Optimization of surgical treatment of post-burn scar deformities of the lower extremities

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Abstract. The article presents the experience of surgical treatment of 172 patients with post-burn scar deformities and defects of the lower extremities. Based on the results obtained, practical recommendations on the optimal choice of methods of operations are given.

1 Introduction

The use of the above methods and the rehabilitation system of patients gave good functional and aesthetic results in 82% of cases.

The relevance of the problem: 20% of patients who have received thermal trauma, there are deep burns of the extremities. Deep burns of the extremities after self-healing of wounds or closing them with free split grafts lead to various scar deformities and contractures.

As a result of the development of hypertrophic and keloid scars at the burn site, scar degeneration of grafts and loss of their elasticity, restriction of movements in the joint develops, sometimes leading to an increment of the limbs to the trunk [1-3].

Pathological changes develop in the muscles, tendons and joint bags lead to myogenic or arthrogenic contractures.

2 Methods

In the department of reconstructive surgery of the Andijan regional Multidisciplinary Medical Center, together with the staff of the FMRI, a system of rehabilitation of patients with post-burn deformities and defects of the lower extremities was introduced.

The system includes 4 stages:

1- conservative measures (from the moment of wound healing within 5-6 months)

2- surgical rehabilitation

3- conservative measures together with sanatorium treatment (hydrogen sulfide baths in the conditions of the sanatorium "Chimen"), every 6 months or after operations.

4- dispensary observation, evaluation of long-term results and selection of patients for the next stages of surgical intervention.

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During the period from 2014 to 2020, more than 172 patients with post-burn and post-traumatic scar deformities and defects of the lower extremities were hospitalized.

After a routine examination of patients, surgical treatment was carried out. The timing of operations from the moment of the burn was determined by the presence or absence of contractures of the joints or fingers, as well as the presence of trophic disorders. When the scars did not interfere with the function of the joints, the operation was performed 8-12 months after the healing of burn wounds [4].

The choice of the surgery method was determined by the location of the scars, their volume, the depth of the lesion, as well as the condition of adjacent areas.

With a circular lesion of the extremities, when the phenomena of venous and lymphostasis were noted distal to the scars, the operation consisted in dissecting the scars longitudinally in the form of a zigzag and closing the resulting wound with free full-layer grafts (Fig. 1).

Fig. 1. Scars longitudinally in the form of a zigzag and closing the resulting wound with free full-layer grafts.

With scar deformities of the extremities limited in width, patients underwent local plastic surgery based on simultaneous stretching of soft tissues without expanders and flap formation (Fig. 2).

Fig. 2. Local plastic surgery based on simultaneous stretching of soft tissues without expanders and flap formation.

Before the operation, the circumference of the shoulder and forearm segments in the upper, middle and lower third of them is determined; the width of the intact skin area, the width of the scar array, as well as the percentage ratio of the width of the scar band and unaffected skin to the circumference of the limb. Manually, by forming a fold of scars, the width of the scar band is determined before the operation, which can be removed with subsequent suturing of the wound edges.

Simultaneous tissue stretching has a number of positive properties: split or full-layer graft is not used, flaps are not formed, secondary deformation of the donor site does not occur, after 6-8 months, tissues can be stretched repeatedly until a thin line of sutures remains. These positive aspects determine the indications for the use of this method.

After 3-4 months, when the stretched tissues reach their initial properties, it is possible to plan the excision of the next scar band, and so on until the scar deformation is completely eliminated. The skin sutures were removed after 2-3 weeks. If tension phenomena persist, the seams can be removed at 4 weeks [5, 6].

By observation, we found that while preserving intact skin by 50% or more of the circumference of the limb, in one step, it is possible to remove a band of scars equal to 15% on the thigh and up to 13% on the lower leg relative to their circumference.

With large scar lesions, planning two or three-fold phased excision, it is advisable to make incisions, retreating from the unaffected skin, so that the sutures connecting the edges of the wound in a state of tension are laid and squeezed only the scar tissue. Traces remain from such sutures, and at the next stage they are excised, since the postoperative scar remains in the middle of the band being removed. If the scars are completely excised, regardless of the stage, then the edges of the wound are brought together first by non-absorbable sutures applied to the deep layers of the skin, the surface layers are adapted by the second row of sutures.

To improve the longitudinal load on the future scar in the joint area or in several places (with long scars), Z-plasty was performed.

To eliminate isolated defects and scar deformations up to 6 cm wide in the area of the antero-lateral surfaces of the knee joint, unaffected hip tissues were used. To do this, the

skin-fat layer of the distal half of the thigh was previously mobilized, not including the fascia covering the muscles.

