Original Article

Modified Girdlestones–Taylor procedure for claw toes in spinal cord injury

S Ozdolop¹, KM Mathew^{*2}, M McClelland² and G Ravichandran²

¹Department of PMR, Zonguldak Karaelmas University, Zonguldak, Turkey; ²Princess Royal Spinal Injuries Centre, Northern General Hospital, Sheffield, UK

Study design: A combination of review of case notes and outpatient follow-up.

Objective: To evaluate the effectiveness of the modified Girdlestones–Taylor procedure in patients with spinal cord injury (SCI).

Setting: Princess Royal Spinal Injuries Centre (PRSIC), Northern General Hospital, Sheffield, UK.

Methods: Nine patients with claw toe deformities to 27 toes were treated at the PRSIC from 1996 to 2005. After examination of their medical records, their toes were assessed for pain, residual deformity and stiffness. They were also asked to grade their satisfaction with the surgical outcome. The results were tabulated.

Results: The average age of our series of patients was 43.3 years. The mean time from injury to surgery was 20.4 years and the mean time from surgery to last follow-up was 37.3 months. All our patients had good to excellent results, with over 70% of the toes having excellent results.

Conclusion: The modified Girdlestones–Taylor procedure for claw toe correction appears to be a safe and effective treatment for patients with SCI.

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Keywords: spinal cord injury; Girdlestone–Taylor procedure; extensor expansion; claw toes; flexor to extensor transfer

Introduction

A claw toe is defined as one with the metatarsophalangeal (MTP) joint in hyperextension and the proximal interphalangeal (PIP) joint and distal interphalangeal (DIP) joint in flexion.¹ The deformity often gives rise to a painful callus on the skin over the interphalangeal (IP) joints and on the tip of the toe. The proximal phalanx tends to subluxate in the dorsal direction which results in excessive pressure on the metatarsal head, giving rise to metatarsalgia. In an earlier study of persons with spinal cord injury (SCI), 10% were found to have claw toes.² We found information in the literature regarding the use of Girdlestone–Taylor procedure for the correction of Claw Toes in other conditions like poliomyelitis, myelodysplasia and crush injury of the foot.^{3,4} However, we did not come across any paper that dealt with surgical correction of Claw Toes in Spinal Cord Injury.

There were nine patients on follow-up at this centre since 1996, who reported with complaints of deformities of the toes associated with pain and/or ulcers of the toes. These patients were offered the chance for surgical

correction of the deformities as a solution to their pain and ulceration. All nine patients accepted the offer of treatment and were treated with the Girdlestone–Taylor procedure. A total of 27 toes were treated in the nine patients.

Methods

Subjects

Since 1996 there were nine patients with spinal cord lesions who presented with foot deformities, pain and ulcers on the deformed toes. They were examined to determine the deformity and to check the mobility of the joints involved. None of the patients had a fixed deformity at the relevant MTP or the IP joints. The toe ulcers were also documented and were found to be primarily on the plantar aspect of the tip of the toes. The descriptive details of the problems encountered are given in Table 1.

The patients were reviewed between 3 and 6 weeks postsurgery and at intervals dictated by their other clinical needs. All patients but one (Patient 3) were reviewed by the first and second authors prior to the preparation of the paper and their toes were assessed

*Correspondence: KM Mathew, Princess Royal Spinal Injuries Centre, Northern General Hospital, Sheffield Teaching Hospitals NHS Foundation Trust, Sheffield, S5 7AU, UK

Table 1 Diagnosis and symptoms

<i>Patient</i>	<i>Diagnosis</i>	<i>Level</i>	<i>Frankel score</i>	<i>Symptoms</i>	<i>Ambulation</i>	<i>Number of toes</i>
1	SCI	L1	D	Pain/deformity	Walking with L AFO and elbow crutches	3
2	SCI	L1	D	Pain/deformity	Walking with bilateral KAFOs and crutches	6
3	SCI	C6	D	Pain/deformity	Walks with bilateral crutches	1
4	SCI	L1	D	Deformity	Walker	1
5	SCI	T6	A	Recurrent pressure sores of toe tips and increased spasms	Wheelchair	3
6	SCI	L1	D	Pain/deformity	Walks with crutches	2
7	SCI (astrocytoma)	T6	D	Pain/deformity	Walks with crutches	4
8	Spina Bifida	N/a	N/A	Pain/deformity/toe ulcers	Walker	4
9	SCI	L1	A	Deformity/pressure ulcers on toes	Wheel chair user/stands with KAFO	3

N/A = Not applicable; N/a = Not available

Table 2 Assessment criteria and scoring of results

	<i>Score</i>
<i>Pain</i>	
No pain	5
Occasional discomfort on prolonged walking or running	3
Usually painful, requiring shoe alteration	0
<i>Deformity</i>	
None	10
Mild on weight bearing	6
Mild even in the resting foot which accentuates on weight bearing callosity	3
Gross even in the resting foot	0
<i>Stiffness</i>	
None	5
Mild	3
Moderate or severe	0
<i>Patient satisfaction</i>	
Pleased	5
Satisfied, but could have been better	3
Dissatisfied	0
<i>Results</i>	
Excellent	22–25
Good	18–21
Fair	14–17
Poor	<14

and scored using the criteria in Table 2. Patient 3 had surgery to only one toe and his results were tabulated with the data from his notes regarding the outcome of the surgery and his expression of satisfaction at the results.

