Long-term results after tenosynovectomy to treat the rheumatoid hand

To be effective as a prophylactic procedure, tenosynovectomy to treat rheumatoid hand has to be done before there is significant tendon damage. Tenosynovectomy is usually considered to prevent subsequent tendon rupture and recurrent tenosynovitis. We reviewed the results of all tenosynovectomies done at the Dartmouth-Hitchcock Medical Center from 1968 to 1983. One hundred seventy-three procedures were done for 125 patients. Fifty percent of patients who had prophylactic tenosynovectomy demonstrated tendon invasion. Examination at a mean of 70 months after 129 procedures showed extensor tendon failure in 1 patient of 44 who had normal tendons, 1 of 42 with invaded tendons, and in 3 of 43 who had ruptured tendons at the time of original surgery. Seven patients had recurrent tenosynovitis. (J HAND SURG 1988;13A:704-8.)

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Rheumatoid arthritis, as a disease of synovial tissues, frequently involves tendons and tendon sheaths. Savill reported a 50% incidence of tenosynovitis in patients with chronic rheumatoid arthritis; Brewerton reported a 64% incidence. Disease occurs in the area surrounded by synovial sheaths and not by paratenon. Involvement of tendons can lead to sequelae, such as restricted gliding and ruptures.

Rheumatologists and hand surgeons agree that tenosynovectomy can improve function and prevent complications, such as tendon disruption. However, controlled studies proving the beneficial effect of tenosynovectomy are difficult to obtain. Therefore, studies indicating the incidence of tendon invasion at the primary prophylactic operation should be informative, especially when combined with long-term data on the status of these tendons. This was the nature and extent of our study.

Materials and methods

All patients having tenosynovectomies done by F. E. B. at the Dartmouth-Hitchcock Medical Center between the years 1968 and 1983 were evaluated. Operative procedures were classified into the following three categories: extensor, wrist flexor, and digital tenosynovectomies. The condition of the tendons at operation was recorded as normal, invaded, or ruptured. Tenosynovectomies were recommended for any patient who had been seen initially in the Arthritis Clinic with a tendon rupture, who had significant tenosynovitis when there had been previous tendon rupture in the ipsilateral or contralateral hand, or when synovial swelling persisted after 6 months of well-supervised medical treatment. Reduced active motion of a digit in the presence of significant flexor sheath swelling and much better passive joint motion was a relative indication for surgery. Also, an early decompression of the carpal tunnel and flexor tenosynovectomy was done in the presence of median nerve compression not relieved by splinting, injection of steroids, and systemic medications.

Extensor tenosynovectomies were done through a straight-line incision over the dorsum of the wrist. The extensor retinaculum was reflected and as complete a resection of synovium as possible was accomplished. Nodules in tendons were excised and a fine suture was used to smooth the irregular tendon surface when indicated. Wrist synovectomy, adjacent tendon suture, or tendon transfer was performed as needed. The extensor retinaculum was replaced deep to the tendons and was used to reinforce the dorsal wrist capsule (Fig. 1). Usu-
ally irregularities of the distal end of the ulna were removed or a hemiarthroplasty of the distal radioulnar joint performed. The Darrach procedure was rarely performed in the latter part of the study period. Ligament reconstruction of the distal radioulnar joint and/or tendon transfers were used to support the ulna and to prevent its dorsal displacement.

Flexor tenosynovectomies were done through a longitudinal incision centered over the fourth ray in the proximal palm, then continued proximally with a break at the wrist crease. When necessary, the incision was extended distally to an involved digit (e.g., the small finger) where skin flaps were elevated by use of the inner zig-zag approach. Radical tenosynovectomies of the digit were done, taking care to preserve the pulley mechanism. Appropriate tendon surgery included excision of nodules, lysis of profundus and superficialis tendon adhesions, tenodesis, adjacent tendon suture, and tendon transfers.

