A long-term review of a modified Evans procedure

A 5- TO 15-YEAR FOLLOW-UP OF 111 ANKLES

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Of 111 primary ankle ligament arthroplasties (modified Evans procedure) performed between 1983 and 1994, we were able to identify 89 patients (94 ankles) for follow-up. All were under 50 years of age. Two had died and one refused to co-operate; 86 patients (91 ankles) were therefore reviewed, 25 by telephone and the remainder by clinical examination with all but three also undergoing radiological review.

Of the 91 ankles, 70 had no or very mild pain and 72 had no or rare episodes of instability and when considered together only 59 (65%) had no or mild pain and minimal instability. The results were supported by the Karlsson grading system. Clinical examination showed that 17 of the 66 ankles examined had increased inversion, while 21 had some limitation of inversion. Early degenerative changes were seen in 11 ankles, although only four had subtalar changes. These results show that this procedure does not give universally good clinical results. Patient satisfaction, however, was high with 97.7% being willing to undergo the same procedure if their other ankle became similarly affected.

J Bone Joint Surg [Br] 2001;83-B:14-8.

Received 10 December 1999; Accepted 10 May 2000

Injuries of the lateral ligament complex of the ankle are common.¹ Opinions on the treatment of an acute disruption of the lateral ligament complex have varied between early repair and non-operative management. The latter is the mainstay of treatment with emphasis on early mobilisation rather than immobilisation in a cast.¹⁻³

A large number of methods of reconstruction have been described, many being slight variations of the same technique. The techniques are either non-anatomical with a tendon graft or fascia lata,⁴⁻⁸ or anatomical in which the remnants of the ligaments are either repaired or sutured to bone, with or without augmentation with another structure such as the inferior extensor retinaculum.⁹

Anatomical reconstructions have been shown to reduce talar tilt and the anterior-drawer sign to a greater extent than occurs with non-anatomical reconstructions.⁷⁻⁹ While the short-term results are good, the long-term results are unknown.

The short- and long-term results for various non-anatomical reconstructions have, however, been well documented and vary considerably.¹⁰⁻¹³ The Evans procedure is a non-anatomical reconstruction which was first described in 1953⁴ as a dynamic stabilisation of the ankle. The tendon of peroneus brevis is divided below the musculotendinous junction and passed through a tunnel drilled in the fibula, starting distally at the tip of the fibula and emerging posteriorly and superiorly. The tendon is then re-attached to its muscle belly. Since the initial description the procedure has been modified by two main variations. One involves routing the tendon of peroneus brevis posterolaterally through the tunnel so that it emerges at the tip of the fibula, and then attaching it alongside its insertion at the base of the fifth metatarsal.^{11,12} The second variation follows the original procedure, but all or part of the tendon is taken through the tunnel and sutured to the fibular periosteum, thus allowing it to act as a tenodesis rather than a dynamic stabiliser.^{13,14}

In 1988, Karlsson et al¹⁰ reviewed the long-term results of the original technique and concluded that only 50% of patients had satisfactory long-term results. Rosenbaum et al¹⁵ have published a review of the results of the first variation. Although the numbers were small, at follow-up most of the ankles were stable, but many continued to have pain. By contrast, very good long-term results have been reported with the second variation.^{6,14,16}

The senior authors (PJD, KRA, PLL, TMS) have used the second modification of the Evans procedure since 1983. We have studied retrospectively all such patients to determine long-term satisfaction, stability, hindfoot biomechanics and the rate of degenerative changes.

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0301-620X/01/110834 \$20.00

Patients and Methods

Between 1983 and 1994, 118 ankles with chronic symptoms of instability underwent ligament reconstruction performed by any one of the four senior orthopaedic surgeons using a modified Evans procedure. Patients were excluded if there was an associated neuromuscular disorder, if there was pre-existing osteoarthritis (OA) of the ankle or if the patient was older than 50 years of age at the time of surgery. Patients undergoing a revision procedure were also excluded. All patients had had failed conservative treatment and had symptoms of instability or chronic pain, limiting activities of daily living. Clinical examination demonstrated laxity, and plain radiographs were otherwise normal, with the exception of the presence of loose bodies, avulsed fragments or ossicles.

