Operative treatment of Linburg-Comstock syndrome

S. Badhe, J. Lynch, S. K. S. Thorpe, L. C. Bainbridge

From Pulvertaft Hand Unit, Derby, United Kingdom

Linburg-Comstock syndrome is characterised by an anomalous tendon slip from the flexor pollicis longus to the flexor digitorum profundus, usually of the index finger. An incidence as high as 60% to 70% has been reported. Post-traumatic inflammation of inter-tendinous connections between the flexor pollicis longus and flexor digitorum profundus, usually of the index finger, may cause unexplained chronic pain in the distal forearm. A total of 11 patients (eight females, three males), mean age 29.1 years (14 to 47) with a clinical diagnosis of Linburg-Comstock syndrome underwent surgical release of the inter-tendinous connection. The mean follow-up was for 27 months (2 to 48).

Ten patients reported excellent relief of pain in the forearm, with independent flexion of flexor pollicis longus and flexor digitorum profundus to the index finger. Surgical release was an effective treatment for the Linburg-Comstock syndrome in this series.

Anomalous connections between tendons can result in a loss of their independent excursions. In 1979, Linburg and Comstock1 described anomalous tendon slips from flexor pollicis longus (FPL) to flexor digitorum profundus (FDP), usually of the index finger, and described a test for clinical diagnosis. They reported the test to be positive in 31% of the population, and demonstrated the anomaly in 25% of cadaver studies. Post-traumatic inflammation of inter-tendinous connections may cause unexplained chronic pain in the distal forearm. The pain is usually of a ‘tearing’ nature and is provoked by an acutely resisted movement that would have required independent excursion of the two tendons. In musicians it can be potentially career threatening.2,3 Excision or release of the connection has been shown to relieve the symptoms.1,2,4,5

In this study we assessed the outcome following release of the interconnection in 11 patients with Linburg-Comstock syndrome.

Patients and Methods

In this retrospective study, 11 patients (eight females, three males) with a mean age of 29.1 years (14 to 47) presented with pain in the volar aspect of the forearm. In eight patients the dominant limb was symptomatic and seven patients gave a history of a traumatic event after which they developed symptoms. Most patients described their pain as aggravated by repeated activity such as writing. They isolated the pain to the volar aspect of the distal forearm, usually along the line of the flexor carpi radialis tendon. On active flexion of the thumb, simultaneous flexion of the distal interphalangeal (DIP) joint confirmed the anomaly. The clinical diagnosis was then made by the test as described by Linburg and Comstock,1 in which the pain is reproduced by asking the patient to fully flex the thumb metacarpophalangeal (MCP) and interphalangeal (IP) joints while holding the fingers extended. Patients in whom this test was positive were included. The test cannot be performed passively as there is no net excursion of FPL on passive flexion of the thumb. The connection between the latter and FDP is usually oblique and based proximally at the FPL. This results in simultaneous flexion of the index finger when the thumb is actively flexed, but there is no demonstrable synkinesis on independent flexion of the index finger. The diagnosis was further confirmed by aggravation of the pain on sudden passive extension of the flexed index finger while the thumb maintained active IP flexion. The pain was most commonly described as ‘tearing’ and on the volar aspect of the distal forearm.

In order to confirm the site of the pain, all patients had an injection of 1 ml to 2 ml of 1% lignocaine around their FPL. This was performed by inserting the needle vertically down to the radius just proximal to the distal edge of the radius and just radial to the flexor carpi radialis sheath. After the injection the diagnostic tests were repeated and abolition of pain confirmed the diagnosis.
Although all patients had a period of non-operative management with splints, oral anti-inflammatory agents and stretching exercises with the physiotherapists, none improved and all underwent exploration and excision or release of the connections. The patients were assessed retrospectively by the first author (SB) for relief of pain using a visual analogue scale (VAS) for pain (0 - no pain, 10 - maximum pain), return to activities, complications, overall satisfaction and negative clinical diagnostic tests at a mean follow-up of 27 months (2 to 48).

Operative technique. With the patient supine, with a high arm tourniquet and under regional anaesthesia, a linear incision was made along the radial aspect of the distal forearm over the flexor carpi radialis. Any anomalous connections were confirmed by the synkinesis of the tendons on pulling them proximally. A number of anomalous connections were noted between FPL and FDP to the index finger. The most common was a fibrous band of thickened synovial tissue (Fig. 1). This was excised along with tenolysis of the FPL tendon. One patient had a common muscle belly proximally between FPL and FDP, and two discrete anomalous tendons arising from the former inserting into the latter to the index finger. Another had an anomalous muscle belly with a tendon slip arising from FPL and winding around the tendon before insertion into the index FDP tendon (Fig. 2). These were divided or excised, depending on the nature of the connection. The independent excursion was reconfirmed by pulling proximally on the individual tendons.

Post-operatively the patients were mobilised immediately, with physiotherapy to encourage independent tendon gliding. They were followed up at two and eight weeks.

Results
At the final follow-up, ten patients reported excellent improvement in their pain on the VAS and had a negative diagnostic test for independent flexion of the IP joint of the thumb and the DIP joint of the index finger (Table I) and were able to return to their occupations and pastimes without discomfort.

Two patients developed symptoms suggestive of median nerve compression at the wrist. These resolved with elevation and splintage. One patient had a hypertrophic scar, and one with pain and swelling in the hand is improving with physiotherapy for complex regional pain syndrome.

