickness.

## MATERIAL AND METHODS

The study group comprised patients hospitalized at the Department of Traumatology and Emergency Medicine, Medical University of Lublin during the period between 2009 and 2014. Analysis considered 62 patients subjected to first-time treatment of lower leg venous ulcerations. The study group comprised 35 female and 27 male patients, aged between 30 and 94 years. All patients were subject to a thorough medical interview and physical examination. Clinical changes and direct treatment results of the ulcerations (graft healing) were obtained on the basis of available medical documentation. The 90-100% graft incorporation rate was considered as very good, 75-89% as good, 50-74% as satisfactory, and < 50% as unsatisfactory. All patients were subject to a skin graft, some required surgical preparation prior to grafting.

In order to prepare patients for the surgical intervention conservative methods were used. Compression therapy and limb elevation, which are designed to reduce the venous reflux in both the superficial and deep systems. In case of compression therapy elastic bands were used. According to our observations elastic bands give better results than stockings available on the market, due to greater possibilities in applying compression. Each patient had wound culture sampling in order to initiate appropriate antibiotics. Painkillers, anti-inflammatory and phlebotropic drugs were ad-

ministered on demand. Local treatment consisted in the changing of dressings at least twice daily, and wound cleansing with an antiseptic. One day prior to surgery a 10% NaCl solution was used, aimed at accelerating wound granulation. If the wound showed signs of necrosis, their surgical excision was performed. In case of patients without necrotic tissue wound cleansing was performed by means of enzyme preparations. Conservative management was aimed at best preparation for surgical intervention-skin graft of intermediate thickness.

The graft was collected by means of a dermatome from the front or side of the thigh, the wound being supplied by a dressing. The collected graft was then incised using a special mesh. The granulation was sacralized until the appearance of insignificant bleeding. After such wound preparation the graft was fixed by means of non-absorbable sutures. The wound was covered by means of a specially prepared dressing with silicone impregnated tulle fat (Parafini liq., Lanolini aa 150).

## RESULTS

Sixty-two patients were subject to surgical treatment consisting in the use of autogenous skin grafts of intermediate thickness. In 46 (74.19%) cases surgery was preceded by necrectomy, while in 16 (25.80%) cases the wound was subject to pharmacological treatment (fig. 1).

Table 1 presented the surface of the ulceration, prior to treatment.

Graft incorporation evaluated on discharge from the hospital: 90-100% in 44 patients, 75-89% in 8 patients, 50-74% in 5 patients, and

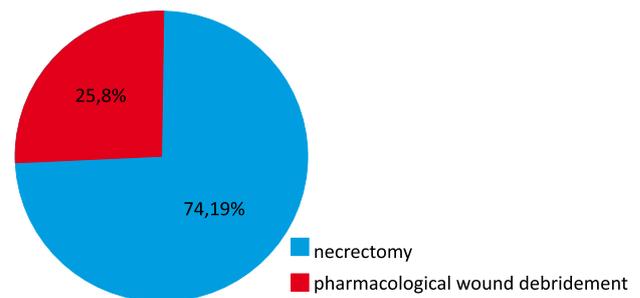


Fig. 1. Group characteristics considering the preparation method before surgery

Table 1. Number of patients depending on the surface of the ulceration on admission to the hospital

Surface of ulceration	Nb. of pts.	%
< 10 cm <sup>2</sup>	5	8,06
10-20 cm <sup>2</sup>	14	22,58
> 20 cm <sup>2</sup>	43	69,35

<50% in 5 patients. Table 2 presented precise data.

Best results were obtained amongst patients with the smallest area of ulceration: in 80% of patients, graft incorporation amounted to 90-100%. In patients with an ulceration surface exceeding 20 cm<sup>2</sup>, 90-100% graft incorporation was observed in 67.44% of cases. Figure 2 presented precise data.

Hospitalized patients were subject to culture sampling from the ulcerations. The dominating bacteria included *Pseudomonas aeruginosa* (32%) and *Staphylococcus aureus* (35%). Table 3 presented the remaining data.

Unsatisfactory results were observed in patients more than 70 years old, with large ulcer surface and with various coexistent disorders.

### DISCUSSION

Venous ulcerations constitute chronic wounds, where the healing process is long-lasting and complex. The selection of the appropriate therapeutic method remains a problem, faced by various medical specialists. The effectiveness of treatment is influenced by

Table 2. Patient characteristics depending on the healed surface at discharge from the hospital

Healed surface	Nb. of pts.	%
90-100%	44	70,97
75-89%	8	12,90
50-74%	5	8,06
<50%	5	8,06

