

EXPERIMENTAL LYMPHOVENOUS ANASTOMOSIS*

By J. NIELUBOWICZ AND W. OLSZEWSKI

SURGICAL RESEARCH LABORATORY, POLISH ACADEMY OF SCIENCES, WARSAW, POLAND

DURING hind-limb lymphography in dogs, the vein draining the popliteal lymph-node was outlined radiologically in about a third of the experiments (*Fig. 1*), although no lymphovenous communication could be identified macroscopically (Pressman and Simon, 1961; Danese, Howard, and Bower, 1962; Malek, 1964; Pressman, Burtz, and Shafer, 1964). It was

lymph-node into the inferior vena cava. After cautious mobilization of the node, paying special attention to the vascular supply at the hilum, the node was transected. The inferior vena cava was then partially occluded and incised in the neighbourhood of the node. An anastomosis was made with interrupted ooooo silk sutures uniting the capsule of the node to the wall of the incised vein so that the cut surface of the node faced the lumen of the vein (*Fig. 2*). Subsequently the dogs were sacrificed at intervals ranging from 1 day to 12 months after the operation. At



FIG. 1.—Lymphography of the hind limb of a dog. Aqueous contrast medium enters the popliteal vein at the level of the lymph-node.

also noted that when the popliteal lymph-node was transected, the afferent lymph-vessels being preserved, lymph drained freely from the subcapsular and medullary sinuses opening onto the cut surface. From these observations it was thought that a permanent lymphovenous shunt might be constructed by direct surgical anastomosis between the cut surface of a lymph-node and a neighbouring vein (Nielubowicz and Olszewski, 1966). This proposition has been investigated experimentally in 50 dogs.

MATERIAL AND METHODS

In 50 dogs lymphovenous anastomoses were performed by implanting the mesenteric or hepatic

* Presented at the Congress of the European Section of the International Cardiovascular Society, Amsterdam, 28 June, 1966.

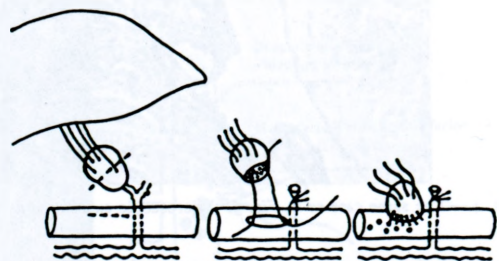
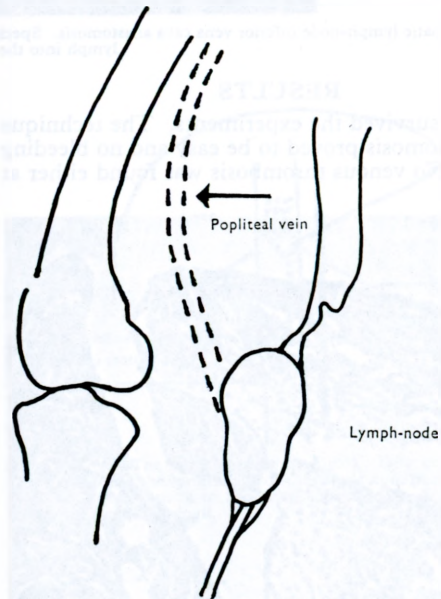


FIG. 2.—Diagram showing various stages of hepatic lymph-node/inferior vena cava anastomosis.

autopsy a special search was made for venous thrombosis at the site of the anastomosis, in the heart, and in the pulmonary artery. Specimens were taken from the site of the anastomosis for histological

examination. Direct lymphography was done in 10 dogs at 2, 4, 10, 12, 18, 24, and 48 weeks after primary operation, the contrast medium being injected into one of the afferent vessels. To demonstrate the flow of the contrast medium through the anastomoses, a special cine-radiographic film was used.

Histological examination of the anastomotic edges revealed that soon after implantation the cut surface of the node facing the vein was covered by a thin thrombus. On the seventh day some necrosis in the cut edges of the node and of the vein, with active immigration of fibroblasts from adjacent connective

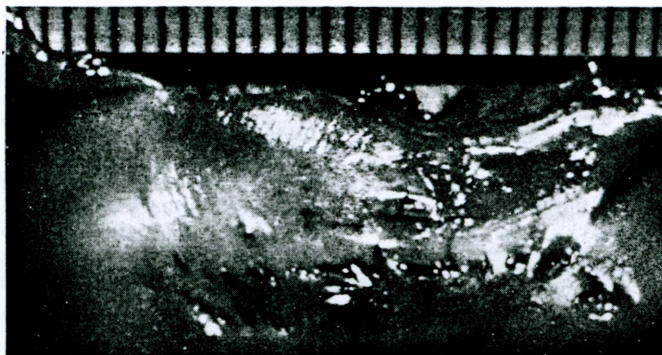


FIG. 3.—Hepatic lymph-node inferior vena cava anastomosis. Specimen taken 1 month after the operation. Visible small openings draining lymph into the lumen of the vein.

