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Reconstruction in chronic lateral ligament injuries of ankle with Colville's technique

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ABSTRACT

We evaluated the results of Colville's technique in young patients with chronic instabilities of the ankle lateral ligaments. Reconstruction with Colville augmented technique was performed in seven male and one female patients (median age 27; age range 23-35 years) with chronic lateral ankle instability at Mugla Sıtkı Kocman Universty Orthopaedic Clinic between 2010-2013. The mean interval time between injury and operation was 29 months (range 21-33 months). The patients were followed up for mean 24 months (range 12-36 months). Excellent results were achieved in all cases. Recurrent instability was not observed in any patient. Complications such as infection, non-healing wound and sural-nerve lesion were not encountered. By means of Colville's technique, stability can be obtained in nearly 100% while the subtalar joint motions are protected.

1. Introduction

Lateral ligament injury of the ankle is the most common sport injuries. It has been reported that 10-30% of the lateral ligament injuries are becoming chronic (Karlsson et al., 1993). They constitute the majority of trauma patients admitted to the emergency department. In the surveys, it was found that 45% of basketball injuries and 54% of volleyball injuries occur due to ankle sprains (Ahlgren et al., 1989; Karlsson et al., 1993; Renstrom and Kanradsen, 1997). It was estimated that 27,000 ankle sprain cases happen everyday in America. It was observed that 80-90% of cases were healed with conservative treatment by achieving satisfactory functional outcomes (Hamilton, 1994). The ankle lateral ligament complex consists of three ligament structure (Renstrom et al., 1997). These are anterior talofibular ligament (ATFL), calcaneofibular ligament (CFL) and the posterior talofibular ligament (PTFL) (Fig. 1).

ATFL is a ligament that prevents the ankle joint from sliding forward and provides primary stability in the internal rotation and inversion movement, and it is important in terms of being first injured ligament structure that gets injured primarily, so these movements are responsible for most of the trauma. 60-70% of isolated ATFL injury is seen. ATFL and CFL injuries occur when inversion and internal rotation force is applied to the ankle in the plantar flexion. CFL injury occurs when the foot is in dorsiflexion and inversion, in which the isolated injury is very rare (Bennet, 1994; Ege, 1997). Physical examination is important in determining which ligament is injured, and grading it. The X-rays, on the other hand, are important in terms of both grading and an avulsion fracture that may accompany (Roberts and De Maio, 1995).

Nowadays, non-augmented (non-anatomical) and augmented (anatomical) methods are used in the late-term

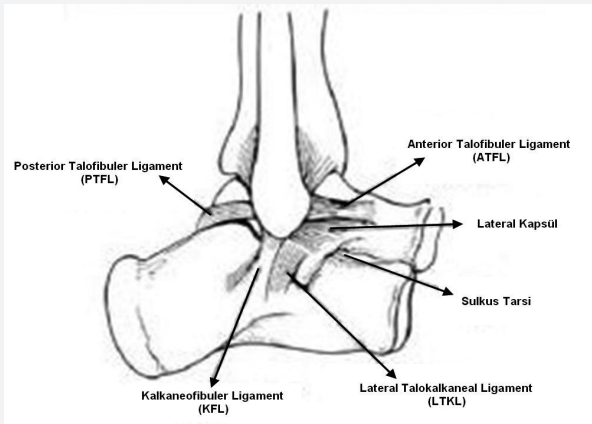

Fig. 1. Ankle lateral ligaments

surgical reconstruction of the lateral ligament. More than %80 of functional stability is obtained with augmented reconstruction techniques done by using tendons around the ankle such as Evans, Watson-Jones and Chrisman-Snook techniques, in which both CFL and ATFL are repaired together. However, because of the fact that peroneal tendon ligaments do not pass through the anatomic attachment sites in these techniques, the subtalar joint movements are highly limited (Karlsson et al., 1988; Colville, 1994)

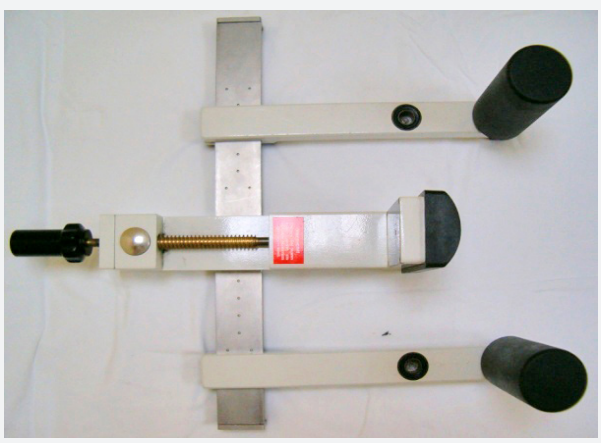

Fig. 2. Telos stress device

In the non-anatomical reconstruction technique defined by Colville in which peroneus brevis tendon, calcaneofibular and anterior talofibular ligament are passed from anatomical attachment sites, stability is achieved without limiting subtalar joint movements (Rodop aet al., 2000).

