Chronic boutonniere deformity—An anatomic reconstruction

Restoration of motion and appearance of the chronic boutonniere deformity is often accomplished by surgery. If the deformity persists following appropriate splinting, and if a full passive range of motion of the proximal interphalangeal joint is present, surgery may be recommended. Thirteen patients had surgical reconstruction over a 10-year period, with satisfactory improvement in all but one. This operation involves release of the transverse retinacular ligaments and reconstruction of the damaged central slip by using the local joint capsule and synovium attached to the base of the proximal phalanx.

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Damage to the central slip of the extensor apparatus leads to an imbalance of forces between the flexor and extensor mechanisms. If the condition is recognized and appropriate treatment instituted, the results of treatment are excellent. Frequently, however, the seriousness of the acute injury is not recognized, and the characteristic flexed proximal interphalangeal (PIP) joint with hyperextension of the distal joint develops. This deformity has proven to be one of the most difficult reconstructive problems in hand surgery.

The anatomy of the extensor apparatus has been well described by various authors, and the pathomechanics of the boutonniere lesion have also been investigated extensively. Numerous procedures have been designed to overcome the chronic boutonniere deformity. Reconstruction of the middle slip by direct repair, sutureting together of the lateral bands, repair using tendon grafts, and fascial slips, and advancement of the central slip have all provided variable results.

Stack has used the superficial flexor tendon to rebalance the forces across the joint and also to reconstruct the middle slip. Matev described a procedure utilizing the lateral bands whereby the lateral band on one side is used to reconstruct the middle slip, and on the other side it is elongated to restore a single lateral band. Salv described a technique to reposition the lateral bands dorsally. Littler and Eaton reported success in restoring full extension of the PIP joint by separating the extrinsic and interosseous tendon from the lumbrical and oblique retinacular ligaments and centralizing the lateral bands. Tenotomy of the extensor tendon distal to the triangular ligament has also proven useful in chronic deformities, especially those caused by rheumatoid arthritis.

Prerequisites for surgery

There are several basic factors required for successful restoration of function. The most important is that there must be a full range of passive motion at the PIP joint. Any compromise of this prerequisite will lead to a disappointing result.

Most of the reported surgical procedures are somewhat complex, requiring the transfer of additional tissue into an area that does not readily accommodate more tendinous or ligamentous material. If the dorsal skin about the PIP joint is abnormal, or if there is considerable subcutaneous edema or induration, operating at the PIP joint is not recommended; a tenotomy of the extensor tendon distal to the triangular ligament is preferable.

The method is simple, uses only local tissue, and restores normal balance. The operation should be performed only after a 1- to 3-month period of splinting has failed to improve the clinical state significantly and a full range of passive movement has been restored at the PIP joint.

Surgical technique

Through a curvilinear, dorsal incision centered over the PIP joint, the extensor apparatus is exposed and the transverse retinacular ligaments are identified and
Fig. 1. Extensor apparatus at PIP joint is exposed by dorsal incision. Probe is placed beneath right transverse retinacular ligament, which is to be separated from lateral band. Triangular flap in extensor tendon is based proximally.

sharply separated from their insertion on the lateral bands (Fig. 1).

A proximally based triangular flap is elevated between the lateral bands of the extensor mechanism. This flap is carefully separated from the underlying joint capsule and synovium and reflected proximally. A further capsular flap, attached to the base of the middle phalanx, is then fashioned and passed through a split in the proximally based flap of the extensor tendon (Figs. 2 and 3).

The lateral bands are then opposed using two or three 4-0 polyester sutures. This approximation is adjusted so that full passive flexion of the DIP joint is possible (Fig. 4).

The distally based capsular flap is then sewn into place on the extensor tendon, and the large proximally based triangular flap is sutured to the extensor apparatus so that it overlaps the dorsally placed extensor slips (Fig. 5). A small Kirschner wire is passed across the joint, which is held in full extension.

After hemostasis has been achieved, the wound is carefully closed and the forearm immobilized in a compression dressing with the metacarpophalangeal joint flexed and the DIP joint free to allow active flexion. Four weeks postoperatively, the Kirschner wire is removed; for a further 3 to 4 weeks, a splint is worn, holding the PIP joint in extension but allowing free flexion of the DIP joint.

Materials and Results

Over an 8-year period, 13 patients, ranging from 21 to 66 years of age, were operated using this technique. The delay from injury to operation was 2 to 6 months, with the exception of one patient who was operated at 2 years. All but one patient had at least 1 month of splinting (Table I). Of the 13 patients in which this procedure was done, there were eight good results, with less than 15° of extensor lag at the PIP joint and at least 30° of flexion at the DIP joint (Fig. 6, Table II).

