

Comparison between Collagenase Injection and Partial Fasciectomy in the Treatment of Dupuytren's Contracture

Terence Tay Khai Wei, Huey Tien*, Elizabeth Lim Yenn Lynn[†]

*Department of Orthopaedics, University of Malaya, Malaysia, *C.M. Kleinert Institute for Hand and Microsurgery, Louisville, KY, USA, [†]Department of Otolaryngology, University of Malaya, Malaysia*

Background: A comparative study between two treatment methods (collagenase injection and open partial fasciectomy) for Dupuytren's contracture. This study will determine differences in clinical outcome, complication rate and patient satisfaction.

Methods: 37 patients with 62 metacarpophalangeal joints (MCP) and 44 proximal interphalangeal joints (PIP) treated. There were 21 MCP joints (34%) and 8 PIP joints (18%) treated with injection. The remaining 66% of MCP joints and 82% of PIP joints were treated by open partial fasciectomy.

Results: Overall, both treatment methods were successful in correcting the passive extension deficit in the MCP and PIP joints. Minor complications were reported in 45% of patients in the injection group versus 42% in the surgery group. Patient satisfaction was nearly equal for both groups.

Conclusions: Both treatment options have proven their effectiveness in treating Dupuytren's contracture. Open surgery is able to address additional joint contracture problems commonly associated with Dupuytren's disease. Collagenase injection has the advantage of early return of hand function and avoidance of surgical complications.

Keywords: Dupuytren's disease, Joint contracture, Open partial fasciectomy, Collagenase

INTRODUCTION

Dupuytren's contracture is a debilitating disease that typically presents with a firm palpable nodule on the palmar surface of the hand and digits. Treatment options for Dupuytren's contracture may vary from non-surgical interventions like needle aponeurotomy, steroid injection, and collagenase injection to surgical options such as partial fasciectomy, dermofasciectomy and radical fasciectomy.¹⁾ There is substantial literature describing the outcomes of Dupuytren's contracture, however, there

is little evidence determining the best treatment for this disease. Open surgery has been the standard of care for patients with this condition for many years. It has been advocated from the mildest form to the most severe cases of palmar and digital contractures. However, recent studies have associated surgical intervention with many complications, necessitating further exploration of non-surgical treatment options.²⁻⁴⁾ The most effective non-surgical treatment, which has recently been approved by Food and Drug Administration (FDA), is injectable collagenase clostridium histolyticum (XIAFLEX; Auxilium Pharmaceuticals, Inc., Malvern, PA).⁴⁾ Given the variety of treatment options available today, a comparison is needed to determine the most effective treatment for Dupuytren's contracture. The aim of this study is to compare the outcomes and complications associated with collagenase injection and open partial fasciectomy.

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Correspondence to: Terence Tay Khai Wei

Department of Orthopaedic Surgery, Faculty of Medicine, University of Malaya, 50603, Kuala Lumpur, Malaysia

Tel: +(6012) 4388687, Fax: +(603) 79494642

E-mail: terencetkw99@yahoo.com

METHODS

Study Design

This study was designed in accordance with the University of Louisville Institutional Review Board (IRB). A retrospective review of prospectively collected data was performed in 37 patients with Dupuytren's contracture treated either by collagenase injection or open partial fasciectomy. Between August 2002 and January 2005, all patients with Dupuytren's disease who visited the outpatient clinics of the principal investigator in our hand and microsurgery unit were considered for this study. Inclusion criteria consisted of a flexion contracture in the MCP or PIP joints and a clearly palpable pathologic cord in the hand or finger. Patients unfit to have surgery, did not show symptoms of Dupuytren's contracture, and those not willing to participate were excluded from this study. Degree of passive extension deficit, patient satisfaction and occurrence of complications were recorded. A two-tailed, unpaired t-test was used to compare outcomes between patient groups.

