Abstract

In 2008 a paper by John Opie, regarding the renewed role of venous valvuloplasty and an intriguing discussion took place on VASCULAB, a well-known network on line with about 1300 expert members in phlebology guided by F. Passariello as conceivers and coordinators.

The valvuloplasty attempts to reduce blood reflux and venous hypertension in chronic venous disease (CVD). The technique requires a skilled and experienced surgeon and a careful patient evaluation and selection. It could be a good approach in selected cases with post-thrombotic syndrome (PTS).

Some studies indicate in the nineties that valvuloplasty or valvular replacement is an effective treatment for venous incompetence in selective cases. After a concise valvuloplasty story from Kistner to Maleti, despite the advances in valvuloplasty, we point out that the surgical mainstay to correct CVD, deep and superficial or both, or primary varicose veins is great saphenous vein (GSV) ligation and stripping but also various conservative or endovascular treatments. Nevertheless actually some clinical studies have reported achieving long-term, effective competence of deep venous system, as well as the superficial venous system, both after valvuloplasty or by implanting an external vein support device.

J. Opie identified as an optional surgical solution for the large underserved patient group of PTS a new technique: «monocusp surgery». He presented a new surgical method to replace a dysfunctional aplastic / dysplastic / absent venous valve using the full thickness viable native vein wall tissue (the monocusp) and covered the defect with an ultra-thin synthetic e-PTFE vascular closure patch (iVena™e-PTFE patch) to successfully reverse venous insufficiency and its effects both early and long-term with limited complications. The description on monoscusp valvuloplasty by Opie in Vascularab was accurate.

At the same time S. Camilli presented his technique of external stretching valvuloplasty with a new device is «oval shaped external support» (OSES), made by a Nitinol net-like framework, very smooth, elastic and flexible, available in different size. The OSES device is suitable for the terminal and pre-terminal valves of the GSV and virtually for any peripheral venous valve, on superficial and deep system, also without ligation of the possible present competent collaterals.

The discussion was ample and very interesting with the contributes of C. Recek, B.B. Lee, C. Franceschi, O. Maleti and others, included J. Opie and S. Camilli.

In general, R. Kistner considerations about Maleti’s technique are true for all valvuloplasties: «I find no fault with valvuloplasty and I am anxious to see if others can duplicate the experience. Points that need to be expanded in these experiences are how many cases were evaluated and found not to be candidates for this procedure, the length of the learning curve for producing a reliably competent valve, and whether there is any sign that these new valves will degenerate with time. If this technique can be successful, the next question will be whether it can be achieved in a more minimally invasive method»

Key-words: Valvuloplasty – Vein surgery – Chronic venous disease

Résumé

En 2008, un article de John Opie sur le rôle remis au goût du jour de la valvuloplastie veineuse et l’intéressante discussion qu’il suscita, fut diffusé sur le site VASCULAB, un
réseau réunissant plus de 1300 experts internautes. F. Passariello en était l'initiateur et le coordinateur.

Le but de la valvuloplastie est de diminuer le reflux sanguin et l'hypertension veineuse dans les affections veineuses chroniques (AVC). La technique nécessite un chirurgien expérimenté avec une sélection et une évaluation rigoureuse des patients. Elle peut avoir tout son intérêt dans des cas bien sélectionnés de syndrome post-thrombotique (SPT).

Plusieurs études datant de la fin du siècle dernier tendent à prouver que la valvuloplastie ou le remplacement valvulaire est un traitement efficace de l'incontinence veineuse dans certains cas. En reprenant l'historique de la valvuloplastie, de Kistner à Maleti, malgré les progrès réalisés, on note que la conduite chirurgicale pour traiter les AVC, profonde ou superficielle ou associant les deux, reste la ligature / crossectomie des saphènes avec aussi quelques traitements variés conservateurs ou endovasculaires. Néanmoins, aujourd'hui, des études cliniques ont démontré une efficacité à long terme avec une continence correcte, aussi bien des veines superficielles que profondes après valvuloplastie ou implantation de manchons externes prothétiques.