Four patients improved. They had between 15° and 30° of lag at the PIP joint, with at least 20° of flexion at the DIP joint. All 12 of the patients in the good groups obtained at least 90° of active flexion at the PIP joint.

There was one poor result with residual contracture of the PIP joint of 30° and an active range of movement of only 15°. This patient had an intraarticular fracture.
Fig. 3. Lateral view of triangular flaps at PIP joint. Flap on left is distally based dorsal capsule from base of middle phalanx. Large more superficial flap on right is proximally based in extensor apparatus.

Fig. 4. Lateral bands are carefully approximated with two or three interrupted sutures after tongue of capsule is pulled through proximally based flap of extensor tendon.

Fig. 5. Final position of two triangular flaps. Proximally based flap is sutured over two distally approximated lateral bands.
Fig. 6. A, Preoperative hand of 21-year-old male with chronic boutonniere deformity of ring finger (MY in Table I). Full passive range of motion is present. B and C. Postoperative hand with full flexion and good extension of ring finger.

Table I. Surgical reconstruction of chronic boutonniere deformity

<table>
<thead>
<tr>
<th>Date of surgery</th>
<th>Age/sex</th>
<th>Injury to surgery (months)</th>
<th>Splinting (months)</th>
<th>Active PIP motion</th>
<th>Active DIP motion</th>
<th>Rating</th>
</tr>
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<tbody>
<tr>
<td>June 73 (TN)</td>
<td>34 M</td>
<td>6</td>
<td>1</td>
<td>45/90</td>
<td>45/90</td>
<td>Failed</td>
</tr>
<tr>
<td>Jan. 74 (GC)</td>
<td>27 F</td>
<td>6</td>
<td>4</td>
<td>60/85</td>
<td>0/90</td>
<td>Good</td>
</tr>
<tr>
<td>Jan. 74 (KE)</td>
<td>47 F</td>
<td>5</td>
<td>Unknown</td>
<td>60/90</td>
<td>20/95</td>
<td>Improved</td>
</tr>
<tr>
<td>May 75 (AR)</td>
<td>38 M</td>
<td>2 (years)</td>
<td>2</td>
<td>70/95</td>
<td>10/95</td>
<td>Good</td>
</tr>
<tr>
<td>June 75 (MY)</td>
<td>21 M</td>
<td>2</td>
<td>1</td>
<td>37/130</td>
<td>0/130</td>
<td>Good</td>
</tr>
<tr>
<td>Sept. 75 (NS)</td>
<td>37 M</td>
<td>3</td>
<td>2</td>
<td>45/90</td>
<td>8/110</td>
<td>Good</td>
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<tr>
<td>Jan. 73 (MH)</td>
<td>24 M</td>
<td>6</td>
<td>2</td>
<td>70/90</td>
<td>20/90</td>
<td>Good</td>
</tr>
<tr>
<td>May 77 (FS)</td>
<td>49 F</td>
<td>4</td>
<td>3</td>
<td>45/95</td>
<td>10/120</td>
<td>Good</td>
</tr>
<tr>
<td>May 78 (UW)</td>
<td>56 M</td>
<td>3</td>
<td>2</td>
<td>65/90</td>
<td>0/95</td>
<td>Good</td>
</tr>
<tr>
<td>Jan. 79 (SR)</td>
<td>66 M</td>
<td>2</td>
<td>1</td>
<td>90/95</td>
<td>15/95</td>
<td>Good</td>
</tr>
<tr>
<td>Feb. 79 (CC)</td>
<td>32 F</td>
<td>4</td>
<td>2</td>
<td>45/90</td>
<td>0/90</td>
<td>Good</td>
</tr>
<tr>
<td>May 79 (EM)</td>
<td>27 F</td>
<td>4</td>
<td>3</td>
<td>60/110</td>
<td>27/105</td>
<td>Good</td>
</tr>
<tr>
<td>April 80 (SD)</td>
<td>37 M</td>
<td>4</td>
<td>2</td>
<td>40/90</td>
<td>5/100</td>
<td>Good</td>
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</tbody>
</table>

and it was not possible to restore a full range of passive motion at the PIP joint preoperatively.

Summary

A method for overcoming the loss of motion and deformity in the chronic boutonniere deformity has been described. The operation consists of (1) reconstructing the damaged central slip using the joint capsule...
and synovium and (2) a careful dorsal repositioning of the lateral bands.

REFERENCES


Elliot RA: Injuries to the extensor mechanism of the hand. Ortho Clin North Am 1:335-54, 1970


