Sutures are used to maintain tissues in apposition until sufficient healing occurs to provide endogenous wound strength. The healing process begins soon after tissue is wounded or incised and progresses through the phases of inflammation, proliferation, and maturation/remodeling. Wound strength is negligible immediately after surgery, increasing rapidly with the deposition of collagen types III and I. Sutures must hold the wound together during these reparative processes.

In inguinal hernias, there are well-defined structural landmarks that are stronger than sutures and that permit assessment of the tension that might be imposed by repair. A McVay repair imposes the greatest tension. A Bassini repair imposes somewhat less tension, and the tension imposed is reduced by a generous relaxing incision. A Shouldice repair is under less tension than either a McVay or a Bassini repair. The tension in a repair is reduced to zero when a section of slack prosthetic material such as polypropylene mesh or polytetrafluoroethylene (PTFE) is interposed between structural fascial elements. Similar considerations apply to umbilical, epigastric, and incisional hernias, where the tension also can be reduced by insertion of a slack segment of mesh or PTFE; a tight prosthesis will simply transmit the tension, putting the repair at risk. All abdominal wall hernias are subject to tension that results from intraabdominal pressure; this is amplified by the radius of the abdomen, as dictated by the law of Laplace.

The present chapter examines the issue of suture selection for hernia repairs. Absorbable versus nonabsorbable sutures are considered, as are continuous versus interrupted suture techniques. Some special mechanical properties of polypropylene sutures are reviewed. Finally, complications of surgical sutures, such as susceptibility to infection, suture granulomas of the bladder, and the formation of "buttonhole hernias," are discussed. Throughout this review, conclusions and recommendations are based on clinical and scientific evidence.

Absorbable Versus Nonabsorbable Sutures

Fascial wound strength after incision has been studied in experimental animals. There is no measurable strength immediately after surgery. After 2 weeks, about 20% of strength is restored. This increases to 50% after 1 month, to about 70% after 2 months, and to about 90% of original strength after 1 year. When absorbable sutures are inserted into tissue they rapidly degrade, losing strength at the same time as the healing tissue is getting stronger. The degradation of absorbable sutures has been studied by several authors. Postlethwait demonstrated that polyglycolic acid sutures lose 30% of their initial strength in 7 days and about 80% of their strength after 14 days. Carlson and Condon summarized the strength half-lives given by the suture manufacturers on the package inserts: chromic catgut, 1 week; poliglecaprone (Monocryl®), 1 week; polyglactin (Vicryl®), 2 to 3 weeks; polyglycolic acid (Dexon®), 2 to 3 weeks; polyglyconate (Maxon®), 3 to 4 weeks; and polydioxanone (PDS®), 4 to 5 weeks. Polypropylene (Prolene®) and polyamide (nylon) retain most of their strength indefinitely. Greenwald and co-workers demonstrated that many absorbable sutures retain little, if any, strength after 6 weeks in vivo; in contrast, nonabsorbable sutures retain various degrees of stiffness, tensile stress, and toughness (Figs. 30.1 to 30.3). The decline in mechanical properties exhibited by absorbable sutures raises concerns about the ability of these sutures to provide sufficient strength for the early healing wound.

Several prospective clinical studies have been undertaken to compare absorbable with nonabsorbable sutures used in hernia repair. Baltazar and Johnston compared polyglycolic acid sutures in 46 patients versus Dacron, cotton, or silk sutures in 41 patients when performing inguinal herniorrhaphies. The study was randomized and prospective. Follow-up was possible in 91% of the patients over a 9 to 37 month period. Six recurrences occurred in the polyglycolic acid group (14.6%) compared with three (7.7%) in the nonabsorbable group. This difference was not significant. The postoperative complication rate also was similar, with five hematomas, ecchymoses, and minor subcutaneous abscesses occurring in each group (p = not significant). The authors concluded that there was no advantage to using polyglycolic acid over nonabsorbable Dacron, cotton, or silk.

Anderson and co-workers performed a randomized prospective study in 235 consecutive patients to compare polyglycolic acid with silk sutures used in herniorrhaphies. Topical ampicillin was applied to all of the wounds at the time of surgery. There were 11 wound infections, no suture sinuses, and 3 recurrent hernias, with no statistically significant difference between groups.

Burchard and co-workers prospectively compared absorbable polyglycolic acid sutures with nonabsorbable silk sutures in 302 patients. Polyglycolic acid was used in 150 cases and silk sutures
in 152 cases. Follow-up at 5 years showed that the recurrence rates were identical, with 9.3% recurrences in each group (p = not significant).

Dorflinger and Kiil14 used a double-blind randomized study to compare absorbable polyglycolic acid sutures with nonabsorbable Dacron sutures in the repair of 61 hernias in 58 patients. Bassini repairs were used for all the inguinal hernias, and McVay repairs were used for all the femoral hernias. There were 29 patients in each group. The patients were reexamined 6 months after surgery. There were no wound infections and no suture granulomas, but there was one recurrence in each of the two suture groups (p = not significant).

Solhaug15 compared the use of polyglycolic acid with polyester (Mersilene) to repair inguinal hernias. A total of 520 patients were randomized to each of the two treatment arms. Recurrence rates were 5.1% in the polyglycolic acid group and 4.9% in the polyester group (p = not significant). Neuralgia requiring excision of the ilioinguinal nerve occurred in two patients, and a suture fistula occurred in one patient. Both of these complications occurred in the polyester group (p = not significant).

Dick and co-workers16 performed a noncomparative prospective study of 111 patients who underwent herniorrhaphy without mesh using absorbable polydioxanone. Two-year follow-up data were obtained from 81 of the 111 patients. There was one wound infection, three hematomas, and two recurrences. Although there were no patients treated with nonabsorbable sutures with which to compare these findings, the outcome data are very acceptable and do not suggest that the absorbable suture degraded before the wound had acquired sufficient strength.

Although they are not reviewed in detail here, at least five randomized prospective studies have been carried out to compare absorbable with nonabsorbable sutures for closing abdominal wounds (not hernias).17-21 Continuous or interrupted suture techniques were used for both absorbable and nonabsorbable arms of the studies. These studies included 1814 abdominal closures. Review of the data demonstrated no significant differences between absorbable and nonabsorbable sutures with respect to outcomes.

Thus, there appears to be no clear advantage on the side of either absorbable or nonabsorbable materials with respect to efficacy and complications such as wound infections and recurrences. Lichtenstein22 argued that, because of their rapid loss of strength, absorbable polyglycolic acid sutures should not be used for