Collagenase Injection

Before the collagenase injection, the skin was prepped with antiseptic solution. Local anesthesia consisting of Lidocaine and Marcaine was given around the skin at the intended area of interest. The Xiaflex vial was then loaded into a 5 ml syringe with a needle (28-gauge) and inserted to a depth of 5 mm for MCP joint lesions and 3 mm for PIP joint lesions. The structure of the cord was palpated with the end of the needle. A gentle amount of passive motion ensures the needle is not in the flexor tendon before the injection of collagenase into the MCP or PIP lesion. The injections were subsequently administered from a proximally-to-distally fashion. A treatment regime consisted of one 0.58-mg per injection (0.9% sodium chloride/ 2 mmol/L calcium chloride) in 0.25 mL diluent for MCP joints and 0.20 mL diluent for PIP joints. After the injection, a dressing was placed on the hand. The patient was then instructed to return to the office the next day for finger extension manipulation, during which the finger was passively extended to break the cord. This again was done with local anesthesia. After the manipulation, early mobilization was encouraged. All the patients were instructed to wear night time splint after the procedure. The patient then returns for followed up after a one month period.

Open Partial Fasciectomy (PF)

Through a Brunner incision, from the overlying of

the distal palmar crease, the fascia presenting with the pathological cord was excised in a proximal-to-distal direction. A digital skin incision was made on the opposite hand using a Brunner incision from the ulnar aspect of the metacarpophalangeal joint crease to the radial aspect of the proximal interphalangeal joint. The skin flaps were raised carefully from the pathological fascia to avoid skin necrosis. The neurovascular structures in the palm, which lie close to the involved fascia at this level, were identified and retracted cautiously. Occasionally, digital neurovascular bundles may be displaced towards the midline in PIP joint contractures, hence careful dissection was required to identify them in such cases before the diseased fascia were excised. The fascia needed to be excised only if it could be visualized and the neurovascular bundles were protected. If necessary, postoperative residual contracture of the PIP joint was examined and addressed with release of the collateral ligaments and checkrein ligaments followed by release of the volar plate.

RESULTS

There were 37 patients with 62 metacarpophalangeal joints (MCP) and 44 proximal interphalangeal joints (PIP) treated by a single surgeon (HT). The average age was 65 years (range, 46-84 y) for the collagenase injection group and 66 years (range, 58-77 y) for the open surgery group. Males accounted for 76% (28) of the subject population. Table 1 shows the measurements obtained at final follow-up for all patients treated. The minimum follow-up was 2 years.

Collagenase injection

For the collagenase group, the pre procedure contracture at the MP joints averaged 38.9°, and 59.4° at

Table 1. Demographic and Pre-treatment Passive Extension Deficit

	Collagenase	Partial Fasciectomy	<i>p</i> value
Age, y (mean ± SD)	65.1 ± 10.4	66.2 ± 7.1	0.56
Gender, n			
Male	13	15	0.26
Female	5	4	0.57
Degree of extension deficit, n (mean ± SD)			
MCP	21 (38.9 ± 16.8)	41 (44.8 ± 19.0)	0.04*
PIP	8 (59.4 ± 17.6)	36 (50.7 ± 17.1)	0.37*

*student t-test.

MCP: Metacarpophalangeal joint, PIP: Proximal interphalangeal joint.

Table 2. Passive Extension Deficit after Treatment at Final Follow-up

n (mean ± SD)	Collagenase	Partial Fasciectomy	p value
MCP	21 (6.5 ± 11.8)	41 (3.9 ± 10.1)	0.02*
PIP	8 (40.6 ± 9.8)	36 (6.5 ± 11.7)	0.0001*

*student t-test.

