Results of surgical treatment of painful neuromas of the hand

The surgical treatment of 50 patients with 101 neuromas over the last 10 years is reported. Simple excision and implantation into local muscle resulted in an unacceptable reoperative rate of 65%. Ray amputation for symptomatic neuromas resulted in the highest reoperation rate but resulted in little or no subjective improvement. There appears to be a correlation between delayed healing after the initial injury and the severity of neuroma symptoms. Dorsal translocation of the neuroma consistently resulted in decreased sensitivity without long-term recurrence.

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Painful neuromas of digital and sensory nerves of the hand can be one of the most frustrating problems a hand surgeon has to deal with. Symptomatic neuromas can significantly prolong disability time and, in the most severe cases, render a partially injured hand functionally useless. Surgical procedures recommended to solve this problem include simple excision with or without relocation of the nerve stump in adjacent tissue, excision and secondary neurorrhaphy or interpositional nerve grafts, translocation of the intact neuroma to an unscarred site away from repetitive trauma, or implantation into bone.1-3 Silicone capping, ligation, coagulation and injection of nerve stumps with alcohol, formalin, phenol, or steroids have all been used in an attempt to prevent recurrent neuroma formation.3-5 We have reviewed our operative experience over the last 10 years to determine which method of surgical treatment results in the best immediate and long-term results.

Material and methods

A chart review of all patients treated surgically for neuromas of the hand from 1970 to 1980 was performed. The group consisted of 50 patients with 101 symptomatic neuromas of the hand. The injuries were classified as either crush, amputation, laceration, or surgical injury. All patients operated on for symptomatic neuromas had disabling symptoms and had failed to improve when physical desensitization methods were used. Thirty-seven of the patients were men, and 13 were women. The time period from date of injury to the first surgical intervention averaged 10 months and ranged from 2 months to 4 years.

Operative technique

Symptomatic neuromas were treated by one of the following methods: (1) simple excision with or without ligation or cautery of the nerve end, (2) simple excision with implantation of the nerve end into adjacent muscle tissue, usually interosseous or lumbrical muscles, (3) excision with end-to-end anastomosis of nerve ends or occasionally interpositional nerve grafting, and (4) dorsal translocation of digital neuromas. All neuromas identified at surgery were translocated because of the difficulty in determining preoperatively which neuromas were most sensitive. The neuromas were mobilized using dissection under ×3.5 magnification loupes, and the intact neuroma was held in place with an absorbable suture without any tension on the dorsal aspect of the digit or palm (Fig. 1). Their new location was selected to be away from repetitive trauma and scar tissue.

Evaluation criteria

Each patient’s result was rated both subjectively and objectively. The subjective criteria were pain, stump anesthesia, and patient acceptance. The grading systems for pain and stump anesthesia were the same: grade I = none; Grade II = mild, causing no interference with daily activities; grade III = moderate, allowing the patient to work but causing some limitation in the use of the hand due to pain or numbness; grade IV = severe, resulting in inability to work or use the...
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Fig. 1. A, Dissection of palmar aspect of left thumb showing neuroma of digital nerve. B, Dorsal translocation of neuroma into first web space.

Table I. Patients who had excision of neuromas and secondary neurorrhaphy or nerve grafting

<table>
<thead>
<tr>
<th>Group</th>
<th>Procedure</th>
<th>Patients</th>
<th>Neuromas</th>
<th>No. of procedures</th>
<th>Improved</th>
<th>Not improved</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Single excision</td>
<td>13</td>
<td>22</td>
<td>13</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>II</td>
<td>Multiple excision</td>
<td>11</td>
<td>32</td>
<td>26</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>III</td>
<td>Ray amputation</td>
<td>14</td>
<td>35</td>
<td>39</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>IV</td>
<td>Translocation</td>
<td>8</td>
<td>17</td>
<td>9</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>V</td>
<td>Neurorrhaphy</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>

hand. The grading system for patient acceptance was as follows: grade I = improved, causing no interference with daily activity, no disability; grade II, A = improved; causing some interference yet allowing patient to work with mild disability; grade II, B = improved, resulting in interference to the point that the patient was unable to work and some mild disability; grade III = no change; grade IV = worse. All patients were graded preoperatively and postoperatively.

The objective criteria included Tinel’s sign and function. Tinel’s sign was graded as follows: grade I = none; grade II = mild, with a slight tingle; grade III = moderate, making the patient very uncomfortable; grade IV = severe, resulting in patient inability to use the hand because of any stimulation of the neuroma. Function was graded as follows: grade I = normal, causing no interference with activity and allowing a full range of motion and strength; grade II = interference with heavy or delicate work secondary to location of the neuroma; grade III = patient was unable to use the hand.11

Results

There were 24 amputation injuries, 15 crush injuries, five traumatic lacerations, and six surgical lacerations. Symptoms were as follows: radial sensory, four; median sensory, two; ulnar sensory, five; thumb, 13; index finger, 23; long finger, 20; ring finger, 20; and small finger, 10. Symptomatic neuromas occurred most frequently in index, long, and ring fingers. Distribution between the radial and ulnar digital nerves was almost equal.