The postoperative program was directed toward protection of adjacent tendon sutures and transfers by avoiding, usually for a minimum of 4 weeks. Guarded motion was allowed the next 2 weeks, under the direction of a hand therapist. When no tendon transfers or repairs were performed, early active flexion and extension of the fingers was encouraged. The wrist was flexed for approximately 3 weeks.

During the years 1983 to 1986 patients who had previously had tenosynovectomies were evaluated in the Arthritis or Hand Clinics by F. E. B. and M. L. B. Patients not available for follow-up at this time because of death or relocation, had the charts reviewed by F. E. B. to determine the status of the operated hand at the time of the postoperative visits. Only those patients who had appropriate postoperative evaluations were included in this study. The postoperative examination focused on tendon function in the previously involved area and on the presence or absence of synovitis.

Results

One hundred seventy-three (112 extensor, 24 flexor, and 37 digital) tenosynovectomies were done for 125 patients during the study period (Table I). Fifty-six procedures were done because of preoperative tendon rupture and 117 to eliminate synovial hypertrophy and provide prophylaxis. In this latter group synovial invasion or normal tendons were found in an almost equal number of patients (58 and 59, respectively) at the time of primary surgery. There was no definitive way to determine preoperatively which patients had synovial invasion of tendons. In general, more active disease or localized disease recalcitrant to medical treatment usually indicated more extensive involvement, as did pre-
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Table I. Tendon condition at original operation

<table>
<thead>
<tr>
<th>Procedures</th>
<th>Total no.</th>
<th>Normal</th>
<th>Ruptured</th>
<th>Invaded</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital tenosynovectomy</td>
<td>37</td>
<td>10</td>
<td>5</td>
<td>22</td>
</tr>
<tr>
<td>Extensor tenosynovectomy</td>
<td>112</td>
<td>35</td>
<td>47</td>
<td>30</td>
</tr>
<tr>
<td>Flexor tenosynovectomy</td>
<td>24</td>
<td>14</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>173</td>
<td>59</td>
<td>56</td>
<td>58</td>
</tr>
</tbody>
</table>

Table II. Follow-up status: Recurrent synovium and tendon function

<table>
<thead>
<tr>
<th></th>
<th>Total no.</th>
<th>Normal</th>
<th>Ruptured</th>
<th>Invaded</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients</td>
<td>90</td>
<td>40</td>
<td>31</td>
<td>31</td>
</tr>
<tr>
<td>Procedures</td>
<td>129</td>
<td>44</td>
<td>43</td>
<td>42</td>
</tr>
<tr>
<td>Recurrent synovium (patients)</td>
<td>7</td>
<td>5</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Tendon failure (patients)</td>
<td>5</td>
<td>1</td>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>

Previous tendon rupture at another site. Concomitant movement of the synovial mass and tendon during flexion and extension of the fingers suggested tendon invasion.

Follow-up examinations were obtained on 90 patients who had previously had 129 procedures (Table II). Approximately 80% of the patients were available for examination by us during the 3-year period cited. The remaining 20% were examined by F. E. B. previous to that time and the results of that visit culled from a chart review.

The mean time of examination was 7 months after operation, with a range from 2 to 12 years. A clinical example of a long-term follow-up is shown in Fig. 2, A and B. Abnormalities were noted in eight patients; seven had recurrent synovitis; and loss of tendon activity was noted in five. All patients with recurrent synovium and tendon failure had had extensor tenosynovectomy. No patients with previous flexor or digital tenosynovectomy demonstrated recurrent synovium or tendon rupture during the study period.

Of the patients with normal tendons at the original operation (44), only one had subsequent tendon failure. Likewise, of 42 patients with tendon invasion seen during prophylactic surgery, only one demonstrated tendon rupture on postoperative examination. Nonfunctioning tendons were noted in three of the 43 patients whose previously ruptured tendons were treated by tendon transfer, suture, or graft. These three patients declined further operations. Therefore, whether the original reconstructive operation was unsuccessful or subsequent tendon rupture occurred could not be determined.