In this study, the results of the technique defined by Colville in young patients with chronic instabilities of the ankle lateral ligaments were evaluated.

2. Patients and method

Reconstruction with Colville augmented technique was performed in seven male and one female patients (median age 27; age range 23-35 years) with chronic lateral ankle instability at Mugla Sıtkı Kocman Universty Orthopaedic Clinic between 2010-2013. The mean interval time between injury and operation was 29 months (range 21-35 months). The etiological reason was ankle sprains happened during basic military training in six patients and during sports in two patients. In the first sprains, below-the knee walking cast was applied in all patients for 2-3 weeks. Patients had at least 3 ankle sprains before admitting to our clinic. Common complaints of all were instability, frequent sprain and pain in the ankle. There is no standard system for grading ankle injuries. Surgical method was used in treatment of patients who were soldiers due to the fact that they were obligated to constantly attend to the trainings and sports activities, so that these kinds of living conditions they were in have limited them to practice individual ankle strengthening exercises and to use long-term splint, and caused frequent sprains.

In all patients, pre and post-operative stress radiographs were taken by using Telos stress device in order to determine the degree of instability in the ankle (Fig. 2). In ankle anteroposterior graphy, talar tilt, and in lateral graphy, talar draw measurements were performed (150N force was applied in the Telos device) (Fig. 3).

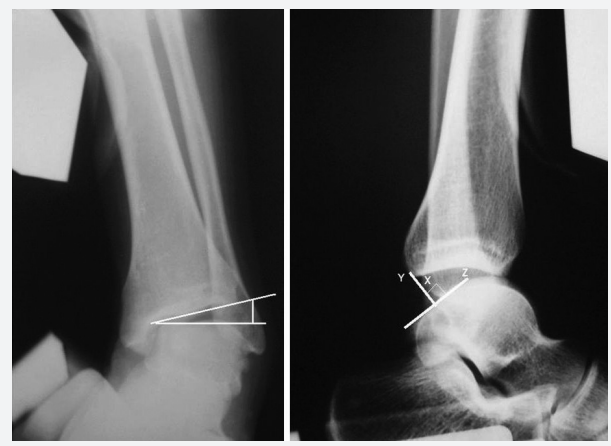

Fig. 3. Measurements of talar tilt in antero-posterior graphy and talar shift in lateral graphy with Telos device (radiographs of Case no.6 in pre-operative)

Indications for surgery: a) In the physical examination, getting laxity in the anterior draw stress and inversion stress tests when compared to the uninjured ankle. b) In the measurements done by using Telos stress device (Austin & Associates, Fallston, Maryland), talar tilt being more than 10° in the antero-posterior inversion stress radiographs (or talar tilt of more than 5° when compared to uninjured side), or anterior talar draw being more than 10 mm in the lateral graphy (or anterior talar draw of more than 5 mm when compared to uninjured side).

