

# 11 - CHIVP - Hemodynamic Deep Reflux Treatment

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The term CHIVP (the P stands for Deep - Profundo) is used to refer to the use of the principles of hemodynamic treatment for varicose veins in the cases of Deep Venous Insufficiency. After an event that dramatically changes the deep venous system (trauma, malformations or thrombosis) occurs a sequence of reactions follows. These reactions usually create alternative ways to get blood drainage and later recanalization of veins. Some patients achieve good recovery and remain asymptomatic.

Unfortunately, some patients have overcompensation or recanalization with severe venous sequelae creating an undesirable shunt. The term overcompensation refers to patients that develop a vicarious shunt to drain the blood stopped at the trauma or thrombosis. The compensation may be perfect or it creates sometimes a new undesirable pathway. For example, a patient with iliac thrombosis with a Palma shunt or a patient with femoral thrombosis compensated by a Giacomini vein going to the saphenous vein and back to the femoral in the groin. In theory, it drains the flow in the right direction, but sometimes it develops a vein that diverts the blood flow from its way back to the heart. Recanalization with severe sequelae also may cause symptoms later after a deep venous thrombosis. For example, a tibial vein has all valves destroyed but keeps flow may perpetuate

reflux and symptoms. The hemodynamic technique aims to get: Gravitational Hydrostatic Pressure Fractionation, Closed Shunts disconnection and Drainage respect.

We reserve the hemodynamic correction CHIVP for patients with important symptoms such as resistant venous ulcer and great compromise in the quality of life not responding to simpler measures. The Duplex examination is important, and inexperienced surgeons should not perform these procedures. We consider the level of difficulty in terms of hemodynamics to be the highest and complications of unsuccessful procedure may be important. The Duplex examination should search for closed shunts that allow dynamic fractionation of the hydrostatic pressure column. We discuss elsewhere these shunts in this book. The strategy must take in account not only the venous incompetence but also the hemodynamic relevance of the frequent associated obstructions. These cases are not common, and there are no clinical trials about this technique. Anecdotal cases performed by several groups proficient on venous hemodynamics have had significant results and we present this chapter as an additional paradigm discussion.

### **Deep venous obstruction assessment:**

We always take the clinical signs and symptoms, echo color Doppler and posterior tibial vein pressure into consideration. The operator measures the pressure at the posterior tibial vein (PTV) when the flow reappears with a calf cuff, deflated slowly. Much like Ankle-brachial Index.. Pressures greater than 20 mmHg in a patient in supine position are consistent with severe disease. These are the parameters to test the obstruction in the venous insufficiency

and consider the expected results after the gravitational pressure fractionation by CHIVP. We examine the venous system, including a complete assessment of deep veins. The treatment includes dilation of all treatable important obstructions when the posterior tibial vein pressure is higher than 20 mmHg, before considering CHIVP. In other cases, these obstructions of a main vein can be clinically less significant, most of the time thanks to a good collateral compensation (see Figure 1).

In addition, some obstructions can be artifacts with no pathological value, as the frequent pseudo May Turner Syndrome horizontal supine position during Venography or Duplex Us show a total compression of the Left Iliac Vein by the Right Iliac Artery. Some cases have the disappearance of the obstruction when examined in a semi-seated position (see QR code 1).

QRCode 1:

