# Camptodactyly as a Spectrum of Congenital Deficiencies: A Treatment Algorithm Based on Clinical Examination

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**Background:** Camptodactyly is a frequent congenital hand disorder, but its cause and treatment remain a matter of controversy. Although it is difficult to establish the primary cause of camptodactyly, careful clinical examination allows the assessment of all the structures involved (e.g., skin, subcutaneous fascia, flexor tendons, extensor tendon, intrinsic muscles, and joints). The purpose of the study was to assess the validity of an algorithm based on the clinical examination in planning the operation.
**Methods:** An algorithm based on clinical examination and the authors' 27-year experience was designed to determine and customize the surgery for each case according to the function of the anatomical structures involved. The authors compared the results of surgical treatment in two groups of patients with camptodactyly of the fifth finger operated on before (group 1, 33 patients) or after use of the algorithm (group 2, 35 patients). All patients had more than 1 year of follow-up (range, 21 to 47 months).
**Results:** There were significantly fewer failures in group 2 (14 percent versus 45.5 percent, $p < 0.01$). The improvement, after an extensive liberation in stiff early cases (type Ia), gave better results than previous attempts but did not reach significance (84 percent versus 66 percent). Similarly, for types Ib (early and correctable) and IIb (late and correctable) camptodactyly, the surgical results were improved, with 91 percent and 90 percent improvement, respectively, in group 2 versus 50 percent and 44 percent in group 1 (not significant).
**Conclusion:** A selective surgical indication, based on careful clinical examination, improves the results of camptodactyly treatment by correcting the involved anatomical components. (*Plast. Reconstr. Surg.* 117: 1897, 2006.)

In 1906, Landouzy[1] defined camptodactyly as a flexion deformity of the proximal interphalangeal joint. Various authors have since restricted the definition to a proximal interphalangeal joint held in flexion, while others also include joints with good passive motion that lack active extension. Virtually all structures surrounding or acting on this key joint have been incriminated in the pathogenesis of the deformity. Except in severe forms, the functional defect is limited and the concern is more about appearance. Unfortunately, the results of treatment have so far been qualified as disappointing or at least unpredictable. As with thumb hypoplasia, symbrachydactyly, and triphalangeal thumb, which became recognized as a spectrum of the same disease with different structures involved in different clinical presentations under the same heading, Smith and Grobbelaar[2] tried to "unify" the pathology of camptodactyly. On the basis of our experience with 155 fingers with camptodactyly in 103 patients, we tried to reduce camptodactyly to one (or a few) anatomical variation and found that every structure previously mentioned in the literature could be involved. The treatment has to address all of them, whether their involvement is primary or secondary. Only after careful preoperative and intraoperative clinical examination can we make a proper decision concerning which technique to use. This analysis also allowed us to develop a treatment algorithm.

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## PATIENTS AND METHODS

A total of 155 fingers with camptodactyly were examined and treated by the senior surgeon (G.F.) between 1975 and 2002. The classification we proposed in 1994[3] (Table 1) separates the two forms of presentation into early

**Table 1. Classification of Camptodactyly as Described in 1994***

| Type | Description | No. of Fingers† |
|---|---|---|
| Ia | Early and stiff | 82 |
| Ib | Early and correctable | 17 |
| IIa | Late and stiff | 32 |
| IIb | Late and correctable | 24 |

*From Goffin, D., Lenoble, E., Marin-Braun, F., and Foucher, G. Camptodactylie: Classification et résultats thérapeutiques d'une série de 50 cas. *Ann. Chir. Main* 20: 13, 1994.
†Data represent number of fingers examined between 1975 and 2002. They were not included the type III, which affected the first ray, and type IV, which is associated with complex syndromes.

(in the first 5 years) or late. In each group, two subgroups are worth considering, based on whether the deformity is correctable passively (the supple group) or the digit is stiff. Age of onset, finger involved, family history, and associated syndromes are summarized in Tables 2 and 3. We have not found a consistent relationship between the form and heredity, with stiff and correctable forms present in the same family. Four patients older than 30 years had fully supple fingers. We found no natural progression from supple to stiff, and the stiff group did not represent an end stage in the progression of the disease. Radiological changes of the head of the proximal phalanx, with some flattening and/or some hypertrophy of the base of the middle phalanx, were present in 29 percent of the fingers (58 percent of the stiff finger group).