To compare results, the patients were divided into five groups. Group I consisted of those patients who
initially had simple excision or excision and implantation into local muscle who were not subjected to reoperation. Group II patients required more than one excision of recurrent neuromas. Group III patients had ray amputations for functional or therapeutic reasons. Group IV patients had translocation of their neuromas. Group V consisted of patients who had excision of their neuromas and secondary neurorraphy or nerve grafting as indicated (Table I).

In group I, 13 patients had simple excision of their neuromas; three of these 13 patients had the nerve ends implanted into local muscle tissue. Five patients also had revision of their amputation stumps at the same time. Although none of these patients was reoperated on, six were not improved postoperatively according to the evaluation criteria (Table II). The 11 patients in group II were subjected to a total of 26 operative procedures for recurrent neuromas. The end result of these procedures resulted in six patients who were improved and five who were not.

Group III consisted of 14 patients, 12 of whom had ray amputation after excision of the neuromas failed. The remaining two patients had their amputations after injury for functional reasons. These 14 patients were subjected to a total of 39 operative procedures. Twelve of these patients required excision of recurrent neuromas after their ray amputation. Nine patients eventually were improved, but five remained unimproved after repeated excisions.

Each of the eight patients in group IV had translocation of their neuromas. One patient was reoperated on early in the series to retranslocate the neuromas away from repetitive trauma; all patients were significantly improved by the procedure.

The four patients in group V had excision of their neuroma and secondary neurorraphy. Three were improved, although one was still moderately symptomatic, and the remaining patient had worsening of symptoms. One patient who had a nerve graft required excision of the graft and proximal anastomosis of the neuroma with secondary neurorraphy.

The 38 patients in groups I, II, and III initially had simple excision of their neuromas. Of these patients, six had implantation of the nerve stumps into local muscle tissue, 25 required a second operative excision, and 11 were subjected to three or more excisions.

**Discussion**

Tupper and Booth reported 68% excellent or satisfactory results after one neurectomy. Thirty-seven of 232 neuromas had a second simple neurectomy.2 Our results show that excision of symptomatic neuromas often results in a period of initial improvement only to be followed by an almost inevitable recurrence. Simple excision or excision and implantation resulted in a reoperative rate of 65% and multiple excisions in 29% of our cases. Even those patients not subjected to reoperation were often symptomatic to a moderate degree. The patients who were subjected to ray amputations in the course of their treatment were the most difficult to treat, with 85% requiring excision of recurrent neuromas after their ray amputations and experiencing phantom pain. Those patients subjected to translocations showed remarkable postoperative improvement, with no worsening of symptoms as time progressed. The only patient in the translocation group who required reoperation was early in the series. This patient originally had translocation of common digital neuromas away from local scar tissue into adjacent subcutaneous tissue. Because of recurrent irritation,
reoperation was performed and the neuromas translocated dorsally to the hypothenar muscles. This patient's symptoms resolved postoperatively.

In reviewing these patients, there seemed to be a correlation between delayed healing after the initial injury and the severity of neuroma symptoms. Undoubtedly scar formation around digital nerve stumps plays an important role in the severity of postinjury symptoms. This partially explains why the eight patients who had translocation of their neuromas to an area away from repetitive trauma were improved immediately postoperatively, with no worsening of their symptoms as time progressed.

Translocation of neuromas in our patients clearly resulted in the best immediate and long-term results. Because a transected nerve heals with varying degrees of neuroma formation, simple excision is often doomed to failure. Translocation of the intact neuroma serves two purposes: (1) the neuroma is removed from its irritating bed of scar tissue, often in an area of inadequate soft tissue cover and (2) it is placed, preferably dorsally, in an area which is not repeatedly traumatized or involved in power grip. In our patients who had implantation of nerve ends into local muscle tissue, it was apparent that either muscular contraction or local pressure in gripping caused irritation of the neuroma.

Conclusions

Delayed wound healing increased the chance of symptomatic neuromas, probably as a result of increased scar formation. Simple excision seemed to be successful only if revision of the amputation stump was performed at the time of surgery to provide adequate soft tissue coverage. Translocation resulted in the immediate improvement of symptoms as well as the lowest reoperative rate. Secondary neurorrhaphy resulted in only modest symptomatic relief. Ray amputation for symptomatic neuromas resulted in the highest reoperation rate, with little or no subjective improvement. Surgical translocation of symptomatic neuromas should probably be the preferred procedure when one is considering ray amputation for symptomatic neuromas. If one has to perform a ray amputation for functional reasons or because of poor stump coverage, careful location of the digital nerves dorsally should be performed.

REFERENCES