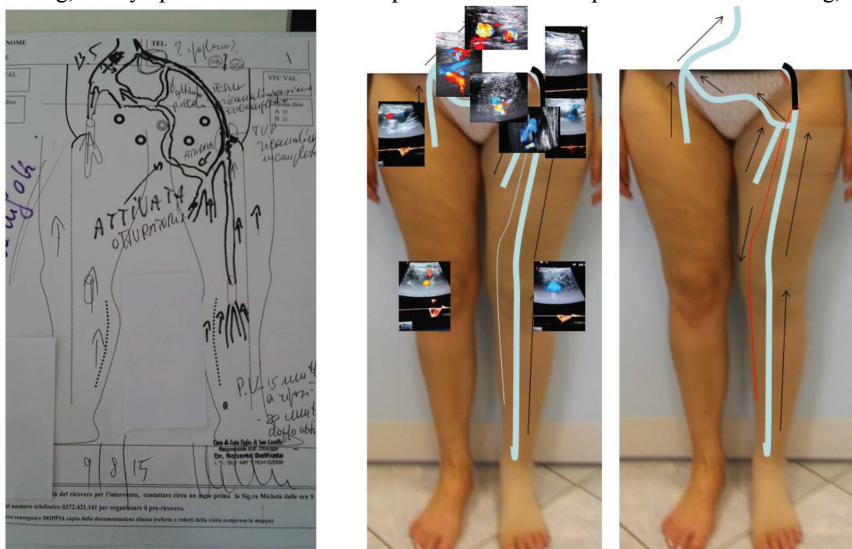


### **Ilio-Caval obstruction:**

The permanent thigh swelling and venous claudication are signs of Ilio-Caval hemodynamic block to the flow. The iliac

obstruction has a pitfall to consider, the iliac size diminishes when the person is in a supine position or dehydrated. Dehydration because of examinations with fasting may also help to diagnose a false stenosis. A study has shown that there is significant overdiagnosis of obstructions in recumbent patients<sup>1</sup>. We should discuss that many iliac compressions are not real and elevating the back of the patient to fill the vein makes some obstructions disappear<sup>2,3</sup>.

There are two main Duplex US findings associated with iliac-cava obstructions. The absence of breathing modulation of venous flow at the femoral vein appears in these cases. The presence of collateral veins (open vicarious shunt - see shunt chapter) through hypogastric and femoral collateral, including superficial veins and saphenous junction collaterals. Cardiac rhythm alterations and right heart insufficiency may also alter the breathing modulation. This happens because of reflex opening of micro-shunts, we should always search actively for the iliac and cava veins to distinguish it.



**Figure 1:** Adequate left iliac vein thrombosis compensation with PTV pressure of 20 mmHg. We observed that cases well compensated without symptoms, usually have pressure below 20 mmHg, and symptomatic cases with complications have PTV pressure above 20 mmHg,

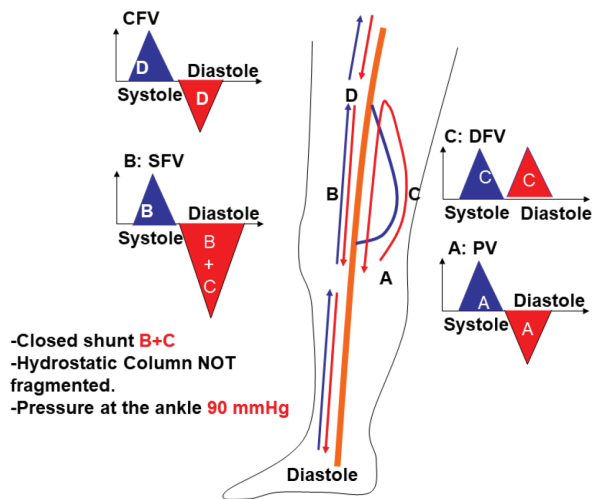
## Lower extremity obstruction and reflux:

Venous claudication is a reliable symptom of femoropopliteal obstruction, as is permanent calf swelling. The duplex ultrasound is fundamental to test deep obstruction of leg veins. The examination of deep veins is demanding, and few considerations are important. The greater the volume ejected from the distal venous system, the better. We use the Parana Maneuver to verify reflux in most of these cases, besides calf squeezing. The Deep femoral shunts are better examined with calf squeezing than Parana Maneuver. The three most common types of deep shunts are (1) Superficial Femoral Vein, (2) Deep Femoral Vein and (3) Tibial vein.

Superficial Femoral closed shunts occur with duplication of the femoral vein, in which one side allows reflux of blood in its

upper connection. Figure 2 helps us understand the anatomy and hemodynamics of this shunt before and after the procedure. Deep femoral shunts to the popliteal vein or superficial femoral. We show the hemodynamics of this shunt in Figure 3. The tibial shunt has a tibial vein with reflux that connects with the superficial system through a perforator. Figure 4 shows an interesting case of tibial shunt. A male patient with a history of motorbike accident had 3 duplex scans with normal results, but symptoms were disturbing and incapacitating. We examined carefully the deep system and found a tibial shunt with flow out through a perforator. The flow was intense during systole of calf muscles and very weak during diastole (the superficial veins failed to show reflux because of this absence of flow reversal). Figure 5 shows the most common shunts and the places of disconnection.