J. Opie propose une option chirurgicale pour la large cohorte de patients présentant un SPT, et pour lesquels on a peu de solutions à proposer actuellement ; cette technique s’appelle la « chirurgie monocuspide ». Cette nouvelle méthode chirurgicale traite les valvules incompetentes, aplaties, dysplasiques ou absentes en utilisant la paroi veineuse recouverte d’un patch en PTFE. Cela donne de bons résultats dans l’insuffisance veineuse, précocement ou à long terme avec peu de complications.

Parallèlement, S. Camilli a présenté sa technique de valvuloplastie externe avec la prothèse OSES, élastique, flexible et disponible en plusieurs tailles. Elle convient parfaitement aux valvules terminales et pré-terminales de la veine grande saphène et théoriquement à toutes les valvules veineuses périphériques, des réseaux profonds et superficiels, sans ligature des collatérales compétentes qui peuvent être présentes.

La discussion a été très fournie et très intéressante en particulier avec les contributions de C. Receck, BB. Lee, C. Franceschi et J. Opie et S. Camilli.

Les considérations de R. Kistner au sujet de la technique d’O. Maleti sont vraies pour toutes les valvuloplasties : « Je ne trouve pas de faute dans la valvuloplastie et je suis impatient de voir si d’autres peuvent répéter cette expérience. Les points à développer concernent le nombre de patients candidats à cette intervention et le nombre de récusés, la durée de l’apprentissage pour réussir cette technique, et s’il existe un signe quelconque témoignant d’une usure de ces valvules au fil des années. Si les résultats sont bons, la procédure question pourra concerner la mise au point d’une méthode encore plus mini-invasive ».

Mots-clés : valvuloplastie, chirurgie veineuse, affections veineuses chroniques.

A recent paper by John Opie, regarding the renewed role of venous valvuloplasty (1) and an intriguing discussion took place on VASCULAB (2), a well known network on line with about 1300 expert members in phlebology guided by F. Passariello as conceiver and coordinator.

**Venous Valvuloplasty story**

The valvuloplasty attempts to reduce blood reflux and venous hypertension in chronic venous disease (CVD). The technique requires a skilled and experienced surgeon and a careful patient evaluation and selection. It could be a good approach in selected cases with post thrombotic syndrome (PTS).

Some studies indicate in the nineties that valvuloplasty or valvular replacement is an effective treatment for venous incompetence in selective cases (3). The repair of incompetent femoral vein valves in patients with primary valve incompetence was first developed by R. Kistner in 1968 (4). The original method involved a venotomy in the femoral vein with the placement of sutures to shorten the vein cusps under direct vision, and others successful variations of open valve repair have been reported (5, 6, 7). The femoral vein valve repair was also carried out under direct vision without venotomy with the use of angioscopy (8).

Initially was a report by Garcia-Rinaldi from Houston, more than 20 years ago with prosthetic bovine monocusp patches in the superficial femoral and great saphenous veins for CVD (9), and Sante Camilli from Rome in early 1990 repeated the performance in a few cases, by applying a bovine pericardium monocusp (hand-made) into a superficial femoral vein (10).

Unfortunately, the « open vein » techniques (like Kistner, Raju, Sottiurai, etc) are difficult and challenging.

Closed valvuloplasty was also developed by R. Kistner as external venous repair. This technique involves complete dissection of the femoral vein up to 4-10 cm in order to place sutures on both sides of the vein wall at the level of the valve commissures (11).

A technique for repair of incompetent venous valves with an implantable device developed to restore venous valve competence by reducing the vein circumference was proposed by D. Hallberg for deep veins in 1972 (12) and by Hetényi and Pahoky for superficial veins in 1985 as "the
tunnel graft of greater saphenous vein in Dacron (13) and in other way experimented with success in two animal models with a silicone device named « venocuff » (14). Similar technique reinforce the commissure adaptation based on the principle V. Krylov from Moscow introduced to B.B. Lee to perform a few case on the femoral vein after Kistner’s simple external valvuloplasty but wasn’t quite successful with residual reflux. The intermediate results of all three cases were dismal within a year as mentioned by B.B. Lee in Vascular discussion (2).

