Acta orthop. scand. 54, 734–738, 1983

RADIOGRAPHIC INSTABILITY OF THE ANKLE JOINT AFTER EVANS' REPAIR

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Forty-two unstable ankle joints were treated surgically by Evans' operation. The clinical postoperative results were correlated with the objective radiological stress examinations. The mean age of the patients was 29 years (15–60 years). The clinical and radiological follow-up examinations were performed 6 months after the operation. In the stress X-ray examinations a modified stress frame was used. Clinical instability was noted in four patients. In the radiological examination one patient had a pathological finding in the talar tilt test and 18 patients in the anterior drawer sign test. The radiological instability correlated poorly with the subjective end results. Six patients were estimated to have a poor result of the operation. Five of these patients had a positive anterior drawer sign in the stress X-ray examination and one had degenerative changes in the ankle. Although Evans' repair is a simple and reliable method of reconstructing ruptures of the lateral ligaments of the ankle joint, it is associated with a relatively high frequency of positive anterior subluxation on radiological stress examination. This finding can be explained by the anatomical and geometrical factors on the lateral side of the ankle joint.

Key words: ankle injuries; ankle joint; ligaments, articular

Accepted 10.iv.83

The difficulties of evaluating the seriousness and degree of ligamentous injuries in the ankle joint are generally agreed (Broström 1966, Lindstrand 1976, Hackenbruch et al. 1979). Inadequately treated lesions cause later instability in the ankle joint with subjectively disabling symptoms and degenerative changes (Harrington 1979, Glassgow et al. 1980). Primary suturing or adequate immobilization are regarded as better methods than elastic supports or bandages alone.

Evans' repair is one of the most widely used late reconstruction methods for lateral instability of the talo-crural joint (Evans 1953, Ottosson 1978, Hansen et al. 1979, Kristiansen 1981). Postoperatively, the results are generally good. However, the patients' subjective symptoms do not always correlate with objective findings in the patients. There are few criteria for evaluating the operative results objectively. In the diagnosis of recent ligament ruptures of the ankle joint, arthrography (Ala-Ketola et al. 1977) and a stress X-ray examination (Hackenbruch et al. 1979) can be used.

The purpose of this study was to measure the objective postoperative stability of the ankle joint after Evans' repair and to correlate the results with the patients' subjective symptoms and the clinical end-results obtained by the physician's follow-up examination.

PATIENTS AND METHODS

During the years 1979–1981, 41 patients (42 ankles) with lateral ankle instability were treated by Evans' method. The mean age of the patients at the time of the operation was 29 years (range 15–60 years). There were 29 men (30 ankles) and 12 women in the series.

The indication for surgery was clinical signs of instability in a previously injured ankle joint. Thirty-eight patients had "giving way" instability, 25 had pain and 15 had swelling as the major complaint. The clinical talar tilt examination was regarded as positive in 29 patients and the anterior drawer sign was positive in 25 patients. Several ankle sprains had occurred in 36 of the patients.

The radiological talar tilt examination using the stress frame was positive in 16 patients of the 25 in whom the examination was done preoperatively. The anterior drawer sign was positive in all 17 patients who were examined preoperatively using the stress frame. The talar tilt angle was considered to be pathological if the distance between the lateral joint surfaces of the tibia and talus was more than 6 mm or the difference was more than 3 mm when compared with the uninjured side. The anterior subluxation was positive if the gap between the posterior joint surfaces of the tibia and talus was 6 mm or more on the injured side or more than 3 mm compared with the healthy side. The stress frame is shown in Figure 1. In 46 patients, the primary trauma occurred during athletic activities (Table 1). The primary treatment was an elastic bandage for 2–4 weeks in 22 patients and plaster of Paris in 16 patients. Three of the patients did not visit a doctor at all.

Evans' operation has been well documented previously (Evans 1953).

The follow-up was at least 6 months postoperatively (0.5–2.5 years). In this investigation subjective opinions were requested, the mobility of the ankle was tested and clinical and radiological stress examinations were performed. The results were compared with the healthy side. The clinical criteria used in the evaluation may be classified as follows:

Excellent – The ankle joint is stable. Mobility is decreased in supination less than 20° and in other movements less than 10°. No subjective pain or instability.

Good – The ankle joint is stable. Mobility is decreased in supination more than 20° and in other movements more than 10°. Intermittent pain after intensive physical exercise.

Moderate – The ankle is stable. The subjective symptoms are not so frequent as before the operation.

Poor – The ankle in unstable. Recurrent painful distortions, swelling and pain in the ankle during everyday activity.

Table 1. Mechanism of 42 ankle injuries leading to instability and treated by Evans' repair

	No.
Athletic injury	25
Injury at work	9
Injury at home or during leisure time	8
Total	42

RESULTS

Twenty-seven ankles were rated by the patients to be excellent or good at the follow-up examination. In 15 ankles there were more or less harmful subjective symptoms (Table 2).

