Lymphology 14 (1981) 145–148

Our Experience on Anatomical Injections of the Lymphatic Vessels

A. Pissas*, M. Papamiltiades**

*Assistant, Department of Surgery, Hospital "Les Sablons", B.P. 217 X 38043 Grenoble Cedex France
**Professor, Center of Cytodiagnostic, 28th October Road, Athenes, Greece

Summary

The authors relate their experience on anatomical injections of the visceral lymphatic vessels. Their experience concerns the stomach, the pancreas, the lungs, the thyroid gland and the esophagus. This work has been carried out on the corpse using solution of cedar coloured oil and china wood coloured oil.

The injection is performed in five steps and every motion of the hand is important. However, the results in the dead are highly depending upon the technique of injection so that the study on the living is absolutely necessary.

Introduction

The importance of lymphology in many fields of pathology, has led to a high degree of interest in anatomical injections of the lymphatic vessels. In this article, we will explain our technique regarding injection of lymphatics.

Ever since the early days of the 20th century any anatomical concept appears as a matter of fact, but actually the anatomists have been processing on acquired knowledges and on established facts rarely discussed and generally never argued. Thus none of the great anatomists *Mascagni, Sappey, Bartels, Cuneo* and *Rouvière* gave a full statement of their own special injection techniques.

Mascagni and Sappey injected mercury solution when practicing on the lymphatic vessels Others used Gerota solution. As stated above, however, we don't know exactly how.

Therefore we offer the reader our own technique of injecting in an accurate way, explaining all details possible, since we don't know any publication on this subject preceeding this one.

Statistical Background

The human material comprises:

- 132 dissections including 97 injections, concerning the stomach
- 80 injections concerning the pancreas
- 40 dissections including 33 injections, concerning the lungs
- 35 injections concerning the thyroid gland
- 25 injections concerning the esophagus.

We are not intending to set up a complete list of all the techniques we utilized but we will try rather to explain the very precise way we have proceeded on the stomach which we have thoroughly investigated.

The lymphatic injections constitute the main part of our work. The human fetuses or the still-borns remain the "nec plus ultra" material for this experiment. The injection needs to be practiced on very recent corpse. Obviously, this precise condition brings to this experiment an emergency character whilst it ensures the possibility of success. 48 hours after death, the paries of the lymphatics are damaged and test failure may often occur.

Solutions for Injection

We have used in a few cases India ink, Gerota's solution, mercury and barium sulfate. Essentially we used *Papamiltiades'* (6) solution that is a mixture of one volume of Cedar oil, one volume of Prussian blue, two volumes of

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toluene. Before use, we have to add ether, 10% of total volume. For the past two years, we have been using a mixture of coloured China wood oil. China wood oil is, far cheaper than Cedar oil but equally efficient as per diffusibility, remanence, intensity of coloration. The mixture ratio is: China wood oil: 40%, Cyclohexan: 40%; Prussian blue: 20%. The injections performed by means of this solution are more satisfactory than Cedar oil ones.

Techniques of Injection

For parenchymatous viscera:

The technique of perfusion is prefered. This is the best way of injecting lungs. The injection pressure is hydrostatic (corresponding to the height of the column). The fetus is placed in a tank. The injection is performed in warm water (50 °C), which heats the corpse, cleans it and facilitates the diffusion of the solution. The needle is placed directly in the parenchyma and do not try to catheterize any lymphatic vessel.

For hollow viscera:

The injection by syringe seems the most adequate. The protocol is taking place according a fixed scheme. The operator is seated, under good light. He has to use a glass syringe with a needle of 0.5 mm diameter. The fetus is warmed (50 °C) and then placed in a tank full of rags, just to bring it in the height of operator's hand. Essentially the injection is performed in five steps. For instance concerning the injection of the stomach:

- The syringe is held (for a right-handed man) by the right hand, leaving free the thumb and the forefinger of the left hand.
- The left forefinger is placed on the gastric face, opposite to the one to be injected. The forefinger will play part of block in practicing counterpressure.
- The injection is absolutely in the subserosa, the eye of the needle facing the operator. The needle has to stop as soon as its eye is completely covered by the peritoneal serosa (Fig. 1).

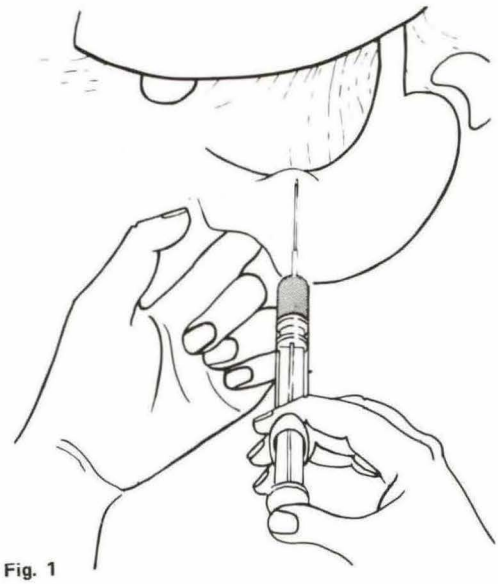

Fig. 1

Fig. 2

Fig. 1 and Fig. 2
The lymphatic injection on the stomach

- The thumb, ahead, obliterates efficiently the point of penetration of the needle. It stops the backflow of the solution which tends to be driven back by counterpressure of the forefinger.

