

Chronic Boutonniere Deformities, Supple, or Stiff: A New Surgical Technique With Early Mobilization in 11 Cases

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Abstract: Injuries to the central slip of the extensor mechanism can lead to a Boutonniere deformity with important functional consequences. We report a series of 11 patients treated by lengthening-dorsalizing the lateral bands and tightening the central slip with early mobilization. The average age of the patients was 42 years (14;52). The extension defect of the proximal interphalangeal (PIP) joint was 64 degrees (80;55) and the hyperextension of the distal interphalangeal joint was 10 degrees (15;5). The surgery was performed with peripheral nerve block (sensitive), allowing dynamic adjustment of the tendinous sutures. With a dorsal incision, a tenolysis of the extensor was performed. The central slip was tightened and the lateral bands dorsalized by cross-stitches over the PIP joint. The active flexion/extension was tested, and then lengthening of the lateral bands by “mesh graft” tenotomy was performed over the second phalange. There was no immobilization. The deformity was improved in 10 patients with a total flexion of the finger. The mean lack of extension in the PIP was 8 degrees (0;20) and the active flexion of the distal interphalangeal joint was 80 degrees (70;85). There was 1 failure. The majority of techniques necessitate an immobilization of 3 to 6 weeks. Our procedure uses the elastic properties of the elongation and allows immediate mobilization. The result can be compromised in case of insufficient tendinous surface or if postoperative instructions are not followed.

Key Words: tendon injuries, central slip injury, Boutonniere deformity, extension lack

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Boutonniere deformities arise after an injury to the central slip of the extensor mechanism. The alteration of the triangular ligament leads to a palmar displacement of the lateral bands with an extension defect of the proximal interphalangeal joint (PIP) and irreducible hyperextension of the distal interphalangeal joint (DIP),¹ with significant functional and esthetic consequences for patients.

Numerous surgical techniques have been proposed for the treatment of Boutonniere deformity. Dolphin² and Littler and Eaton³ described a tenotomy of the lateral bands above the DIP to correct hyperextension of the latter. Salvi⁴ described effecting pulleys to dorsalize the lateral bands at the back of the PIP. Matev⁵ proposed the transfer of a lateral band on the central slip. Other reconstruction techniques for the central slip have been performed, notably by tendon graft.⁶

We propose a technique without interruption of the extensor mechanism that permits immediate mobilization.

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FIGURE 1. Preoperative deformity. full color online

INDICATION/CONTRAINDICATION

Various surgical procedures have been described, but these are most often complex and require immobilization by splint or pin for 2 to 6 weeks because of tenotomy of the extensor mechanism.^{7,8} The authors classically contra-indicate their techniques in the case of joint stiffness.^{9,10}

Tightening the central slip and dorsalization of the lateral bands of the extensor mechanism with early mobilization is advisable for stiff and flexible boutonniere without osteoarthritis, after conservative treatment failure (Figs. 1, 2). Surgical treatment was performed after 3 to 6 months of retraining with a dynamic splint to prevent stiffness of the finger. X-ray, ultrasound, and magnetic resonance imaging of the finger were conducted on all patients by the family doctor.

THE TECHNIQUE

The intervention was carried out as outpatient surgery under pneumatic tourniquet and mild, pure sensory distal nerve block, which allowed dynamic control of the tendon sutures.



FIGURE 2. Boutonniere deformity after conservative treatment failure. DIP indicates distal interphalangeal; PIP, proximal interphalangeal joint. full color online



FIGURE 3. Release of the extensor mechanism over the proximal interphalangeal joint. [full color online](#)

A dorsal curvilinear incision extending from the metacarpophalangeal joint to the DIP was performed to expose the extensor mechanism. The first tenoarthrolysis of the PIP was performed, conserving the scar from elongation of the central slip (Figs. 3, 4). Arthrotomy was performed with a lateral approach passing under the lateral band, which allowed the extensor mechanism to be lifted.

A complementary palmar arthrolysis of the PIP was performed through the same dorsal incision in case of passively irreducible deformities. A spatula introduced through the dorsal face of the PIP allowed palmar adhesions to be freed, by slipping under the head of P1 or the base of P2. The central slip was then tightened with 3 to 4 PDS 2-0 cross-stitches to the back of the PIP, which also allowed the lateral bands to be dorsalized. The active extension of the PIP was controlled with mild distal nerve block and the central slip was tightened if needed by additional cross-stiches, until the maximal active extension was obtained. An elongation of the lateral bands by mesh-graft, as performed for the expansion of a thin skin graft, was performed with a scalpel by staged punctiform tenotomy to the back of the intermediate phalanx (Fig. 5), followed by passive hyperflexion of the DIP (Fig. 6). There was no immobilization by pin or splint.

The final postoperative result was shown to the patient before bandaging (Figs. 7, 8), and the amplitudes obtained and the principles of retraining were explained. Wearing of loads and sports were contraindicated for 2 months. Physiotherapy with full active motion and no passive motion was begun

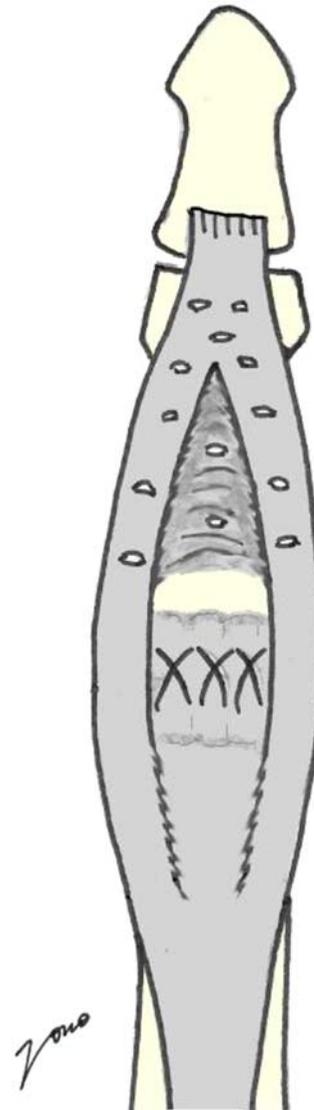


FIGURE 5. Cross-stitches over the proximal interphalangeal joint and “meshgraft”/punctiform tenotomy over the second phalanx. Courtesy of Goubier J.N. [full color online](#)

