

Commentaries

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Invited commentary on 'Conservative REflux Elimination Device (CREED): The Virtual Phlebectomy' by S. Ricci

Venous hemodynamics revival

C Franceschi¹

¹Consultant Groupe Hospitalier Saint Joseph Paris, France
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Claude Franceschi, claud.franceschi@gmail.com

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With the Conservative Reflux Elimination Device (CREED): The Virtual Phlebectomy¹, Stefano Ricci rightly reminds us that it is not varicose veins that are the cause of venous insufficiency, but the escape points that overload them by closed shunts effect and lack of blood column height fractioning.

The later was first mentioned in 1846 by Sir Benjamin Brodie (1783-1862) who attributed the cause of ulcers to excessive weight of the blood column and proposed tight compression with rubber bands². Then by Trendelenburg (1844-1924) who replaced the compression by his finger (Trendelenburg test) by surgical ligations. The closed shunts were hypothesised by what he called "private circulation".

Georg Clemens Perthes (1869-1927) showed the shrinking Varicose veins when walking below a tourniquet. This "Perthes test" was initially proposed to indirectly test the deep venous system supposed malfunctioning when the shrinking doesn't occur. Then it was assumed as a validation of the "private circulation" and its CHIVA translation as specific closed shunt. This hemodynamic approach to the treatment of venous insufficiency was then "forgotten" for almost a century when the surgical

destruction of varicose veins was made possible by the progress of anaesthesia and antisepsis.

Stripping (Keller in 1905, Mayo in 1906 and Babcock in 1907) became a dogma ("preventive" destruction of healthy superficial veins was proposed by Jean Sicard), then substituted or completed by sclerotherapy and the various current endovenous ablative procedures.

In 1988, I proposed a treatment based on the hemodynamic physiopathology that I revisited thanks to the progress of the echodoppler³. The notion of closed shunts CS (private circulation) overloaded by $N1 > N2$ or $N1 > N3$ escape points was extended to the concepts of open shunts by deviation OSD (varicose vein overloaded only by the GSV or SSV through $N2 > N3$ escape point), classified in various types of shunts (0 to 7) according to their of the hemodynamic and topographic configurations.

Though the weight of the blood column is certainly a determining factor, the varicose veins are mainly dilated by the haemodynamic overload of the shunts during walking and sportive activities. The re-entry points above the knee may not be activated by calf compression-release or Paraná test because they may not activate the thigh muscles diastole. For that reason, the Reflux Elimination Test (RET) must be performed also with Valsalva manoeuvre when compression release or Paraná test are negative⁴.

CREED therefore achieves, when effective, dynamic fractioning of the GHSPF hydrostatic pressure column and disconnection of the shunt according to the hemodynamic concepts of CHIVA. Finally, it should be considered as a disconnection of the CHIVA rather than a phlebectomy as it only removes the overload and preserves the physiological drainage function of the still draining underlying varicose vein. It is also not a stocking or bandage compression. The latter does not fractionate the column or disconnect shunts but reduces stasis and improves tissue drainage by reducing transmural pressure at the microcirculation level.

This article recalls how the haemodynamic concepts of diagnosis and treatment of venous insufficiency have progressed over the last 30 years, confirming, or correcting previous ones in the light of haemodynamic investigation especially provided by the Echodoppler. Unfortunately, despite this evidence, most practitioners have not yet expanded on this knowledge and still favour destruction of the GSV, which is not only unnecessary, but deprives patients of venous capital for possible future life-saving arterial bypass needs.

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Invited commentary on 'Conservative REflux Elimination Device (CREED): The Virtual Phlebectomy' by S. Ricci

Hemodynamic effect of compression below the knee

C Recek

¹Retired, former workplace: Department of Surgery, University Hospital, Hradec Kralove, Czech Republic. Mantlbergasse 24 A-1130 Vienna, Austria.
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DOI: [10.24019/jtavr.134](https://doi.org/10.24019/jtavr.134) - Corresponding author: Dr. Cestmir Recek, cestmir@recek.at

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The article by S. Ricci 'Conservative REflux Elimination Device (CREED): The Virtual Phlebectomy'¹ presents a theoretical proposal of a simple but – based on venous hemodynamic principles – predictably effective conservative method for the treatment of varicose veins. The author mentioned a very interesting curiosity, a “Bandage for varicose veins”, which was patented by Schultz A. and Landerer A., firstly in Germany in 1890 and later in USA in 1894. The device was similar to the CREED one but did not gain popularity. Nevertheless, the device proposed by S. Ricci is promising. It must be assumed that it would be able to interrupt the saphenous reflux during calf pump activity and to block the development of ambulatory venous hypertension. In addition, due to the abolishment of

the drainage of blood from the incompetent thigh saphenous system into deep lower leg veins and keeping thereby the dividing line of the ambulatory pressure gradient at the knee level, as is the case with healthy people, it could rein the tendency to progression of the varicose vein disease.

