Flexor tendon ruptures in patients with rheumatoid arthritis

One hundred fifteen flexor tendon ruptures were reviewed in 43 hands with rheumatoid arthritis, one hand with psoriatic arthritis, and one hand with lupus erythematosus. Ninety-one tendons were ruptured at the wrist, four ruptures occurred at the palm, and 20 ruptures occurred within the digits. At the wrist level, 61 ruptures were caused by attrition on a bone spur and 30 were caused by direct invasion of the tendon by tenosynovium. All ruptures distal to the wrist were caused by invasion of the tendon by tenosynovium. Patients whose ruptures were caused by attrition regained better motion than those whose ruptures were caused by invasion by tenosynovitis; however, motion overall was poor. Patients with isolated ruptures in the palm or at the wrist had the best functional results. Those patients with multiple ruptures within the carpal canal had a worse prognosis. Ruptures of both tendons within the fibro-osseous canal had the worst prognosis. The severity of the patient’s disease and the degree of articular involvement had a great effect on the outcome of surgery. Prevention of tendon ruptures by early tenosynovectomy and removal of bone spurs should be the cornerstone of treatment. (J HAND SURG 1988;13A:860-6.)

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Rheumatoid flexor tenosynovitis is common, seen initially either as an isolated finding, or in association with dorsal tenosynovitis or joint involvement. Flexor tendon rupture, however, is infrequent. Ruptures may occur by attrition on bone spurs or from direct invasion by rheumatoid tenosynovitis. The diagnosis is easily made in most patients because of the acute loss of flexion of one or more digits. Ruptures may be more difficult to diagnose in patients with joint stiffness or instability. Isolated ruptures of the flexor digitorum superficialis (FDS) or even multiple flexor tendon ruptures within the carpal canal caused by invasion of the tendons by hypertrophic tenosynovitis may not always be clinically apparent. This study identifies the sites and causes of ruptures, reviews the surgical experience in the treatment of this condition, and describes the various factors that influenced the results. We present our current approach to the management of this difficult problem.

Materials and methods

One hundred fifteen tendon ruptures in 45 hands with rheumatoid arthritis treated from 1967 through 1984 were studied retrospectively by chart review. There were 36 patients, 16 men and 20 women. Their ages ranged from 30 to 74 years, with an average age of 57 years. Rheumatoid disease had been diagnosed from 3 to 36 years before rupture; however, the average course of the disease was 9 years at the time of the initial rupture. The group studied included patients with seropositive, seronegative, and juvenile rheumatoid arthritis, and one patient with lupus erythematosus and one patient with psoriatic arthritis.

The ruptures were documented during 52 surgical procedures. Only those tendons that were completely ruptured were included in the study. The site of the rupture was recorded, and the presence or absence of

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Fig. 1. A-C. A, Typical bone spur of the scaphoid seen within the carpal canal. B, Attrition ruptures of the flexor digitorum superficiais and flexor digitorum profundus to the index finger. C, Bridge graft to the flexor digitorum profundus using a portion of the ruptured superficiais tendon.

Fig. 1 Cont'd D-E. Postoperative flexion and extension.
a bony lesion was noted in those tendon ruptures that occurred within the carpal canal.

A rupture was placed into one of three groups, wrist, palm, or digit depending on its location. They were further divided by cause into those caused by infiltrative flexor tenosynovitis or by attrition on bone spurs present within the carpal canal. Attrition ruptures were further subdivided by location of the bone spur. Treatment techniques reviewed included secondary repair, tendon grafting, tendon transfer, or arthrodesis. The results of those procedures in restoring motion were reviewed.

Determining a meaningful criterion to compare these patients in terms of postoperative motion was difficult because of the severity of the disease process in these patients and because of the multiple joints that were involved by rheumatoid arthritis. Many of these patients had previously had metacarpophalangeal (MP) joint arthroplasty or distal interphalangeal (DIP) joint fusion before tendon rupture. Measurement of proximal interphalangeal (PIP) joint motion in the digits and interphalangeal (IP) joint motion in the thumb rather than total active motion (TAM) was therefore recorded in an attempt to minimize the influence that these procedures had on TAM.

Results

Tendon ruptures occurred in 27 right hands and 18 left hands. Of the 115 ruptures, 66 occurred on the right and 49 occurred on the left. Ninety-one tendons were ruptured at the wrist, four ruptures occurred in the palm, and 20 ruptures occurred within the digit.

