

Complications of ascending phlebography of the leg

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Summary and conclusions

Forty patients were studied prospectively for complications of ascending phlebography. The commonest immediate complication was pain at the site of injection and the commonest delayed complication pain in the foot or calf. Out of 30 patients with pain in the foot and calf, 15 had venous thrombosis. Review of 200 case notes disclosed only one recorded complication—namely, necrosis of the dorsal skin of the foot. Complications of the procedure reported by referring clinicians over 10 years comprised four cases of necrosis of the dorsum of the foot and two of gangrene of the foot, in one of which the gangrene spread to the leg.

Major complications of ascending phlebography are rare, though when they occur may cause serious morbidity. If a scrupulous technique is used contrast phlebography remains the most accurate method of diagnosing venous disease of the leg.

Introduction

The use of phlebography has greatly increased in recent years, both to diagnose deep vein thrombosis and to investigate the post-thrombotic syndrome. This increase has occurred despite the introduction of non-invasive techniques such as the ¹²⁵I-fibrinogen uptake test,¹⁻⁴ ultrasonic Dopplergram,⁵⁻⁷ and impedance phlebography⁸ because these methods do not give the same degree of accuracy as contrast phlebography.⁹⁻¹⁶ Complications of phlebography of the leg are rarely mentioned in reports and are generally described as uncommon and mild.¹⁷⁻¹⁹ The most detailed study of the side effects of contrast phlebography was that carried out by Bettman and Paulin.²⁰

We report our experience in a partly prospective and partly retrospective study of the complications of phlebography and suggest how these may be minimised.

Patients

Forty patients were questioned about immediate side effects after phlebography and followed up for four days to exclude complications. We also reviewed the case notes of 200 patients who had had phlebography for any recorded complications. The severe complications were brought to our attention by the referring clinician.

During the past 10 years 3060 patients have undergone phlebography at this hospital. In all cases the procedure was carried out by our standard technique,¹¹ with a fluoroscopic table tilted foot downwards and equipped with a television monitor. Meglumine iohalamate 60% is injected into a foot vein through a 23- to 19-gauge scalp-vein needle, with tourniquets above the knee and ankle to direct the contrast into the deep veins. Each leg is examined separately. The total amount of contrast used is about 200 ml. At the end of the examination the veins are cleared of contrast by flushing with physiological saline and passive and active contraction of the calf muscles.

Results

The table lists the complications that occurred in the 40 patients who were questioned at the time of examination and followed up for four days. Of the 30 patients who had pain in the foot and leg, 15 were found to have venous thrombosis. In the 200 case notes reviewed the only complication recorded was one patient with necrosis of the skin of the dorsum of the foot.

Side effects of phlebography of the leg in 40 patients noted at time of examination and over subsequent four days. Figures are numbers of patients (percentages in parentheses)

Immediate effects		Delayed effects	
Localised pain at injection site	25 (63)	Pain localised to foot	13 (33)
With extravasation	6 (15)	With extravasation	3 (8)
Without extravasation	19 (48)	Without extravasation	10 (25)
Swelling of foot	3 (8)	Calf pain	5 (13)
Generalised pain in calf	19 (48)	Chest pain	2 (5)
		Skin necrosis	1 (3)
		Cellulitis	1 (3)

Out of the 3060 patients examined by phlebography the complications serious enough to be drawn to our attention were necrosis of the skin of the dorsum of the foot in four patients (including the one recorded in the reviewed case notes) (0.1%) and gangrene of the foot in two, which in one spread to the leg (0.6%).

Discussion

The commonest immediate complication in the 40 patients studied in detail was pain at the site of injection, which occurred with or without extravasation of contrast and usually lasted only a few minutes. The pain was described as stinging and localised to the puncture site, which suggests that it is caused by chemical irritation of the vein or soft tissues by the contrast, similar to that described by some patients during intravenous injection for pyelography.

The local pain at the injection site is far more severe when extravasation of contrast into the soft tissue occurs and every effort should be made to prevent this. A single, clean puncture is the ideal, but when more than one has been necessary contrast may leak into the tissues from an earlier puncture site. To minimise this, needles from failed venepunctures are left in position until the examination is finished, and pressure is applied to any leaking puncture sites until haemostasis occurs before the contrast is injected. Use of a plastic cannula²¹ instead of the metal needle may appreciably reduce the frequency of extravasation. We, however, find that venepuncture is more difficult with a plastic cannula than with a sharp fine-gauge needle, especially in inexperienced hands, and the advantage of reducing minor extravasation would be outweighed by the distress of multiple punctures. With our screening technique we can easily check that the needle is correctly positioned in the vein at the start of the examination and monitor the injection of contrast so that it can be stopped immediately should extravasation occur.

The medium best tolerated by our patients is meglumine iohalamate 60%, which causes less local discomfort than media containing the sodium ion. Although dilution of a 60% contrast may reduce side effects,²⁰ diluted medium is likely to produce undiagnostic opacification of the veins of the pelvis and inferior vena cava, which we examined routinely with our technique.