G. Belcaro in 1989 proposed an external valvuloplasty as « plication » of the sapheno-femoral junction for primary varicose veins (15), and after a plication of superficial femoral vein for deep incompetence (16). Finally, was developed a device comprised of expanded polytetrafluoroethylene (ePTFE) with an embedded Nitinol alloy wire frame to provide a better basis for fixation. The device is wrapped around the vein at the valve site to restore competency to an incompetent venous valve by remodeling the vein at the valve site, and/or by preventing local dilatation of the vein to which it is applied (17).

Since more than 20 years in some series is performed a competent-valve venous segment transplantation (18).

Another experience was presented in the 2000 with the Ven-Pro endo-prosthesis, following Quijano’s ideas, whose clinical trial was stopped because of unacceptable rate of thrombotic complication.

The last landmark report of an exciting approach to definitive treatment of late post thrombosis deep vein reflux (PTS) in highly selected patients was the case series of endovascular neovalve construction by O. Maleti. Valvular cusps were created at the femoral site by dissecting the thickened venous wall to obtain material with which to fashion a new monocuspid or bicuspid valve (19).

### Venous superficial or deep valvuloplasty

Despite the advances in valvuloplasty, the surgical mainstay to correct chronic venous insufficiency (CVI), deep and superficial or both, or primary varicose veins (PVV) is great saphenous vein (GSV) ligation and stripping but also various conservative or endovascular treatments.

For the superficial insufficiency many phlebologist today have been convinced, by their own practice and literature, that conservative strategy, when applicable, has a better outcome than ablative one in varicose veins treatment. At the same time, even if the first reason of recurrent varicose veins may be a genetic-hormonal one, but the second certainly is hemodynamic – to be precise, the GSV ablation itself. At the present conservative approaches (e.g. CHIVA technique, collateral selective ligation, endovascular treatments) with a reliable valvuloplasty technique may be not the « final solution » but could reach a more satisfying outcome than usual.

Actually some clinical studies have reported achieving long-term, effective competence of deep venous system, as well as the superficial venous system, both after valvuloplasty or by implanting an external vein support device.

For the deep incompetence recently we had a review about valvuloplasty, indications and results by R. Kistner (20) and we have a good analysis in french language by M. Perrin (21, 22) but from epidemiological point of view the CVD is enormously more frequent than the primary venous insufficiency, and superficial reflux more than deep reflux.

About the indication and patients selection in CVD, the suggested today are people suffering (a) GSV junctional reflux with (b) movable and symmetric leaflets and (c) mild to moderate PVV, but also (d) in secondary varicose veins. In secondary varicose veins, you may bring back the natural deterioration history by stopping the reflux and - at the same time - you maintain the forward flow. Of course, it is suitable in primary deep venous insufficiency (PDVI) for (e) deep venous system external valvuloplasty as well.

From the technical point of view the main problems are to see both the commissures and a precise stitch application just at the apex of them. Should it be difficult to see the commissure apex, you may trans-illuminate the vein by a small glassfibre inside.

The rationale for sapheno-femoral external valvuloplasty is based on the histological finding that in the initial stages the valve cusps are still healthy but are incompetent because of dilation of the vessel walls. It must be shown echographically that the cusps are mobile and not atrophic in the terminal and/or subterminal part of the great saphenous vein. The aim is to bring the valve leaflets back together, closing up the dilated vessel walls. This can be done by either suturing the wall directly or by « buckling » the vessel with some sort of external prosthetic belt in silicone, Dacron, e-PTFE. Competence should be tested during the operation using the milking maneuver or a Doppler scan, or both.

After more than a decade in the experimental stage, this approach can now boast encouraging results from multicenter randomized clinical trials, as long as the surgical indications are respected and external valvuloplasty is feasible (23, 24, 25, 26, 27), and the Italian College of Phlebology Recommendations are: external valvuloplasty of the terminal and/or subterminal valve of the great saphenous vein, after thorough preoperative assessment, and with careful intraoperative checks, is a good way to treat saphenous reflux in 5-8% of patients. Grade B (28).