During our 27-year experience, we developed, in 1988, an algorithm based on the clinical examination to determine the surgical procedure to be used. The aim of the algorithm was to customize the surgery for each case based on the function of the anatomical structures involved in this spectrum of anomalies presenting as lack of extension of the proximal interphalangeal joint (Table 4). This algorithm was constructed by looking for a rationale while analyzing the knowledge accumulated during our experience[1,9,13,14,18–24] (Fig. 1).

To assess the benefit of this algorithm, we compared the results of surgical treatment in two groups of patients with camptodactyly of the fifth finger operated on before (group 1, 33 patients) or after the development of our precise clinical examination (group 2, 35 patients); these patients had more than 1 year of follow-up (range, 21 to 47 months). These two groups were comparable for age, type of camptodactyly, and preoperative extension deficit (Table 5). We did not include patients with the type IIa camptodactyly (late and stiff), because it was no longer considered as indication after our review in 1994 demonstrating poor outcome. We also excluded patients with type III camptodactyly (first ray) as well as those with type IV, which is associated with complex syndromes.

In group 1 (Table 5), 12 patients had type Ia camptodactyly operated on after unsuccessful splinting (mean age at operation, 5.4 years). The operation consisted of some cutaneous flaps (mainly Z-plasties), flexor digitorum superficialis section, and some form of arthrolysis. Twelve patients had type Ib (eight digits) or type Ia camptodactyly after successful splinting on passive range of motion (four digits) (mean age at operation, 6.2 years), and nine patients had type IIb camptodactyly (mean age at operation, 12.2 years). All of these patients had a tendon transfer of the flexor digitorum superficialis of the fifth finger.

**Table 2. Location of Camptodactyly**

| | No. of Fingers* ($n$ = 155) |
|---|---|
| Fifth finger | 113 |
| Ring finger | 28 |
| Index finger | 9 |
| Middle finger | 5 |

*Number of fingers examined between 1975 and 2002.

**Table 3. Family History and Associated Pathologies**

| | No. of Patients* ($n$ = 103) |
|---|---|
| Known familial history | 37 |
| Say syndrome (triphalangeal thumb and patella luxation) | 1 |
| Courtens syndrome (facial dysmorphy, cleft palate, hearing deficit) | 1 |
| Baraitser syndrome (scoliosis, torticolis) | 1 |
| Velores syndrome (obesity, agenesis of corpus callosum) | 1 |

*Number of patients examined between 1975 and 2002. Excluded were operated cases: complex syndromes (12 fingers), cleft hand (11 fingers), central polydactyly (nine cases), arthrogryposis multiplex congenita (six fingers), Freeman Sheldon syndrome (two fingers), and ulnar deficiency (two fingers).

**Table 4. Anatomical Structures Involved in Camptodactyly**

| |
|---|
| Rheumatism[1] |
| Circulatory disturbance[18] |
| Skin shortness and subcutaneous bands[9,19] |
| Lumbrical abnormality[13, 20, 21] |
| Short flexor superficialis[14] |
| Shortness of the flexor profundus[22] |
| Dysfunction between the flexor and extensor tendons[23] |
| Retraction of the collateral ligaments and volar plate[24] |