RESULTS

All dogs survived the experiments. The technique of the anastomosis proved to be easy and no bleeding occurred. No venous thrombosis was found either at

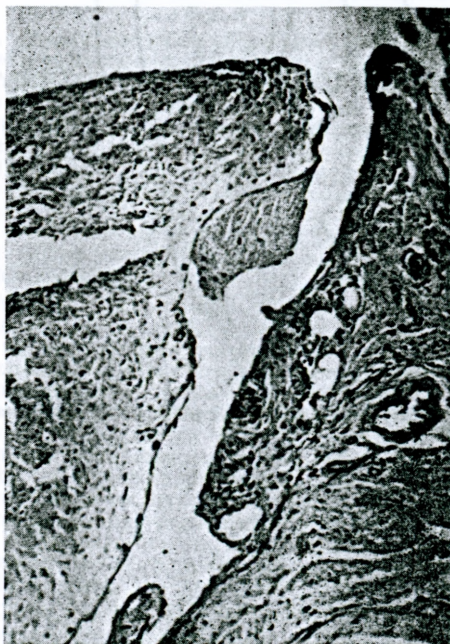
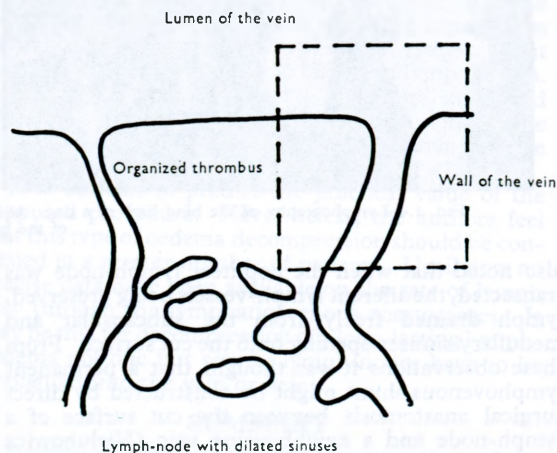


FIG. 4.—The same case as in Fig. 3. Microscopic examination of the area of lymphovenous union revealed patent anastomosis lined with endothelium.

the site of the anastomosis or in any other part of the venous system. Examination of the intraluminal surface of the implanted node revealed openings through which the lymph drained freely into the vein (Fig. 3). These openings were already to be seen macroscopically 1 month after the primary operation.

tissue, was seen. The process of organization continued until the fourth week after the operation. At that time the patent marginal sinuses draining into the vein were visible (Fig. 4). These neoformed sinuses were lined with endothelium and no gaps in the area of the lymphovenous union were noticed. The draining sinuses were filled with lymph.

Lymphography demonstrated that the contrast medium injected into one of the afferent vessels flowed freely into the vein. This was easy to observe 4 weeks after the implantation (Figs. 5, 6). Cine-radiography showed free passage of the injected contrast medium into the vein.



DISCUSSION

Previous attempts at direct anastomosis between lymph-vessels and veins have generally failed because of the small size of the former (Laine and Howard, 1963). The use of a transected lymph-node overcomes this technical difficulty and makes it possible to construct a functioning lymphovenous shunt. In

the experiments reported here, such lymphovenous shunts were shown to remain patent by lymphography and histological examination for up to 1 year after operation. With this method it may be possible to relieve secondary lymphoedema by the creation of one or more lymphovenous shunts distal to the level of the obstruction.

SUMMARY

A method for the production of lymphovenous shunts by direct surgical anastomosis of the cut surface of the lymph-node with the lumen of the neighbouring vein has been described. Lymphographic cine-radiographic and histological examination 1 year after the operation demonstrated patency of the anastomosis.

