DEEP VENOUS THROMBOSIS
DIFERENTIAL DIAGNOSIS

Dra. Liliana Servente (1), Dr. Martin Rodriguez Parodi, Dr. Agustin Arruti, Dr. Alejandro Crisci (2), Dra. Veronica Gigirey, Dra. Natalia Lopez (3)

ABSTRACT-
Deep venous thrombosis (DVT) of lower limbs is frequent in emergency services. Clinical presentation is very evident in cases of extensive DVT, but not in cases of infrapatellar location or partially obstructive thrombosis. Confirmation requires Doppler examination to make a positive diagnosis and rule out potential differential diagnoses. Processes that may mimic DVT are multiple; cellulite and postphlebitic syndrome are the most common. The objectives of this study are: to review the indications of emergency ecodoppler ordered to rule out DVT in patients’ with clinical suspicion, to evaluate the results of these studies and to review the differential diagnosis. Between March and September 2009, 60 patients from Emergency and inpatient services of the Hospital with clinically suspected DVT were prospectively evaluated. They were sent to Radiology department for lower limb venous Doppler ultrasound. Doppler ultrasound was performed on pathological lower limb with B-mode, spectral and color Doppler, exploring the deep and superficial venous system. Compression manoeuvre was performed every 2cm on the venous axis and distal compression manoeuvers was realized except in obvious acute DVT. Data were completed: medical history and results of paraclinical previous studies. The results of Doppler ultrasound were classified as normal or pathological. In case of proven DVT was classified in stage: acute, subacute and chronic and extent of the thrombosis was indicated. The most frequent differential diagnosis found were: thrombophlebitis, IVC, Baker cyst, muscular hematoma, postphlebitic syndrome, erysipelas, cellulitis and causes of generalized edema and heart failure. Of a total of 60 patients reffered for clinical suspicion of DVT, in only 12 patients (20%) was confirmed this diagnosis. Of 48 patients who not had thrombosis 28 were undiagnosed, 8 patients were diagnoses as chronic venous insufficiency, heart failure in 5 patients, 2 patients with erysipelas and the remaining 5 with other causes of edema. Doppler ultrasound in emergency reduces the cost of hospitalization of patients with clinical suspicion of DVT, confirms or rules out this diagnosis and identifies other pathologies. The low percentage of patients with DVT in this series suggests that an adjustment on the indications of Doppler must be made.

Key words: Deep vein thrombosis, venous Doppler, differential diagnosis of DVT.

(1) Associate professor of the department of Radiology of the Hospital de Clinicas.
(2) Resident of the department of Radiology of the Hospital de Clinicas, Hospital Pastur y CASMU.
(3) Assistant of the department of Radiology of the Hospital de Clinicas.
INTRODUCTION-

Deep vein thrombosis (DVT) of lower limbs constitutes a highly frequent reason for consultation in emergency services. It has a high morbidity and mortality if not diagnosed on time. In cases of extensive thrombosis the clinical presentation is very eloquent but in cases of infrapatellar thrombosis or partially occlusive thrombosis the clinical presentation has low sensibility. An objective diagnostic test is required for its confirmation. Echodoppler studies are of great importance to confirm the diagnosis and rule out differentials. This is a non-invasive study which is available in all health centers. With a correct training it could be performed by a resident with the surveillance of an experienced radiologist. There are many pathologies that can simulate a DVT, cellulitis and post thrombotic syndrome are the most frequent.

OBJECTIVES

To review the indications of emergency echodoppler applied to rule out a DVT. To evaluate these studies results and review the differential diagnoses.