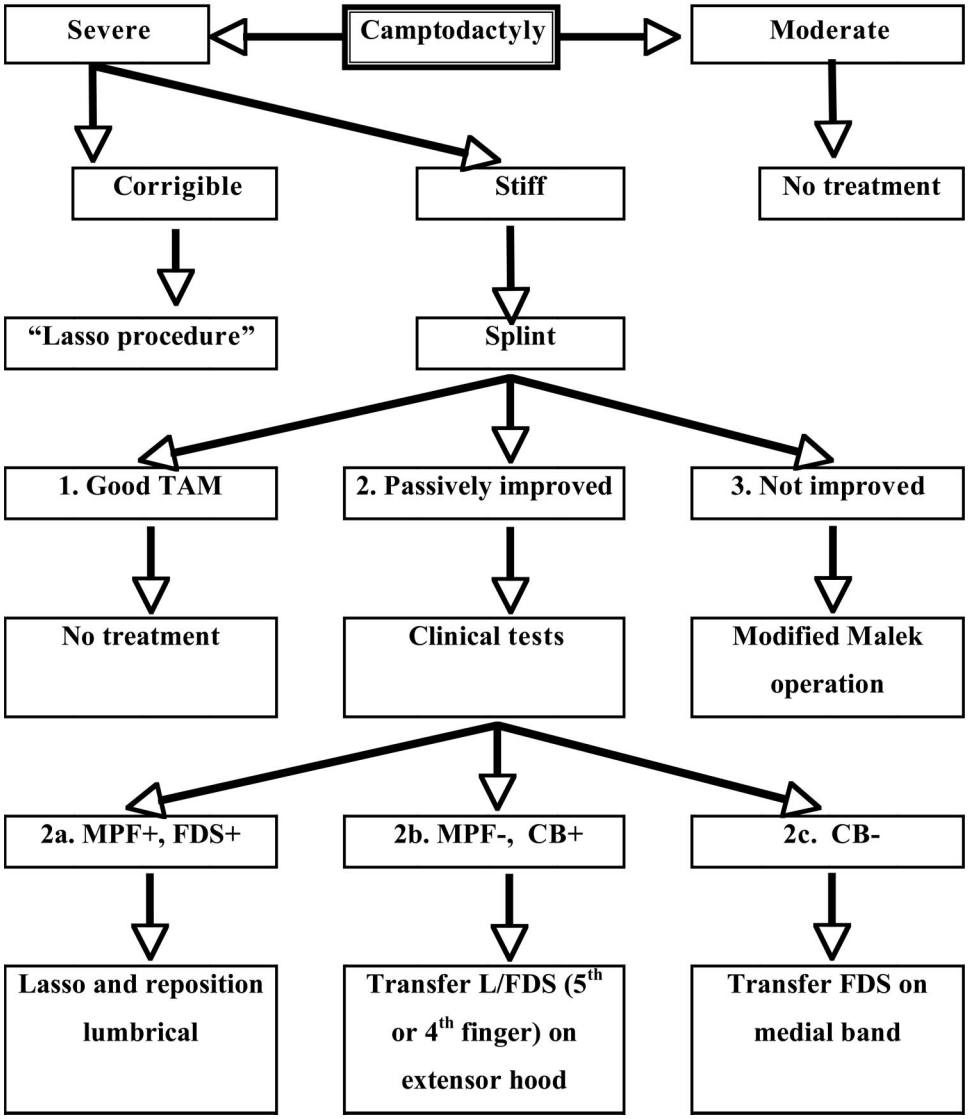


**Fig. 1.** Algorithm from treatment of camptodactyly. *MPF+*, positive metacarpophalangeal joint flexion test; *L*, lumbrical; *CB+*, positive central band test; *FDS+*, tenodesis effect of flexor digitorum superficialis.

In group 2, 13 patients had type Ia camptodactyly operated on using Malek's approach after unsuccessful splinting (mean age at operation, 6.4 years), 12 had type Ib (6 digits) or Ia camptodactyly after successful splinting on passive range of motion (six digits) (mean age at operation, 6.8 years), and 10 had type IIb camptodactyly (mean age at operation, 14.1 years). Among these 22 "correctable" cases, nine underwent modified a "lasso" procedure, 11 underwent flexor digitorum superficialis transfer on the extensor hood, and two underwent medial band reconstruction. The indications for these treatments were based on the algorithm.

**Description of the Algorithm**

The algorithm was based on clinical examination only. Six tests were performed (Fig. 2):

(1) Active proximal interphalangeal joint extension with wrist in neutral;
(2) Dermodesis test, to check for cutaneous shortening and the presence of subcutaneous fibrous bands. The test is positive when skin blanching disappears in the metacarpophalangeal joint flexion, while in the proximal interphalangeal joint, passive extension deficit improves;