The three sites of ruptures presented different treatment options. Seventy-six of the 115 ruptures had some form of treatment, with 57 procedures attempted to regain motion and 19 primary or secondary arthrodeses or tenodeses. Thirty-five ruptured flexor digitorum superficialis tendons were not repaired; however, they provided material for tendon grafting, and the proximal muscle was often used for tendon transfer. Two flexor pollicis longus (FPL) and two flexor digitorum profundus (FDP) ruptures were not repaired nor was an arthrodesis performed.

Wrist

Of the 91 ruptures at this level, 61 were caused by attrition of the flexor tendons on a bony spur present within the carpal tunnel (Fig. 1, A through E). The scaphoid was the most common site of the bone spur, causing 44 tendon ruptures. Ruptures also occurred from spurs on the trapezium, radius, lunate, ulna, and hamate, sites not previously stressed in the literature (Fig. 2). All attrition ruptures at the wrist were treated by excision of the bony spur and primary closure of the defect by the mobilization of adjacent soft tissue or the rotation of a flap of volar capsule to cover the defect in the floor of the carpal canal in addition to the treatment directed toward the ruptured tendons.

Thirty episodes of ruptures were caused by the invasion of the flexor tendons by rheumatoid tenosynovitis. When preoperative active motion was impaired by extensive flexor tenosynovitis, unexpected tendon ruptures were often unmasked after tenosynovectomy. The invading tenosynovitis often bound the ruptured tendons into a mass, allowing limited flexion, thereby obscuring the actual number of ruptures (Fig. 3).

The distribution of tendon ruptures at this level is documented in Fig. 4. The predominance of ruptures involving the tendons of the thumb, index, and long fingers reflects the large percentage of ruptures caused by attrition on the scaphoid. The techniques used for repair are outlined in Table I.

Palm and digit

Four of the tendon ruptures occurred within the palm, distal to the transverse carpal ligament but proximal to
Fig. 3. A-C. A, Abundant tenosynovitis leading to alteration in active compared to passive range of motion. B, After tenosynovectomy, multiple flexor tendon ruptures are identified. C, Tendon graft of the flexor digitorum profundus to the index finger using a free segment of ruptured flexor digitorum superficialis tendon, and adjacent transfer of the flexor digitorum profundus of the ring and small to the flexor digitorum profundus of the long (repair held in forceps) in an attempt to restore FDP function.

Fig. 3 Cont'd D-E, Postoperative flexion and extension.
the digital sheath, and 20 ruptures occurred within the digital sheath. In all cases, invasion of the tendons by rheumatoid tenosynovium was the cause of the rupture.

In the palm, one rupture involved the ring finger FDP, and three of the ruptures involved the small finger FDP. Of the ruptures within the digits, three were single tendon ruptures involving the FDP, eight were ruptures of both tendons within the digital sheath, and one was a rupture of the FPL from its insertion.

The distribution of the tendon ruptures within the palm and digit are documented in Fig. 5. The treatment techniques used are listed in Table II. Complete flexor tenosynovectomy was performed in each case in addition to the primary procedure listed.

Postoperative range of motion

While active motion was achieved in 88% of the tendons that were repaired, the average motion was poor. IP thumb motion averaged 23 degrees, with a range of 0 to 45 degrees after FPL repairs at the wrist. Flexor profundus repairs at the wrist or in the palm achieved an average PIP arc of motion of 55 degrees with a range of 20 to 80 degrees. The patients whose ruptures were caused by attrition averaged 59 degrees of PIP motion after operation and those whose ruptures were caused by infiltrating tenosynovitis averaged only 38 degrees of PIP motion. Excluding the cases within the digits that required subsequent arthrodesis, the tendon grafting procedures averaged 45 degrees of PIP motion.

Discussion

This large group of patients with flexor tendon ruptures demonstrates the generally poor results associated with rupture of a tendon caused by rheumatoid disease. There were multiple factors that influenced the outcome after a tendon rupture. Attrition ruptures at the wrist...
tended to have a better prognosis, particularly when only one or two tendons were involved. Extensive flexor tenosynovitis adversely affected the outcome. Ruptures within the digits had the worst prognosis for the restoration of flexion. Because the results are so poor, prevention of tendon ruptures by tenosynovectomy or the elimination of bony spurs at the level of the wrist before the occurrence of a rupture should be the cornerstone of treatment.