Really, both the Gore-EVS (now out of the market in Europe for economics reasons) and the Venocuff are unfitting in several cases, and – anyway – they are of unpredic-
table result because they bundle up valve leaflets on a blind way. Moreover, these devices need collateral ligation which involves the collateral stump deforming the valve wall’s shape. New devices may be applied around the junctional valves (terminal and pre-terminal) without collaterals involvement.

**The Opie’s and Camilli’s proposals**

Deep venous thrombosis (DVT) induced CVI, and about 5% of the population have this ghastly, aggressive illness. Previous reparative valvular surgical options directed at reconstructing damaged common femoral vein (CFV) valves associated with pathological CVD have not succeeded in reliably managing CVD. In consequence, venous valvuloplasty is rare and most patients are managed conservatively.

Maletti’s technique gives today great credit but the same author points out the intrinsic limits for clinical indications in absence of valve flaps and PTS, and technical feasibility. Probably for these reasons we have now interest for the two new proposals by Opie for frequent PTS patients and by Camilli for more frequent CVD patients.

J. Opie published (1) and discussed in Vasculab (2) that current external compression treatments are largely a giant expensive failure. The secret here is to continuously control (normalize) internal distal venous hypertension – if you do that successfully, external compression is not necessary anymore and normal venous physiology is restored. Over time the results are startling. Symptoms resolve, ulcers heal, swelling resolves, compression hose are support devices of the past (Opie’s point of view). Hemosiderin starts to resolve commencing around 2 years and liposclerosis also resolves, and is particularly noticed by the patient around 3 years. As a result, for this reason J. Opie identified as an optional surgical solution for this large underserved patient group a new technique: “monocusp surgery”. He presented a new surgical method to replace a dysfunctional aplastic/dysplastic/absent venous valve using the full thickness viable native vein wall tissue (the monocusp) and covered the defect with an ultrathin synthetic e-PTFE vascular closure patch to successfully reverse venous insufficiency and its effects both early and long-term with limited complications. He moved around that by formally redefining the operation, using these terms to book surgery: (a) CFV valvuloplasty (monocusp); (b) CFV patch venoplasty.

Make sure the diagnosis is correct have a duplex in the ORs if you want and have anesthesia Valsalva before and after implant. It’s quite interesting duplex with a sterile sheath right on the CFV. You have to get the duplex head below the monocusp (Fig. 1).

The description on monocusp valvuloplasty by Opie in Vasculab was accurate.

Clean off the adventitia, liberally coat the CFV early and frequently with papaverine as it wants to spasm. Don’t let that occur.

Draw the lines on the CFV before you place any clamps. Make the cuts as potbellied as convenient. Each cut is about as long as the vein’s diameter – has to reach the back and side walls. Don’t over do that however, minor monocusp leaks are well tolerated.

Make sure the patient is fully heparinized before clamping.

The external aspect of the CFV between the distal and proximal clamps was examined for any indication of valvular sinuses and to avoid injuring a valve that might be repairable.

**Fig. 1 – Monocusp technique: a representative echo, before the monocusp. Grade 4 CFV reflux by Valsalva (with permission J. Opie)**
Three necessary incisions were made to construct the monocusp valve (Fig. 2), on the anterior surface of the clamped CFV in the manner of a trap door with an uncut distal hinge.

Each incision should have a 1–2 mm convex outward track so as to conform to the rounded, filled vein when the vein re-expands to its circular, tubular shape after the operation was completed.

If no repairable valve was identified at the site of the incision, the monocusp operation should be continued. All incisions were as long as the diameter of the vein.

Make the leading edge sutures long enough so that the monocusp can function - both open and close, but do not let those leading edge sutures get too long - that will allow the leading edge of the monocusp to approximate the e-PTFE patch (iVena™). If that occurs, the monocusp and the patch will tend to adhere and the operation will fail. That has happened once to us and we had to redo above. Think of these leading edge sutures as similar to the chords restraining the mitral valve.