**Table 5. Comparative Results of Two Groups of Patients Treated before (Group 1) and after (Group 2) the Algorithm Was Developed**

| Type | No. | Age (yr) | Preoperative Extension Deficit | No. Improved | Improvement* | No. Unchanged | No. Aggravated |
|---|---|---|---|---|---|---|---|
| Group 1 | | | | | | | |
| Ia | 12 | 5.4 | 58° | 8 (66%) | 54% | 2(17%) | 2(16%) |
| Ib | 12 | 6.2 | 61° | 6 (50%) | 39% | 4(33%) | 2(16%) |
| IIb | 9 | 12.2 | 52° | 4 (44%) | 42% | 4(44%) | 1(11%) |
| Group 2 | | | | | | | |
| Ia | 13 | 6.4 | 65° | 11 (84%) | 78% | 1(7%) | 1(7%) |
| Ib | 12 | 6.8 | 64° | 10 (91%) | 68% | 1(8%) | 1(8%) |
| IIb | 10 | 14.1 | 56° | 9 (90%) | 88% | 0 | 1(10%) |

*"Improvement" is defined as the percentage of gain of the preoperative active range of motion.

(3) Flexor tenodesis test, in which the wrist and metacarpophalangeal joint are maintained in full extension to assess the flexor digitorum superficialis "tenodesis" effect. Frequently in this position, the patient loses some passive extension at the level of the proximal interphalangeal joint, indicating that the flexor digitorum superficialis has to be cut during the operation;
(4) Metacarpophalangeal joint flexion test (the "Bouvier maneuver"), which is positive when full active proximal interphalangeal joint extension is obtained by avoiding metacarpophalangeal joint hyperextension (maintaining the metacarpophalangeal joint in neutral or slight flexion). This test guides the surgical treatment;
(5) Functional flexor digitorum superficialis test (two-step test for the flexor digitorum superficialis of the fifth finger). We first perform a classic superficialis test, and for the fifth finger, we repeat the test after freeing the fourth finger to diagnose a functional but nonindependent flexor digitorum superficialis of the fifth digit; and
(6) Central band or extensor tenodesis test. With the wrist and metacarpophalangeal joint in flexion, we check for full extension of the proximal interphalangeal joint by tenodesis effect. This test was proposed by Smith and Ross[4] for the boutonniere deformity to assess the incompetence of the extensor central band. Indeed, longstanding and severe flexion deformity can lead to stretching of the band. In rare cases, hypoplasia of the central band has been claimed.

At initial presentation, the camptodactyly is either supple either stiff. In the group with a stiff proximal interphalangeal joint, whether early or late onset, we instituted a splinting program. In patients less than 3 years old, we used a static splint that includes the forearm for easier fitting. In older patients, we used a dynamic splint fixed on an X-lite glove, with a dorsal support (longer than the proximal phalanx) to maintain the metacarpophalangeal joint in 65 degrees of flexion. We applied the distal fixation of the dynamic splint to the volar aspect of the distal interphalangeal joint to avoid hyperextension of this joint. The splint is initially worn a few hours during the day until the patient becomes accustomed to it; it is then worn only at night so as not to impede normal development. Patients with 90 degrees of flexion are difficult to splint and require serial castings. The splinting program has two goals. First, it serves to improve passive range of motion of the proximal interphalangeal joint (and even active motion in some cases, because of progressive shortening of the central band of the extensor mechanism, as in treatment of the boutonniere deformity). Second, it tests the compliance and motivation of the patient and family (if the patient is a child). Since a postoperative splinting program is mandatory, we consider poor compliance with preoperative splinting a strong contraindication to surgery. Indeed, poor compliance after surgery can lead to worsening of the condition, since the more useful arc of flexion of the proximal interphalangeal joint may be lost. This explains why 12 patients, despite having the severe form of camptodactyly type 1a, were not considered good candidates for surgery.

After splinting, three outcomes are possible: good total active motion, passively improved, and not improved.

In "good total active motion," the improvement in passive and active range of motion is satisfactory and considered sufficient by the patient or family. This could mean complete active extension (never achieved in our series) or an active