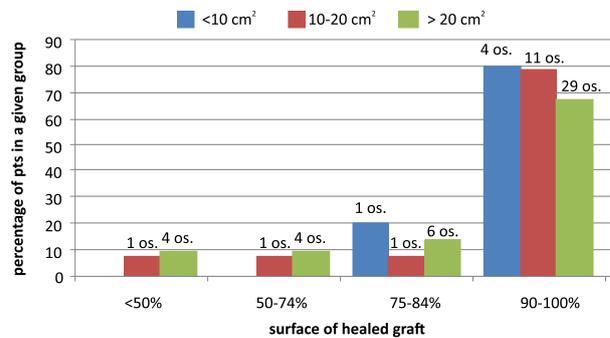


Fig. 2. Dependency between healed surface and size of ulceration before surgery

many factors, related to both the etiology and initial local condition of the ulceration, as well as the patients' general condition. Graft incorporation following our treatment methods was evaluated upon hospital discharge. Results were as follows: more than 90% graft incorporation in 70.97% of patients, and healing of more than 50% of the surface of the ulceration in 91.94% of patients. Failure during the early postoperative period was mainly associated with the duration and extent of the ulceration. Similar results- more than 90% of graft healing were observed by other Authors, based

Table 3. Bacterial flora characteristics

Pathogen	Nb. of pts.	Percentage
<i>Staphylococcus aureus</i>	22	35
<i>Pseudomonas aeruginosa</i>	20	32
<i>E. cloacae</i> , <i>S. aureus</i>	3	5
<i>P. mirabilit</i> , <i>S. dysgalactiae</i>	3	5
<i>E. coli</i> , <i>Enterobacter cloacae</i>	3	5
<i>S. aureus</i> MSSA	3	5
<i>S. pyogenes</i> , <i>S. aureus</i>	3	5
<i>S. agalactiae</i> , <i>Proteus vulgaris</i> ESBL- <i>S. aureus</i> MSSA	1	1,6
<i>Acinetobacter baumannii</i>	1	1,6
<i>Klebsiella</i> spp.	1	1,6
<i>Bacillus</i> spp.	1	1,6
<i>Citrobacter braakii</i> ESBL- <i>P. aeruginosa</i> , <i>S. aureus</i>	1	1,6

on several years of follow-up (8, 9). In case of conservative treatment and compression therapy, it is estimated that the use of the above-mentioned methods will lead to 12 to 74%, and according to other Authors 40 to 80% of ulceration healing during a period of 12 weeks (10, 11, 12).

Studies comparing both methods show a greater percentage of healed ulceration surface in case of patients subjected to skin grafting, as compared to those subject to compression therapy only. These studies demonstrated the significant difference in the local healing rate, which is in favor of the first group (13). A significant problem affecting the effectiveness of venous ulceration treatment is their recurrence, which was observed by most authors, regardless the therapeutic method used. However, literature data showed a much less frequent recurrence rate after surgical intervention, which is evidence of its greater efficacy (14, 15, 16).

The healing process of leg ulcers is extremely complex, and the significant cause of poor prognosis is attributed to bacterial or fungal infections. Therefore, the inflammatory response leads to growth factor destruction, matrix protein degradation, and cellular proliferation disturbances. Natural processes of wound debridement are insufficient and one may observe advanced tissue necrosis. Regardless the therapeutic method used, elimination of inflammatory foci seems to be the key issue in improving the local condition of the ulceration. Bacteria most often isolated from the ulcerations were *S. aureus* and *P. aureginosa*, being characterized by the ability to form a biofilm. Available literature data provided similar flora from the venous ulcerations (17, 18, 19). It has been shown that the presence of the biofilm leads to significant increase in antibiotic resistance and impaired functioning of internal defense mechanisms against pathogens (20, 21). This translates to insufficient antibiotic efficacy, as evidenced by the report concerning treatment of chronic wounds, published in 2001. The above-mentioned report found no justification for the routine use of antibiotics in the management of venous leg ulcers (22). Therefore, surgical wound debridement seems to be a better solution, allowing

the mechanical cleaning of the infected areas.

Surgical wound debridement was performed in 74.19% of the analysed group, while conservative treatment (physiological saline and pharmacological preparation dressings) in 25.80%.

Without doubt conservative treatment continues to be the mainstay of treatment for venous leg ulcers, especially in case of small ulcerations, and is an important element, prior to surgical intervention. However, it has many disadvantages and contraindications (23, 24). There are also patients where compression therapy and local treatment does not lead to healing, and the process is long-lasting. These are mainly elderly patients with long-lasting and extensive ulcerations. In such cases, skin grafts seem more effective (25, 26).

Surgical treatment is often regarded as the method of last resort, when there are no positive effects following conservative treatment. However, the above-mentioned results and available study data indicate the legitimacy of early surgical intervention, as the method reducing the duration of treatment and risk of recurrence, which will translate into lower costs and improve the patients' quality of life.

## CONCLUSIONS

1. Surgical treatment with the use of skin grafts is an effective and rapid therapeutic method, considering extensive venous leg ulcers.
2. In order to obtain good graft healing proper ulcer preparation is necessary, prior to surgical intervention.
3. The obtained results show that in case of an increased venous ulceration surface, the percentage of patients with the smallest graft healing area is on the increase.
4. The results are influenced by coexisting disorders, such as: diabetes and hypertension.
5. Early qualification for surgery allows to obtain good treatment results in short time.

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