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NOTE ON THE INJECTION TREATMENT OF VARICOSE VEINS OF THE LEG.

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Varicose veins is a common and very disabling condition. It interferes with work and with pleasure; its sequelae are numerous and some of them, e.g., thrombosis and haemorrhage, are not without danger. It is a distressing complication of pregnancy. It debars people from entering the Public Services and last, but not least, its unsightliness makes it a matter of great concern to women who adopt that excellent and hygienic fashion—the short skirt. The treatment of this condition has, until recent years, been the tedious and unsatisfactory operation of partial or total saphenectomy but this has been entirely replaced by a method which is much simpler and more lasting in its results, viz., the injection method. It is free from danger, inexpensive and ambulatory, and, therefore, in every way preferable to operation.

An extensive and rather confusing literature in which various methods are advocated has grown up in connection with the injection treatment, and the novice will be well advised to adhere to one recognised method such as the quinine method and to continue with it until he has attained proficiency. It is a very simple procedure and no special knowledge is required in carrying it out.

It may be of interest, before describing the technique of injection, to make a few remarks on the venous circulation in the leg. Normally, a considerable quantity of blood circulates through the superficial veins of the leg. In addition to the two saphenous veins and their numerous tributaries there are a large number of independent skin vessels. The general direction of the blood in the saphenous veins is upwards but there is a complicated circulation between the superficial and the deep vessels. Broadly speaking, the flow below the knee is from superficial to deep veins and, above the knee, in the reverse direction. This is borne out by the arrangement of the valves in the communicating vessels and also by the radiographic experiments of Sicard and others who injected lipiodol into the superficial veins and observed the passage of the opaque fluid into the deep veins. The saphenous veins are subject to a considerable amount of variation in their arrangement and it is possible that these variations have a bearing on the etiology of varicose veins.

The small saphenous vein begins behind the lateral malleolus, passes up to the popliteal space, lying outside the deep fascia, and pierces the latter to end in the popliteal vein. It is supplied with, on an average, eight bicuspid valves situated just below the entrance of the main tributaries. Communications with the deep veins are scanty but there are from two to four large and constant vessels which pass to the great saphenous vein, carrying a considerable quantity of blood to the latter.

Further, while the vein usually terminates in the popliteal vein, the proportion in which it does so is, according to Kosinski, only 57 per cent. of cases. In 9 per cent. of cases it is short and usually ends in the great saphenous, while in 33 per cent. of cases it is long and, winding round the thigh, terminates also in the same vein. So that in at least a third of all cases the great saphenous vein receives all the blood from the small saphenous, a heavy burden should it happen to be varicose. Another variation of the small saphenous is that in a proportion of cases it lies deep to the deep fascia and is, therefore, not so likely to cause symptoms should it become varicose.

The great saphenous vein is more constant in its arrangement. A considerable quantity of blood is pcured into it by means of numerous tributaries, by the communications from the small saphenous and by the latter vein itself in a large percentage of cases. All this blood, however, does not reach as far as the saphenous opening for a good deal of it passes into the deep veins of the leg. It is interesting in this connection that the calibre of the saphenous veins is frequently smaller at their terminations than in their more distal portions.

While it is generally agreed that the underlying cause of varicosis is a congenital weakness of the vessel walls and that there is a large hereditary factor in the disease, Kosinski suggests that the actual predisposing cause may be found in the anatomical variations he describes, particularly those relating to the small saphenous vein. Some such cause seems more than likely since factors such as the erect position, prolonged standing, the height of the column of blood, lack of muscular support, can only come into operation **after** dilation has occurred and the valves no longer are competent. The interesting suggestion of Mr. Philip Turner that the sharp edge of the falciform ligament obstructs the great saphenous vein in the erect position also comes into this category of late factors.

In a patient with well developed varicose veins the whole of one or both saphenous veins may be affected. In addition, their tributaries may be varicose and form bunches of dilated vessels alongside the main trunks. The branches communicating with the deep vessels may also be affected and in some cases the deep veins themselves. Owing to the fact that the latter are well supported by muscles, their varicosity, in uncomplicated cases, is of no consequence clinically. The circulation in the leg of a patient with varicose veins differs radically from that in a normal person. Incompetent valves lead to a flooding of the great saphenous vein from various sources. Further, the circulation in this vein is reversed, for Jentzer and Sicard have shown by radiographic methods that in the erect position blood flows in peripheral direction. A vicious circle is created, particularly if all the saphenous valves are incompetent, for the femoral vein then probably spills a good deal of its contents into the upper end of the saphenous vein. The accumulated blood in the lower end of the saphenous flows into the deep veins of the leg and so completes the circle. It has frequently been observed that after injection of a varix, thrombosis extends peripherally and patients may complain of a burning feeling travelling **down** the leg. Indeed, it is now generally recommended that injections should begin near the upper end of the diseased veins. According to Paterson Brown and others, if this be done, fewer injections will be needed to effect a cure. The real advantage of proximal injection is that it probably acts in the same way as the Trendelenburg operation by interrupting the column of blood in the saphenous vein. The bearing of the reversal of the circulation in varicose veins on the question of embolism will be referred to later.