MCP: Metacarpophalangeal joint, PIP: Proximal interphalangeal joint.

the PIP joints (range, 30° to 80°; SD 17.6). Among the 18 subjects in the injection group, 3 patients underwent repeated injection on the same joint and 5 patients had injections in more than one joint or finger. There was statically significant ($p = 0.0001$) correction of MCP joint contractures from an average of 38.9° before treatment (range, 7° to 70°; SD 16.8) to an average of 6.5° at final follow up (range, 0° to 40°; SD 11.8). MCP joint contractures were corrected at an average of 83% at final follow up. For PIP joints, statistically substantial ($p = 0.02$) correction was also observed. Collagenase injection reduced the contracture from 59.4° pre procedure (range, 30° to 80°; SD=17.6) to 40.6° at follow up (range, 30° to 55°; SD=9.8). PIP joint contractures were corrected and maintained at an average of 32% at final follow-up.

Open Partial Fasciectomy

All patients in the surgical treatment group had Dupuytren's contracture in more than one joint or involvement of more than one finger. Three patients had an additional PIP joint release, which involved releasing the accessory collateral ligament, checkrein ligaments and volar plate.

Before surgery, the mean passive extension deficit in the PF group was 44.8° at the MCP joint. The average contractures at the PIP joints measured 50.7°. After surgery, the mean extension deficit for the MCP joint was 3.9°, a reduction of 91% compared to before surgery ($p = 0.0001$). There was no extension deficit left in 34 of the 41 MCP joints treated. For the PIP joint, the pre procedure contracture averaged at 50.7° (range, 15° to 90°; SD=17.1), and was reduced to 6.5° (range, 0° to 45°; SD=11.7) at final follow up ($p < 0.001$). An average of 87% of correction was seen in the PIP joints and 25 of the 36 joints had no extension deficit left.

Collagenase injection versus partial fasciectomy

In both treatment groups, the preoperative passive extension deficit did not differ significantly in the PIP joint ($p = 0.37$). However, the passive extension deficit

Table 3. Complications after the Treatment

Complication, n	Collagenase	Partial Fasciectomy
Pain	9	0
Swelling	6	0
Hematoma	6	1
Skin tear	5	1
Paraesthesia	0	6
Scar tenderness	0	2
Infection	0	0
Tendon injury	0	0
Total	26	10

was significantly greater in the MCP joint for the partial fasciectomy as compared to the injection group.

Partial fasciectomy resulted in a significantly greater reduction of the flexion contractures compared with collagenase injection at final follow up for both the MCP ($p = 0.02$) and PIP joint ($p = 0.0001$) as depicted in Table 2.

Complication

In the injection group, we noted 26 complications which were consisted of 9 cases of post injection pain, 4 cases of swelling, 6 cases of hematoma and 5 cases of skin tear. No major complications occurred.

In the surgery group, 10 minor complications were encountered. Six patients complained of finger paraesthesia after surgery, 2 patients with scar tenderness, 1 hematoma and 1 skin tear. No infection or tendon injury was noted in both groups. All the complications resolved without any further treatment (Table 3).

Satisfaction

Patient satisfaction for the injection group was measured at 77%. In one instance, a patient was dissatisfied after the first injection, but was pleased with the subsequent injection. Two patients showed dissatisfaction because they felt no improvement in the correction of contracture while another patient was not satisfied due to intolerable pain and swelling after the procedure.

Most patients who underwent partial fasciectomy were comfortable with their treatment. Only 2 out of 19 patients were dissatisfied with the surgery and would not choose the same treatment again in the future. Both of the dissatisfied patients had hematoma and skin breakdown after the surgery, however, they were self-limiting.

DISCUSSION

Both collagenase injection and open partial fasci-

ectomy have proven to be effective options for treating Dupuytren's contracture. The results of our study have shown that both the MCP and PIP joint contractures can be successfully treated with either injection or open surgery. Open fasciectomy has greater reduction of the flexion contractures for both the MCP and PIP joints compared with collagenase injection at final follow up. However, the amount of correction is not the only determinant for successful treatment. The majority of patients were satisfied with their outcome regardless of treatment employed, and residual deficit did not interfere with hand function.