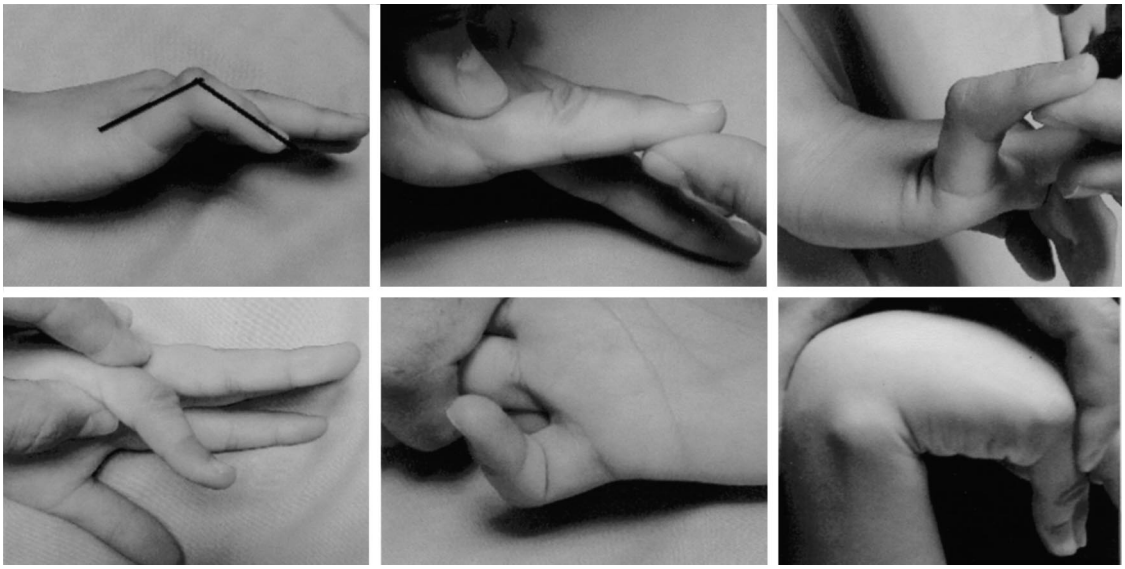

**Fig. 2.** The different clinical tests. *FDS*, flexor digitorum superficialis; *FDSV*, flexor digitorum superficialis of the fifth finger.

extension lag that does not impede good function and acceptable appearance. The end of treatment is determined by the patient's (or parents') opinion and satisfaction. Some accept 45 degrees as a decent result when they started at 80 degrees, while others complain of a 30-degree extensor lag. When the active deficit is less than 30 degrees, we try to dissuade the patient from surgery, emphasizing the length of the rehabilitation program after surgery and the risk of the condition worsening. However, special considerations are made for demanding activities, such as typing or playing an instrument. We found that 12 weeks of splinting is a good trial period before we make a decision about surgery.[5] Even if the result is considered sufficient, however, splinting should continue for at least 5 months to maintain the gain, with later intermittent splinting modified according to growth. To reduce the number of office visits, we advise the patient or relatives to draw on a paper the dorsal contour of the finger and to confirm lack of recurrence after they stop the 5 months of night splinting. During growth, the relatives regularly check the range of motion, and if there is any worsening, splinting is resumed. Twenty-four percent of the patients with type 1a camptodactyly fall into this category of purely conservative approach.

A "passively improved" outcome indicates that improvement in the passive range is more significant than that in the active range. Surgery is offered after the previously described clinical tests have been performed. The surgical technique used is identical to that used for type Ib and IIb camptodactyly (correctable), as discussed below.

When an outcome is "not improved," there is no significant improvement after the splinting program. Some patients were considered noncompliant (12 with type 1a) or too old (three patients >15 years of age with type 1a) and no surgery was offered. An operation was offered to the remaining children with limited or no improvement despite regular wearing of the splint for at least 12 weeks.

In this group, multiple nonstandardized operations were performed until 1988, when we started using a modified Malek approach,[6] which allows palmar exploration and tendon transfer at the same stage. The approach is through a proximally based volar flap (Fig. 3). The flap is lifted from the volar aspect of the middle phalanx, leaving as much fat as possible on the flexor tendons for later full-thickness skin grafting. When the proximal interphalangeal joint is reached, the dissection goes deeper to pass in front of the flexor sheath and the radial neurovascular bundle. The flap remains attached to the ulnar bundle, which is freed on its deep aspect to dissipate the tension on the pedicle. A transverse incision in the flexor sheath is performed at the proximal border of the A2 pulley to allow step-by-step liberation of the proximal interphalangeal joint flexion contracture. The first step is always a division of the flexor digitorum superficialis of the fifth finger; one or two more proximal transverse incisions through the sheath are required to deliver the flexor ten-

