B. Operative Technique and Postoperative Management

I. Basic Principles of Operative Technique

Without the strictest asepsis, open reduction of a fracture should not be undertaken. In closed fractures even one single case of osteitis occurring in one hundred internally fixed fractures is a tragedy for which the method used must be held responsible. It is often overlooked that even with the conventional treatment of fractures using extension, osteitis of the femur or the os calcis may occasionally occur, and that there have even been cases where amputation was necessary.

a) Asepsis is a problem of organization, which can be solved only if aseptic standards can be rigidly enforced from the preoperative period until the wound is healed. The prevention of wound infection alone is not enough, for a wound, under the best conditions, can never be kept absolutely sterile. There is practically always some bacterial invasion. Hematomata and necrotic tissues form excellent nutrient media for invading pathogens. Consequently an atraumatic technique combined with meticulous asepsis is vital for operative fracture treatment. Osteitis and necrosis of wound edges are clearly infectious, but any postoperative tissue induration should be regarded also as potentially infectious. Even after an extensive exposure of a fracture the resulting scar should be free of irritation and movable on its bed 10 days postoperatively. As soon as one or more infections, however slight, occur, a careful investigation should be carried out involving everyone concerned in order to discover the source of infection.

b) Operating Theatre. If possible a special operating room where no other surgery — especially abdominal surgery — is carried out, should be reserved for internal fixation operations. To keep the theatre as germ-free as possible, filtered slightly humidified fresh air should be introduced under positive pressure. “Air sterilization” devices such as ionization equipment have shown some good results though they do not actually sterilize but merely reduce the number of bacteria. Beds from the wards must always be regarded as septic and must under no circumstance be brought into the theatre. Patients should be placed on a litter or the actual operating table in the preparation room whence they are wheeled into theatre, and following surgery they should be returned to the preparation room on the operating table. Sheets and linen from the wards have no place in the theatre, nor do cabinets with dressings and instruments or case histories and x-ray envelopes. Dust particles are excellent germ carriers and must be meticulously eliminated. Floors should be washed daily with an antiseptic solution, and walls and cylinders in the theatre and adjacent rooms should be thoroughly washed once a week.

c) Staff. No one should be admitted to the theatre in street clothes or shoes, nor without a mask or cap. As more than a third of all people are pathogen carriers, care must be taken that surgical masks fit closely around the mouth and nose. To avoid the contact of an unsterile part of a coat with the instrument table, the backs of operating gowns should also be sterile.
Presterilized packs of theatre linen have produced better results than keeping these materials in drums that have to be repeatedly opened. There should be as little conversation as possible in the theatre itself, not only to maintain asepsis but to allow the surgeon to concentrate fully on the operation.

d) Disinfection of Hands. Hands are disinfected according to general surgical rules and if Phisohex is used, cultures of the solution must be made at regular intervals. Saprophytes may develop in containers that are not regularly sterilized. It is to the surgeon’s advantage to wear cotton gloves over his rubber ones. Not only does this reduce the danger of perforation of the rubber gloves but the moistened cotton gives the surgeon a feeling of increased safety when handling instruments. With a little experience he will be able to use them even for the most delicate procedures.

e) Care of the Soft Tissues. Careful anatomically correct surgery of the soft tissues is just as important as the mechanical treatment of the bone. Scalpels, scissors and osteotomes should be razor-sharp and kept in this state. Only the most delicate forceps and sutures should be used. The assistant too, by the careful use of hooks and retractors, must take care to avoid damaging soft tissue and thereby increasing the danger of infection. Fragments of fascia, periosteum or other necrotic looking tissue must be excised. At intervals of half an hour we rinse the wound with sterile Ringer solution, which reduces the bacterial count, prevents desiccation of the tissues and washes out loose necrotic particles. A local antibiotic, suitable for topical application, may be added to the Ringer solution, e.g. Neomycin and Bacitracin in a concentration of \(\frac{1}{4}\text{ to }\frac{1}{2}\%\). We have given up the non-touch technique; a securely covered finger can provide information about conditions which evade the eye. Fracture reduction itself can also be facilitated by the pressure of a finger on the right place. In general, however, fingers have no business in the wound. The surgeon should also cultivate the habit of touching as little as possible the metal parts that are introduced into the bone.

If diathermy is used, blood vessels should only be coagulated singly since coagulated tissue is necrotic tissue, and necrotic tissue provides a good nutrient medium for bacteria.

f) Local Preparation. For emergency operation, the skin must be washed with soap and a brush, shaved with a sterilized razor and painted with an antiseptic solution. Although preparation is chiefly the duty of a nurse or orderly, we require the final painting to be done by a doctor.

In elective surgery a skin test for sensitivity to the adhesive used (e. g. Mastisol) must be made 24 to 36 hours before the operation, since we found that between 1 and 2\% of all patients show some allergy to Mastisol. On the day before operation the skin is washed, brushed and covered overnight with a clean cloth.

g) Draping. To cover the skin, a polyethylene or other plastic film is fixed in place with an adhesive. This hermetically seals the pores of the skin. Since polyethylene breaks down at a temperature of 100\(^\circ\)C, it cannot be autoclaved, but it can be boiled. For this purpose the films are covered with cotton gauze and rolled into a thick tube, quite conveniently around a medullary nail. The whole is then boiled for 15 minutes (Fig. 21).

The adhesive we have used over many years is the solution advocated by Leveuf. This solution, which needs to be filtered twice by the pharmacist, must be very fluid and is stored only in small bottles containing enough for one day’s use.

The formula is: \(\text{Rp. mastix 200.0, colophonium 400.0, oleum ricini 10.0, dichloramine T 1.0, ether 580.0.}\)

h) Skin Incisions. Standard incisions are used according to the type of operation. They should avoid dividing nerves as much as possible. Long straight incisions provide better exposure. Incisions are usually made longitudinally for shaft fractures and transversely for articular fractures, following normal skin creases.