The Use of Skeletal Traction to Correct the Flexed PIP Joint in Dupuytren's Disease :

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THE USE OF SKELETAL TRACTION TO CORRECT THE FLEXED PIP JOINT IN DUPUYTREN'S DISEASE

A pilot study to assess the use of the *Pipster*

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The flexed PIP joint presents a particular problem in the treatment of advanced Dupuytren's disease. Following reports of the use of skeletal traction in the treatment of this condition, a simple device, the "*Pipster*" was developed to extend the PIP joint by skeletal traction before surgery. In seven fingers in five patients with severe contractures, there was a pre-operative improvement of at least 45° in the flexion angle (measured as maximum achievable passive extension). The technique was effective in primary and recurrent disease. Subsequent surgery was facilitated and amputation avoided in five fingers. The optimum distraction technique was identified. The study continues with more patients.

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Although there have been several attempts to use mechanical devices to straighten fingers flexed due to Dupuytren's disease without surgery, it is the recent reports from Messina and Messina (1991: 1993) that have demonstrated most clearly the possibilities offered by the use of skeletal traction. Illustrations in recent reports of the apparatus used in this particular technique suggested that it was rather cumbersome and unlikely to be readily accepted by the average patient in the North East of England. This was confirmed subsequently for me by those who have used this equipment themselves. In addition, it was felt that the particular problem in the flexed Dupuytren's finger is the PIP joint rather than the MP joint, the latter being more amenable to simple fasciotomy and splintage as a primary procedure, in a severe case.

Any device to be used on the PIP joint alone could be confined to the affected finger but must be small enough to be of use on central fingers. Such a device might be more acceptable to the patient. Commercially available skeletal traction devices appeared too large to find widespread use. A device was designed—the PIPSTER (Proximal Interphalangeal Skeletal Traction ExtendeR)—and two were manufactured by an engineer.

It was decided that some assessment of the usefulness or otherwise of this device and some guidelines for its best use should be developed before a large study was embarked upon. In addition, although Messina and Messina (1993) have stated that joint contractures recur rapidly after the cessation of traction, it is not clear whether this might be prevented by static splintage and it was questioned whether PIP joint skeletal traction in these fingers should *automatically* be followed by operation. There was also doubt about the usefulness of this technique in the heavily scarred finger with recurrent disease and it was hoped that a small-scale trial, with the only two devices available, would identify a suitable population for study.

DEVELOPMENT OF METHOD

The *Pipster* (patent applied for) is a very simple device in which two fixation points are separated as a nut is turned. Skeletal fixation is achieved with two 0.065 inch or 0.045 inch K-wires inserted percutaneously under ring-block anaesthesia, one transversely across the base of the proximal phalanx and the other across the head of the middle phalanx. A silicone gel spacer separates the device from the skin of the finger. Although designed to work in pairs on either side of an affected finger (Fig 1) an assessment was made of the use of a single *Pipster* on one side only.

Five patients with seven affected fingers agreed to undergo skeletal traction prior to operation. Their details are given in Table 1. In three of these patients with severe recurrent disease it was felt that amputation of at least one finger was the most likely eventual outcome of surgical treatment alone. It should be stressed that this group was not selected to be representative of the population of patients with Dupuytren's disease and they are considered to represent the more severe end of the spectrum of disease.

Patients 1, 2 and 5 had a pair of *Pipster*s on their single affected finger. In Patients 3 and 4 with two-finger disease, a single *Pipster* was fixed to one side only of each affected finger.

All patients were treated as out-patients. Traction continued over a period of 10 days to 4 weeks until no further improvement in joint angle was achieved on further activation of the device. Initially this was under close supervision in the hand clinic but the last two patients were given a spanner and told to turn the extending nut each night and morning until the finger just began to feel tight or uncomfortable.

For all patients the angle of flexion (maximum achievable passive extension) was measured by the author before treatment was begun and at each subsequent visit, immediately before activation of the traction device and immediately afterwards. Problems encountered by each patient and a record of discomfort were recorded by the author.