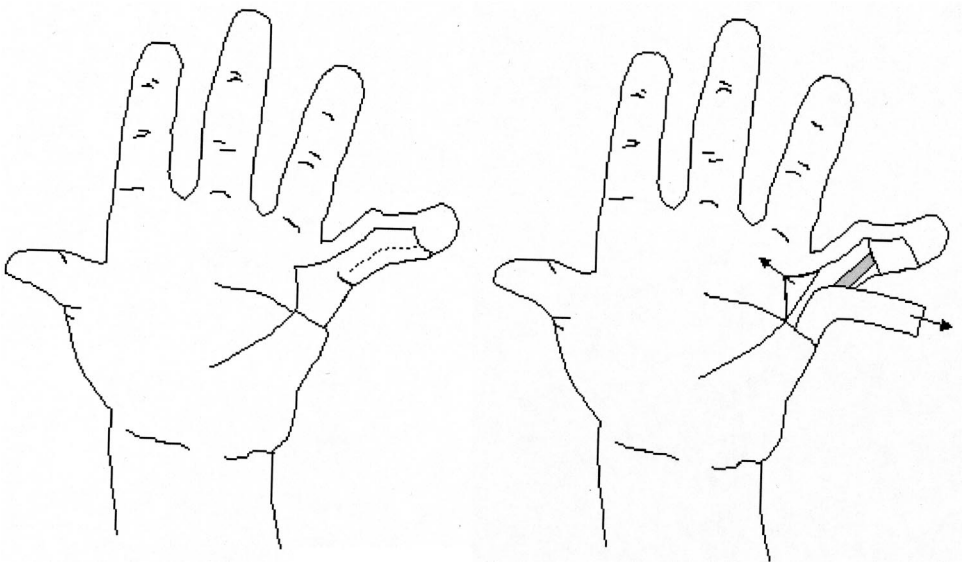

**Fig. 3.** Modified Malek approach for stiff early camptodactyly. The proximally based flap is put back after extensive liberation to obtain extension of the finger. After extension of the proximal interphalangeal joint, the flap is replaced and the denuded second phalanx where fat was maintained is covered with a full-thickness skin graft.

don proximal to the A1 pulley. The course of the tendon is checked, and the lumbrical is dissected to look for its track and distal insertion. The checkrein ligaments are divided to allow good extension, but frequently it is also necessary to perform an intra-articular release with accessory ligament resection and even proximal sectioning of the volar plate. Once proximal interphalangeal joint extension is passively obtained, a central band extensor test is performed to determine the appropriate site of insertion for the tendon transfer, as described below for correctable types. The joint is then immobilized in full extension with a Kirschner wire. In all cases, the skin flap is sutured back in place, leaving open part (if not all) of the palmar aspect of the middle phalanx. This part is grafted with a full-thickness graft harvested from the ulnar border of the hand or the inner part of the arm. The dressing includes a plaster splint that maintains the metacarpophalangeal joint in full flexion to relax the tension on the neurovascular bundles. The distal phalanges are left exposed to allow mobilization of the flexor digitorum profundus at 5 days. After removal of the Kirschner wire at 2 weeks, a dynamic extension splint is worn to allow full flexion but maintain the finger at rest in full proximal interphalangeal joint extension.

For the passively correctable group (group 2 in the algorithm, types Ia after splinting, Ib, and IIb), the surgical options are determined by the above-mentioned clinical tests. A positive metacarpophalangeal joint flexion test (2a in the algorithm) is treated using a "lasso" operation, as described by Zancolli in ulnar nerve palsy,[7] to stabilize the metacarpophalangeal joint. We favor increasing the level arm of the transfer of the flexor digitorum superficialis by passing it outside in. This means that the tendon is delivered proximal to the A1 pulley, passed superficially to the pulley, and introduced inside the pulley in a proximal direction to be sutured to itself.