The Lateral Edges (LE) suture length is the most important and it is also the most frustrating. Once they are both placed, check the monocusp excursion and replace if too excessive or insufficient. That is part of the art involved. Some lateral leaking is not rare, but usually it has no clinical effect.

One way of assessing the LE suture length is to place the two corner sutures fold the monocusp to closed, have your assistant hold it there and tie the back wall sutures usually around 7 and 5 o’clock at the level of the proximal cut against the resistance. But remember the vein wall with stretch and these sutures can become too short. Don’t tie these sutures with too much pull that will drag the vein into a closed position must avoid that.

This operation works well when done right.

Fig. 2 – In a view of stylized CFV illustration of the monocusp operation and proper valve function.
(A) View of the monocusp looking down at the incisions and sutures. (B and C) Transverse view of the monocusp while open and closed, respectively. (D) View of the completed operation with the iVena™ e-PTFE vascular patch covering the monocusp. (E and F) Lateral views of the monocusp while open and closed, respectively. Arrows denote the direction of venous blood flow (with permission J. Opie).

Put the patient on coumadin for 6 months, then convert to ASA for life. Major venous surgery has much more potential of DVT in comparison to arterial surgery.

The role of Camilli’s technique

Recently S. Camilli from Rome has reported a new technique: the external stretching valvuloplasty. The preliminary trials, both experimental and clinical, gave positive outcomes in terms of safety and efficacy, and was presented to the Italian Society of Vascular and Endovascular Surgery (29). This is an innovative working principle which aims to give a stretching action on the opposite inter-commissural walls, and parallel to the free edge of the valve cusps, to modify the cross section of the valve so that the cusp’s free edge extralength is reabsorbed. A new device has been developed, working as a surgical implant around the incom-
patent venous valve which increases the inter-commissural diameter and, in this way, resulting in the valve cusp's coaptation and function recovery (Fig 5). The new device is an Oval Shaped External Support (OSES™), made by a Nitinol net-like framework, very smooth, elastic and flexible, available in different size (3 sizes just now) (Fig. 6). The OSES™ device is suitable for the terminal and pre-terminal valves of the GSV, also without ligation of the possible present competent collaterals. Virtually the Camilli’s device can be useful for any peripheral venous valve, on superficial and deep system, obviously when the valves are present.

**Discussion**

First, C. Reeck put some questions and a comment addressed to colleagues who perform valvuloplasty: the necessity to perform selective valvuloplasty with additional procedure and the necessity to verify the results plethysmographically to achieve normalization of the venous hemodynamics. As concerns the indication to valvuloplasty, it must be distinguished between PVV and PTS. In PVV could be taken into consideration for valvuloplasty the incompetent CFV and the incompetent GSV. As concerns the femo-
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ral vein, from the hemodynamic point of view it does not matter whether the femoral vein is competent or not: the ambulatory pressure in this vein is in both cases the same, reminding the work of Höjensgard and Stürup that the hydrostatic pressure in the femoral and popliteal veins remains uninfluenced during the activity of the calf muscle venous pump (30). On the other hand, when GSV reflux is accompanied with CFV incompetence, abolition of saphenous reflux alone, without influencing the femoral incompetence, restores the disturbed venous hemodynamics to normal (31, 32). Analogously, cases with incompetence of the small saphenous vein (SSV) are very often accompanied with incompetence of the popliteal and femoral vein and abolition of the SSV reflux alone restores the disturbed venous hemodynamics to normal (33). Finally, Recek emphasized that deep vein incompetence of the iliac, femoral and popliteal veins per se do not cause CVI provided the valves in the lower leg veins are competent, the outflow pathway is patent and no shunting of blood in superficial venous system is present.

