

Anatomy of the superficial lymphatics of the abdominal wall and the upper thigh and its implications in lymphatic microsurgery

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▲ Background

The recent resurgence of enthusiasm in the surgical treatment of lymphedema warrants a through revisiting of the anatomy of the lymphatic system. When performing lymphovenous anastomosis (LVA) a detailed knowledge of the depth of the collectors in the superficial fascia and their topographic relationship to the superficial veins is essential. In vascularised lymph node transfer (VLNT) using a groin donor site, it is of utmost importance to preserve the lymphatic function of the donor site given that patients with lymphedema may have genetic predisposition to this condition (1-3).

Methods

Eight anterior hemi-abdomen/upper thigh specimens from 4 fresh human cadavers were used for this study. The integument was harvested down to and including the deep fascia. Using the previously described technique the lymphatic collectors were identified and injected with a lead oxide mixture (4). The injected collectors were traced by radiography and microdissection. After conclusion of the injections, the superficial inguinal nodes draining each region and their interconnections to the second tier nodes were dissected. Complete investigation on each side required 5 weeks, 7 days a week, 9 hours a day.

Results

The upper and lower abdominal collectors were found originating at the umbilical and midline watershed areas by union of their interdigitating, small diameter (<0.1mm), blind-ended tributaries. They were found above Scarpa's fascia, immediately deep to the subdermal venules. They were distributed evenly across the anterior abdominal wall and had thin and translucent walls. In the mid-thigh two groups of superficial collectors were found that were different both morphologically

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and topographically. The collectors of the ventromedial bundle constituted the majority of the collectors of the anterior thigh. They were found concentrated around the greater saphenous vein right over the membranous layer of the superficial fascia or between the membranous layer and the deep fascia of the thigh. Their depth gradually increased

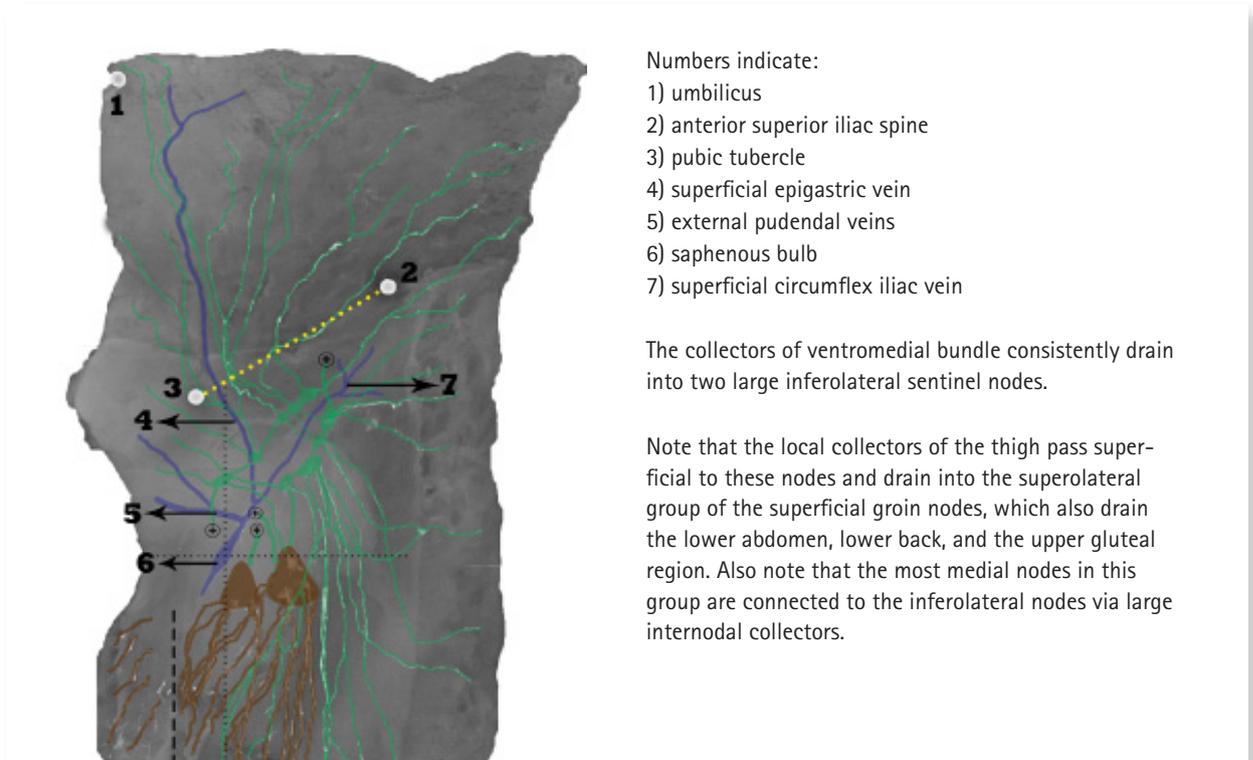
so that they were all deep to the membranous layer before ending in the groin nodes. They were thick-walled and measured 0.6-1mm. They consistently drained into two large nodes located inferolateral to the saphenous bulb on the deep fascia (Figure). The local collectors of the thigh were immediately deep to the subdermal venules, measured 0.3-0.5mm and had thin and translucent walls. They drained into Daseler's superolateral group of the superficial inguinal nodes that also drained the lower abdomen, the lower back and the upper gluteal region (5). The presence of unilateral scars in two of the cadavers allowed us to study the effects of surgical trauma on the cutaneous lymphatic drainage. There was limited recanalization of the collectors across the scars. Reversal of flow and midline crossover was seen in two collectors.