A negative metacarpophalangeal joint flexion test indicates either a hypoplastic extensor or a distended central band. When the central band test shows full proximal interphalangeal joint extension (2b in the algorithm), the extensor simply needs to be reinforced with a transfer on the extensor hood at the metacarpophalangeal joint level. On the contrary, if full extension is not obtained (2c in the algorithm), a central band reconstruction is contemplated. The final decision, however, has to be made intraoperatively, as we found false-positive tests when the flexor digitorum superficialis of the fifth finger is reduced to a simple band inserted inside the sheath (two cases). In these cases, the test has to be repeated during surgery after the flexor digitorum superficialis of the fifth finger was cut. Central band reconstruction is possible by rerouting the flexor digitorum superficialis along the lumbrical pathway (anterior to the intermetacarpal ligament) and delivering it dorsally through a central lon-

gitudinal incision proximal to the proximal interphalangeal joint (four cases). It is fixed to the remnant tissue, and in no case did we find a total absence of fibers. When either type of extensor reinforcement is to be performed, a functional and independent flexor digitorum superficialis of the fifth finger is mandatory. If it is only a fibrous band (negative step 1 and step 2 flexor digitorum superficialis tests), or whenever there are unforeseen intraoperative events, the flexor digitorum superficialis of the fourth finger is used. Total independence, however (positive step 1 of the flexor digitorum superficialis test), is not mandatory. When camptodactyly of the middle or ring fingers is being treated, it is not necessary to sacrifice two flexor digitorum superficialis, and it is possible to use the fourth with two separate bands for the lasso (passing underneath the bundle) and lengthening of the flexor digitorum superficialis of the third finger in the forearm (being careful not to lengthen the flexor digitorum superficialis of the fifth finger at the same time). In this case, immobilization is performed as previously described, but a dynamic extension splint is worn all the time, including during sessions of active mobilization.

## RESULTS

We took into account the active range of motion at the level of the proximal interphalangeal joint because it has the advantage to consider any loss of flexion. We did not constantly record the distal interphalangeal joint range of motion, but in the eight cases (five in group 2 and three in group 1) where it was mentioned, a mean loss of 8 degrees was present. The apparent superior proportion in group 2 was due to the constant mention of the distal interphalangeal motion in the prospective part of the study.

In order to compare severe forms to more moderate ones, we expressed the gain in percentage of the preoperative active range of motion. As previously mentioned, type IIa (late and stiff) was not included, because it was no longer considered an indication after our review in 1994 demonstrating poor outcome.

Results are presented in Table 5 for each type of camptodactyly and each group of patients. Statistical analysis was made using Fisher's exact and chi-square tests. Fifteen fingers (45.5 percent) in group 1 and five fingers in group 2 (14.2 percent) remained unchanged or were aggravated by surgery, reaching significance ($p < 0.01$). The improvement in results was observed in the three subgroups without reaching significance, because of the small number of cases. In the improved fingers (Ia), the use of Malek's approach improved the results (84 percent versus 66 percent). Similarly, in types Ib and IIb, our treatment algorithm allowed improved surgical results (91 percent and 90 percent versus 50 percent and 44 percent, respectively).

## DISCUSSION

A number of classifications have been proposed for camptodactyly, but they fall short of being useful as a basis for surgical treatment.[8–11] The classic division between early onset and late onset needs to be subgrouped according to stiffness or good passive range of motion, as their treatment is different and some studies include them while others consider only the stiff type. Most authors concur that a flexion deformity of less than 60 degrees does not require any surgical treatment.[2]

Many anatomical structures have been incriminated as being responsible for the deformity (Table 1), which explains the variety of proposed operations, including skin plasty or graft, division of subcutaneous fibers,[9] tenotomy of the flexor digitorum superficialis and/or lumbrical,[8] tendon transfer,[8] proximal interphalangeal joint arthrolysis,[6] anterior total tenoarthrolysis,[12] and even proximal phalangeal osteotomy. All of these operations have provided limited results, from 14 percent improvement[13] to a bit more than 30 percent (33 percent for Smith and Kaplan[14] and 35 percent for Engber and Flatt.[8] Because of this insufficient outcome, and even some aggravation of the deficit, some authors prefer to rely only on splinting.[15] Hori et al.[15] reported good results in 22 of their 24 patients. In our previous review,[3,16] splinting was very effective in type Ia camptodactyly, mainly in the younger population (<2 years old), with a mean gain of 80 percent for a mean splinting time of 21 months. Similar results were found by Benson et al.[10] In the entire group of type Ia patients, the mean improvement was 40 degrees for a mean period of 19 months of splinting. For Hori,[15] splinting is to be pursued until growth ends, and indeed, among the 11 patients treated early by simple splinting and followed for more than 10 years, four dropped out of the program and experienced recurrence (m = 38 degrees of deficit).