Regarding the Recek’s standpoint valvuloplasty of any kind indicated or not with varicose veins treatment, Opie replied that if the PVV are due to GSV or SSV and/or accessory vessel incompetence and no CVI exists, the correct management is treatment of the superficial varicose veins by ELT, RF, stripping, phlebectomy, foam etc whatever is the preferred method of the surgeon. Monocusp is certainly not indicated with such conditions. However, if PVV and CVI exist at the same time in the same patient, he chose to correct the superficial varicose vein conditions first, and see how the patient does. If the CVI is still an issue then he recommends a valvuloplasty - if usable valves are encountered then can do a Kistner type repair (this is quite uncommon in secondary CVI). If no valves or no usable valves are encountered then Opie proceed with a monocusp.

Regarding the last point, B.B. Lee disagreed with Recek’s quotation of absence of valves in the femoral vein, and in the same way Opie, quoting a Canadian pathologist study in «nonvenous» patients that founded the absence of valves in CFV in only 21% (34), replied that a competent valve(s) lower down the leg in the femoral vein may well control CVI even if the CFV valves are leaking. All it takes is one deep valve to remain competent and CVI will not occur. As concerns the absence of competent valves in deep veins above the SFJ in PVV, Recek opposed that «Trendelenburg is correct, pathologist Basmajian not», confirming unequivocally Trendelenburg’s findings by venous pressure measurements and registration of pressure waves (35). A pathologist can recognize the valves, but he is not able to credibly assess whether the valve is competent or not. This is possible and convincing in the standing position in a live person.

Considering that we need to make an effort, aiming to a more conservative and even reconstructive approach to vein surgery S. Camilli exposed the opinion the time is mature, the technique also, the technology a bit less for valvuloplasty, opposing Recek’s some statements.

The on line discussion was also stimulate by an agreement on the term venous hypertension remembering that there are two kinds of venous hypertension: the hydrostatic one and the ambulatory one. But Opie added a third kind of «malignant» venous hypertension, the «constant» venous hypertension (WBCs and RBCs accumulate via the super high constant venous pressure expanded desmosomes and the end result is first hemosiderin staining followed by liposclerosis followed by skin break down and venous ulcers development potentially eliminable repairing a valve in the CFV).

C. Franceschi presented his practical heamodynamics: (a) mechanical venous valve competence is not a problem because it can be achieved according to various techniques; (b) mechanical venous valve challenge is to be not destroyed by DVT; (c) mechanical venous competent valve efficiency cannot be different from a natural one in terms of haemodynamic outcomes; (c) mechanical venous competent valve has to be located at an haemodynamic strategic point...

Fig. 6 - Oval Shaped External Support by S. Camilli (with permission S. Camilli).
point which requires an appropriate and tailored strategy. Hydrostatic pressure fractioning is obviously more efficient to lessen the ankle pressure when the valve is located at the popliteal vein than at the CFV. Anyway, the dynamic fractioning at the CFV is efficient proportionally to its height; (d) accurate hemodynamic assessment permits to apply deep CHIVA strategy with good long term outcomes but only when closed shunts are usable for disconnexion (36, 37).

O. Maleti remembered that the inward flexing of a venous segment in order to create a flap working as a valve was first suggested by Karagoz in 1993 (38); the segment used by Karagoz was the terminal end of the GSV. Opie creates a flap fixed only in one extremity and free in both lateral edge fixed by two stiches. Maleti thinks that such a flap presents some serious fixing problems. It is in fact well known that the valve is subject to an important pressure, and the best results are obtained when a very large flap is used, being able to create a «sailing effect». The same happens in nature: valves are not simple diaphragms anchored in a single point, otherwise the side pressure would cause the vein to expand, and a blood leakage caused by poor fixing would inevitably occur. Valves are true pockets which inflate following to the expansion occurring at the sinus venous level, and it is just such mechanism that ensures the continence effect, as F. Lurie has widely explained in his hemodynamics researches. Opie’s technique would greatly benefit from increasing the diameter of the flap inserted to the extent of two thirds of its circumference, fixing it on the edges and increasing the length of the flap itself. In such a case, the patch will cover the circumference by 2/3. Opie agree with Maleti’s thoughts here. The monocusp is by no means as clever nor as good as a native valve with sinuses etc, but it is a viable structure and if the iVena patch is used, it (the patch) bulges anteriorly when the clamps are removed and an anterior sinus is created. How long that bulge remains Opie doesn’t know. It is easy to make the flap long simply by extending the vertical incisions - not so easy to make it wide because the diameter of the vein limits.