By pulling up the skin-fat layer by the holders, and taking into account the available reserves of tissues for plastic surgery, the scars were excised and the edges were stitched. A vacuum was drained under the patchwork space by drainage. To eliminate broader defects and scar deformities, 6-12 months after the first operation, the skin-fat layer was re-mobilized and reduced until the deformities were completely eliminated.

With limited scars and soft tissue defects, the method of "tissue stretching by expanders" was widely used. Tissue stretching was performed on an outpatient basis. The second stage, with the longitudinal arrangement of scars, after their excision, the previously stretched skin-fat layer moves to the defect zone without cutting out the flaps by "sliding".

In cases where there was a combined scarring of the knee joint and lower leg, two expanders were implanted simultaneously. When the necessary increase in the area of the skin above the expander was achieved, the knee joint and lower leg area were simultaneously plasticized by directly moving the stretched layers to the defect. In cases of a lack of tissues, provision seams are used.

To eliminate isolated lesions of the lower leg, when the scars were located longitudinally, the remaining skin was stretched throughout the scar strip, followed by moving to the defect zone.

Defects in the soft tissues of the posterior surface of the lower leg were eliminated by unaffected stretched tissues over the defect. For their rational use, scraps were cut out.

When using tissues stretched by an expander in the area of the lower extremities, it is necessary to strive to move them to the defect zone as a whole layer, without forming flaps from them. This allows them not to disrupt the blood supply in them and contributes to the formation of minimal scars after plastic surgery.

In case of scar contractures of the hip, knee and ankle joints, flap plasty was applied using undamaged tissues of adjacent areas. We have developed a technique of plastic surgery with "double-humped flaps", when the end of the flaps was given the appearance of a double hump. This excluded the presence of sharp corners of the flaps and there were no cases of necrosis of the ends of the flaps.

In the absence of healthy adjacent tissues, after excision of scars and joint redressation, the resulting wounds were closed with a full-layer whole autodermotransplant. The donor wound was sutured with nodular sutures.

To close foot wounds after excision of trophic scars and soft tissue defects, cross-flap plasty was used. The flap on the leg was trained according to an accelerated technique, which allowed excision of the flap leg for 12-13 days.

The operation to eliminate extensor scar contractures of the toes consisted of the following stages:

- transverse excision of scars at the base of the fingers and the back of the foot;
- maximum reduction of fingers by bending them to the sole;
- stitching fingers through the nail phalanges to the plantar surface of the foot with hypercorrection of flexion;
- closure of the resulting wound with a layered whole autodermotransplant taken from the hip;
- suturing of the donor wound;
- applying a plaster splint to the ankle joint and sole;

The seams on the nail phalanges are removed for 20-22 days.

Antibiotic therapy was performed by the regional lymphotropic method for 4-5 days.

After complete wound healing and grafting, removal of sutures after 10-14 days, patients were sent for sanatorium treatment in the condition of hydrogen sulfide baths, where physiotherapy procedures were carried out in parallel.

3 Conclusions

The choice of the method of plastic surgery or reconstruction for post-burn scar deformities and defects of the lower extremities is determined individually in each case. With a circular scar lesion of the extremities, a longitudinal zigzag dissection of the scars and closure of the resulting wound with free grafts is shown.

While preserving more than 50% of the skin around the circumference on the upper and lower extremities, scar deformities are effectively eliminated by acute or expander stretching of tissues. At the same time, stretched tissues on the extremities are completely stabilized after 6-8 months, elasticity is restored, they can be reused for plasty of the remaining scars.

Depending on the anatomical location of the scars, expanders can be implanted transversely or longitudinally with respect to the axis of the limb.

Marginal flexion scar contractures of the knee and ankle joints, as well as adducting contractures of the hip joint are effectively eliminated by "double-humped" skin-fat flaps on the feeding leg. With total scar contractures of large joints, combined plastic surgery and free full-layer autodermoplasty are shown.

To eliminate deep post-burn defects of soft tissues and ulcerated scars of the extremities, the method of accelerated plasty with a medial gastrocnemius skin-fascial flap is optimal.

In the postoperative period, 172 patients underwent regional lymphatic therapy. Of these, marginal necrosis of the flap occurred in 4 (2.3%) patients, graft lysis in 1 (0.5%), and wound suppuration were also observed in 1 (0.5%) patients, which was 3.3%.

The use of developed and improved methods of lower limb plastic surgery in 97% of patients achieved good functional and aesthetic results.

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