REFERENCES

DANESE, C., HOWARD, J. M., and BOWER, R. (1962), *J. Surg. Res.*, **2**, 317.
 LAINE, J. B., and HOWARD, J. M. (1963), *Surg. Forum*, **14**, 111.
 MALEK, P. (1964), *Acta chir. belg.*, **63**, 655.
 NIELUBOWICZ, J., and OLSZEWSKI, W. (1966), in *Excerpta Medica*, Congress of the European Section of the International Cardiovascular Society, Congress Section, Amsterdam, 28 June, 1966.
 PRESSMAN, J. J., BURTZ, M. V., and SHAFER, L. (1964), *Surgery Gynec. Obstet.*, **119**, 984.
 — and SIMON, M. B. (1961), *Ibid.*, **113**, 537.

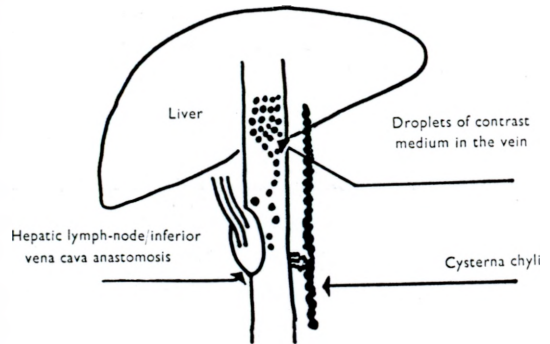
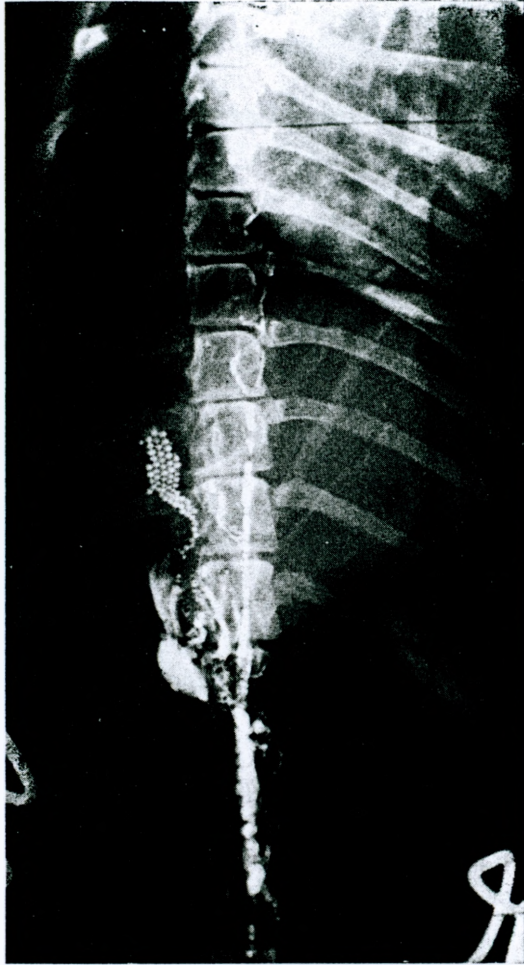


FIG. 5.—The same case as in Fig. 3. Oily contrast medium injected into the lymphatics of the liver hilum passes through the hepatic lymph-node to the inferior vena cava. Some of it enters the cysterna chyli.

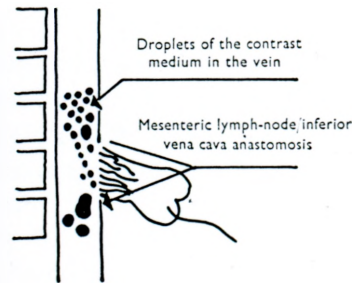
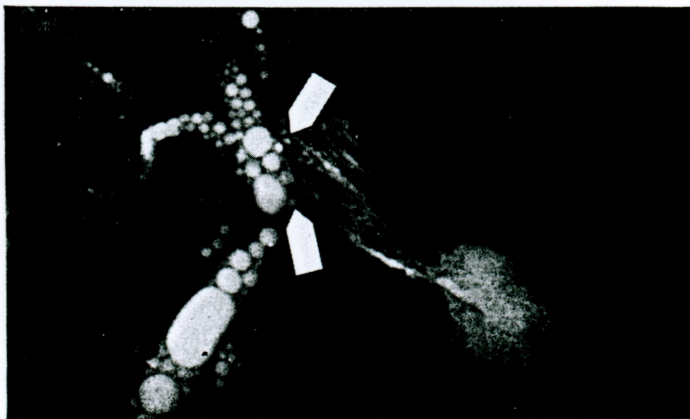


FIG. 6.—Mesenteric lymph-node/inferior vena cava anastomosis. Oily contrast medium injected into the mesenteric lymph-vessel fills the lymph-node, then enters the vein through the neoformed lymphovenous anastomosis (lateral view).