Operative technique. The procedure was carried out under either general or spinal anaesthesia with the patient supine and a sandbag under the ipsilateral buttock. A tourniquet was applied. A longitudinal hockey-stick incision was made over the posterolateral aspect of the fibula, approximately 6 cm in length. Proximally, the sural nerve, if identified, was protected and the short saphenous vein was either mobilised or ligated. The tendon of peroneus brevis was identified and divided just below the musculotendinous junction. The distal aspect of the tendon was left attached to the base of the fifth metatarsal and delivered distally out of the peroneal retinaculum. A 3.5 mm hole was drilled into the fibula, commencing distally at its tip and emerging proximally and posteriorly. The tendon was passed through the tunnel in the same direction and sutured onto itself and to the periosteum of the fibula, while the ankle was held in a neutral position. The wounds were then closed in layers using absorbable sutures. A below-knee plaster cast was applied for six weeks. The patient remained non-weight-bearing for two weeks and was then allowed to bear weight.

Initially, the whole of the tendon of peroneus brevis was used. Subsequently, the technique was modified to use one-half to two-thirds of the tendon depending on its size, leaving the remainder intact.

Rehabilitation, after six weeks, consisted of exercises with a proprioception and a muscle-strengthening programme. Patients were reviewed at six and 12 weeks after surgery. Limited sporting activities were allowed at three months and full activities at six months.

Clinical evaluation. This included assessment of pain, stability and symptoms of apprehension, the use of ankle supports including braces or taping and the ability to play sport and undertake activities of daily living. Patients were also asked whether they would undergo the procedure again and whether they were satisfied with the results.

The range of movement of the ankle and hindfoot, the power of the peroneal tendons and stability of the ankle were recorded. The movements were compared with those on the contralateral side or, if both ankles had been operated on, with a normal range. Ankle stability was assessed by the anterior-drawer test and tilting of the talus on applying a varus force.

The ankles were scored using the grading system of Karlsson et al,⁹ which uses a series of questions to give a score out of 100, and the results classified as excellent, good, fair or poor. Other scoring systems used were that of Good et al,¹⁶ and of the American Orthopaedic Foot and Ankle Society.¹⁷

We developed a further scoring system which is summarised in Table I and has two components, one of which is based upon pain and the other on instability. A patient with an excellent result will have a pain component of grade 1 and an instability component of grade 1 while a patient with both marked instability and pain will have a grade of 4. We considered an acceptable result to be grade 1 or 2 in both components.

Radiological evaluation. After informed consent, anteroposterior, lateral and mortice radiographs were taken which were reviewed by an independent examiner as well as two orthopaedic surgeons (PJD, PLL), who were blinded to the clinical details. The radiographs were inspected for ankle and subtalar degenerative changes, in particular narrowing of the joint space, subchondral sclerosis and the presence of marginal osteophytes and osteochondral lesions. Stress radiographs, which were considered to be unreliable and unreproducible, were not taken.

Statistical analysis. The chi-squared test was used to compare the results between groups.

Results

Of the 118 ankles, seven were excluded, two because of pre-existing OA, two because the ligament reconstruction was performed for a neuromuscular deficit and three because the patients were over 50 years of age at the time

Table I. The scoring system which we used which identifies pain and instability, and the number of ankles in each grade

Grade	Pain	Symptoms	Number of ankles	Grade	Instability	Number of ankles
1	None		55	1	None or rare (<1 to 2 times/year)	51
2	Mild	Does not bother patient	15	2	Apprehension (with instability <2/year)	21
3	Moderate	Affects patient during recreation	15	3	Regular (instability 3 to 6/year)	8
4	Severe	Interferes with work	6	4	Constant (>6/years)	11
	Total		91		Total	91