In this study, we evaluated the efficacy and tolerability of collagenase injection and examined the complication of its usage. Collagenase injection effectively restored normal finger extension in the majority of patients with an average of 83% passive extension correction in the MCP joint and 32% in the PIP joint. Collagenase Option for Reduction of Dupuytren (CORD I and II) studies have also reported similar clinical success in the treatment of 65% to 77% of MCP joint contractures and 28% to 40% of PIP joint contractures.⁵⁾ Patient satisfaction is likewise high with 77% stating that they would pursue further injection for treatment of recurrent or progressive disease.

Collagenase injection is much more effective in the involved MCP joint than the PIP joint as depicted in the results of our study. This is because manipulation after injection will rupture the pathological cord but not the periarticular adhesion that is occasionally encountered in the PIP joint. It must be emphasized that the manipulation required is a gentle and passive stretching. It should not, under any circumstances, be implemented in such a manner as to rupture the joint adhesion and volar plate. Such force would only lead to bleeding, further scar formation and contracture.

The most common complications for the collagenase injection group were swelling, injection site ecchymosis, pain/tenderness and skin breakage. Most of these side effects were self-limited and resolved within 3 weeks of injection. Thus, collagenase injection offers a simple, safe and efficacious treatment method which can be easily performed under local anesthetic in the office setting. The complication rate of this procedure is minimal and it is particularly useful in patients who may be unsuitable for local radical fasciectomy. Collagenase injection also offers the potential advantages of early return of hand function and avoidance of any surgical complications.⁶⁾

Based on the results, it is evident that open surgery marked improvement in the degree of correction in both

the MCP and PIP joints. A reduction of 91% of extension deficit was seen in the MCP joint after surgery. Similar results were observed in the PIP joint, which showed an average of 87% correction at final follow up. All subjects that underwent open surgery in our study had multiple joints or fingers involved suggesting that this treatment method is more appealing in more complex and advanced forms of Dupuytren's disease.

Open surgery for Dupuytren's contracture also has an added advantage of being able to address the potential joint contracture, especially in the PIP joints. With better understanding of anatomy, various efforts have been made to facilitate the release of contracted structures around the PIP joint. Watson et al.⁷⁾ reviewed 115 cases with fixed PIP joint contractures, of which 52 were affected by Dupuytren disease, and accomplished full intraoperative extension by release of the checkrein ligaments alone in nearly all cases. They concluded that the checkrein ligaments are the critical factors in restricting PIP joint, and could be an associative factor in dealing with early stages of Dupuytren disease.

Complications associated with surgical treatment for Dupuytren's contracture cannot be avoided especially when the severity of contracture is high.⁸⁾ The most common complications reported in our study are paraesthesia (60%), scar tenderness (20%), skin breakdown (10%), and hematoma (10%). Complications such as infection or injury to tendon/vessel were not observed in our study, although they have been reported in other literature.⁸⁻¹⁰⁾ Boyer and Gelberman⁸⁾ noted that surgical complications may include injury to the tendon, injury to nerve loss of flexion or grip strength, injury to artery, complex regional pain syndrome, skin necrosis, and complications related to wound healing. Complication rates after reoperation are even greater.^{9,10)}

The average cost of collagenase injection was USD \$1,523.21 and that of an open partial fasciectomy was USD \$2,532.57. The collagenase group had an average of 2 physician follow-up appointments and 1 physiotherapy appointment. On the other hand, every fasciectomy patient had at least 3 physician and 2 physiotherapist follow-up appointments routinely. This concludes that collagenase treatment for Dupuytren's contracture of a single digit is about USD \$1,000 less than treatment for the same condition using open surgical fasciectomy.

This study, like most, has several shortcomings which need to be considered when evaluating the information and conclusions drawn. The sample size for this study was underwhelming and reflected only a small proportion of patients undergoing surgery and colla-

nase injection for Dupuytren's disease. However, the information gathered from this research is still influential for patients and physicians deciding on treatment options for Dupuytren's contracture. Apart from that, our current study has short term follow up and any recurrence after final follow up was not taken into account. Hence, a long-term follow up study would be able to address this problem, especially regarding the chance of recurrence.

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