In this series, the level of initial exploration for treatment of a tendon rupture was usually easily determined before operation by the patient’s signs and symptoms, a fact noted by others. The greatest number of ruptures occurred in the carpals canal and two thirds were caused by attrition. Attrition caused by the presence of a bony spur within the carpals canal presents the greatest threat of flexor tendon rupture to the patient with rheumatoid disease, since there may not be any antecedent symptoms. The occurrence of a rupture caused by such a bone spur dictates the necessity for early exploration at the level of the carpals canal to prevent the occurrence of subsequent ruptures. Although the scaphoid was the most common site of the bone spur, ruptures also occurred to a lesser extent on spurs of the trapezium, lunate, radius, ulna, and hamate. 

Ruptures of the tendons of the thumb, index, and long fingers tended to occur at this level most frequently, and to a much lesser extent within the digits. Therefore, if a site of rupture is unknown, the primary site of exploration should be at the wrist; failure to locate a tendon rupture at this level necessitates exploration into the palm and digit.

The patient whose ruptures are caused by infiltrating flexor tenosynovitis within the carpals canal, palm, or digital sheath often demonstrated clinical signs before tendon rupture. The presence of carpals tunnel syndrome, with or without limitation of active compared with passive ROM or triggering, crepitis, or fullness within the digit, point to the diagnosis of flexor tenosynovitis. The presence of flexor tenosynovitis seemed to have the greatest effect on the outcome. It was the sole cause of tendon rupture within the palm and digit, and in one third of the ruptures within the carpal tunnel. Motion averaged only 38 degrees in the cases caused by tenosynovitis while those patients whose ruptures were caused by attrition had an average of 59 degrees of PIP motion after operation. Treatment should be directed toward early flexor tenosynovectomy and preservation of any remaining intact function.

One of the most difficult problems encountered in this series was the finding of multiple flexor tendon ruptures in association with severe, infiltrating tenosynovitis within the carpals canal. In several instances, the presence of multiple tendon ruptures was not anticipated before operation, since the volume of tenosynovium had bound the ruptured tendons into a mass allowing a moderate, though limited, range of active motion. The limitation of active compared with passive range of motion was often believed to be caused only by the flexor tenosynovitis. These cases were treated by extensive flexor tenosynovectomy to establish the number and extent of the tendon ruptures. Extending the incision proximally and distally permitted the exposure of tendon stumps less involved in the disease process. Depending on the number of ruptures, bridge grafts and tendon transfers were used to attempt to restore function of the FDP. The ruptured flexor digitorum superficialis may be used for graft material, and the muscles can be used for transfers. In the face of multiple tendon ruptures, interphalangeal joint arthrodesis is a satisfactory alternative to FPL repair.

Flexor tendon ruptures within the palm were caused by infiltrating flexor tenosynovitis. When there is flexor tenosynovitis and a flexor digitorum superficialis rupture is encountered, flexor tenosynovectomy and excision of the ruptured FDS will generally restore motion and protect the FDP from further infiltration. If an FDP
rupture occurs in the presence of an intact FDS, flexor tenosynovectomy should be performed to protect FDS function, and a tenodesis or arthrodesis of the DIP joint will provide stability and restore function to the digit.

Ruptures of both tendons within the digit offer more limited surgical options. In this series, single- or two-stage grafting procedures gave poor results with several patients requiring secondary arthrodesis or tenodesis. Those patients who successfully regained motion only achieved 45 degrees of PIP motion on average. In older patients, or those with joint involvement, arthrodesis of the PIP and DIP joints in functional positions gave satisfactory functional results. In the occasional young patient with good joint function, an attempt at single- or two-staged tendon grafting may be justified.

The severity of the patient’s disease had a greater long-term effect on the outcome of treatment than did the technical aspects of the procedures that were performed. The presence of arthritis at the metacarpal phalangeal and interphalangeal joints led to eventual loss of motion. Patients with isolated tendon ruptures at the wrist or palm tended to have the best functional results. The patients with multiple ruptures within the carpal canal tended to have a better functional outcome if the ruptures were caused by attrition rather than by invasion of the tendons by tenosynovium. The patients with double ruptures within the digits had the worst prognosis with attempted repair.

REFERENCES