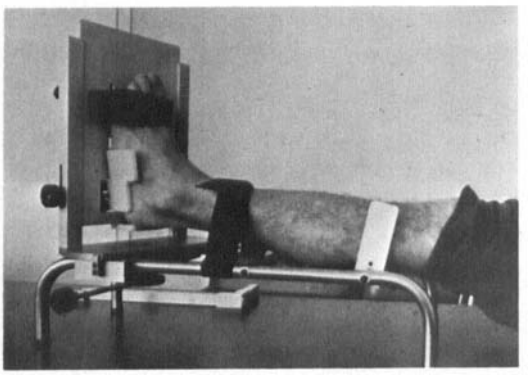

Figure 1. The stress X-ray examination frame used in the study.

Table 2. Subjective evaluation of the results by 41 patients (42 ankles) treated by Evans' repair

	No.
Excellent	14
Good	13
Moderate	13
– better than before reconstruction	
– light symptoms	
Poor	2
– as poor as before the operation	
Total	42

Table 3. Objective findings in the clinical follow-up examination of the 41 patients (42 ankles) treated by Evans' repair

	No.
Clinical instability	4
Palpation pain	11
Swelling	7
Crepitation	3
Normal finding	17
Total	42

Table 4. Radiological findings in the postoperative stress X-ray examination of the 42 ankles treated by Evans' repair

	No.
Positive anterior drawer sign	18
Positive talar tilt test	1
Degenerative changes	5
Normal finding	18
Total	42

Table 5. The correlation between the objective postoperative findings and the radiologically detected pathological findings

Classification of the results	No.	Positive drawer sign	Positive talar test	Degenerative changes
Excellent	13	2	–	1
Good	16	6	–	3
Moderate	8	5	1	1
Poor	5	5	–	–
Total	42	18	1	5

In the clinical examination four ankles were unstable. Swelling and pain on palpation were found in 18 patients (Table 3). Supination was limited by more than 10° in 15 patients and pronation in 11 cases. Dorsal flexion was normal in 41 ankles and limited in one case. Plantar flexion was normal in 39 ankles and limited in three ankles.

The radiological stress examination was positive in 19 cases (Table 4). Degenerative or reactive changes were seen in five ankles. They were slight and did not correlative with the age or with the end result in the patients.

The radiological results were compared with the objective functional results (physician's opinion) (Table 5). Positive findings in the stress X-ray examination correlated positively with the moderate or poor end results. There were statistically highly significantly more ($P < 0.001$) unstable ankles (positive anterior drawer sign) in the group of moderate and poor results than in the group of excellent and good results. In the group of poor results two patients self-evaluated the end result as excellent and one as good. In these cases the radiological instability was clear. The subjective evaluation of the patients of the postoperative symptoms correlated poorly with the radiological instability measured by the stress frame at the follow-up examination.

Although the end results were rated as excellent or good by 27 patients, there was a tendency to develop symptoms during athletic activities. Eight of the active athletes had symptoms hampering hard physical exercise. Twelve patients were still using an elastic bandage during sports activities at the time of the follow-up. Only one patient had not been able to continue his earlier athletic activities because of the ankle symptoms. No difference between the sexes was found in the aspects examined.

DISCUSSION

In addition to clinical examination, stress radiographs have been proved to be reliable for examination of ligamentous lesions of the ankle joint (Seligson et al. 1980, Adler 1982). The correlation of the anterior drawer sign with the degree of seriousness of the ankle injury or with the operative findings is considered to be better than talar tilt angle measurements (Lindstrand 1976, Hackenbruch et al. 1979). The normal variation of the talar tilt angle is great, but together with the anterior subluxation test it is of

