

Transplantation of lymphatic vessels

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1. Introduction

Using the patient's own lymphatic vessels for bypassing a regional interruption of the lymphatic vascular system is a pure vascular surgical answer to the underlying problem of most of lymphedemas in Europe¹.

There, because of medical interventions, mostly after lymph node resection, at narrow passes of the lymphatic transport system, the lymphatic transport capacity is diminished.

Healthy lymphatic vessels as autografts, which are used to transport lymph actively, are able to improve the transport of lymph if they are connected with lymphatic vessels in front and behind the affected area. Staying within the lymphatic vascular system does also mean that the pressure gradient is appropriate in each case. Very low risk of thrombosis within lymphatic fluid is of additional advantage.

2. Harvesting of grafts

Harvesting of lymphatic autografts is possible at the so-called ventro-medial bundle at the inner aspect of the thigh. There up to 16 lymphatic collectors are found. About two to three collectors can be taken. However it is im-

portant not to touch the narrow pass of the lymphatic system peripherally at the knee and centrally at the inguinal lymph node station. Nevertheless the length of the grafts, dependent of the length of the thigh, is sufficient to reach the opposite thigh or to bridge the distance between upper arm and neck.

Preoperatively a lymphatic scintigraphy is performed in order to elucidate possible pre-existing lymphatic disturbances at the donor limb. During surgery, first dye is administered at the foot in order to facilitate the harvest, but also to make sure leaving back enough stained, which means working, lymphatic vessels at the thigh.

Currently investigations by lymphoscintigraphy are under way which show that lymphatic transport is not changed after the removal of grafts under these precautions.

3. Treating arm lymphedemas

Lymphedemas after treatment of mammary carcinoma resecting axillary lymph nodes are the most frequent ones in Europe.

Lymphatic main collectors at the inner aspect of the upper arm are searched above the fascia.

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At the neck region lymphatic vessels and lymph nodes are searched below the *musculus sternocleidomastoideus*.

Between these two areas a tunnel is created within the subcutaneous tissue with blunt instruments and a Redon tube is placed containing a thread. The lymphatic vessel grafts which have been transected beneath the inguinal lymph nodes, occluded and secured with fine threads centrally, with open endings at the distal end, are pulled through the tube after connecting the two threads. Since the lumen of the tube is moistened no friction occurs. When the tube is removed the grafts lay in place between upper arm and neck.

Under the operating microscope using maximal magnification the lymphatic vessels are anastomosed in the so called tension free anastomosing technique which means oblique tension to the vessel wall is avoided. Mostly 3 to 4 single stitches are sufficient for the end to end anastomoses. We use the smallest absorbable suture material available, size 10-0, armed with a BV75-4 needle.

At the neck end to end or end to side anastomoses are performed with lymphatic vessels bringing the lymph towards the venous angulation. Alternatively also the lymphatic grafts may be anastomosed to lymph nodes through an incision in the capsule giving access to the outer lymphatic sinuses.

4. Treating of unilateral leg edemas

In cases of unilateral edemas of lower extremities lymphatic collectors are used from the healthy leg. They stay attached to the inguinal lymph nodes, are transposed via the symphysis with the help of a temporary tube like in the treatment in upper extremities and anastomosed with ascending main collectors in the affected limb. Lymph is by that way transported from the affected side to the healthy inguinal region.

Not only secondary lymphedemas can be treated by that way but also a specific group of primary lymphedemas, showing a local atresia of the inguinal and/or pelvic lymphatic system in one side.

5. Treating other lymphatic alterations

With the help of short lymphatic vessel grafts also local interruptions of lymphatic vessels at peripheral parts of an extremity, like at the inner aspect of the knee region may be bypassed.

Treatment of lymphatic fistulas and lymphoceles may need lymphatic vascular procedures, especially if lymphedema is present distally.

Lymphedema of scrotum and penis can be treated using short lymphatic grafts if one lower limb shows normal lymphatic outflow. Lymph is then directed to this side after anastomosing the transposed grafts to lymphatic vessels at the root of penis and scrotum.

6. Experiences with vessel autografts

Long term patency with a follow up of more than 10 years was demonstrated using water soluble contrast medium. Also MRI- Lymphography showed a long term patency². Additionally follow up studies using nuclear medical investigation indirectly demonstrated long term patency³.

Lymphoscintigraphies moreover allow quantifying the lymphatic transport. Repeated studies show the measurable effect of lymphatic grafts in the treatment of lymphedemas up to the normalization of the flow of lymph^{4,6}.

There exists also a correlation between the reduction of volume and the improvement of lymphatic outflow at has been stated recently⁷.

Long term follow up studies revealed significant reduction in volume again after more than 10 years^{8,9}.

Quality of life is significantly increased after lymphatic grafting. One of the mayor contributions is given when additional treatment became unnecessary¹⁰.

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