In our prospective study (group 2), conservative treatment was also tried in all noncorrectable cases. In case of a surgical decision, the technique was based on a preoperative examination completed by perioperative assessment of the flexor

muscle course. Six tests were used (Fig. 2): (1) active proximal interphalangeal joint extension with wrist in neutral; (2) passive proximal interphalangeal joint extension with wrist in neutral and metacarpophalangeal joint flexed (dermodesis test and subcutaneous bands assessment); (3) active proximal interphalangeal joint extension with metacarpophalangeal maintained in slight flexion [metacarpophalangeal flexion test (the "Bouvier maneuver")]; (4) passive proximal interphalangeal joint extension in the wrist and metacarpophalangeal joint extension (flexor tendon superficialis tenodesis test); (5) active proximal interphalangeal joint extension with metacarpophalangeal joint and wrist in full flexion (similar to Smith test for boutonniere deformity); and (6) two-step test for flexor digitorum superficialis of the fifth finger (active proximal interphalangeal joint flexion when performing a classic superficialis test and with modified superficialis test by liberating the fourth finger).

The first test requires precise measurement of the extensor lag with a goniometer, as do the second, fourth, and fifth tests. When the lack of extension at test 1 is less than 50 degrees, there is usually no indication for surgery (except in special circumstances). When it is more than 50 degrees, we separated patients into two groups (test 2): passively correctable or passively stiff. All patients with stiffness were first treated by night splinting in extension. The surgical decision was based on the algorithm (Fig. 1).

We tested the hypothesis that such careful preoperative and perioperative examinations could improve surgical outcome. After our previous study demonstrated that 33 percent of type IIa patients were not improved and that 67 percent improved an average of 26 degrees,[5] we stopped considering them as possible indicators, which explains why they are not included in the present study.

Our hypothesis was confirmed statistically with regard to the number of digits unchanged or aggravated by surgery in groups 1 and 2, although the improvement was no longer significant when subgroups were compared. Indeed, even if the Malek approach[6] seemed to improve the results, the small number of patients did not allow this to reach significance. However, this approach in type Ia, which resisted a well-followed splinting program, has solved the problem of the shortened skin and has provided an ample view for the release of all structures limiting the extension. With some modifications of the original technique, with more proximal (and unilateral) extension of the incision, it has been possible to reinforce the extensor mechanism in case of longstanding "attrition" of the medial band or exceptional (in our experience) hypoplasia of the band.

It is difficult to know the precise role of the frequently noted abnormal lumbrical muscle. A recent article provides an in-depth study of the fourth lumbrical based on 14 fresh cadavers.[17] The fourth lumbrical was the most variable. Proximally, 57 percent inserted on both the fourth and fifth flexor digitorum profundus, 14 percent inserted on the ulnar side of the fifth flexor digitorum profundus. Distally, half of them inserted into bone, 12.5 percent on transverse fibers of the extensor, 31 percent on the oblique fibers, 62.5 percent on the volar plate, and 93.8 percent on the lateral band. The authors concluded that these findings could explain camptodactyly, but on the contrary, it will be more appropriate to consider these variations as irrelevant, because none of the dissected cadavers were known to have camptodactyly. However, they did not observe any distal lumbrical insertion on the flexor digitorum superficialis. We observed such variation in surgical cases, with the bulk of the lumbrical impeding the normal gliding into the A1 pulley (14 fingers). We have coined the term of "lumbrical obstructing syndrome" just to stress its possible role in type IIa of quite pure imbalance.[16]

Our study presents many flaws in addition to the small group size. It is not randomized, and it compares a prospective series of patients with a retrospective review for the control group. Because all the patients were operated on by the senior surgeon, some improvement could be due to the quite prolonged period of study. Even more of a concern, this protocol evolved during the study, and even in the first group of patients, the metacarpophalangeal joint flexion test and the superficialis tenodesis test were regularly used. However, the absence of a test of the independence and course of the flexor digitorum superficialis, as well as the state of the extensor central band, made the transfer more unpredictable.

We propose a treatment algorithm for the different types of camptodactyly based on careful clinical assessment and taking into account the different structures that might impede active extension of the proximal interphalangeal joint. This algorithm has improved our surgical outcomes.

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