A similar deliberation was presented in an article by Recek². Apart from the invasive procedures, a sheer conservative measure might produce beneficial hemodynamic results. Based on the pressure changes in deep and superficial veins of the lower extremity, which are induced during calf pump activity, it can be anticipated that a positive therapeutic effect might be achieved by the external pressure applied in the form of a pneumatic cuff or a rubber sleeve closely below the knee joint. The pressure of about 35 mm Hg might be able to compress the saphenous system during the diastolic phase of the calf pump activity and impede in this way the saphenous reflux. It follows that it would

1. hinder the diastolic saphenous reflux and the occurrence of ambulatory venous hypertension
2. not interfere with the physiological systolic centripetal flow
3. impede the pathological drainage from the thigh saphenous system into deep lower leg veins occurring during calf pump activity in the treated patients, in whom saphenous reflux was abolished, and inhibit thereby the creation of preconditions for recurrent reflux.

During calf pump activity, the hydrostatic venous pressure decreases to about 25 mm Hg in the distal posterior tibial vein and to about 30 mm Hg in the great saphenous vein above the ankle. During calf muscle contractions the systolic pressure in the posterior tibial vein increases by about 75 mm Hg above the hydrostatic pressure, so that the systolic centripetal flow toward the heart is guaranteed; external compression of about 35 mm Hg cannot hinder it. The Perthes test – applying a tourniquet in the thigh in order to compress the incompetent saphenous vein – documents the emptying of the venous reservoir of the lower leg; the bulging varicose veins in the lower leg empty during calf pump activity.

Thus, the theoretically deduced external pressure of about 35 mm Hg applied below the knee would keep the dividing line of the ambulatory pressure gradient closely below the knee, as it is distinctive of healthy people. This principle could set a new therapeutic modality in the treatment of varicose vein disease. A few years ago, I have proposed a similar device to an important company, but it did not attract interest.

It should be mentioned that the above deliberations have been supported by the findings presented by Mosti and Partsch who studied the hemodynamic impact

of compression stockings using plethysmography³. The authors showed that progressive elastic compression stockings providing median pressures of 33 mmHg in the gaiter area and 46 mmHg at calf level increased the ejection fraction up to the normal range. The results were significantly better in comparison with the conventional graduated pressure profile with higher pressure in the gaiter area and lower pressure in the calf.

In conclusion, the device presented by Ricci should be used in patient cohorts and the hemodynamic effect should be verified by plethysmography. The optimal value of the external pressure should be found out.

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Invited commentary on 'Conservative REflux Elimination Device (CREED): The Virtual Phlebectomy' by S. Ricci

CREED-The Virtual Phlebectomy

BB Lee^{1,2}

¹Clinical Professor of Surgery, George Washington University, Washington DC, USA.

²Adjunct Professor of Surgery, Uniformed Services University of the Health Sciences, Bethesda, MD, USA.
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The Author proposed a special tourniquet over the venous tributary termination as an interim management of varicose veins to eliminate the reflux in the GSV axis when a definitive care is need to be delayed or not

possible¹. According to the author, the tourniquet made with sport taping material with a thickening is sufficient enough to provide simple elimination of the tributary when placed exactly over the tributary termination and named to Conservative Reflux Elimination Device (CREED).

When a varicose tributary is related to a 'perforator', a tourniquet would precisely close the vein to provide the same hemodynamic effect of a phlebectomy (virtual phlebectomy), matching to the results of the Reflux elimination test shown through the Figures. Indeed, the 'finger compression' of the main tributaries has been known to be able to eliminate the reflux in the GSV axis so that this maneuver of simple positioning of a tape in a strategic site should be initially sufficient with same effect of a phlebectomy, as the author claims, if a conservative strategy is concerned.

Such outcome is an expected hemodynamic response acceptable by current hemodynamic principles of venous circulation of the lower extremity² most of current diagnostic tests for Venous Refilling Time calculation (plethysmography) still employ same principle of Trendelenburg Test designed by Trendelenburg (1890) and also Perthes Test by his pupil Perthes (1895).

Nevertheless, the extension of this rationale for the CREED further to the CHIVA (Cure Conservative Hemodynamique de l'Insuffisance Veineuse en Ambulatoire) concept, proposed by C Franceschi (1988), adopting the new concept of 'escape and reentry' point of venous reflux, remains to be seen especially for the repositioning of the CREED on the knee level to allow its possible new role to substitute the first stage in a non-

invasive way, favoring the perforator development and directly allowing the second stage (simultaneous treatment

of junction and tributary disconnection) when the perforator effectively develops³.

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Invited commentary on 'Conservative REflux Elimination Device (CREED): The Virtual Phlebectomy' by S. Ricci

A useful tool for KTS and marginal vein

F Passariello¹

¹Fondazione Vasculab ONLUS, via Francesco Cilea 280 - 80127 Naples, Italy

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The Author introduces the Conservative REflux Elimination Device (CREED)¹ to perform and maintain a prolonged venous compression, which acts as if one or more fingers were pressed on selected superficial vein(s).

