Thrombophlebitis and Pulmonary Embolism

By John A. Spittell, Jr., M.D.

Acute venous thrombosis and its complications continue to be a challenging problem to the physician. Incomplete understanding of the pathogenetic mechanisms, lack of objective measures for diagnosis, and differences of opinion concerning therapy are parts of this problem. These difficulties, however, should not discourage the physician in his attempts to diagnose and treat venous thrombo-embolism.

Although thrombophlebitis may occur without pulmonary embolism, and vice versa, they are frequently associated. It has been suggested that venous thrombosis can be divided into two types, thrombophlebitis and phlebothrombosis. Since the distinction has no practical value in management or prognosis, the generic term "thrombophlebitis" seems preferable when the clinical findings permit the diagnosis of acute venous thrombosis.

Three factors, known as Virchow's triad, stasis of blood flow, damage of endothelium, and hypercoagulability of the blood, have been considered important in the genesis of venous thrombosis, but the relative importance and interdependence of these factors are not understood. Nonetheless, they serve as a valuable starting point in the management of thrombophlebitis.

The pathologic picture of venous thrombosis includes both thrombosis and variable inflammatory changes in the wall of the vein. In thrombophlebitis of more than a few days' duration, organization of the clot is also seen. The end result of thrombophlebitis usually is thickening of the venous wall with partial restoration of the lumen and variable destruction of the valves. The clinical manifestations of both the inflammatory and obstructive components of acute venous thrombosis are important.

Although there is no adequate explanation, thrombophlebitis occurs more frequently in the lower than in the upper extremities.

Superficial Thrombophlebitis

Clinical Aspects

Thrombophlebitis involving superficial veins may be caused by trauma (for example, after injection of various dyes or solutions), or by systemic diseases (for example, blood dyscrasias, certain malignant lesions, and thromboangiitis obliterans), or it may occur repeatedly for no apparent reason. The veins most frequently involved are the small saphenous, median cephalic, and median basilic, and other superficial veins of the upper and lower extremities. The superficial veins of the chest or abdominal wall rarely are involved.

The characteristic appearance in thrombophlebitis is a red, painful, tender nodular or linear area in the skin (fig. 1). The involved vein can be felt as a tender cord and the surrounding tissue may be indurated. Typically, the inflammatory reaction subsides in 1 to 2 weeks, leaving a bluish or brownish area that may remain for several more weeks. Multiple superficial veins or segments of the same vein may be involved simultaneously or in succession. Systemic manifestations, edema, and pulmonary embolism rarely occur as a result of superficial thrombophlebitis.

Although the diagnosis of superficial thrombophlebitis is not difficult, one must differentiate it from cellulitis, which is more diffuse, from acute lymphangitis in which no thrombosed vein is palpable but chills and fever are prominent symptoms, and from nodular lesions such as erythema nodosum. The possibility of an underlying systemic process should be considered unless there is an obvious cause such as trauma, varicose veins, or a postoperative or postpartum state.

Management

Superficial thrombophlebitis rarely is complicated by pulmonary embolism, but the
thrombotic process may extend to deep veins. Treatment should be dictated by the extensiveness of the process. For varicose vein and chemical thrombophlebitis, warm moist packs and rest are usually all that is necessary. Phenylbutazone (Butazolidin) in a dose of 200 mg. four times a day for 3 or 4 days is helpful to reduce the inflammation.

When superficial thrombophlebitis is more extensive or extends despite this therapy, the use of anticoagulant therapy with coumarin-type or related drugs until the acute process subsides is advisable.

For recurrent bouts of superficial thrombophlebitis for no apparent reason (idiopathic recurrent thrombophlebitis), long-term anticoagulant therapy is effective. In general, the use of long-term anticoagulant therapy is indicated when attacks of superficial thrombophlebitis are frequent enough to warrant the expense, the inconvenience, and the risk of such therapy.

Deep Thrombophlebitis

Clinical Aspects

While distal edema is uncommon in superficial thrombophlebitis, it is a characteristic feature of thrombosis of the large deep veins, such as the iliofemoral or the axillary. The deep veins serve as the "final common pathway" for the return of blood from the extremities and, when they are acutely thrombosed, the collateral venous return through the superficial venous system is usually inadequate. Edema varies with the deep vein involved, being slight or absent in sural thrombophlebitis and usually of greater degree in iliofemoral thrombophlebitis.

Generally, the systemic reaction accompanying deep venous thrombosis is minimal even when thrombosis is extensive. A slight fever (100 to 102 F.) and a proportional increase in pulse rate are the only constitutional symptoms. Malaise, chills, and high fever are not clinical manifestations of deep venous thrombosis. Local findings in the extremity involved, however, are characteristic and include dull aching pain, tenderness and, if a large vein is involved, signs of venous obstruction.