Fig. 3

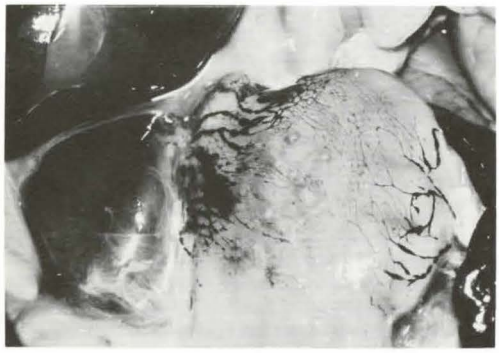

Fig. 4

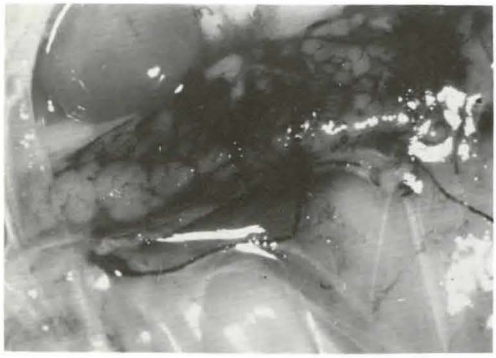

Fig. 5

Fig. 3, 4 and 5
Figures of lymphatic injections on fetuses

– The injection is performed slowly, at uniform pressure. It is practiced close to the curvature, it outlines fine beads (the valvulated collectors of subserosa) which converge towards precise points of the curvature (Fig. 2).

Washing under the tap is replacing the massage which is prescribed by *Papamiltiades*.
The most frequent accidents are:

– crossing the serosa a second time causes a leakage of solution
– converting the subserosa injection to a muscularis propria injection, if the needle has deeply penetrated.
– making a décollement of subserosa, simulating an ink hematoma. In such a case, the operator has to stop the injection and start again, further.

Results and Discussion

The techniques on the corpse have procured descriptive results quoted in our previous publications (7, 8, 9, 10, 11, 14) (Fig. 3, 4, 5). After having completed our study we intended to proceed with discussions concerning the validity of our technology. We confirm the high importance of the direction we were giving the needle during the injection.

In other words, the solution was injected, at first, the area we were unconsciously aiming. A series of injections with oriented needle confirmed this principle. Injecting very close to the greater curvature of the stomach and pointing to the lesser curvature, the left gastric nodes were dyed and vice-versa injecting close to the lesser curvature and pointing to the greater one, the gastroepiploic nodes were dyed (Fig. 6). Besides, if the needle was oriented vertically (neutral position), the solution was adopting the injection axis (upwards or downwards). So, if the anatomist is exclusively studying on the corpse he is not allowed to speak of "lymphatic drainage of viscera" because of the complete absence of lymphatic circulation. The anatomical study of lymphatic drainage cannot be done without trials on the living.

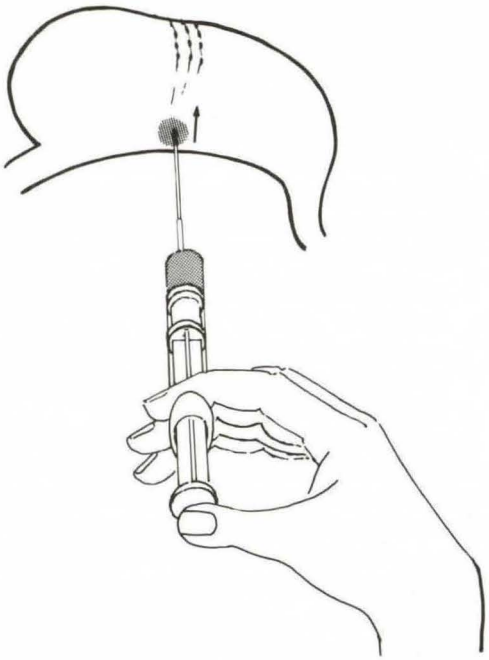

Fig. 6 The results of the injection are highly depending upon the direction given to the needle

Therefore, in every stage of our anatomical study, we have collated the results with the informations given by lymphographies or injections of vital staining dye during surgery. Unfortunately, investigation on the living is by no means the same as an anatomical investigation, which is long, delicate, complete with enduring results.

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A. Pissas, Department of Surgery, Hospital "Les Sablons", B.P. 217 X, 38043 Grenoble Cedex – France