Discussion

One of the most deleterious effects of synovial proliferation in rheumatoid arthritis is tendon rupture. This is most commonly produced by synovial invasion of tendons. Kellgren and Ball consider fibrinoid degeneration of the tendon collagen fibrils to be the primary pathologic change. Zaine, Sairanen, and Vainio believe rheumatoid granuloma to be an important factor. Interference with blood supply can also be contributory. The most frequent site of extensor tendon rupture is at the distal end of the extensor retinaculum where the greatest load is placed on the synovial mass and the tendon. Also, this is the watershed for blood supply of the extensor tendons. Chronic chafing of a tendon on an irregular bony prominence (e.g., the dorsally subluxed ulna, Lister’s tubercle, or the palmar edge of the scaphoid) can precipitate tendon rupture.

To be truly prophylactic (i.e., to prevent tendon rupture), tenosynovectomy has to be performed after only a few months of persistent synovitis that has been unresponsive to a well-supervised medical program. Continued close collaboration with the rheumatology service at Dartmouth has generally allowed us to recommend surgical intervention to patients who have had 6 months of persistent synovitis. Yet 50% of these patients demonstrated tendon invasion at the time of exploration. Thirty of 65 prophylactic extensor, 22 of 32 digital, and 6 of 20 flexor tenosynovectomies showed tendon invasion. This experience is similar to that reported by Backhouse et al. and Backdahl and Strandberg.

We would have expected the natural course of the lesions in our patients to be an expansion of the infiltrating synovium, production of enlarging nodules, and central necrosis with subsequent tendon rupture since few of the tendon fibrils remained intact. Yet the tenosynovectomies appeared to interfere with this progression since only one invaded and one normal extensor tendon ruptured during our follow-up period. Comparable results are reported in the literature. Backdahl and Strandberg found no ruptures of operated flexor tendons and only one rupture each of operated normal and invaded extensor tendons during a 6-year follow-up. Backhouse et al. emphasized that tendons that had appeared intact examined Ranawat ruptures mes. Mie cases after the extensor cuff. Recurrence of 70 mo.
Fig. 2. A-B, Ten-year follow-up of patient who underwent flexor and digital tenosynovectomy.

had had radical surgical clearance of synovium appeared in imminent danger of rupture, but follow-up examination revealed normally functioning tendons. Kauvet and Straub described six postoperative tendon ruptures in 60 patients who had flexor tenosynovectomy. Millender et al. reported two postoperative ruptures after prophylactic extensor tenosynovectomy but attributed them to tendon attrition on a roughened ulnar epicondyle. Eiken, Haga, and Salgeback reported only one postoperative rupture in their 139 patients who had previous flexor tenosynovectomy.

Recurrent tenosynovitis occurred in seven of our patients who had had extensor tenosynovectomy a mean of 10 months previously. We saw none in patients who had had flexor or digital tenosynovectomy. Our data is comparable to that reported.

After nearly 20 years' experience of performing operations to treat patients with rheumatoid arthritis with tenosynovitis we wholeheartedly support Flatt's statement that "radical synovectomy of both the flexor and extensor tendons is a useful procedure." "Radical" surgery has meant removal of all synovium in the operative area, including attention to the bulging synovium in the wrist. Jackson and Paton emphasized that this approach is important in the management of widespread flexor tenosynovitis. Complications have apparently been reduced by use of a straight-line incision over the dorsum of the wrist, by minimal resection of the distal
Conclusion

Review of 125 patients having 173 tenosynovectomies indicated a 50% incidence of tendon invasion by synovium when prophylactic surgery was done. Tenosynovectomy was usually indicated when tenosynovitis persisted after 6 months of extensive medical therapy. Such prophylactic surgery almost always prevented tendon rupture. We found that after a mean follow-up of 70 months, only one invaded tendon and one normal extensor tendon ruptured. Three of 43 previously ruptured tendons treated by graft or transfer subsequently failed. Our low incidence of recurrent synovitis (seven patients) is consistent with that reported in the literature. Prophylactic tenosynovectomy is strongly recommended and is facilitated by a close working relationship between rheumatologists and hand surgeons.

REFERENCES