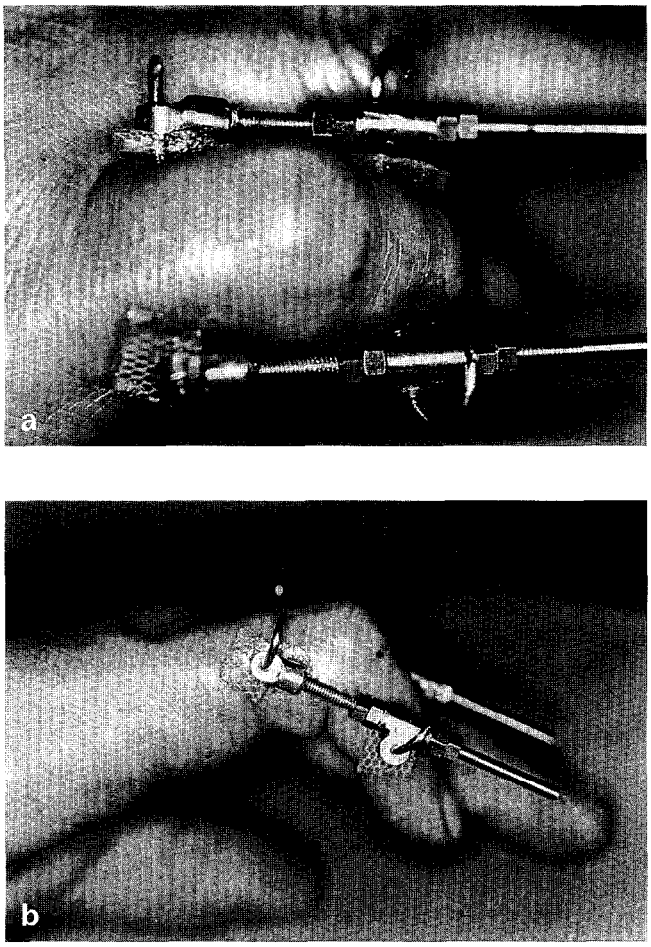

Fig 1 (a and b) Patient 1 showing the flexed finger and paired *Pipsters* immediately after application and first activation.

Table 1—Details of patients in pilot study

Patient	*Age*	*Finger treated*	*Dominant hand Y/N*	*Minimum PIP flexion*	*Recurrence Y/N*
1	67	R little	Y	85°	N
2	48	R index	N	55°	N
3	52	L ring	N	60°	Y
		L little	N	90°	Y
4	67	L ring	N	90°	Y
		L little	N	90°	Y
5	68	L little	N	110°	Y

All patients received 10 days of oral flucloxacillin as routine for patients with exposed K-wires, according to the antibiotic policy of the Newcastle Plastic Surgery Unit.

At the end of the period of traction the K-wires were removed, and in three patients a custom-made thermoplastic splint was used in an attempt to hold the position of the finger before operation, which was performed on the next available list. The longest wait for surgery was 10 days (patient 1).

At operation two patients underwent fasciectomy and two underwent limited segmental fasciectomies. One refused surgery because he decided that his finger was now "straight enough". Further details of surgical treatment and early follow-up are given in Figures 2 to 6.

RESULTS OF SKELETAL TRACTION

The progress of PIP joint extension is as plotted in Figures 2 to 6. The flexion contracture was significantly improved in all patients (Table 2). In Patients 1, 2 and 3, who were seen and assessed more frequently, it appeared that initially the flexed finger "gave" or relaxed in the days between episodes of operation of the traction device, i.e the angle of PIP joint flexion measured prior to the finger extender being activated was greater than that measured immediately after the previous activation of the extender 2 or 3 days before (Figs 2, 3 and 4).

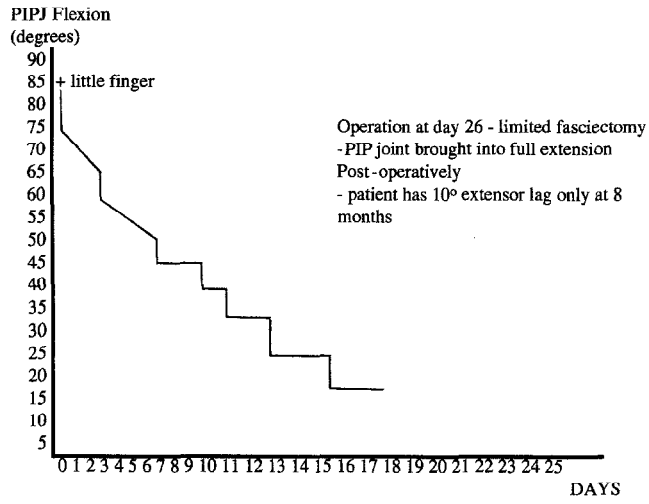

Fig 2 Progress of extension treatment for Patient 1.