Figure 1

Superficial thrombophlebitis of the left leg and thigh in a patient with cancer of the lung.

The signs and symptoms of thrombophlebitis occur acutely and subside in 1 to 3 weeks. Residual edema, when it occurs, is the result of fibrosis and valvular incompetency and is not due to "chronic thrombophlebitis," which is a misnomer. The findings in the extremity have no prognostic value as to the risk of pulmonary embolus, since a pulmonary embolus may be the initial manifestation of venous thromboembolism with local symptoms in the extremity either being absent or appearing within several days.

Sural thrombophlebitis rather frequently complicates trauma, bed-confining illness, and postoperative and postpartum states. The clinical features of thrombophlebitis of the sural veins typically include pain in the calf and tenderness; firmness and slight enlargement of the affected calf are found frequently but edema is seldom present. Although pain in the calf on dorsiflexion of the foot (Homan's sign) is usually present, it is not a specific indication of thrombophlebitis. Other causes of calf pain, which may mimic sural thrombophlebitis, are myositis, sciatica, herniation of a Baker's cyst beneath the gastrocnemius muscles, popliteal aneurysm, and muscle strain or tear.

Thrombophlebitis of the popliteal and femoral veins frequently appears as an extension of sural thrombophlebitis and is similar to it with the additional findings of edema of varying degree, of the leg and ankle, increased superficial venous pattern, and tenderness on
palpation of the popliteal space and lower part of Hunter’s canal.

Iliofemoral thrombophlebitis produces aching and tenderness of the groin and thigh, increased venous pattern of the leg and thigh, and frequently a suffused or slightly cyanotic color of the affected limb (fig. 2). Generally, systemic manifestations are mild fever and slight tachycardia. The simultaneous occurrence of similar findings in both lower extremities indicates inferior vena cava thrombophlebitis. A severe and extensive form of ileofemoral thrombophlebitis, phlegmasia cerulea dolens, is a rare complication in some cases of advanced malignancy. In addition to the findings mentioned, there may be massive edema, shock, arterial spasm, and gangrene.

Conditions in the differential diagnosis of femoral or iliofemoral thrombophlebitis include (1) lymphedema which is typically a painless, firm edema, (2) acute lymphangitis which produces erythema, chills, and high fever (to 105 F.), and (3) acute arterial occlusion which produces a pale, cool, and pulseless extremity.

Management

Treatment for acute deep venous thrombosis should include measures to relieve venous congestion, prevent further thrombosis and pulmonary embolism and restore venous flow to as near normal as possible. Rest in bed with elevation of the affected extremity, the use of analgesics, and the application of moist warm packs to the involved limb are accepted generally as valuable measures.

No unanimity of opinion exists, however, concerning the more definitive measures of treatment, which include anticoagulant therapy, thrombolytic therapy, or ligation of the vein with or without thrombectomy. Advocates can be found for each of these forms of treatment, and until there is valid statistical proof of the superiority of one, treatment must be determined on the basis of available knowledge of the pathogenesis and the clinical course of venous thromboembolism.

The ligation of the involved femoral vein has the distinct advantage of preventing pulmonary embolism provided proximal or additional thrombi in the opposite extremity do not occur. Ligation of the inferior vena cava, a more formidable procedure, has the same limitation as ligation of the femoral vein with the added disadvantage of producing chronic venous insufficiency in many instances. Ligation of veins is best used in cases in which anticoagulant therapy is contraindicated or has proved ineffective.

The dissolution of thrombi by lytic enzymes holds promise as effective therapy in venous thrombosis. At present, however, limited experience with this measure indicates that it
is best suited for investigative rather than for general use.

Short-term anticoagulant therapy has certain definite advantages over the other forms and is preferred by many for venous thrombosis. If one assumes that hypercoagulability is a factor in the formation of a thrombus, effective doses of the anticoagulant drugs should prevent further thrombosis. This has been the experience of most physicians. In addition, evidence indicates that anticoagulant therapy hastens recanalization of thrombi. While bleeding is a hazard during anticoagulant therapy, sufficient experience with these drugs has been accumulated to minimize the risk provided dosages are regulated by adequate laboratory tests. The choice of heparin or an oral anticoagulant drug depends on the experience of the physician and the availability of laboratory facilities. When reliable determinations of prothrombin time are not available, oral anticoagulants should not be used. Details of the action, use, and control of anticoagulant therapy are available in several recent reports.