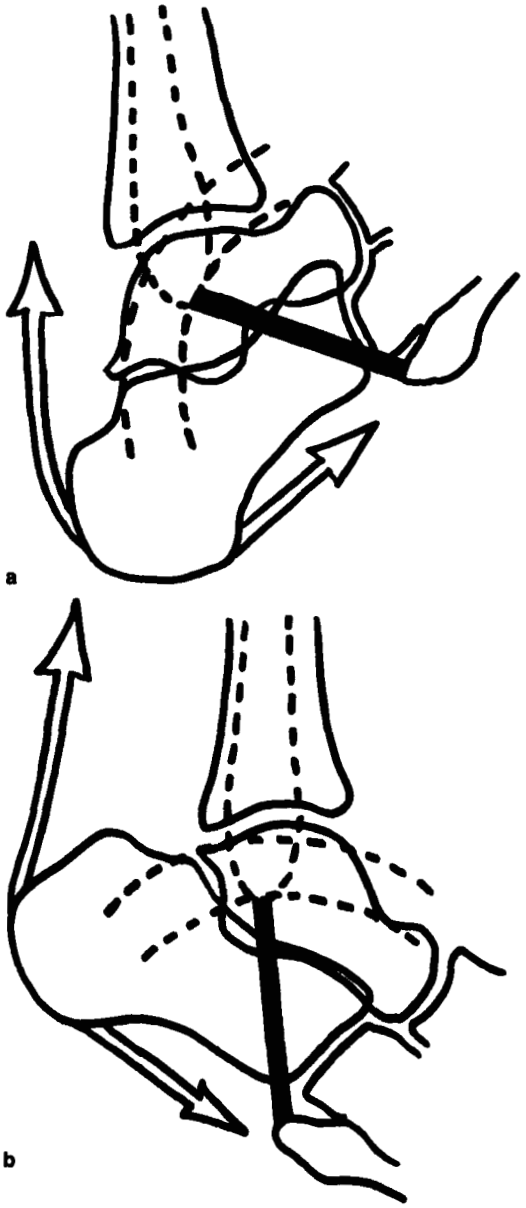

Figure 2. A. In the dorsiflexed ankle joint after Evans' repair, anterior subluxation is not possible.
B. In the plantarflexed ankle joint, tangential subluxation of the talus may occur.

value in examining ankle injuries (Staples 1972, Johanssen 1978). Arthrography is also a reliable method in acute ankle injuries. It is invasive, but the ligamentous lesions, fractures and solitary rupture of the deltoid ligament are easily seen. (Broström 1966, Ala-Ketola et al. 1977). The reliability of standardized stress X-ray examination using the special stress frame seems to be better than that of clinical investigation or arthrography. In investigations of old lesions, clinical and radiological stress examinations are the most useful methods (Hackenbruch et al. 1979, Adler 1982).

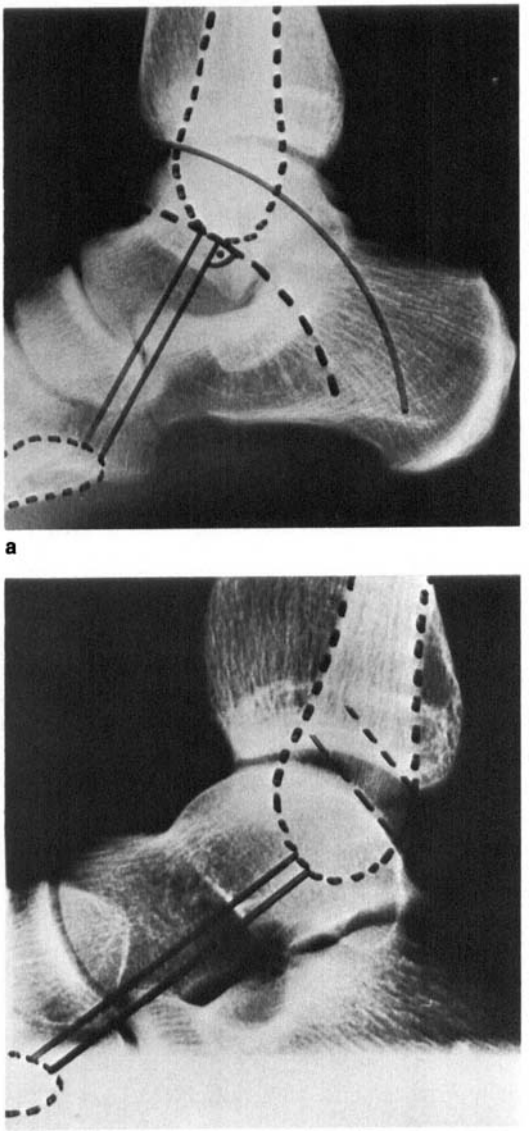

Figure 3A. A radiograph of an athlete after Evans' repair without stress.
B. The anterior drawer sign occurs during stress. Note the 8 mm gap of the posterior TC joint.

The subjective and objective end results in the present series were similar to the previously reported results. Ottosson (1978) found good results in 91% of the patients after Evans' repair, and in Kristiansen's series (1981) the corresponding figure was 73%, if the same criteria were used as in the present study.

After Evans' repair, relatively many of the patients had radiological instability in their ankles when examined by the stress X-ray frame. This can be explained, if the functional anatomy of the ankle joint is observed more closely (Figure 2). The geometrical circumstances at the talo-crural joint allow tangential anterior movement (anterior subluxation of the talus) in relation to the origin or the distal insertion point of the short peroneal tendon at the base of the fifth metatarsal (Figure 3). This anterior drawer sign is detected during antero-posterior stress. It means that there is no intact anterior fibulotalar ligament left or that the anterior capsule and the fibulotalar ligament have been transformed to loose connective tissue and scar by recurrent injuries.

The Evans' tenodesis gives functionally good or moderate results, but is associated with an objective pathological anterior instability in about half of the patients. The difference between the clinically observed instability (4 patients) and the radiological instability (18 patients) shows how uncertain the postoperative clinical examination is. The grade of instability is difficult to estimate clinically.

In spite of the results, we consider Evans' repair to be a satisfactory operation, because it is easy to perform, has minimal complications and needs a relatively short immobilization time. However, we recommended that in addition to the tenodesis the torn ligaments should be sutured or duplicated and fixed to the short peroneal tendon during the reconstruction, since by using this or similar modified techniques, more reliable end results can be achieved. This is especially important in physically active young patients like athletes.

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