Risk of Surgical Procedures In Limbs With Edema (Lymphedema)

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Etiology of Swelling

Lymphedema belongs to the clinically recognized swellings of limb soft tissues. There are, however, many causes of edema, not necessarily due to lymphatic obstruction. They should be properly diagnosed, as edema of tissues poses a serious problem for surgeons prompted to perform emergency or elective surgery of soft tissues, blood vessels, nerves or bones of the lower or upper extremity. Etiology of edema should be known to the surgeon before surgery, and its location, extent and duration have to be taken into consideration while planning the surgical procedure. Edemas of the extremity look, at first glance, very much alike, irrespective of the etiological factors responsible for their development. Edema is a clinical sign and not a disease, and its etiology should be accurately defined. Differential diagnosis should be made between obstructive or primary lymphedema and chronic venous insufficiency (varicose veins with valvular insufficiency, post-thrombophlebitic syndrome), post-traumatic edema (after injury of soft tissues, fracture or dislocation), cardiac and nephrotic edema, as well as rheumatoid arthritis. Physical and laboratory examinations are necessary for revealing the cause of edema.

The highest number of false diagnoses of lymphedema is seen in the group of patients with a history of venous thrombosis, in whom the lack of the ultrasonographically-detected changes in large veins suggests the presence of lymph stasis. It is often forgotten that venous thrombosis develops initially in the muscular venous sinuses. The dissolving power of the Doppler technique is still not sensitive enough to detect these subtle changes. The second highest number of misdiagnoses is observed in patients with post-traumatic edema of limbs after soft tissue or bone injuries. A long-lasting inflammatory-type swelling clinically manifests as lymphedema. Patients often complain of edema, but fail to report prior injuries sustained. Cardiac and nephrotic edema develops bilaterally, and although patients are aware of the fact that cardiac or renal insufficiency lead to formation of edema, they often take limb swelling for a separate entity. Rheumatoid arthritis affecting the foot may mimic primary lymphedema. Thus, the establishment of proper diagnosis may be extremely difficult.

Surgery performed on limbs indiscriminately, without prior diagnosis of the cause of edema, may lead to unnecessary complications. These include: activation of the thrombotic process in veins and poor wound healing with secondary infections.

Diagnosis of Type of Swelling

Physical evaluation of swollen limbs, allowing differentiation between lymph and venous stasis, has been presented below.

PHYSICAL EXAMINATION (PE)

The PE should include the following (L-lymphedema, VS-venous stasis):

Level of edema:
- dorsum of foot (L)
- foot, calf and thigh (L, VS)
- calf only (lipedema)

Skin changes:
- Stemmer’s sign, hyperkeratosis, fluid leakage (L)
- calf dermatoliposclerosis (VS)

Skin color:
- pale (L)
- erythema (dermatitis, lymphangitis, dermatolymphangioadenitis/DLA) (L)
- bluish (dilated skin and superficial veins) (VS)

Skin compliance:
- pitting (L, VS)
- hard (L)

LABORATORY EVALUATION

The laboratory diagnosis should include the following:

- Ultrasonography of veins (color Doppler) (to detect venous insufficiency and thrombosis)
- Soft tissue X-ray or computed tomography (CT) (to define whether swelling affects skin and subcutaneous tissue [L] or muscles [VS]. CT more accurately defines location of swelling compared with soft tissue X-rays)
- Lymphoscintigraphy (depicts lymphatics and nodes, allows evaluation of the speed of absorption of lymph from tissues, observation of the lymph flow and calculation of the time for filling of nodes.)

Lymphoscintigraphy is considered today to be an indispensable diagnostic procedure in each case of protracted edema of limbs. It allows visualization of the lymphatics and lymph nodes draining lymph from the site of injection of the tracer; it shows tissues with the lymph
dermal backflow; it helps to semiquan-
titatively evaluate lymph flow and depict
areas of inflammation (the tracer bound to
aggregated albumin is taken up by tissue macrophages). Thus, lymphoscintigraphy
is useful for detection of lymph stasis
(lymphedema) as well as inflammatory
foci in limb soft tissues (inflammation,
post-traumatic local reaction).