The device remains fixed, compression showing its delayed hemodynamic response or therapeutic effect even after a long time.

The CREED seems a very simple and versatile tool. Let me add here just a hypothesis of an unforeseen enhancement, using as clinical sign the wall tension. As an alternative, a Doppler device can be used as well.

KTS and CREED

Two important (though inconstant) components of the Klippel-Trenaunay Syndrome (KTS)² are the deep veins

occlusion/hypoplasia/agenesia and the superficial atypical venous conduct called Marginal Vein (MV).

MV is an embryonic remnant which can totally or partially compensate for the deep vein obstacle, realizing a so-called vicarious shunt and sometimes a systolic reflux in the saphenous-popliteal junction, which transfers blood towards the surface into the MV to jump the deep occlusion.

Very often the MV can be overcharged by the deep veins through a diastolic reflux, transmitting the hydrostatic pressure downwards^{2,3}.

Deep veins and MV in KTS can be figured as two parallel channels, connected by perforators, with an occlusion in the deep segment above a perforator.

Using the CREED on the MV below the perforator, the effect could be the same as after transient finger compression, but it could persist for a long time. Especially, the wall tension in the MV can be checked by palpation: the wall tension can 1) decrease (closed shunt disconnection) 2) remain constant (flow diverts into the deep system) 3) increase (impeded outflow)^{2,4}.

The surgical interruption of the MV is indicated just when the wall tension decreases and remains stable for a long time.

A delayed change can occur from decreased to increased tension instead, due for instance to the abrupt thrombosis of the compensating MV segment, long time after CREED compression. In this case, MV interruption in the site of CREED should be avoided and the CREED could be (if needed) checked in a different place.

KTS treatment is a difficult and unshared procedure with no quick alternative therapy, thus there is no need to speed up. A thorough pathophysiologic study and an accurate strategy are mandatory instead, sometimes with useful pauses between the therapeutic steps, in order to let the system reach a stable condition.

Note that, CREED would be the sole method to test non-invasively a delayed patency change.

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Answers to the invited commentaries on 'Conservative REflux Elimination Device (CREED): The Virtual Phlebectomy' by S. Ricci

S Ricci¹

¹Private practice - Roma

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Four invited commentaries on 'Conservative REflux Elimination Device (CREED): The Virtual Phlebectomy'¹ were received. The astonishing event is that the peculiar idea over which the paper is based did encounter a general consensus. Did the editor choose only friendly opinion makers? Apparently not, as commentators are between the “angriest” vascular characters of phlebology word.

Claude Franceschi² whose theories inspired the CREED, and to whom we owe most of the knowledge on venous ultrasound recalled the “Perthes Test” as being in some ways a predecessor of the closed shunt indicator, and in my personal thoughts, the CREED is nothing more than a Perthes test of long duration. That the RET for exploring above the knee perforators should be done also through a Valsalva maneuver when negative, is a good advice even if (or above all) these perforators are not frequent. The difference between disconnection and phlebectomy is also correctly underlined as CREED is more like to a CHIVA

disconnection, but as both techniques have conceptually the same function, I thought the term phlebectomy could be more generally understood. The only thing which I disagree with Claude is the bandage effect: I think that a good bandage is able to stop the reflux in tributaries (if not in the GSV).

Cesmir Recek³ cited the curious historical finding of a patent of more than 100 years ago suggesting a device similar to the CREED. In fact, the idea is so simple and evident that it is impossible that people did not think to it, as demonstrated by the same Recek's similar proposal not accepted by an important firm, probably because scarcely productive of business. Very interesting, and a real addition to the study is the identification of a pressure (35 mm Hg) as the possible threshold to be achieved by the CREED application and by the strategic positioning of the device at the knee level (a strong point of this Author). Like for every novelty, further ideas will be stimulated. Plethysmography studies are certainly the most interesting in further research (and possible collaborations). However, I dare to disagree with the suggested use of CREED for the compression over the GSV stem. This is a secondary use (although interesting), the one that inspired the cited historical device. In my mind, the most important action of CREED is for tributary external compression/closure (like a phlebectomy), thus giving the connected GSV the possibility of “resting”. To do this effect, the pression on the tributary is very limited and easily achieved. This hemodynamic effect is the true difference with the other old devices.

BB Lee⁴ described in a perfect way, with plenty of details, in a very comprehensive mode all the principles of CREED and I am honored by his commentaries. It is one of the rare cases of a traditional surgeon being able to understand and adapt his mind to modern changings.

Fausto Passariello⁵ accepting the CREED logic, immediately suggests a further application, on the difficult subject of KTS. Here, for establishing the patency of deep vessels CREED could be placed on the MV below the perforator: the effect could be the same as after transient finger compression, but it persisting for a long time giving the possibility of selecting the cases that can be submitted to MV interruption.

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