Focus On
Flexor Tendon Repair

Flexor tendon injuries are common with over 3 200 per annum in the UK,\(^1\) yet historically the results of primary repair were so poor that the area beyond the distal palmar crease was considered to be ‘no man’s land’\(^2\) and delayed tendon grafting of FDP was the standard treatment. Kleinert\(^2\) and Verdan\(^3-7\) established the superiority of primary repair for flexor tendon injuries. Successful outcomes depend upon meticulous surgical technique and early post-operative mobilisation.

A non-absorbable 3/0 or 4/0 braided or monofilament stitch is usually used for the core suture, combined with a 6/0 epitendinous suture. There have been significant improvements in suture material and suture techniques for flexor tendon repair. Tendon repairs are thought to be weakest between post-operative days five and 21, which is the inflammatory stage of tendon repair, and this is reflected in the timing of re-rupture.\(^8-10\) Rupture rates can exceed 10%. A key factor determining the strength of repair of a flexor tendon at the time of surgery is the grip of the suture in the tendon, and a ‘gripping’ core suture prevents the suture pulling out of the tendon (Fig. 1). A strong repair is vital during early mobilisation, which subjects the repair to longitudinal tension forces. The Kirchmayr stitch was modified by Kessler and was one of the first tendon grasping core suture techniques. The strength of the repair can also be increased by increasing the number of core strands that cross the repair site\(^8\) (Figs 2 and 3). Suture material has been shown to impair tendon vascularity, and multi-strand repairs remain controversial\(^10\) despite a recent unpublished study which has confirmed the clinical superiority of four strand repairs.\(^7\) An epitendinous suture not only improves gliding, but adds to the tensile strength of the repair, and reduces rate gap formation, which is often the initial event in repair failure.\(^11-13\) A locked running suture has greater tensile strength.\(^11\) (Fig. 4) Although good surgical technique reduces rupture rates, poor compliance with post-operative care will significantly contribute to rupture and stiffness.

Controlled mobilisation limits restrictive adhesions and improves tendon healing. Kleinert\(^2\) used active extension and passive flexion in a “lively” elastic band splint. In the 1970s Duran\(^14\) developed a protocol based on active extension and patient assisted passive flexion with the patient’s hand placed in a dorsal blocking splint. Many institutions now use “the Belfast regime”, a rehabilitation protocols based upon early active motion under supervision.\(^6\) Supervised active mobilisation starts within 48 hours, and patients are protected in a dorsal blocking splint with the wrist in 20° to 30° flexion and MCP 50° to 70° flexion. After six weeks the patient is weaned from the splint and over the next six weeks increases the range of movement and strength to return to non-contact sports and manual work. In Small’s study\(^6\) the final range of movement was graded excellent or good in 77%, the re-rupture rate was 9.4% with 64% of these ultimately achieving a good or excellent result. Elliot’s study\(^9\) based on a modified post-
operative Belfast regime had a re-rupture rate of 5.8%; the outcome was good or excellent in 67% of this patient group. In the 1980s Strickland studied the results of controlled passive movement, his outcomes were 73% excellent or good result and a 6% re-rupture rate of zone 2 repairs. He reported his findings in a review article published in 1989. Generally, post-operative advice to patients is that the splint should remain in place for four to six weeks, they should be able to return driving by eight weeks and to work and sports by 12 weeks.

Flexor sheath repair remains controversial. Lister suggested that reconstruction of the tendon sheath is vital in providing the tendon with nutrient rich synovial fluid, improving the result of tendon healing. However, Tang has suggested that excising the sheath may promote healing, and that closure contributes to poor repair. The A2 and A4 pulleys should be preserved or repaired to allow biomechanical function and to prevent significant tendon bowstringing. Kwai and Elliot advised lateral release or 'venting' of the A2 and/or the A4 pulleys, to improve tendon gliding after a Zone 2 repair.

Repair of partial lacerations has been debated. In the 1970s and 1980s some surgeons suggested that partial lacerations up to 60% could be treated with early active motion, and if the laceration was < 25% but bevelled the bevelled area could be excised or repaired with interrupted sutures. Other authors have suggested that an increased risk of triggering, entrapment, or rupture, is associated with partial lacerations that are not formally repaired.

Despite supervised rehabilitation, post-operative stiffness due to adhesions can be a problem. Tenolysis may be indicated when the active movement of a joint is less than the passive movement. It is rarely carried out less than six months following injury or repair. Regional anaesthesia that permits the patients to mobilise the joints intra-operatively is preferable; 60% will have good to excellent results, but 10% can be expected to rupture following tenolysis.

Flexor tendons should ideally be repaired within 72 hours of injury, however delayed presentation of flexor tendon injuries does not preclude primary repair if there is no segmental loss of the tendon, with a good range of movement in the affected finger and there are no associated bony or soft tissue problems. If the injury presents after more than six weeks, tendon grafting is the treatment of choice. Grafting can be a single or two-stage procedure. The alternative to tendon grafting is DIP arthrodesis for an isolated FDP injury.

**References**


