Arthrodesis of the Carpometacarpal Joint of the Thumb
A Review of Patients with a Long Postoperative Period

ROBERT E. CARROLL, M.D.*

Arthrodesis of the carpometacarpal joint of the thumb is useful in reconstruction of hand deficiencies and in eliminating pain at this site. The author has speculated that fusion of the carpometacarpal joint might lead to pantrapezial arthritis in later years. No patients with painful arthritis received this operation if they were beyond 50 years of age. Sixty-seven patients were followed for three to 25 years after surgery and none have yet developed painful pantrapezial arthritis. Many are still at an age when arthritis is not a problem. A colleague contributed a case of a 60-year-old patient who received a carpometacarpal arthrodesis and who later developed painful arthritis of the adjacent joints. This case demonstrates the need for restraint in using this procedure for the alleviation of arthritis pain in patients over 50 years of age.

The indications for carpometacarpal arthrodesis vary considerably. It is not a commonly used procedure but does have a distinct place in hand reconstruction. In 1973, 39 cases were featured in a report describing a technique for arthrodesis. Since then this author has used arthrodesis in an additional 28 patients. The last procedure was done in 1985 for a 31-year-old patient who had a painful subluxation of the carpometacarpal joint. She had had a repair of this joint capsule with a segment of wrist tendons, but the result was unsatisfactory to her because her job as a filing clerk involved great pressure on her thumb. All forms of correction were considered, but the carpometacarpal arthrodesis seemed best suited for a strong, lasting pinch (Fig. 1).

Carpometacarpal fusion of the thumb is extremely useful in the reconstruction of hands with congenital deformities and paralytic conditions. The fusion will give stability and permit tendon transplants to give better function to the thumb. The experience at the author’s hospital is summarized in Table 1. Arthrodesis has been found to be of value in reconstruction for cerebral palsy as well as arthrogryposis. There have been patients with trauma to the base of the thumb whose pain and instability persisted, including victims of gunshot wounds. It is extremely unusual to find persisting pain following fracture to the base of the thumb metacarpal but if it should occur, this type of arthrodesis is helpful. Rarely, painful arthritis occurs at the base of the thumb in patients younger than the age of 50. Attention must be directed to see that there is no sign of arthritis in the adjacent joints. The need for stability in the thumb must be reviewed.

Arthrodesis of the carpometacarpal joint of the thumb eventually results in a fully mobile hand and thumb. Increased mobility was noted each year as the patient’s progress was evaluated (Fig. 2). Cineroentgenographic studies were done on seven nonparalytic patients, which showed that movement of the
Fig. 1. Case 1: A 31-year-old filing clerk with a painful carpometacarpal joint at the thumb. Arthrodesis allowed her to return to full activity.

Fig. 2. Case 2: A 35-year-old secretary has full mobility of the thumb two years after carpometacarpal arthrodesis.

TABLE 1. Trapeziometacarpal Arthrodesis

<table>
<thead>
<tr>
<th>Condition Requiring Arthrodesis</th>
<th>Number of Operations</th>
<th>Age Range for Arthrodesis</th>
<th>Range of Observation Time (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Paralytic deformities</td>
<td>13</td>
<td>12–53</td>
<td>3–24</td>
</tr>
<tr>
<td>3. Cerebral palsy</td>
<td>12</td>
<td>12–15</td>
<td>3–21</td>
</tr>
<tr>
<td>4. Traumatic deformity</td>
<td>8</td>
<td>18–33</td>
<td>3–18</td>
</tr>
<tr>
<td>5. Arthrogryposis</td>
<td>7</td>
<td>11–20</td>
<td>3–23</td>
</tr>
<tr>
<td>6. Osteoarthritis</td>
<td>5</td>
<td>44–47</td>
<td>3–24</td>
</tr>
<tr>
<td>7. Other</td>
<td>3*</td>
<td>19–31</td>
<td>1–8**</td>
</tr>
</tbody>
</table>

* One patient who grasped masses of filing cards all day could not continue working because of pain at the base of the thumb. The other two patients had subluxing carpometacarpal joints.

** Great effort was used to achieve at least a three-year follow-up period. Group 7 includes one operation done in 1983 and one in 1985.
thumb power is not needed, this method is highly successful.

The power of pinch was tested by a meter in nonparalytic thumbs and was found to be equal to that of the normal thumb. In six cases the power was better than that of the normal thumb. In all instances, it was greater than that resulting from any type of arthroplasty. By far the weakest pinch was recorded in patients who were treated by excision of the trapezium alone for painful arthritis.

Surgical Technique

A solid arthrodesis of the carpometacarpal joint can be difficult to achieve with the conventional method of squaring off and pinning the opposing surfaces of the joint, even when bone grafts are added. In the technique presented in 1973 and used from 1950 to the present, the initial operation did not achieve primary fusion in four of 67 patients. Two of these failures were in patients with severe cerebral palsy, one of whom also had a wound infection. Both of these were later treated by a bone graft across the site to give a solid fusion. The two other failures occurred in patients treated for osteoarthritis. One was later corrected by a bone graft to fuse the joint. The other patient declined any further operation. She developed useful, painless motion over the four years that the authors followed her. Even with nonunion, this technique produced a stable joint that would not displace or slip.

The principle of small joint arthrodesis is similar to that applied to all small joints of the hand. The base of the thumb metacarpal is denuded of articular cartilage and shaped into a blunt point, giving an excellent exposure of
the articular surface of the trapezium. This surface is removed with a power drill and the trapezium is shaped into a cup to receive the base of the metacarpal (Fig. 3). A Kirschner wire is drilled retrograde through the metacarpal to exit from the skin at the metacarpophalangeal joint, which is held in flexion. When the base of the metacarpal is firmly compressed in the socket of the trapezium, the wire can be drilled across this joint. The distal wire is left superficial to the skin, cut off, and bent. A plaster cast is applied to the thumb and forearm for six weeks.

FIG. 4. Case 3: A 41-year-old patient. Arthrodesis in construction for paralytic defect due to nerve damage which occurred at age 18. Full use without pain was achieved.

FIG. 5. Case 4: A 66-year-old patient. An arthrodesis for osteoarthritis which began at age 45. Full use without pain was achieved.

DISCUSSION

Most of these operations were done in patients at an early age, because they were less likely to develop pantrapezial arthritis (Table 1). The shortest follow-up period was three years and the longest was 25 years (Fig. 4). Roentgenograms were obtained when the patient was last seen.

As time progresses, there may be increasing stress on the junction of the trapezium with
Fig. 6. Case 5: A patient, 60 years of age, had an arthrodesis of the carpometacarpal joint of the thumb three years before for painful arthritis. While initially relieved, pain returned and a silicone disc was subsequently inserted between the scaphoid and the trapezium.

the scaphoid, trapezoid, or base of the second metacarpal, producing a painful arthritis. To date, no patient who received this treatment has developed such a problem (Fig. 5). The most recent films indicate no development of painful arthrosis, however, Dr. Gerald Blatt has addressed this problem.3

To treat his patient, a silicone disc with a short stem that can be inserted between the scaphoid and the former trapezium was developed.3 This procedure has given a painless range of motion and eliminated all disability of the thumb (Fig. 6). Another solution may be to excise the previous trapezium and implant a mass of fascia.4 So far this operation has not been performed for this specific problem. It has the potential of eliminating all articular irritation for the three adjacent joints without risking silicone disintegration, synovitis, or fragmentation.

ACKNOWLEDGMENT

Grateful acknowledgment is given to Gerald Blatt, M.D., of Long Beach, California, for permission to use the case presented in Figure 6.

REFERENCES