All Circulatory and Inflammatory
Processes Affect the
Limb(s)' Lymphatic System

It should be pointed out that all of
the listed factors causing edema also
affect, to a higher or lesser degree, the
lymph transport system. Chronic venous
insufficiency brings about initial over-
loading of lymphatics with excess lymph.
In the later inflammatory stages, partial
obliteration of lymphatics and fibrosis of
lymph nodes will develop. Protracted
local reaction to trauma of soft tissues or
bone fracture causes dilatation of lym-
phatics with lymph stagnation and
enlargement of lymph nodes. Dermatitis
is followed by perilymphatic fibrosis and
subsequent obliteration of lymphatic
trunks. Cardiac and renal insufficiency, as
well as rheumatoid arthritis, are accom-
panied by increased lymph formation in
the extremities and lymph overload.

The pathomechanism of various forms
of edema of the legs and arms, including
lymphedema, should be well known to
the surgeon who plans surgery on the
swollen tissues.

Type of Surgery
Performed on Limbs

The most frequently performed surgical
procedures on limbs are:
-- Fracture fixation
-- Venous surgery in chronic venous
insufficiency with all known
complications such as:
• infections, ulcers and skin fibrosis
• arterial reconstructive surgery
• correction of hallux valgus
• correction of foot bone architecture
  in diabetic foot
• carpal tunnel syndrome
• excision of nevi

Planning any type of surgery, as listed
above, should be preceded by consulting
an experienced Lymphologist or certified
lymphedema therapist.

Surgical Problems Connected
with Presence of Edema

What are the expected problems after
surgery on the swollen limbs?

In all types of edema there will be possible
complications in wound healing due to:
(i) mechanical forces pulling wound
dges apart and
(ii) infection. There might also be stimu-
lation of the thrombotic process in
cases with the post-thrombophlebitic
syndrome, and keloid formation in
limbs with lymph stasis. The mechan-
ism of keloid formation (fibroblast
proliferation and excessive deposition
of collagen) is not clear. The trans-
forming growth factor beta seems to
be responsible for the process.

Contraindication for Surgery
on Swollen Limbs

The contraindications for surgery on the
swollen limbs are recent
(i) dermatolymphangioadenitis, and
(ii) venous thrombosis.

Preoperative Measures

Preoperative preventive measures include:
(i) decrease of edema by one week
elevation of the extremity, with
bandaging or compression sleeve/
stocking (operating on swollen and
hard tissues poses large problems
with wound closure);
(ii) administration of long-term penicillin
with one shot seven days prior, and
another one day prior to surgery, in
order to saturate with antibiotic the
swollen tissues with impaired
lymphatic transport;
(iii) avoiding pre-operative disinfection of
skin with iodine containing lotions and
shaving until the last moment before
surgery, in order to prevent skin irrita-
tion and infection with the patient's
own skin-resident bacterial flora.

Perioperative Treatment

This includes: one dose of wide spectrum
antibiotic routinely given for prevention of
infection by hospital bacterial flora, and in
cases with thrombotic history,
administration of low-molecular heparin.

Postoperative Care of Limbs

The postoperative care of limbs includes:
(i) elevation;
(ii) bandaging before resuming upright
position (wound dehiscence is not
infrequent);
(iii) diuretics in patients with tendency for
water retention;
(iv) administration of long-term penicillin
for a period of one to three months at
one week intervals; and
(v) wearing of compression garments
and or bandages for months after
surgery (the wound healing process
in lymphedematous tissues lasts for
many months in terms of remodeling
of the healing tissue and persistence
of the inflammatory process).

Conclusions

The surgeon performing an operation of
swollen limbs should be aware of the
etiology of the edema. This will allow him/
her to apply specific measures protecting
against wound dehiscence, infection and
thrombosis of veins. Preoperative reduc-
tion of edema is necessary to facilitate
wound closure without tension. There is
no evidence of risk of development of
healing complications after surgery on
swollen (lymphedematous) limbs if the
precautionary measures are taken.

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