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CRYOSTRIPPING

varicose veins
with use of Cryo-S devices and cryoprobe
manufactured by Metrum CryoFlex

I. CRYOSURGERY IN TREATMENT OF VENOUS ULCER

Venous ulcer is a dominant (leading) symptom in third stage of progression of so called chronic venous incompetence according to Marshal or 6 in CEAP scale. Necrotic lesions are a direct effect of long – lasting venous stasis. They are most frequently formed on medial third lower part of calf. Pathophysiology of ulceration in post – thrombotic syndrome is due to recanalization of deep and perforator veins after post – thrombotic process (5).

Recanalized vein is a rigid pipe deprived of valves. A column of blood filling it moves back down with large pressure and blood stays in supraankle veins. This process is accompanied by plasma transudate and minute haemorrhagic spotting. It results in collagen fibres degeneration and skin and subcutaneous tissue sclerosis – lipodermatosclerosis (9). A process of fibrosis and discoloration proceeds due to haemosiderin deposition. There often appears so called white shin atrophodermatosis. Lately the meaning of reperfusion has been emphasised, so has been the meaning of free radicals release, white blood cells mobilization and inhibition of growth factors penetration. Additionally a retention of fibrin around capillary vessels and microthrombosis leads to a blood perfusion disorder. These processes result in necrosis and ulceration (10).

According to the English research programmes from 1992 it is adopted that the frequency of venous ulceration concerns about 1% of population and after 65th year of age this rate even goes up to 3%. Before planning venous ulceration treatment it is necessary to exclude the possibility of venous ulceration of other etiology. Traumatic ulceration, more frequent in the group of older people, and iatrogenic one, after sclerotherapy (11).

Ischaemic ulceration connected to atherosclerosis is frequently preceded by symptoms of intermittent claudication or resting pain (8).

Ulceration happens also due to diabetic microangiopathy or to the inflammatory process in Burger disease and periarteritis nodosa . Rheumatoid arthritis may be accompanied by ulceration. It must be considered that there exist mixed arterio-venous ischaemia and arterio-venous fistulas.

In the group of extravascular causes of ulceration: after steroid treatment, neoplastic, malnutritional, infectious, contact dermatitis and bleeding tendencies must be mentioned. In differentiation special attention must be paid on excluding the possibility of existence of arterial ulceration, especially in relation to the planned compression therapy (7).

Venous ulcer is most frequently located above medial ankle, rarely over lateral ankle. The most of arterial ulcerations are located on the dorsal parts of toes and front tibial parts (5). Typical venous ulcer has a fundus covered with pink granulation tissue. Edges are covered with pink epidermal tissue surrounded by area of lipodermatosclerosis with typical discoloration. In ischaemic ulceration there are a pale-yellow crust with fragments of necrotic tissue or tendon exposed in the fundus. The edges are flat.

II. TREATMENT

Treatment of venous ulcer is divided into two categories: traditional and surgical. Traditional treatment consists of well-known elements: extremity elevation which is lifting it up, often limited because of practical and financial inconveniences.

Compression therapy is considered to be the best way for traditional treatment. Four-layer bands used nowadays enable the ulceration to heal within 13 weeks in 73% of cases. There are therapeutic stockings, knee-length socks, tights of different makes and of gradual compression decrease, beginning from the point over the ankle to the point located 5 cm below the groin used. Sometimes collodium dressings are applied. The ulcer hygiene is the third element of conventional treatment. Antiseptics are used locally as well as enzymatic factors cleansing the wound and mechanical demarcation (fibrolan, iruxol, ozone, laser). Wet dressings of alginat type, hydrocolloids, hydrogels and polysaccharide agents are known. Their value is variably assessed by authors of scientific literature and clinician doctors. There are two categories that could be distinguished in surgical treatment:

- Cosmetic one which is excision of ulceration together with fascia and covering the defect with autodermic graft or covering the granulation fundus of ulceration with small flakes of skin grafts.
- Causal one which consists of eliminating venous hypertension. To obtain this, regional anastomosing veins must be ligated and cut. With co-existent varices, saphenous vein and possibly small saphenous vein are being removed (12).

Linton operation – subfascial ligation of perforators and Cocett operation – suprafascial ligation are listed as classical operations. In Linton method (*pic. 1, pic. 2*) – longitudinal incision is performed along medial edge of tibia bone from the ankle to the distance of 15-20 cm. Then triceps muscle of the calf is separated from the fascia, anastomosing veins are being cut in between the ligatures. The operation last very long, is invasive and leaves bad scars.



pic.1 Patient after Linton operation performed in hospital



pic.2 The same patient after conservative treatment in our clinic

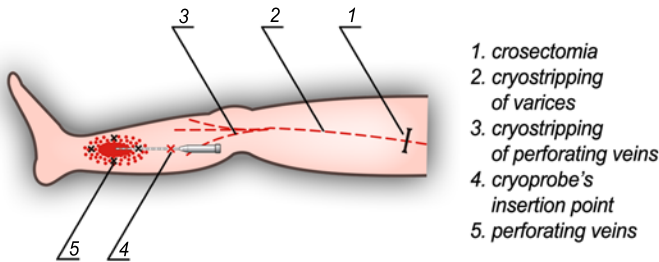
Felder method is the modification of this surgical procedure, where the access to perforators is reached through a back incision. In the post-thrombotic syndrome: ligation of popliteal vein – Węgliński operation, ligation of superficial femoral vein – Homans operation, gracilis muscle plastic operation under popliteal vein – Psathakis operation are performed.