Table II. Details of the 91 ankles

	Number of ankles
Mechanism of injury	
Netball	20
Basketball	10
Australian rules football	9
Recurrent inversions	13
High velocity	6
Work	10
Other	23
Length of instability before surgery	
2 to 6 mths	6
6 mths to 1 yr	13
1 to 5 yrs	42
5 to 10 yrs	16
>10 yrs	14
Additional procedures carried out at the time of surgery	
Removal of loose body	9
Arthroscopy	3
Removal of accessory bones	2
Repair of ankle ligament	1
Stabilisation of subluxating peroneus longus	1

Table III. Ability to walk and return to sporting activities in the 91 ankles at the time of review

	Number of ankles
Walking distance now	
Unlimited	86
3 to 5 km	2
2 to 3 km	3
Sport	
Plays sport	48
Did return to sport, but none now	20
No - due to lifestyle/health	12
No - due to ankle	11

Table IV. The 91 ankles graded according to the scoring system of Karlsson et al¹⁰

Grade	Number of ankles
Excellent	40
Good	12
Fair	32
Poor	7

Table V. The 91 ankles graded according to the scoring system of Good et al¹⁶

Grade	Assessment	Number of ankles
1	Full activity, including strenuous sport. No pain, swelling or giving-way	22
2	Occasional aching only after strenuous exercise. No giving-way or feeling of apprehension	27
3	No giving-way, but some remaining apprehension and takes care when walking on rough ground	26
4	Recurrent instability and giving-way in normal activities, with episodes of pain and swelling	16

of surgery. This left 111 ankles. We were able to locate 89 patients (94 ankles), a follow-up rate of 84.6%. Two had died and one other refused to be involved in the study, but in all three cases the relatives who were called described the patients as having been able to do most activities and having little problem with the ankle. Therefore, 86 patients (91 ankles; 82%) were reviewed. All were invited to return for clinical and radiological review and to answer a questionnaire; 25 (25 ankles) declined to return, but answered the questionnaire over the telephone. Consequently, in 66 ankles, a clinical review was undertaken, of whom all except three agreed to have radiography. The mean follow-up period was 9.7 years (4.5 to 15.5). The mean age of the patients at the time of surgery was 25.4 years (13.7 to 47). The mechanism of injury, period of instability between initial injury and surgery, additional surgery carried out at the same time, and the ability to walk and take part in sporting activities are shown in Tables II and III.

A review of the results with the Karlsson scoring system showed that only 52 of the 91 ankles (57%) had an excellent or good result (Table IV). The results were also disappointing using the Good grading system (Table V). The American Orthopaedic Foot and Ankle Society ankle/hind foot score gave a mean score of 87.2 (95% CI 75 to 100).

Table I shows the results of our scoring system for pain and instability. As it was possible to have one symptom without the other Table VI shows that 59 ankles had a good result with regard to both pain and instability. This was not statistically different from the results using the Karlsson score.

Of the 86 patients, 84 (97.7%) said they would have the operation again if their other ankle became similarly affected and 76 (86%) were satisfied with the result. In most patients, walking and sport were not limited by symptoms from the ankle (Table III).

An ankle support was required for 35 ankles during activities or exercise in patients who reported apprehension; no patient wore the ankle support constantly.

On clinical examination, 17 of the 66 ankles were thought to be unstable. There was a strong correlation between the clinical examination and the instability score ($p = 0.00004$).

Two patients (two ankles) described reduced sensation on the outer aspect of the foot. Table VII shows the range of hindfoot inversion. All except three patients had full power of eversion of the hind foot and the remainder had power grade 4+.

Of the 63 ankles examined radiologically, 16 showed abnormalities. Three had pan-talar changes, one with early OA (Fig. 1) and the other two with early degenerative changes (Fig. 2). A further seven had early degenerative changes of the ankle and the remaining one had early degenerative changes of both the ankle and subtalar joint. Of the remaining five ankles, three had an anterior osteophyte on the tibia, one a loose body and one osteochondritis dissecans of the lateral aspect of the talus.

Comparison of the pain score in ankles with radiological

Fig. 1

Lateral radiograph showing an ankle with OA.

Fig. 2

Lateral radiograph showing an ankle with early degenerative changes.

abnormalities with the remainder showed a significant association between the presence of abnormalities and pain ($p = 0.046$).