Conclusions

When raising the groin lymphatic flap for VLNT, the medial extent of the dissection should be limited to the lateral border of femoral artery. When following up patients after VLNT with a groin donor site, circumference measurements must include the upper thigh. Further studies are required to assess the extent of lymphatic regeneration following surgical trauma.

References

1. Newman B, Lose F, Kedda MA et al. Possible genetic predisposition to lymphedema after breast cancer. *Lymphat Res Biol.* 2012;10(1):2-13.



Numbers indicate:

- 1) umbilicus
- 2) anterior superior iliac spine
- 3) pubic tubercle
- 4) superficial epigastric vein
- 5) external pudendal veins
- 6) saphenous bulb
- 7) superficial circumflex iliac vein

The collectors of ventromedial bundle consistently drain into two large inferolateral sentinel nodes.

Note that the local collectors of the thigh pass superficial to these nodes and drain into the superolateral group of the superficial groin nodes, which also drain the lower abdomen, lower back, and the upper gluteal region. Also note that the most medial nodes in this group are connected to the inferolateral nodes via large internodal collectors.

Fig. 1: Collated final radiographs of the left lower abdomen and upper thigh specimens from cadaver 4. The dotted yellow line shows the position of the inguinal ligament. The black dashed line overlies the GSV harvest scar. The black dotted lines intersecting at the saphenous bulb divide the nodes into four Daseler zones. The fifth zone overlies the saphenous bulb. Symbol ⊕ indicates where a large efferent collector penetrates through the deep fascia. The superficial veins are highlighted in blue. The superficial collectors and nodes are highlighted in green except for the collectors of ventromedial bundle and their draining inferolateral nodes that are highlighted in brown for distinction.

2. Finegold DN, Baty CJ, Knickelbein KZ et al. Connexin 47 mutations increase risk for secondary lymphedema following breast cancer treatment. *Clinical cancer research : an official journal of the American Association for Cancer Research* 2012;18(8):2382-2390.

3. Viitanen TP, Maki MT, Seppanen MP et al. Donor-site lymphatic function after microvascular lymph node transfer. *Plast Reconstr Surg* 2012;130(6):1246-1253.

4. Suami H, Taylor GI, Pan WR. A new radiographic cadaver injection technique for investigating the lymphatic system. *Plast Reconstr Surg* 2005;115(7):2007-2013.

5. Daseler EH, Anson BJ, Reimann AF. Radical excision of the inguinal and iliac lymph glands; a study based upon 450 anatomical dissections and upon supportive clinical observations. *Surgery, gynecology & obstetrics* 1948;87(6):679-694.

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