Experience with Patent Blue Tracing to Prevent Lymphorrhagia after Dissection of Inguinal Lymph Nodes

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Summary Lymphorrhagia is a common complication of inguinal lymph node dissection (ILND) surgery. In this study, we prevent lymphorrhagia after dissection of inguinal lymph nodes efficiently through injection of patent blue. During the operation, 7 of 8 patients exhibited blue lymph spillage at the wound sites from the broken ends of the lymphatic vessels, the other one patient exhibit negative results. After operation only one patient had lymphatic edema of the lower limb. we recommend patent blue dye as a good method for preventing and curing lymphorrhagia by reducing wound exudate.

Lymphorrhagia, the loss of lymph from damaged lymph vessels, is a common complication of inguinal lymph node dissection (ILND)surgery. Lymphorrhagia results in subcutaneous lymph effusion, thus affecting the wound healing process and causing infection. Although many therapeutic methods have been used to prevent lymphorrhagia in clinical practice (such as pressure dressing and improved drainage procedures), the curative effects remain unsatisfactory. One of the main reasons for this problem is that it is difficult for the surgeon to see and thus repair the lymphatic vasculature in routine wound preparations. In light of the sentinel node biopsy method described by He *et al* [1], we used patent blue dye to trace the broken ends of the ligated lymphatic vessels in 8 ILND patients to prevent groin effusion. From these experiments we obtained good results.

EXPERIMENTAL PROCEDURES

We recruited 8 patients (6 men and 2 women) aged 38~89 years for this study. 1 patient with anal canal melanoma underwent dissection of the left inguinal lymph nodes. The remaining 7 patients presented with lower extremity melanoma and enlarged inguinal lymph nodes, and underwent unilateral ILND (left: 5; right: 2).

After dissecting the inguinal lymph nodes, the surgeon injected 1 ml of 1% patent blue solution into the homolateral second toe web, 5 cm above the knee joint, median subcutaneous area in the lower part of the anterior abdominal wall and the perineal subcutaneous tissues (4 points in total). The injection sites were massaged gently. After 5~10 min, we examined the superficial lymphatic vessels, which, in the operating field, turned blue. The anatomical areas that spilled dye represented the lymphatic vessel rupture sites. These sites were ligated, and multilayer stitching was performed after rinsing the wounds.

RESULTS

7 patients exhibited blue lymph spillage at the wound sites from the broken ends of the lymphatic vessels (most patients had 3~6 lesions). There were no broken lymphatic vessels ends in 1 patient. 6 patients had 10 ml~80 ml of groin drainage within 1~3 days, and achieved union by the first intention. However, 2 patients had 10ml~300ml of groin drainage within 28 days, though achieved union by the second intention. One patient had lymphatic edema of the lower limb.

DISCUSSION

In humans, the groin is densely populated with lymphatic vasculature. The inguinal lymph nodes comprise two groups, including the superficial nodes, which lie a-

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long the greater saphenous vein and the deep nodes, which are located medial to the femoral vein and under the cribriform fascia. The superficial group is divided into upper and lower clusters, and each cluster can be further subdivided into inner and lateral groups. The upper cluster including 2~6 lymph nodes lies in parallel arrangement under the inguinal ligament, and the lower cluster consisting of 2~7 lymph nodes kies in a longitudinal arrangement along the both sides of the terminal part of the great saphenous vein. The superficial group collects the lymph from the lower anterior wall of the abdomen, hip, perineum, external genital organs, as well as most superficial lymphatic vessels of the lower extremities. The deep nodes collect the lymph from the efferent lymphatic vessels of the superficial inguinal lymphatic nodes and the deep lymphatic vessels of the lower extremities. Therefore, although conventional therapeutic methods (including pressure dressing and improving drainage) are used typically after ILND, the volume of drainage remains excessive and union by first intention is difficult to achieve. The causes for large drainage volumes include the distribution characteristics of the inguinal lymph, the tissue fluid exudation of large wound surface and the rupture of the lymphatic vessels caused by dissection (such as electrotome dissection). The colorless lymph fluid flows to the surface of the wound continuously from the broken end of the lymphatic vessels and the drainage volume is small when the patient is inactive during the operation. Thus, lymph vasculature is not easy to detect as the blood vessels in fresh wounds. Moreover, the amount of prothrombin in the lymph system of the lower limbs is only 1/10 of that in the plasma [2]. The healing process of broken lymphatic vessel ends does not depend on blood coagulation as it does in small blood vessels, but mainly results from the pressure of peripheral tissues. In clinical practice, if the lymphatic vessels with broken ends in fresh wounds are successfully compressed by pressure dressing, very little drainage ensues, and healing by the first intention is likely. If the compression fails, however, the healing of the broken lymphatic vessel ends requires the proliferation of peripheral tissues, thus the more prolongation the healing time is and the more risk the wound infection is. Lymph effusion is the leading cause for voluminous lymph drainage and a low success incidence of first intention. Thus, in light of our previous research on the sentinel nodes of breast cancer, we used patent blue tracing to search for the broken lymphatic vessels and to perform ligations to reduce drainage[1]. Some researchers used isosulfan blue tracing dye to investigate the long-term resistance to healing of lymphorrhagia after surgery, they obtained good curative effects with broken end ligations of lymphatic vessels using isosulfan blue in the secondary procedure[3]. From our experience with these 8 cases presented herein, we recommend patent blue dye as a good method for preventing and curing lymphorrhagia by reducing wound exudate. In addition, we recommend that the aforementioned drainage areas should be included as much as possible according to the lymph collection affinity of the inguinal lymph nodes. Herein, we designed a 4-point injection procedure to seek out the broken lymphatic vessels in the incisions, and found them in 7 of the 8 patient cases. When ligation of the broken end of lymphatic vessels and peripheral tissue pressure was achieved, the lymph drainage decreased significantly with first intention in most of the wounds. However, in 2 cases, although the above measures were taken, the drainage remained capacious, and a second intention was necessary. Therefore, we should investigate this method carefully, including the selection of the tracer and injection sites and the methods for finding the broken lymphatic vessels. Efforts toward achieving these goals are ongoing in our laboratory.

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