Hach fasciotomy and endoscopic ligation of anastomosing veins are among modern operations. In the beginning they were performed with simple equipment with direct optical system, now they are performed using video visual systems (1, 2, 3, 6).

In case of reflux in deep veins, the reconstruction of venous valves is performed using Kistner and Taheri method, which is segment grafting of brachial or axillary vein. There is research carried out on usage of artificial homogenous and xenogenous vein valves (6).

III. CRYOSURGICAL METHOD

Fundamental part of this method is removing, partially randomly, anastomosing veins in the region of ulceration, leading cryosurgical probe in suprafascial layer. To do that, after removing varices I enter the probe to the position possibly nearest to the ulceration (*pic.3*), but in the region of healthy skin. I definitely try to avoid an incision in the region of lipodermatosclerosis. At first using cryostripping method, I remove perforators, previously marked during doppler test and palpation. Then I try to separate the whole region of ulceration from the fascia together with few centimetres of skin margin. Sometimes this procedure needs an additional incision and entering the probe from the different place (4).



1. crosectomia
2. cryostripping of varices
3. cryostripping of perforating veins
4. cryoprobe's insertion point
5. perforating veins



pic.3 Cryosurgical treatment of venous ulceration

IV. MATERIAL

Since 1994 till now I have operated in one of the private clinics in Warsaw, and lately in my own one using cryosurgery method over 3000 cases of patients with low extremity varices. In this group there were 52 patients with chronic tibial venous ulceration. All the patients suffered from varices of low extremities. Isolated tibial ulceration and in few cases multiple ones, existed in spite of traditional treatment with spells of remission of 1,5 year, and in few cases even over 10 years. Arterial, diabetic, rheumatoid etc. components were excluded in all patients. Standard doppler testing showed reflux in deep veins system in about 50% of the group. Treatment was complex in all cases. In pre- and post-operative period there were usually drugs administered: systemically – Detralex, Clexane, Sintrom, Acetylsalicylic Acid, Pentoxifylline, Troxescorbin (troxerutin, ascorbic acid) etc. Locally on healthy skin and sclerodermatosis: Hirudoid, Helason (heparin, hyaluronidase), Zinc Ointment, Heparin Ointment, Arcalen and Flucinar (Neomycin, Fluocinolone acetonid) – in case of stasis egzema.

High limb elevation and compression therapy were applied after the surgery. I treat ulceration with laser therapy with waves length 904 nm in the dose of 3J. per location.

Compression therapy of large strength was limited to the period of the ulceration healing (on average 6-7 weeks and to patients with reflux in deep veins system). Then gradually compression of mild class was applied.

Healthy granulation was covered with skin graft flakes in cases of 2 patients.

All patients were classified according to American Venous Forum from 1994 in CEAP scale (which stands of Clinic, Etiology, Anatomy, Pathophysiology) and according to the point scale of venous system disorders had the amount of points above 10.

V. RESULTS

Group	No of patients operated	Results 1	Results2	Results 3
I	16	10	3	3
II	36	26	4	6
Total	52	36	7	9

Group I - Patients with reflux in deep veins (Doppler). Insufficient perforators.

Group II - Patients with efficient deep veins but with insufficient perforators

Result 1 - Very good, without recurrence, full healing of ulceration

Result 2 - Good. One recurrence healed with compression and elevation

Result 3 - Sufficient. The procedure has been repeated because of activation of additional communicating veins

VI. CONCLUSIONS

1. Cryostripping is the most advanced form of mechanical stripping.
2. Cryostripping as a procedure for treatment of venous ulcer is cheap, precise and low invasive.

VII. BASIC ADVANTAGES

1. Ambulatory procedure.
2. Local anesthesia.
3. Very small, cosmetic scars (2-3 mm)
4. Short time of the procedure.
5. Short time of recovery.
6. Nearly full activity after procedure.
7. Low costs in comparision with endoscopic perforator ligation (SEPS).

VIII. CLINICAL CASES

Treatment of venous ulcer using cryosurgical method.

Before cryosurgery

5-6 weeks after cryosurgery



IX. CRYOSTRIPPING

More and more people suffering from varices of the lower limbs seek information for new, alternative therapies. The majority of patients obtain information of therapeutic modalities from their own kith and kin. The information obtained in this way does not encourage to make decision for surgery, as it often results in deforming, post-operative scars.