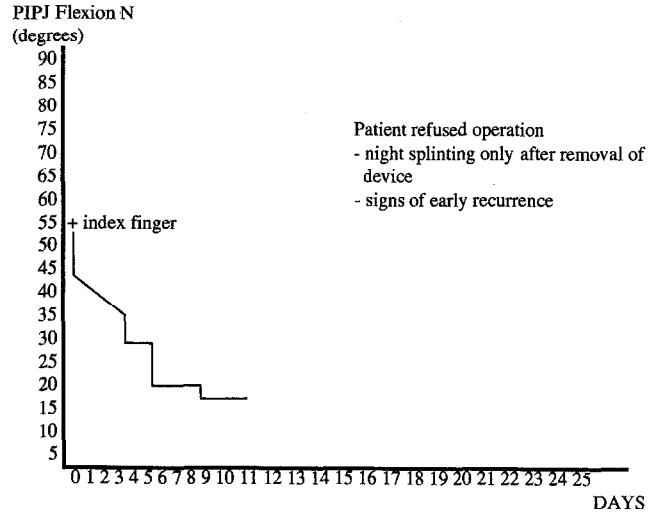

Fig 3 Progress of extension treatment for Patient 2.

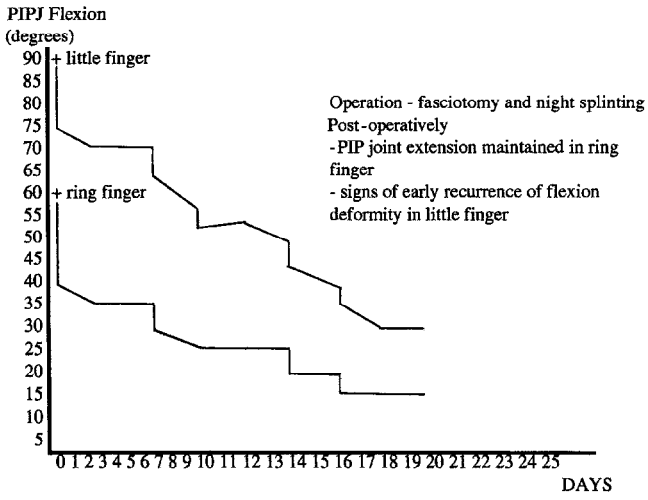

Fig 4 Progress of extension treatment for Patient 3.

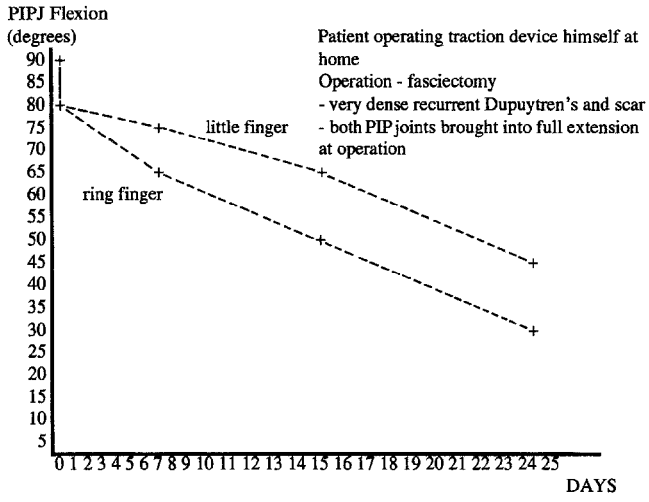

Fig 5 Progress of extension treatment for Patient 4.

All patients managed to carry on their normal activities with minimal inconvenience. Discomfort was experienced after activation of the traction device but was controlled with simple oral analgesia.