**Example : Superficial Femoral V Closed Shunt B+C**



## Superficial Femoral V Closed Shunt **Disconnection**

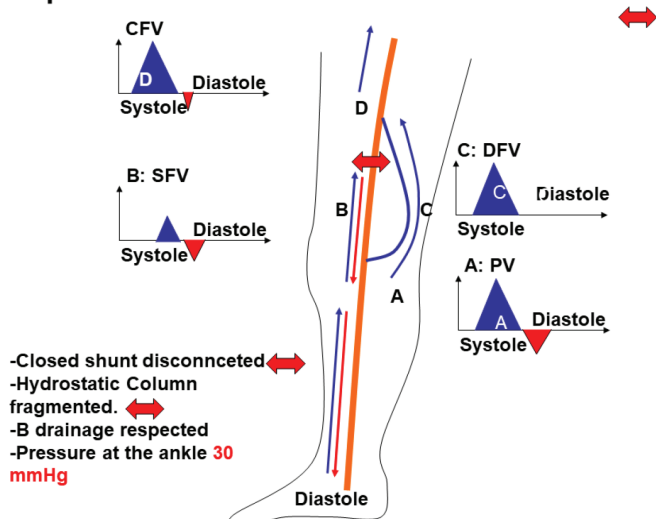


Figure 2: Duplex ultrasound of Femoral closed shunt preoperative and postoperative.

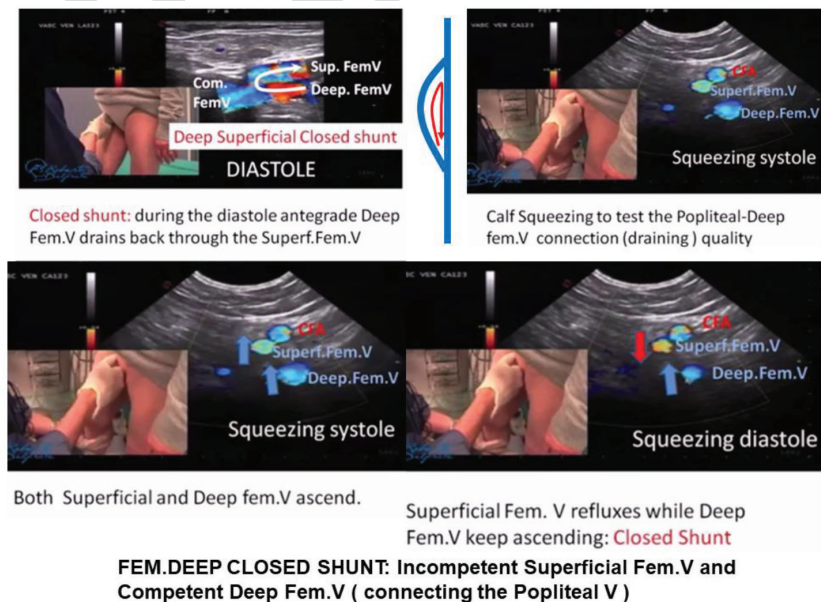
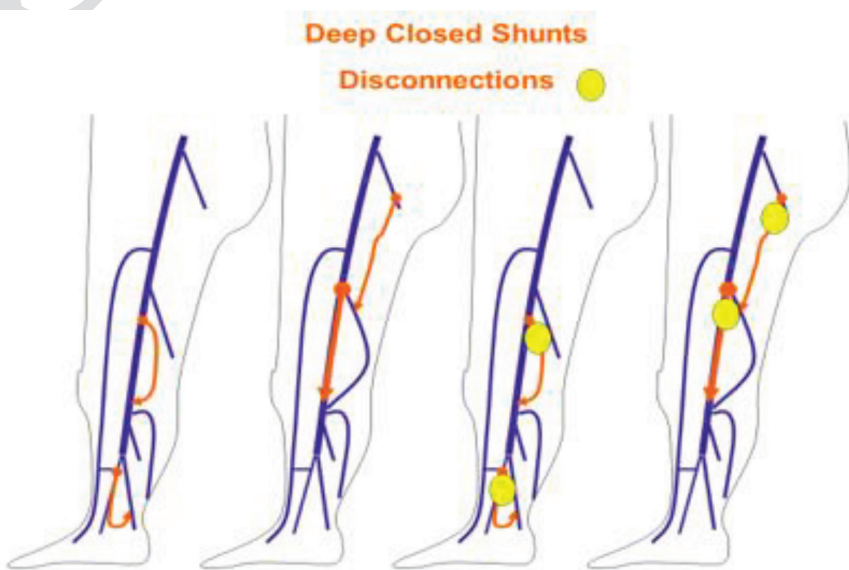