MATERIALS AND METHODS

Between March and September of 2009 we evaluated prospectively 60 patients from the emergency service of the “Hospital de Clinicas” in whom was suspected a DVT. These patients were sent to the radiology department to have an echodoppler of the lower limbs done. Patients with suspected pulmonary thromboembolism were excluded. The study was performed using mode B, spectral Doppler and color Doppler. All the studies were performed by the authors (residents and radiologist) using a linear probe with a frequency between 4 to 7 MHz attached to an Ultramark 9-HDI. Deep venous system was explored: common femoral vein, superficial femoral vein, deep femoral vein, popliteal vein, and distal veins of the lower limbs as well as the venous lakes of the calf. The superficial venous system was explored too (external and internal saphenous system). If necessary the study was complemented with the exploration of the cava and iliac system. Compression maneuvers in mode B were performed and the venous system was evaluated with spectral and color Doppler to study their patency and the flow characteristics. Distal compression maneuver was performed to identify the flow response except in cases of evident DVT. All important data was collected in a specially designed form (fig. 1). The studies results were classified as: normal or pathologic. In the cases of DVT the results were classified according to the evolution in acute, sub acute and chronic. The thrombosis extension was noted as well as its location: infra or supra patellar. If DVT was not confirmed the differential diagnosis item was checked, these diagnosis were classified as: thrombophlebitis, Baker cyst, hematoma, aneurysm or pseudo aneurysm, erysipela or cellulitis. When the cause of the symptoms was not detected it was classified as unknown diagnosis. The differential diagnosis were defined by the following criteria: thrombophlebitis by clinical and ultrasound findings. Baker cyst and muscular hematomas cases by mode B ultrasound findings. The presence of aneurysm and pseudo aneurysm was diagnosed by Doppler findings. Erysipelas or cellulitis were diagnosed on the basis of clinical findings (fever, leukocytosis, blushing). Post thrombotic syndrome, when there was past evidence of DVT in association with clinical and Doppler findings. Chronic venous insufficiency by clinical and Doppler manifestations. Patients were between 21 and 91 years old, a mean of 57 years old. Of all patients 21 (35%) were male and 39 (65%) were female. 28 patients were sent from emergency service, 29 were admitted in the hospital and 3 were ambulatory.
RESULTS

Risk factors and clinical symptoms were analyzed.
Risk factors: 35 patients had at least one of these risk factors: neoplasms, prolonged bed rest, DVT history, coagulopathy. In 25 patients there were no risk factors.
Clinical symptoms: 18 patients had clinical suspicion of DVT (defined as edema and positive Homans sign in one limb) (table 1) In only 4 patients D dimmers were performed, in all of them the result was negative.

<table>
<thead>
<tr>
<th>TABLA 1. TOTAL DE PACIENTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factores de riesgo</td>
</tr>
<tr>
<td>---------------------</td>
</tr>
<tr>
<td>Sospecha clínica TVP</td>
</tr>
<tr>
<td>Diagnóstico de TVP</td>
</tr>
<tr>
<td>TOTAL</td>
</tr>
</tbody>
</table>

48 patients did not had thrombosis, of these: 8 cases (17%) were diagnosed as chronic vein insufficiency, 2 patients (4%) as erysipelas and 5 patients were diagnosed with other differentials (Baker cyst, thrombophlebitis, tendinopathy, muscular hematoma and post thrombotic syndrome) . In 28 patients the cause of the symptoms was not identified. Table 3.

In 12 patients DVT was confirmed representing 20% of the total. Of these, 7 patients had femoro-popliteal thrombosis, 3 popliteal and 2 infra patellar thrombosis. (fig. 2 and 3)
As for the evolution of the thrombus: 8 cases were acute, 4 sub acute and chronic.
Considering the patients in whom DVT was diagnosed, in half of them there was high clinical suspicion and 5 patients had risk factors.

<table>
<thead>
<tr>
<th>TABLA 2. Características de los pacientes con TVP</th>
</tr>
</thead>
<tbody>
<tr>
<td>TVP aguda</td>
</tr>
<tr>
<td>-----------</td>
</tr>
<tr>
<td>8</td>
</tr>
<tr>
<td>TVP subaguda-cronica</td>
</tr>
<tr>
<td>Factores de riesgo</td>
</tr>
<tr>
<td>Sospecha clínica</td>
</tr>
<tr>
<td>Factores de riesgo y Sospecha clínica</td>
</tr>
<tr>
<td>TOTAL</td>
</tr>
</tbody>
</table>

Fig. 1- Predesigned form for data recollection.
DISCUSSION

DVT is caused by the formation of a thrombus that partially or totally occludes the deep venous circulation. In general, it is originated in the deep veins of the calf and can extend to the veins of the thigh and pelvis and then get fragmented and generate emboli. These can strike in the pulmonary circulation and originate a pulmonary thromboembolism. Thrombosis in superior limbs exists but is rare. The DVT incidence is estimated in 70-100 cases/100000 habitants and it increases with age (2,4). The identification of risk factors is useful to commence the prophylactic treatment which reduces the probability to develop a DVT. This is of great importance in post traumatic and post operatory patients, also in oncologic and neurologic patients. Other risk factors are obesity, previous history of DVT, cardiac failure, varicose veins, pregnancy and thrombophilia.