The other immediate type of pain described was a bursting sensation in the foot or leg, which appears to be related to

restriction of the venous return by the tight ankle and thigh tourniquets and is relieved when these are released. This sensation was commoner when venous obstruction from thrombosis was present. Tourniquets are not considered by all workers to be essential for phlebography used to visualise venous thrombus,⁹ though we think they result in improved definition by reducing the dilution of the contrast. Tourniquets are essential, however, for examining incompetent perforating veins to ensure that the superficial system is occluded.

The commonest delayed side effect in the patients followed up for four days was pain in the foot or calf. This was described as a dull, aching pain with local tenderness similar to that experienced in deep vein thrombosis. The explanation is not clear, though contrast damages the venous intima²²⁻²⁴ and predisposes to thrombosis.²⁵⁻²⁶ Hence this pain and the occasional instances of swelling of the foot and ankle probably result from venous thrombosis caused by the contrast. The two patients who complained of chest pain some days after phlebography may have had small pulmonary emboli due to further venous thrombosis.

Metrizamide, the non-ionic contrast medium being developed for clinical use, may reduce venous thrombosis as it causes less intimal damage²⁷ than the ionic media used at present. The local toxic effects of the currently available contrast media make it essential to clear the veins of the contrast to minimise thrombotic complications. Some workers^{13 23 28} routinely use heparin, but since the individual response to heparin is so variable we reserve this for patients with a high risk of venous thrombosis, such as those with suspected malignant disease. Provided the contrast has been completely cleared from the veins the overall incidence of thrombosis judged by clinical examination is about 0.5%.²⁹ The delayed complication of cellulitis of the foot in one patient appeared to be due to chemical inflammation from extravasation of contrast, and it responded to conservative treatment.

All the complications so far referred to were minor and carried virtually no morbidity. The most serious complications in our series were tissue necrosis of the foot and gangrene. The two cases of gangrene have been reported³⁰ and were thought to be due to tissue damage resulting from an obstructed or deficient deep venous system. If the deep venous system does not fill when the standard technique is used the examination should be abandoned and an alternative approach, such as intraosseous injection, considered.

Tissue necrosis is associated with severe extravasation of contrast. Hypertonic fluids such as contrast medium may cause necrosis of soft tissue,³¹ and tissue necrosis after contrast phlebography has been reported.^{32 33} The patients described by Gothlin and Hallbook³² had foot ischaemia, suggesting that such patients are at increased risk. One of our patients who developed tissue necrosis had severe arterial insufficiency. Should extravasation occur the injection should immediately be stopped and an attempt made to disperse the contrast. This is best achieved by gentle local massage and diluting the contrast in the tissues by injection of physiological saline. Hyaluronidase has been advocated,³² but the combination of this drug and contrast may increase tissue damage³⁴; we therefore do not recommend its use.

We conclude that minor local complications of contrast phlebography are common. Severe complications such as thrombosis, skin necrosis, and gangrene, though rare, may cause serious morbidity, and a most careful technique is therefore required. Despite the newer, non-invasive techniques phlebography remains the final arbiter in diagnosing venous disease of the leg, but possible complications should be considered when ascending phlebography is requested.

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ONE HUNDRED YEARS AGO We mentioned last year a meeting held at the house of Mr Ernest Hart [Editor of the *BMJ*] for the purpose of initiating combined effort in favour of temperance by the institution of coffee taverns in London. It may be interesting to state that that effort succeeded in the formation of a Coffee Tavern Association, which has now twenty houses in possession, of which a considerable proportion are in active and successful operation, and the rest are being rapidly fitted. The Association is, of course, not one which aims at profit. The directors, who include Mr Thomas Hughes, QC, Mr H R M Pope, Mr Sydney Holland, Mr Harrison, the Hon Rollo Russell, Mr Ernest Hart, Dr Norman Kerr, and Mr J C Barnard, honorary secretary, give somewhat laborious services gratuitously. It is, however, considered to be a necessary condition of this enterprise, as of the Industrial Dwellings of Sir Sidney Waterlow, that, in order to its adequate extension throughout the country, and its imitation on a large scale by others, the capital employed should be made to return a moderate dividend. This effort has also been thus far attended with success. The primary laws of the Association provide that the dividend returned shall not exceed five per cent. One of the most interesting accessible examples of these houses is that which occupies a position in the Seven Dials in St Giles's. Through this house, upwards of a thousand customers a day of the poorest class often pass, and they can buy a pint of coffee, tea, or cocoa during the winter, or iced milk, etc, during the summer, for a penny. The experiment thus initiated on a limited scale promises to assume large proportions; and if it be as satisfactorily proved in London as it has been in Liverpool, and is being also in Bristol and elsewhere, that such temperance houses can be carried on with care and judgment on a self-supporting basis so as to secure for the working classes wholesome refreshment in pleasant places of resort at cheap rates, we feel somewhat sanguine that a successful attack may thus be made upon the degrading and injurious intemperance which is at present the greatest enemy of the health, morals, and prosperity of the poorer classes in this country. No such house, however, should be opened without careful study of the site, population, management, etc, for failure is more easy than success, and failures are very discouraging, and hurtful to real progress. (*British Medical Journal*, 1878.)