SOLUTION USED:—The two solutions most commonly used are the Genevrier solution, viz., quinine hydrochloride 4 grams, urethane 2 grams, distilled water 30 cc., and the Sicard solution of sodium salicylate (20-40 per cent.). All I wish to say here regarding the latter solution is

that it has given excellent results in many hands and that it is stated to have one great advantage over quinine in that larger quantities can be used so that it is possible to cure an extensive varix by a single injection (Colt). The **quinine** method is a very safe and effective one and is the one I would advocate. The solution, a few ounces of which may be obtained at any chemist, is clear and colourless but crystallises out on standing and the bottle should therefore be immersed in hot water for a few minutes before using. The solution may be sterilised by boiling but this is hardly necessary if one uses ordinary precautions. The solution tends to become discoloured after a time and should then be renewed.

POSITION OF PATIENT:—It is generally agreed that the emptier the veins are the better are the results. It is essential that the injection should be **intravenous**, and to facilitate this one naturally places the patient in a position which will make the veins stand out, viz., standing lie down after having inserted the needle and then inject into the almost empty vein. I find the sitting position quite satisfactory and must say I prefer it. The patient sits on a high couch with the legs hanging over the edge; the operator sits on a chair. The veins are not so full that the solution will be unduly diluted but should they be very large the patient can be made to lie down after the needle has been inserted. The sitting position is more comfortable and more dignified than the standing, and there is no danger that the needle will be dislodged while the lying position is being assumed. Personally, I never like to do even the smallest operation on a patient who is standing. I think therefore that the whole process—the insertion of the needle and the injection of the fluid—can be comfortably and satisfactorily carried out with the patient sitting.

TECHNIQUE:—The skin is purified with ether or alcohol. A small Record syringe of 2 to 5 cc. capacity with fine hypodermic needles may be used, though there are several special syringes on the market now. Personally, I use an ordinary glass hypodermic syringe with a few needles which I keep ready for use in absolute alcohol. A single injection is given at the first sitting and not more than 1 c.c. of the solution injected, which gives me an opportunity of testing the patient's sensitivity in more ways than one. A vein is selected midway between the knee and the ankle and the needle is inserted through healthy skin and pushed obliquely into the vessel. The whole secret of successful technique is to make certain that the needle has entered the lumen of the vein. This is done simply by withdrawing the piston and aspirating a few drops of blood, but, if there is the slightest doubt, the needle should be withdrawn and inserted at some other point. The injection is made slowly and should be quite painless. The slightest leak into the surrounding tissues will instantly cause a burning sensation, and the operator will know that he is at fault. After the injection has been satisfactorily accomplished a small pad of wool is pressed over the vein and the needle quickly withdrawn. The pad is then fixed with a few turns of a bandage which prevents leakage of solution and bleeding and is at the same time comforting to the patient. He should then lie down for 15 minutes or so as this prevents aspiration of the fluid into the deep veins which occurs normally with muscular exertion. The patient then departs and may resume his ordinary occupation. On the following day the pad and bandage are discarded. While the treatment is essentially ambulatory patients should be advised to avoid excessive muscular activity until the injections are finished.

The question is sometimes asked whether it is necessary to do Trendelenburg's test before injecting. I do not think it is. Whether the upper part of the saphenous vein is valveless or not does not, in my own experience, seem to influence the end results one way or another.

SUBSEQUENT INJECTIONS:—It is seldom necessary to inject more than 2 c.c. of the solution into one varix. Injections are given at intervals of a week and two or three varices may be treated at the second

sitting either above or below the site of the first injection. If the patient is pushed for time and the reaction after injections is not too severe injections may be given at shorter intervals, e.g., on alternate days.

EFFECT OF INJECTION:—Apart from the slight prick of the needle the actual injection is quite painless. On the following day there is some soreness over the injected area. This varies in different patients but is never so severe as to necessitate their lying up. Patients often report an immediate disappearance of the aching to which they have so long been accustomed. Discolouration, due to subcutaneous leaking of blood, is not uncommon but is never permanent. Giddiness, faintness and cramp in the legs have been recorded but are rare with quinine injections. The day after injection the vein feels hard and thrombosed; a few weeks later it is much diminished in size, being gradually replaced by a fibrous strand which, in three months, is invisible and almost impalpable. The treatment results in a complete cure and recurrences are infinitely rarer than after operation. The circulation in the leg is improved, the aching pain and swelling and the unsightly bulges disappear and there is a marked improvement in the colour and contour of the limb. On rare occasions the injection does not "take." One should then make sure of a completely empty vein and, having injected, keep the patient lying down for half-an-hour. If this fails then it is best to use a different solution, e.g., sodium salicylate.