**Fig 3. Acute Infrapatellar DVT.** Female, 32 years old, history of cervix carcinoma, asymmetric oedema and positive Homans. Longitudinal view of the calf with colour Doppler. Posterior tibial veins enlarged with echogenic material inside and absence of colour Doppler signal. The posterior tibial artery is permeable.

**TABLA 3. OTROS DIAGNÓSTICOS**

<table>
<thead>
<tr>
<th>Diagnóstico</th>
<th>N° depadientes</th>
<th>Porcentaje</th>
</tr>
</thead>
<tbody>
<tr>
<td>TVC</td>
<td>8</td>
<td>17%</td>
</tr>
<tr>
<td>Insuficiencia cardiaca</td>
<td>5</td>
<td>10,5%</td>
</tr>
<tr>
<td>Erisipela</td>
<td>2</td>
<td>4%</td>
</tr>
<tr>
<td>Otros</td>
<td>5</td>
<td>10,5%</td>
</tr>
<tr>
<td>Sin diagnóstico</td>
<td>28</td>
<td>58%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>48</td>
<td>100%</td>
</tr>
</tbody>
</table>

Acute popliteal DVT. Female, 40 years old, history of DVT, actually oedema, positive Homans. Fig 2a: Mode B, longitudinal image of the popliteal vein (superficial) and artery. The vein is enlarged, uncompressible, has a hipoecogenic material inside. Fig 2b: Same view as fig 2a with a color Doppler box, popliteal artery has flow however the vein has no color signal inside.
Diagnosis of DVT is based on clinical and echo doppler findings. Clinical presentation varies and it depends on the severity of the thrombosis (extension, partial or total occlusion), presence of collateral vessels, thrombosis location (supra or infrapatellar). It may cause pain, edema, increase in calf diameter, and positive Homans sign. Sensitivity and specificity of clinical presentation are low (68 and 58% respectively) which results in important diagnostic errors (2). Half of the cases of DVT do not present any symptoms. Multiple clinical scores that predict high probability of DVT taking into account risk factors have been postulated. It is remarkable that half the patients diagnosed with DVT in our serie did not have a high clinical suspicion. Regarding ancillary studies, D-dimers are a sensible but not specific method for diagnosis of DVT. They are helpful when negative because they rule out a DVT with high probability; they have 97% negative predictive value (3). If D-dimers are positive, causes of the increase are multiple, including DVT.

In our serie, only 4 patients came to have the echodoppler done with D-dimers. In all of them D-dimers were negative and trombosis was not found either. Echodoppler allows to make a positive diagnosis of thrombosis when the thrombus inside the vein is seen, and the vein is not compressed. Echostructure of the thrombus and vein compression help to diagnose the evolutive stage. Using color Doppler and spectral Doppler in the area of thrombosis we will not detect flow if thrombosis is complete. If it is partial we will detect a collateral flow channel.

Fig 4- Differential Diagnoses.
Fig 4.1- Internal saphenous thrombophlebitis. Female, 46 years old, history of varicose veins, pain in indurate varicose vein in medial face of thigh and leg. Transversal view of the internal saphenous vein, note that it is enlarged, and has a echogenic material inside. Fig. 4.2- Internal saphenous arch thrombophlebitis. Patient of 55 years old with pain in the localization of the internal saphenous vein. 4.2a, Mode B longitudinal view of the saphenous arch, subacute thrombus un the interior of the saphenous vein that does not introduce in the common femoral vein. 4.2b, with the color Doppler box it is noted the absence of flow inside the saphenous vein.
Proximal to thrombosis a loss in the flow increase with a distal compression maneuver can be seen. Thrombosis extension and proximal end of the thrombus can be established. Presence of a mobile thrombus proximal end is helpful to establish embolic risk.