Figure 3: Deep Femoral Closed shunt assessment with Duplex ultrasound.



**Figure 4.** Tibial shunt with flow out of the tibial vein to the superficial system through a perforator and tibial vein (same incision). Simple ligation of the perforator and tibial vein solved symptoms with no recurrence at 2-year follow-up.

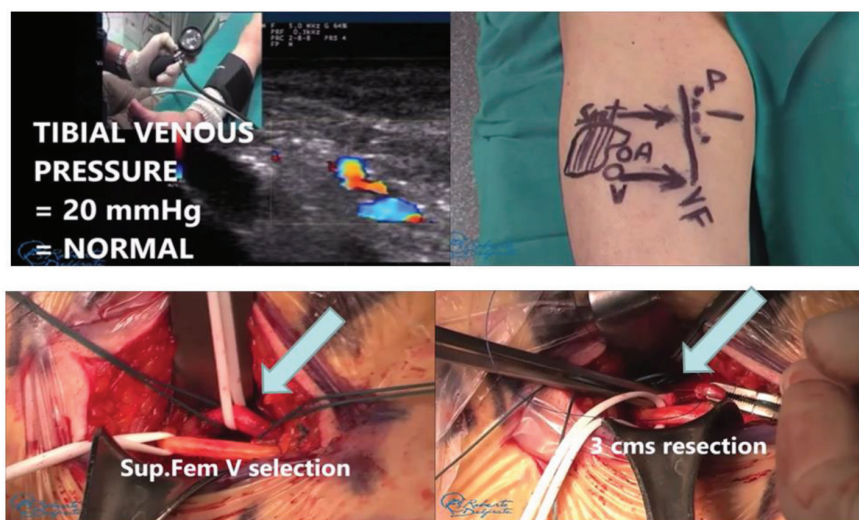


**Figure 5:** Possible Deep Venous Closed Shunts and disconnections. The first leg shows superficial femoral shunt and tibial shunt. The second leg shows deep femoral shunt. The third leg shows the disconnection to treat leg 1 and the fourth shows disconnection to treat leg 2.



## CHIVP Procedure

We use local anesthesia if possible, but regional or general anesthesia is used according to the case. The preoperative duplex mapping is pivotal to the result, as is the intraoperative duplex sometimes. The surgeons should do or take part actively in this examination. The ligation of the wrong femoral vein in a duplication case cannot happen. We have reported that lack of surgeons link to duplex ultrasound may lead to wrong site surgery<sup>4</sup>. The procedure consists of flush ligation of the vein with reflux near the escape point (Figures 6, 7 and QR code 2). Some patients have superficial shunts combined with the deep ones (i.e. femoral and small saphenous vein concomitantly). We always treat the deep system first and wait weeks before deciding about intervention at the other system. Some cases improve even without the correction of the superficial disease.



**FEMORAL DEEP CLOSED SHUNT: Venous Pressure Checking Skin Marking. Superf.Fem.V Dissection and 23 cm resection**

**Figure 6.** Example of femoral disconnection and Posterior Tibial vein Measurement.



**TIBIAL DEEP CLOSED SHUNT:** Duplicated PTV. 1 collat. Is incompetent. The other ones competent. 2 cm resection in healthy tissues.

Figure 7. Example of Posterior Tibial Vein disconnection.

QRCode 2 . CHIVP. Two cases in video.



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