ILL EFFECTS are rare and are invariably due to faulty technique. Injection outside the vein leads to pain and swelling which may be so severe as to prevent the patient doing his work. Ulceration and sloughing are rare with quinine but frequently occur with salicylate solutions when the vein is missed; they may occur in either case when there is lack of aseptis.

The fear of **EMBOLISM** has probably been the chief reason why the injection method has not been more generally used, and yet there is no case on record among all the thousands of cases treated during the last 20 years of embolism following either quinine or sodium salicylate injections. The risk of ordinary post-operative embolism is no doubt small but it is especially liable to occur after operations on varicose veins. When quinine comes into contact with the endothelium of a varicose vein an intense chemical irritation is set up (Endovenitis) and thrombosis begins within a few hours. The thrombus is firmly adherent to the damaged endothelium: it is very tenacious and non-friable and remains so until it becomes organised. Further, the vein is completely blocked by the thrombus and cannot become re-canalised. Ordinary non-chemical thromb-phlebitis, so common in patients with varicose veins, is usually much more widespread and though the thrombus occasionally becomes organised, it tends to remain soft and friable. Portions of it become detached, particularly if the phlebitis is of a septic nature, and re-canalisation is common. Cases have occurred where, after injection, thrombosis has spread through a large part or the whole of the saphenous vein, not necessarily near the site of injection. I think these are instances of ordinary thromb-phlebitis occurring in patients who are prone to this condition and who should, therefore, not have been treated.

The fact, previously mentioned, that the circulation in varicose veins is reversed is undoubtedly a safeguard against embolism, but even if this were not so the nature of the "chemical" clot would in itself prevent such an accident.

QUININE POISONING:—The injection of two to four grains of quinine into a sluggish varix once or twice a week cannot possibly cause symptoms of poisoning, but idiosyncrasy to the drug should be borne in mind. I think a sufficient safeguard against this to tell the patient beforehand that the solution contains quinine but, if one wished to make sure, a few drops of the solution injected intradermally would reveal any sensitivity.

CONTRA-INDICATIONS TO INJECTION:—

1. Obstruction to the deep veins due to Phlebitis (e.g., white leg) or pressure of a pelvic tumour. Injection of any obstructive or compensatory varicosity is obviously contra-indicated.
2. Idiosyncrasy to drug used.
3. Advanced heart and kidney disease. Arterial diseases, particularly those affecting the vessels of the leg.
4. Phlebitis and thrombo-phlebitis. This, I think, is the commonest and most important contra-indication. Patients who have had recent attacks of thrombosis should on no account be injected.
5. Pregnancy. Pregnant women show a tendency to phlebitis and it is safer to postpone injection for this reason. It is also best not to inject a patient who is menstruating. Marked varicosis of the veins of the vulva is such a serious condition during labour that one would nevertheless advise injection and use sodium salicylate in preference to quinine.

In conclusion, I should like to refer briefly to the injection treatment in connection with VARICOSE ULCER. The essential features of this ulcer are due to the faulty circulation caused by varicosis. Defective nutrition of the skin, often evidenced by a patch of dermatitis or eczema, predisposes to trauma and infection and so to an ulcer. Venous congestion, aggravated by the reversal of the blood flow, interferes with healing and makes for chronicity. Innumerable forms of treatment have been devised to deal with this condition of affairs. The injection treatment has the double advantage that it is ambulatory and not only causes healing of the ulcer but removes its cause. It is necessary to exclude syphilis and other possible causes of ulceration, though the existence of these diseases is seldom a contra-indication to the injection of the veins—the treatment of each may go on simultaneously. The only real contra-indication is phlebitis, a condition which, unfortunately, is not uncommon in ulcer cases. If the ulcer is very septic it should be cleaned up first with boric formentations, followed by evol dressings. Unna's paste, if properly applied, is still a valuable adjunct. Both clinical types of ulcer are amenable to injection treatment—the small deep ulcer and the large callous variety. Injections should be made well above the ulcer—this avoids the danger of passing the needle through infected tissues and, by producing a downward spreading thrombosis, lessens the number of injections required. In ambulatory cases the ulcer will, in a few weeks' time, become much cleaner and will have soundly healed in from 3 to 6 weeks time. Eczema, if present, will rapidly improve. It is seldom, and then only in very neglected cases, that surgical measures such as curetting, undercutting and skin grafting will be required.

Though Thornhill claims that 98 per cent. of varicose ulcers can be cured by injections, it must be remembered that the best treatment is preventative and herein lies the chief value of the injection method.