Diagnosis of evolutive stage is established by thrombus echogenity and vein caliber, in acute phase thrombus is anechoic and there is an enlargement of the vein caliber without compression. In subacute and chronic phase thrombus becomes more echoic with a reduction of vein caliber and recanalization(3). The most sensitive sign of DVT is the absence of vessel compression. (3).

Fig. 4- Differential Diagnoses.
Fig. 4.3- Muscular hematoma, fibrillar rupture of the medial gastrocnemious (tennis leg). Male patient of 53 years old with asymmetric oedema, calf pain and ecchymosis. 4.4a, longitudinal view of the calf, anechogenic collection with fin walls and internal septa, that dissects muscular planes. 4.3b- Mode B image with zoom in the internal septa.
Fig. 4.4- Complicated Baker cyst. Female patient of 62 years old that complains of asymmetric oedema and calf pain. 4.4a Mode B transversal image of the popliteal region in which is seen a cystic formation with heterogenic internal echoestructure. 4.4b, transversal image on the medial popliteal region, it is seen how this cystic formation communicates with the femoro-tibial articulation.
PPV of echodoppler for diagnosis of suprapatellar DVT is 95% with more than 95% sensitivity and 97% specificity. Sensitivity significantly decreases (70-80%) at infrapatellar level (1, 2, 4).

An ultrasound-guided compression technique that shortens examination time has been described, several authors found 95% sensitivity and 98% specificity for proximal DVT. For infrapatellar location they found 73% diagnostic specificity (3).

The advantages of Doppler ultrasound over other imaging studies is that it does not use ionizing radiation, nor contrast material, it can depict anatomical variants and establish differential diagnosis. (3, 5, 6). Limitations come up when studying obese patients, with very edematous limbs, in recent post operative care with extensive wounds or casts (3).

Conventional phlebography, which used to be very common, is the gold standard for this disease, is kept aside for doubtful cases and it is little used because it is invasive, uses ionizing radiation and contrast material and it is not exempt from complications. MSCT and MR are alternative methods to diagnose DVT but they present limitations due to their cost and feasibility. They are useful in some territories such as pelvic trombosis (2).

Cellulitis and venous insufficiency are the processes that are more commonly confused with DVT and the ones that more frequently pose differential diagnosis (1). Chronic venous pathology and heart failure were the processes that more commonly simulated a DVT in our serie.

We remark the fact that more than a half of our patients (58%) without thrombosis did not have a pathology diagnosis.

In classical series there were more cases of muscular trauma pathology without diagnosis but thanks to the wide use of ultrasound that is very useful to establish such diagnosis more trauma pathology cases have been detected (1, 7).

It is striking the low thrombosis incidence detected (20%) which could be explained by the scarce selection of patients that are referred in order to rule out thrombosis and to the lack of specificity of the clinical presentation.

CONCLUSIONS

Systematic performance of echodoppler in patients with clinical suspicion of DVT confirms this diagnosis or can establish differential diagnosis. The first line method for diagnosis of DVT is venous echodoppler as it provides both excellent sensitivity and specificity for proximal vein trombosis and it is widely available and has reasonable costs.

Chronic venous pathology and heart failure are the processes that most frequently simulated a DVT in our serie.

In order to generalize the results of our study we should include more patients to our serie. Despite this limitation we remark the low incidence for thrombosis detected (20%) which could be explained by the scarce selection of patients that are referred in order to rule out thrombosis and to the lack of specificity of the clinical presentation.

We also remark that in more than a half of patients without trombosis (58%) no other pathologies were identified, may be because in some cases thrombosis was not a clinical option or the study was not indicated.

Regarding the results obtained patient selection could be improved by the systematic use of clinical scores and also
taking into account ancillary studies that in many cases rule out the possibility of trombosis.

REFERENCES

7. Pérez Monreal, J. Ecodoppler venoso. Anales de cirugía cardíaca y vascular, 2001, 7(4) 253-