The need to minimize the duration of the treatment is also the reason to seek new therapeutic methods. Many individuals cannot afford a few weeks away from work (10-day hospitalization followed by rehabilitation period). It results from concern for work, own business matters or studies. A numerous group of patients seek other therapeutic methods as they are afraid of stay at hospital and anaesthesia. People seek methods allowing them to leave hospital immediately following effective treatment. Methods of management of varicose disease may be divided into two categories: traditional and invasive.

- Traditional management includes elevation of the limb, compression therapy, i.e. use of bandages or elastic stockings. High vitamin, fibre rich diet and oral phlebotropic drugs, as well as topical gels and ointments should be used concomitantly. All these measures act prophylactically and alleviate symptoms of varicose disease, but they are unable to eliminate existing varicose veins.

It may be attained only by invasive methods.

- One of them is sclerotherapy, or obliteration of varicose veins by an injection of substances into the varicose vein, which should induce aseptic inflammation of the venous wall. It leads to obliteration of the varicose vein. This method may present some complications such as inflammatory, thrombotic or allergic reactions. Recurrence of symptoms caused by recanalization is frequently observed. In our clinic this method is designed only for very small, intracutaneous varices (web veins) and, first of all, for teleangiectasia or dilatation of small vessels.
- Surgery so far is the most important method of treatment of varicose veins. Initially, a longitudinal incision of the skin followed by excision of long segments of the great saphenous vein (Mandelung operation) or ligation of the outlet of the great saphenous vein (Trendelenburg operation) were performed.
- Stripping or subcutaneous extirpation of the vein was a major breakthrough in surgical techniques. It was initiated by Babcock in 1905 and then modified by Homans, Dodd, Cockett and Linton; unfortunately, stripping became the most common method for treatment of varicose disease. It consists of insertion of metal wire with an olive-shaped ending into

the vein, followed by brutal extirpation of entire vein. The remaining varices of collateral branches and perforators are resected via a series of incisions and additional extirpation. This method, commonly used in Polish hospitals, requires long term (several days) hospitalization, anaesthesia and results in multiple, deforming scars.

- Miniflebectomy is a major progress of effective treatment, but, first of all, an improvement of cosmetic effects. This technique consists of extraction of varices through the very small incisions of the skin. Unfortunately, this technique is unsuitable for varices situated farther from the puncture and does not eliminate perforating veins and are responsible for development of varices.
- At present, cryosurgery is the only method of elimination of varicose veins, which meets patients' and doctors' expectations. It allows to get rid of the disease with minimal damage. It results in removal of perforators without deforming scars (miniflebectomy technique has been applied). It is also unnecessary to stay at hospital and undergo anaesthesia. This technique is based on insertion of the probe through a very small incision of the skin. The ending of the probe decreases temperature to -80°C , resulting in cryoadhesive effect, i.e. sticking of the surrounding tissues to the probe. Then the Babcock's idea is applied, i.e. extirpation, but just frozen varicose vein. The mystery name cryostripping has been decoded as Krios - in Greek it means cold, frost - plus stripping. The benefits for patient and also for surgeon are obvious. In order to remove the varicose vein, cryoprobe may be introduced into the lumen of large varicose vein, or may be only in external contact with the vessel. It is a unique method allowing removal of varices after previous sclerotherapy and thrombophlebitic process. Low temperature exerts an analgesic effect with simultaneous occlusion of small vessels, resulting in prevention of intraoperative bleeding. The design of the probe allows the surgeon to obtain an approach to all varicose veins without the necessity of additional incisions of the skin. In our clinic, this method became an ideal measure in the treatment of venous ulcers. In these cases, this technique is absolutely competitive for classic, very drastic Linton operation (skin incision from the knee to the ankle), or a new - but expensive method of endoscopic ligation of perforators.

For about 30 years I have been engaged in surgical treatment of varices. I have performed several hundreds of traditional operations. For a few years, I have been removing all varices using only cryosurgery, even in the very advanced stage with venous ulcers (VI, the highest degree in the CEAP scale). The number of patients, who underwent this surgery exceeds 3000. Based on my own experience and literature findings I state, that an incidence of relapses after classical methods reaches 40%, whereas following cryosurgery it does not exceed 6% (Milleret - Erbe Medical Lyon, 1993).

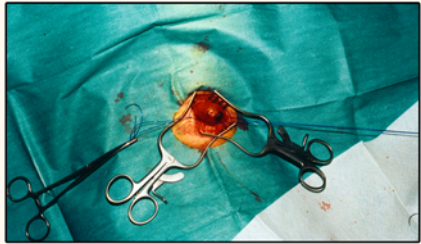
Decision belongs to the patient.

X. PROCEDURES OF VARICOSE VEINS TREATED BY CRYOSURGICAL METHOD

Marking



Crosectomia



Cryostripping of distal part of Saphena vein



The same leg 7 days after cryostripping



XI. VARICOSE VEINS TREATED WITH CRYOSURGICAL METHOD

Before cryosurgery

5-6 weeks after cryosurgery



XII. BIBLIOGRAPHY

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