Discussion
It has been noted that the structure of FPL and FDP differs between humans and anthropoid apes, in whom the former has a large tendon inserting on to the index finger and a small tendon on to the thumb. The shortened thumb in apes, along with other anatomical modifications, means that they are only capable of two basic grips: the hook grip, which excludes the thumb and is used as a power grip, and the pinch precision grip, in which the terminal digit pad of the thumb is opposed to the radial side of the index finger. A link which results in flexion of the index finger as the thumb flexes would enhance the ability to exert a precision grip without needing individual control of the muscles for this action. The presence of a separate FPL appears to be an evolutionary adaptation to allow opposition of the thumb in humans. Although early anatomists recognised anomalous tendon slips from FPL to FDP, their clinical relevance, diagnosis and the results of surgical treatment were first reported by

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**Fig. 1** Photograph of the intertendinous connection between flexor pollicis longus and flexor digitorum profundus index finger.
Linburg and Comstock,¹ who described the clinical signs and reported a 31% incidence of the syndrome. Other studies have reported the incidence to be as high as 60% to 70%.² As well as clinical diagnosis, MRI can help confirm and localise the anomalous connection.¹¹ In our series, whereas some patients had MR scans to exclude other causes of pain, they were not used to determine the location of the anomalous connection.

Tenosynovitis in the area of the connection may cause persistent pain in the distal forearm and wrist. The most common anomalous connection in our study was thickened synovium, which could have been post-traumatic. The majority of patients (seven) reported an injury before the development of symptoms (Table I). Although the relationship with injury is not clear from this study, we agree with Lombardi et al⁴ that a hyperextension force to the fingers

Table I. Clinical findings

<table>
<thead>
<tr>
<th>Number</th>
<th>Gender</th>
<th>Age (yrs)</th>
<th>Dominance</th>
<th>Affected side</th>
<th>Event</th>
<th>Operative findings*</th>
<th>Follow-up (months)</th>
<th>Pain relief (out of 10 on VAS†)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M</td>
<td>47</td>
<td>Right</td>
<td>Right</td>
<td>Hyperextension</td>
<td>Fibrous connection</td>
<td>43</td>
<td>9</td>
</tr>
<tr>
<td>2</td>
<td>F</td>
<td>43</td>
<td>Right</td>
<td>Right</td>
<td>No injury</td>
<td>Fibrous connection</td>
<td>26</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>M</td>
<td>31</td>
<td>Right</td>
<td>Right</td>
<td>Hyperextension</td>
<td>Fibrous connection</td>
<td>24</td>
<td>10</td>
</tr>
<tr>
<td>4</td>
<td>F</td>
<td>15</td>
<td>Right</td>
<td>Right</td>
<td>No injury</td>
<td>Thickened fascia and oblique tendon</td>
<td>21</td>
<td>8</td>
</tr>
<tr>
<td>5</td>
<td>F</td>
<td>14</td>
<td>Right</td>
<td>Right</td>
<td>Fall on outstretched hand</td>
<td>Fibrous connection</td>
<td>13</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td>M</td>
<td>24</td>
<td>Right</td>
<td>Left</td>
<td>Sudden pain as he released weight from grip</td>
<td>Fibrous connection</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>7</td>
<td>F</td>
<td>30</td>
<td>Right</td>
<td>Right</td>
<td>Stretching fingers reaching for the computer mouse, felt sudden pop and developed acute severe volar forearm pain</td>
<td>Two tendons: Proximal common muscle belly and distal scar between tendons</td>
<td>34</td>
<td>10</td>
</tr>
<tr>
<td>8</td>
<td>F</td>
<td>19</td>
<td>Right</td>
<td>Right</td>
<td>Injury to dorsum of hand as door slammed</td>
<td>Muscle belly and tendon winding around FPL to FDP</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>9</td>
<td>F</td>
<td>21</td>
<td>Right</td>
<td>Left</td>
<td>Lifting heavy object, sudden give way of the hand</td>
<td>Tear at distal attachment</td>
<td>40</td>
<td>7</td>
</tr>
<tr>
<td>10</td>
<td>F</td>
<td>41</td>
<td>Right</td>
<td>Left</td>
<td>No injury</td>
<td>Thickened fibrous connection</td>
<td>48</td>
<td>10</td>
</tr>
<tr>
<td>11</td>
<td>F</td>
<td>36</td>
<td>Right</td>
<td>Right</td>
<td>No injury</td>
<td>Anomalous muscle and thickened scar</td>
<td>47</td>
<td>9</td>
</tr>
</tbody>
</table>

* FPL, flexor pollicis longus; FDP, flexor digitorum profundus
† VAS, visual analogue scale
with the thumb held in flexion may initiate the problem. Steroid injections into the tendon sheath of FPL are unsuccessful in the long-term management of this condition. Therefore, we used local anaesthetic injections only for diagnostic purposes. In the first description of the condition, Linburg and Comstock had excellent relief of pain following surgical excision of the anomalous interconnection in four cases. Karalezli et al found the anomaly in 13% of musicians and described full painfree function in one patient following excision of the tendinous connection. Lombardi et al had good results in 13 of 17 patients after operation followed for up to six months, and Takami et al reported a successful outcome of independent excursion of thumb and index finger flexor tendons at one year in a patient who had bilateral excision of an anomalous tendon slip. The improvement in forearm pain following excision or release in our study is maintained and compares favourably with earlier studies.

Our results are encouraging, especially as these patients have often had multiple examinations for vague, persistent wrist pain. Awareness of the Linburg-Comstock syndrome and operative treatment can lead to a satisfactory return to work and leisure activities in this young, and active group of patients.

References