Although the duration of treatment for acute deep venous thrombosis depends on the clinical response of the patient, in general, it varies from 1 to 2 weeks. Rest in bed and elevation of the extremity affected should be continued until the edema and tenderness have disappeared. An adequate elastic support should be used (from the ankle to the knee) whenever the patient is out of bed and walking. Anticoagulant therapy should be continued for several days after the patient is ambulant. The use of elastic support on the limb should be continued for at least a month; it can then be discontinued unless chronic venous insufficiency is present.

It is well to remember that recurrent thrombophlebitis of either superficial or deep veins may be the first clinical manifestation of an obscure visceral malignancy.

**Pulmonary Embolism**

**Clinical Aspects**

Treatment for deep venous thrombosis includes the prevention of pulmonary embolism. Unfortunately, in many cases pulmonary embolism is the first sign of venous thromboembolic disease. The diagnosis of pulmonary embolism is often difficult because the symptoms, physical signs, and roentgenographic findings are vague and inconclusive. The classic triad of symptoms, thoracic pain, dyspnea, and hemoptysis, is not present in the majority of cases. The most frequent symptom is sudden pain in the thorax; dyspnea is less frequent except when large emboli are present, and hemoptysis occurs in less than 20 per cent of the cases. Consequently, the diagnosis of pulmonary embolism often must be presumptive, based on the occurrence of chest complaints in a situation likely to be complicated by venous thromboembolism.

Physical examination may reveal little or no abnormality in patients with small pulmonary emboli. Elevation of the diaphragm, impaired percussion, or a localized patch of rales may be detected, but a pleural friction rub is heard in only about 10 per cent of cases.

The roentgenographic manifestations may vary from minimal areas of fibrosis and small accumulations of pleural fluid to the uncommon classic wedge-shaped density. Electrocardiographic changes frequently are absent. When they occur, they are usually transient. These changes may consist of inversion of T waves in the right precordial leads, evidence of right bundle-branch block, or the changes of acute eur pulmonale. The last-mentioned is the most characteristic. Electrocardiographic changes occur within the first 48 hours after pulmonary embolism and disappear rapidly.

In the differential diagnosis of pulmonary embolism one must consider atelectasis, pneumonia, myocardial infarction, and intra-abdominal processes such as subdiaphragmatic abscess. In postoperative patients atelectasis is likely to develop in the first 3 postoperative days whereas pulmonary embolism is more likely to occur in the second postoperative week. Fever, cough, and physical findings in the chest are more prominent in pneumonia than in pulmonary embolism. In acute myocardial infarction the pain is not pleuritic,


Table 1

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<thead>
<tr>
<th>Conditions with Increased Risk of Venous Thrombosis</th>
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<tbody>
<tr>
<td>1. Postoperative period following pelvic operation, splenectomy, or any abdominal operation for a malignant lesion</td>
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<td>2. Periods of immobilization of patients</td>
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<tr>
<td>a. With a past history of venous thrombo-embolic disease</td>
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<td>b. With leg trauma</td>
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<td>c. With cardiac disease or obesity</td>
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Table 2

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<tr>
<th>Valuable Measures in the Prophylaxis of Venous Thrombo-embolism</th>
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<td>1. Measures to minimize venous stasis</td>
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<td>a. Early ambulation</td>
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<td>b. Avoidance of constricting dressings on limbs</td>
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<tr>
<td>2. Measures to retard hypercoagulability</td>
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<tr>
<td>a. Avoidance of dehydration and shock</td>
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<tr>
<td>b. Anticoagulant therapy</td>
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<tr>
<td>3. Other measures</td>
</tr>
<tr>
<td>a. Avoidance of injections into veins of legs</td>
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<tr>
<td>b. Correction of anemia</td>
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and the thoracic roentgenogram usually reveals no abnormalities; very often the electrocardiographic changes of acute myocardial infarction are the best differential point. Intra-abdominal processes such as subdiaphragmatic abscess can be very difficult to distinguish from pulmonary embolism, but, in the former, abdominal pain and tenderness are more prominent.

Management

The therapy of pulmonary embolism should include those measures outlined for deep venous thrombosis. In cases of large emboli with cardiorespiratory embarrassment, oxygen is indicated and atropine may be desirable to relieve associated bronchial spasm. Anticoagulant therapy should be initiated with heparin because of its immediate effect and should be continued until the prothrombin time is within the therapeutic range. Anticoagulant therapy should be continued for several days after the patient is ambulatory. Rest in bed is advisable until all signs and symptoms have disappeared, usually 8 to 10 days.

The morbidity and mortality associated with venous thrombo-embolic disease indicate the need for strong, concerted prophylactic measures when the risk of venous thrombosis is high (table 1).

Valuable measures in the prophylaxis of venous thrombo-embolism are listed in table 2.

Relevant References

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