Table VIII lists the ankles which required further intervention, either operative or non-operative. Of these, six required intervention as a result of a complication of surgery, and seven required surgery for continuing pain. It is notable however that, following this, the pain did not improve. The remaining five had a further operation for symptoms of instability, three of which had suffered a new injury.

While there was correlation between the pain score and radiological changes, there was no correlation with restriction of inversion. Finally, there was no significant difference in our scores for pain or instability for those patients who returned for assessment and those who did not. This would suggest that the questionnaire gave an accurate indication of disability.

Table VI. Summary of the outcome for the 91 ankles using our pain and instability grading system

		Pain	
		1 or 2	3 or 4
Instability (grade)	1 or 2	59	13
	3 or 4	11	8

Table VII. Summary of the hindfoot movement of 66 ankles

Amount of inversion	Number of ankles
> 75% of normal	45
25 to 75% of normal	19
<25% of normal	2

Discussion

Our review is the largest for a single surgical procedure for instability of the ankle. We used multiple scoring systems to assess the clinical outcome and to allow comparison with other techniques and, when possible, took radiographs to determine the incidence of degenerative changes.

The use of multiple scoring systems has allowed comparisons. Of the three established scoring systems of ankle function, the score of Karlsson et al⁹ seemed to be the best for detecting instability. According to the grading system of Good et al¹⁶ patients with only rare episodes of giving-way or mild pain will fall into the lowest grade, which gives too much weight to the poor results. The American Orthopaedic Foot and Ankle Society ankle/hindfoot score¹⁷ is not sensitive enough to deal with all aspects of ankle instability, and is complicated by the inclusion of hindfoot pathology.

Table VIII. The number and reasons for further intervention

	Number of ankles
Complications	
Debridement of pressure sore caused by plaster	1
Removal of stitch granuloma	3
Re-admission for wound dehiscence - no surgery	1
Cortisone injection for neuroma of the sural nerve	1
Further surgery-unrelated to symptoms of instability	
Arthrotomy and debridement for pain	4
Arthroscopy for pain	2
Revision stabilisation for pain after surgery	1
Revision operation	
For new injury	3
For continual symptoms of instability	2

Also, this score has only recently been described, and we could find only one other study for comparison, in which the long-term results of the Watson-Jones tenodesis were reviewed, with a mean outcome score of 90.⁵ Since the score does not grade the results into groups of excellent to poor we were unsure how to interpret the result.

Stress radiographs were not taken due to the inconsistency of results obtained without the aid of a stress-testing machine.¹⁸ Clinical stability of the ankle is dependent not only on mechanical stability, but also on proprioception.² We relied on clinical examination and found a strong correlation between ankles which were clinically lax and symptoms of instability. In the group of clinically lax ankles to examination there were three which had only minor symptoms and no apprehension. In our view, the most useful information when assessing instability is obtained from the questionnaire which reveals the severity of the symptoms.

We were not able to review all patients clinically as many lived a long way away, but we found no difference between the scores of those patients who attended the clinic and those who did not.

The long-term results of this procedure were disappointing, and should be used when comparing the results with those after other procedures, particularly anatomical reconstructions.

Despite the low scores obtained, most patients were pleased with the outcome and only two required further surgery for continuing instability.

Seven patients had further intervention for symptoms related to pain. This and poor pain scores achieved suggests that performing a stabilisation procedure for symptoms of pain may not be the solution. Perhaps arthroscopy of the ankle should be undertaken concurrently or before operation. Certainly, there was a correlation between the eventual radiographic changes and those patients who continued to complain of pain.

Of the 63 ankles examined, 11 had degenerative changes. It is not possible to determine whether these would have developed inevitably in an injured ankle or whether they were due to altered biomechanics after surgery.³ Although the operation alters the biomechanics of the subtalar joint, degenerative changes were seen radiologically in only four cases. This would dispel concerns about such a procedure regularly leading to subtalar osteoarthritis.

We would like to express our gratification to Shirley Howard and Angela Poli for their assistance in preparing the manuscript and acknowledge the assistance of Perrett's and partners for the radiographic services.

No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

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