Opie stressed the tendency to form a DVT will be present to some extent in all venous reconstructive surgeries and that tendency will be likely a constant situation if nonviable tissue (such as an intimal dissected flap) or a prosthesis is placed into the venous circuit. Constant anticoagulation is probably required here. The reason why Opie choses a full thickness vein wall structure is that with one side being uncut that means the flap is vital. That infers several hypothetical very beneficial activities: (a) the monocusp will secrete nitric oxide synthase (NOS); (b) the monocusp will secrete thymomodulin (TM); both powerful local vessel wall anti-thrombotic micro hormones/enzymes; (c) because of its vitality, the monocusp will likely have the full capacity to 100% endothelialize its external surface due to the different receptors triggered by now becoming intra-vascular rather than being programmed by the extravascular tissue milieu. He figures that will have occurred by 5-6 months. For those reasons he gives coumadin for 6 months and then switch it out to daily ASA 81 mg for life. By then the external surface of the monocusp is likely fully endo- thelized and actively secreting NOS and TM, and the inner surface of the iVena e-PTFE patch will also be covered by some form of deposited intimal tissue with +/- hormone capacity. All it would likely require is an antiplatelet drug (ASA). Doing this he has not encountered any late DVTs now out to 5.5 years with zero support device management and all patients are living an unrestricted lifestyle.

B.B. Lee asked for critical fact claimed by Opie: «the external surface once exposed to blood will acquire an endothelium and produce the antithrombotic hormones within 4 months», asking also for references in this regard. If so, it is revolutionary! What mechanism controls these developments? The Opie’s reply was: «i suspect it is hormonal-receptor based and whatever microenvironments act on those blood vessel wall progenitor cells. In the blood it programs the living vein wall to grow endothelium. I suspect that if you place the adventitial side of a living blood vessel inside the blood stream over time it will react to the new hormonal environment and it will become lined with endothelium because it is alive ». According to R. Kistner and M. Perrin, the major risk after neovalse and any other deep venous reconstruction procedure is not related to postoperative thrombosis as far as the patient is postoperatively fully anticoagulated but recurrence or persistence of deep reflux in the other deep venous system mainly the profunda femoral vein or secondary valve reconstruction degradation.

Regarding these Opie suggests a name change from CVI – which infers the condition is incurable and chronic to DVI (Deep) meaning that now with additional input from scientific minds, we actually have a good chance at beating this ancient curse with what appears to be a low-risk long-term effective, easy to complete operation (DVI is similar to DVT).

Conclusion

Fausto Passariello, Vasculab Moderator, concluded that we understand that actually 3 valvuloplasty methods must be compared, the ones by Opie, Maleti and Camilli, already tested in living humans. Franceschi method was tested only in vitro and is mechanically highly efficient (39).

Other methods, which are worth citing for historical reasons, have however a high rate of failure. At the end of this discussion, a very interesting topic was started, about the functional value of venous valves in the deep venous sys-
tem, and superficial too. However, cited papers are often old, therefore this points out the need for new up-to-dated papers. Indeed, Doppler Ultrasound investigations added a lot of observations in the living patient deep system, which claim for a new physiopathological interpretation.

R. Kistner considerations about Maleti’s technique are true for all valvuloplasties: «I find no fault with valvuloplasty and I am anxious to see if others can duplicate the experience. Points that need to be expanded in these experiences are how many cases were evaluated and found not to be candidates for this procedure, the length of the learning curve for producing a reliably competent valve, and whether there is any sign that these new valves will degenerate with time. If this technique can be successful, the next question will be whether it can be achieved in a more minimally invasive method» (40).

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