Procedure

A modified Girdlestone–Taylor procedure was used to correct the toe deformities. Through a mid-lateral incision the flexor retinaculum was identified and opened longitudinally. The Flexor digitorum superficialis (FDS) tendon was identified and the two slips divided but were not sutured to the extensor tendon. This ‘modification’ of the Taylor’s procedure, possibly saved time taken for the surgery. The Flexor digitorum longus (FDL) tendon was hooked out and cut as distally as possible. The FDL tendon was then pulled below the dorsal expansion, brought out medially and sutured onto the extensor tendon and to itself. The MTP joint and the IP joints were held in the neutral position and a moderate amount of tension was applied to the transferred tendon before suturing it. The wound was then closed with interrupted nylon sutures. Appropriate dressings were applied and the foot covered with cotton wool and crepe bandage. A relative rest period of 6 weeks was advised but full weight bearing was permitted during this time with the use of appropriate protective footwear. We did not have to do an ‘Z’ plasty of the extensor tendon nor did we have to release the collateral ligaments at the MTP joints of any of our patients. Despite having a claw toe deformity for varying periods of time, strangely, none of our patients had a fixed deformity of the MTP or the IP joints.

First review was after the initial 6-week period of rest. Thereafter, the patients were reviewed at intervals determined by their other clinical requirements on account of the SCI. The authors followed-up all the patients except one (Patient 3) who had immigrated to Canada after his initial review. He had surgery to his R 4th toe to correct the deformity and for reduction of the pain he felt in that toe while walking. He had good correction of his deformity and had become pain free at

the time of his review and was very satisfied with the outcome.

Results

Our patients' age ranged between 33 and 76 years with a mean age of 43.3 years. The time from injury to the surgery ranged between 4 and 42 years with a mean of 20.4 years. The last follow-up from the time of surgery ranged between 8 and 68 months with a mean of 37.3 months.

Results were judged to be excellent, good, fair or poor following a previously published classification of results for a similar surgery for curly toe deformities in children⁵ (Table 2). Table 3 gives the tabulated results.

All patients (toes) had good or excellent results. Over 70% of the toes had excellent results. The main problem encountered was mild stiffness that had developed in their toes. However, this did not contribute to any functional limitation to our patients' walking. Pain relief was not hampered because of this problem.

Deformities were corrected in all patients. Pain had been a problem in six of our nine patients. All of them had good relief of pain. Two of our patients had Frankel A type of paralysis and therefore they were excluded from the assessment of pain in their follow-up. They did not have pain as a complaint prior to surgery. The three patients who had pressure ulcers on the toe tips also had complete relief of their recurrent ulcers.

Two patients had mild postoperative infections that were effectively treated with antibiotics. There were no other complications in the immediate or late postoperative period till the time of follow-up.

Discussion

Girdlestone–Taylor procedure has been used for the treatment of claw toe deformities arising from different conditions. Several previously published papers present the results obtained using the procedure in patients with poliomyelitis, congenital curly toes, myelodysplasias and in 'idiopathic'³ claw toes. To the best of our knowledge there has been no reference to the use of Girdlestone–Taylor procedure for claw toes occurring in spinal cord injuries. Our series of patients belonged almost exclusively to this group.

Table 3 Final results

	Toes				Total
	II	III	IV	V	
Excellent	5	7	6	1	19
Good	3	2	3	—	8
Fair	0	0	0	—	0
Poor	0	0	0	—	0
Total	8	9	9	1	27

Taylor described the division of the FDS and FDL tendons and re-routing of the tendons to the extensor aspect to be sutured to the extensor expansion using the 'buttonhole' method⁶ (first described by Prof GR Girdlestone). We used a modification of the above procedure, in that the FDS tendon slips were divided prior to the division of the FDL but were not sutured to the extensor expansion. Myerson *et al*¹ in 1989 described the pathological anatomy of claw and hammer toes. They dissected 33 fresh frozen cadaver specimens that became available as a result of below-knee amputations. In all, 14 of them had claw toes, six had hammertoes and 10 were normal. Measurement of joint ranges was carried out in the normal and deformed toes. Flexion contracture of the PIP joints of the 2nd to the 5th toes averaged 55°. They found that release of the FDL tendon did not have any effect on this contracture. However, tenotomy of the FDS gave 20° of extension. We believe that dividing the FDS tendon helped to prevent recurrence of the flexion deformity of the PIP joints. Recurrence of the original deformity was reported by Cyphers *et al*⁴ as a problem in patients who had myelodysplasia, but they did not divide the FDS tendon as part of their technique. Barabari *et al*³ reported that 'unsatisfactory results were found in the second toe in three occurrences because of fixed contractures in the midphalanx joints....' However, they also did not divide the FDS or insert it into the dorsal expansion as originally described by Taylor. Division of the FDS without suturing it to the extensor expansion gave us results that were comparable with published data.

In our series, we did not have any patient with a fixed flexion deformity – all our deformities were flexible that is, the deformities were correctable passively. Therefore, we did not have to resort to capsulotomies of the MTP or PIP joints. Neither did we lengthen the EDL tendons. The good to excellent results, we observed, might have been partly contributed to by the fact that none of our patients had very severe fixed deformities of their joints.

Pain was a major complaint in six of the nine patients. The experience of preoperative pain nor its remission with surgery could be explained by the initial severity of the deformities present in our patients. All the patients had excellent relief of pain in all their toes postsurgery. This contrasted with Barabari *et al*³ who found that when metatarsalgia was the dominant preoperative complaint, there was no improvement, despite very good correction of the deformity with good preservation of the range of movement in the toe joints. Also, the three patients who had pressure ulcers in our series had complete relief of that problem.

Conclusion

Transfer of the FDL tendon alone to the extensor expansion, combined with division of the FDS (modified Girdlestones–Taylor procedure) for the treatment of non-fixed claw toe deformity in patients with SCI

appears to be a safe and effective procedure that gives good to excellent results.

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