There were two minor complications: a minor skin ulcer in the web, healing with some overgranulation in Patient 2 who dug his garden while his finger was being extended; and self removal of the K-wires from one finger by Patient 5 when treatment was nearly complete.

DISCUSSION

This pilot study was performed to identify the questions that should be addressed in a larger study and to confirm that manufacture of the *Pipster* would be worthwhile. Although this device appeared to be effective, no firm conclusions can be drawn because of the small numbers involved, and these results are not suitable for statistical analysis. However, it has confirmed that this particular technique is acceptable to the patient and suitable for use in an outpatient population.

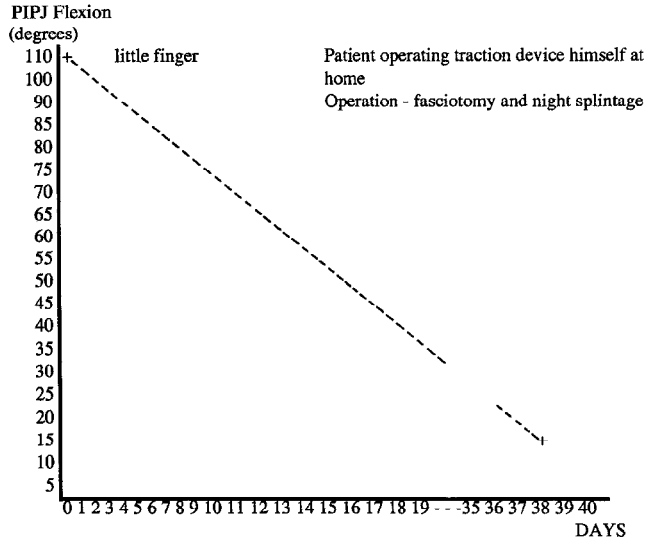

Fig 6 Progress of extension treatment for Patient 5.

Table 2—Details of PIP joint extension achieved by Pipster before operation

Patient and finger		*PIP joint flexion deformity (degrees)*	
		Pre-treatment	*Post-treatment (before surgery)*
1	R little	85	18
2	R index	55	18
3	L ring	60	22
3	L little	90	35
4	L ring	90	50
4	L little	90	45
5	L little	110	15

The flexion contractures of the treated fingers of all patients were improved by this technique and some indications were given to identify the directions of our future study. It has not yet been possible to ascertain whether the additional correction of the flexed PIP joint obtained by skeletal extension and surgery will be maintained long-term. This will clearly be influenced by the tendency of Dupuytren's disease to recur, especially in this group of patients with severe disease. However, improvement in the flexion of the PIP joint to the degree seen in this study not only simplifies the technical performance of subsequent surgery because of the change in "shape" of the finger but may also produce benefits in regard to the availability and condition of the surrounding tissues.

The relaxation phenomenon noticed in three patients warrants further study. It suggests a reduction in tension within the finger following prolonged application of an extending force, allowing the PIP joint to extend

"passively" over several days to the limits of the inherent play within the skeletal traction system.

Skeletal extension was effective in recurrent disease in the presence of surgical scarring although it seemed to take longer and was more uncomfortable.

The *Pipster* is less effective when used singly than as a pair; extension took longer and was more uncomfortable. This may be related to the unbalanced forces acting upon the joint. This asymmetrical configuration is less sound, although adopting paired devices as the standard treatment may require the extension of adjacent fingers to be performed in stages because of lack of space between them.

In the unoperated patient and in the patient who was splinted for 10 days while waiting for surgery there was some evidence of recurrence of flexion deformity in the PIP joint which was not prevented by the static splintage. This is in line with the observations by Messina and Messina (1993), and indicates the need for surgery in all patients following skeletal extension, even when treated with static splintage.

This device and the technique for skeletal extension of the flexed PIP joint in Dupuytren's disease have been shown to be effective in a small pilot study. Further studies continue to assess more formally the impact of pre-operative traction upon subsequent surgery and to investigate the long-term effects of such treatment. These studies will utilize a pair of *Pipster*s per finger. Skeletal extension of the flexed PIP joint will be followed immediately by surgery.

Acknowledgements

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