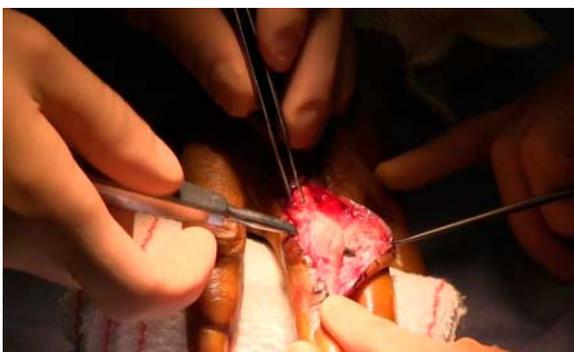


FIGURE 4. Tenoarthrolysis of the proximal interphalangeal joint. [full color online](#)



FIGURE 6. Hyperflexion of the distal interphalangeal joint to break up adhesions and to allow distal interphalangeal active flexion. [full color online](#)



FIGURE 7. Dynamic extension testing. full color online

immediately after the intervention. After 1 week, bandages were permanently removed to facilitate icing and mobilization.

OUTCOMES

A total of 11 patients presenting a chronic Boutonniere deformity of the long fingers treated by elongation-dorsalization of the lateral bands and tightening of the central slip between 2005 and 2013 were retrospectively evaluated.

There were 7 women and 4 men; their average age was 42 years (range, 14 to 52 years). The etiology was a closed rupture of the central slip in 8 cases and a section of the central slip in 3 cases. The deformity affected 5 long fingers, 5 ring fingers, and 1 small finger. The principal complaint was incomplete curling of the fingers. The average defect in active extension of the PIP was 64 degrees (range, 80 to 55) and the average hyperextension of the DIP was 10 degrees (range, 15 to 5). According to the classification of Boutonniere deformities,¹¹ there were 7 stage 1 deformities, 3 stage 2 deformities, and 1 stage 3; that is, 4 stiff deformities that were passively irreducible. The average pulp-to-palm distance was 2 cm and there was no osteoarthritis (Table 1).

After surgery, a clinical examination was performed, which included measuring the joint amplitudes of the PIP and DIP with the help of a goniometer and measuring the pulp-to-palm distance.

The average follow-up was 13 months (range, 10 to 15). Ten patients recovered a near-complete curling of the finger

TABLE 2. Results

Patient	PIP Extension Defect (deg.)	DIP Active Flexion (deg.)	Quick Dash (0-100)
1	55	-5	27
2	10	80	0
3	0	75	0
4	15	80	4.5
5	5	85	13.6
6	5	78	0
7	3	83	9
8	10	78	0
9	7	75	6.8
10	20	80	13.6
11	7	83	2.27

DASH indicates disabilities of arm, shoulder, hand score; DIP, distal interphalangeal joint; F, female; M, male; PIP, proximal interphalangeal joint.

with a pulp-to-palm distance <0.5 cm. The average active flexion of the DIP was 80 degrees (range, 70 to 85). For the PIP, the residual active extension defect was 8 degrees (range, 0 to 20) (Table 2).

Our technique is an effective and simplified treatment of Boutonniere deformity. Its advantages are the preservation of the continuity of the extensor mechanism (scar of elongation), the perfect dynamic perioperative adjustment of the sutures under mild local distal nerve block that it is quick to perform, the absence of removal or transfer of healthy adjacent tissues, and the immediate mobilization of the fingers with active participation of patients in their treatment.

COMPLICATION

The benefit expected can be compromised in the case of insufficient tendon surface and/or not following guidelines. We have observed a broken suture at postoperative day 18 with relapse of the Boutonniere deformity for a 5th finger of a 14-year-old patient, after an excessive sporting effort although this was contraindicated in the postoperative instructions. This represents one of the limits of this technique.

TABLE 1. Patients' Characteristics

Patient	Age (y)	Sex	Classification of the Deformity	Mechanism	Finger	PIP Extension Defect (deg.)	Hyperextension DIP (deg.)
1	14	F	1	Closed rupture	5th	55	5
2	48	F	1	Closed rupture	3rd	58	12
3	37	F	1	Closed rupture	3rd	68	10
4	39	F	2	Closed rupture	4th	55	5
5	46	M	1	Section	3rd	63	10
6	38	F	2	Closed rupture	4th	77	10
7	45	M	1	Section	3rd	58	7
8	42	M	2	Section	3rd	73	12
9	48	F	3	Closed rupture	4th	80	15
10	52	M	1	Closed rupture	4th	58	15
11	51	F	1	Closed rupture	4th	63	5

DIP indicates distal interphalangeal joint; F, female; M, male; PIP, proximal interphalangeal joint.



FIGURE 8. Active flexion testing. 

LIMITATION OF STUDY

However, our study presents a few limitations. First, it is a retrospective study. Another limitation is that the preoperative evaluation was performed on passive and active motions of the PIP and the DIP joints, and there was no presurgical disabilities of arm, shoulder, hand score to compare.

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