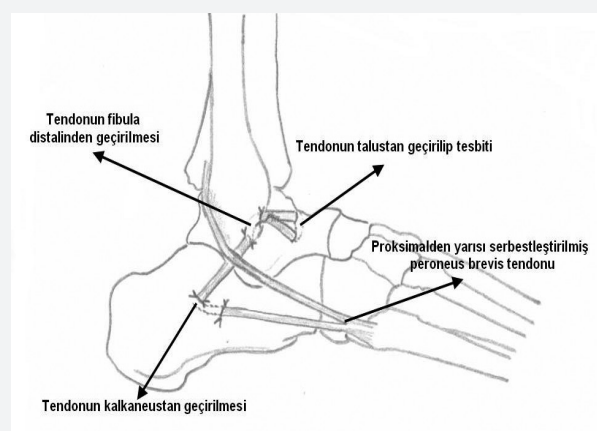

Fig. 4. Schematical illustration of Colville's Technique

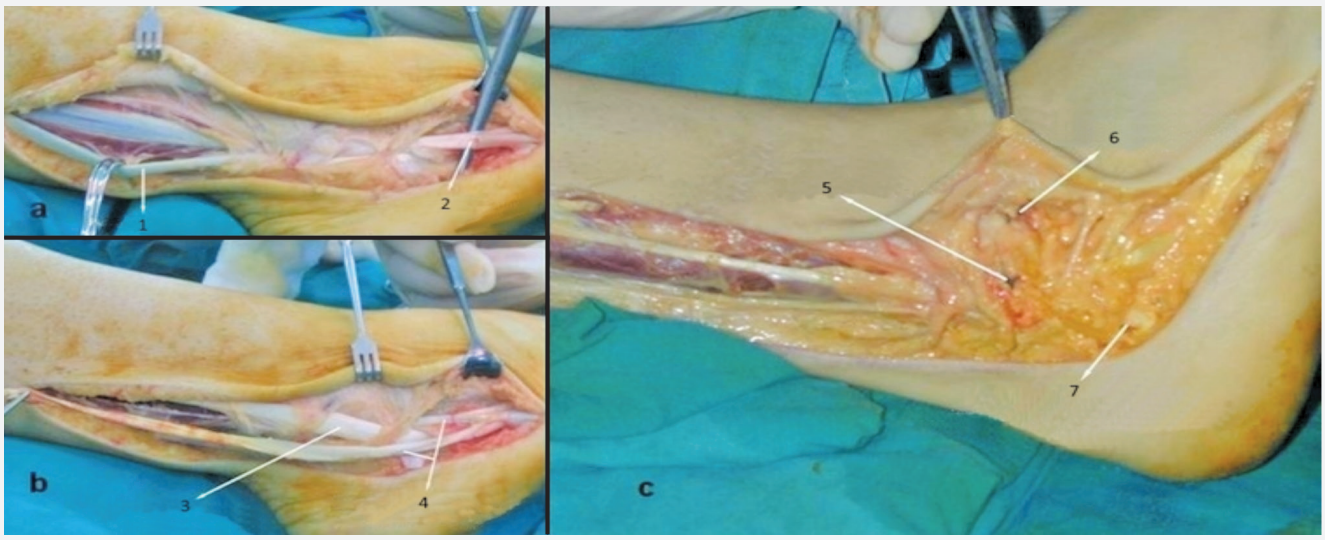

Fig. 5. Application of Colville technique (operation photos of the Case no 3). **1:** Pereneus longus tendon; **2:** Pereneus brevis tendon; **3:** Pereneus longus tendon; **4:** Pereneus brevis tendon proksimal half of the liberalized; **5:** Pereneus brevis tendon was passed through canal opened state of the distal fibula; **6:** Pereneus brevis tendon was passed through canal opened state of the talus; **7:** Pereneus brevis tendon was passed through canal opened to the calcaneus state

Operative technique: Tendon was reached with the incision done along peroneus brevis tendon in the ankle lateral. Half of the peroneus brevis tendon was released from the proximal musculo-tendinous junction by leaving the distal attachment site intact.

Calcaneus was passed through a tunnel prepared at the calcaneofibular ligament attachment site. Then it was passed from the oblique tunnel opened in the graft fibula to the proximal. The exit of the tunnel was exactly the attachment site of the anterior talofibular ligament. The graft was then sutured to itself after being passed through the canal opened in the talus neck (Fig. 4, 5) (Corville 1994).

Statistical evaluation

In the data evaluation, the SPSS (Statistical Package for the Social Sciences, Windows version 16.0) software program was used. Results were stated as median (minimum-maximum). In the statistical comparison of values between groups, the Independent Sample t-test, the Mann Whitney U-test and the Chi-square test were used. A value of $p \leq 0.05$ was accepted as statistically significant.

3. Results

In the third month of post-operative period, measurements were repeated with Telos stress test device. While pre-operative anterior talar draw was 13 mm (range 12-15 mm), it was 1.3 mm (range 1-3 mm) in the third month of post-operative; while talar tilt was 15° (range 11-18°) in the pre-operative, it was 0° in all cases in the third month of post-operative (Table I) (Fig. 6). The same results were also obtained in the repeated measurements (in 6th, 9th, 12th months). Ankle and subtalar joint movements completely returned to normal by the end of the fifth month and pain complaints disappeared. Recurrent instability was not observed in any of the patients at the latest examinations (Table 2). Complications such infection, non-healing wound and sural-nerve lesion were not encountered.

According to Chrisman and Snook (1969) classification system all patients were evaluated as excellent (Snook et al., 1985; Solakoglu et al., 2003). All patients have returned to their sports activities and military trainings in average of six months.

Table 1. Distribution of the results according to the cases

Case / F-M	Age	Side	Cause of trauma	Interval time (month) between trauma and surgery	Anterior talar draw in the stress radiographs (mm)		Talar tilt in the stress radiographs		Follow-up period (month)
					Preoperative	Postoperative (3rd month)	Preoperative	Postoperative (3rd month)	
1/F	35	Left	Sport	35	12	1	11°	0°	11
2/M	25	Right	Military training	21	14	1	18°	0°	8
3/M	24	Right	Military training	29	13	2	13°	0°	7
4/M	28	Left	Sport	28	12	3	16°	0°	10
5/M	22	Right	Military training	26	13	1	16°	0°	6
6/M	27	Right	Military training	30	12	1	14°	0°	7
7/M	28	Left	Sport	32	15	1	15°	0°	10
8/M	26	Right	Military training	33	13	1	17°	0°	6

Table 2. Instability level according to Ahlgren and Larsson Criteria 100% stability was obtained on the post-operative follow-ups according to Ahlgren and Larsson Criteria

		Pre-operative	Follow-ups
Functional level	1 (Instability walking on smooth ground)	6	0
	2 (Instability running on smooth ground)	2	0
	3 (Instability walking on rough ground)	0	0
	4 (Instability running on rough ground)	0	0
	5 (stable)	0	8
	Total	8	8

4. Discussion

The main lateral supports of ankle joint are anterior and posterior talofibular ligaments, and calcaneofibular ligament. The secondary support is talocalcaneal ligament in the tarsal sinus. If a patient has visible instability, it means both talofibular and calcaneofibular ligaments are torn. In the ankle inversion type sprains, usually anterior talofibular and calcaneofibular ligaments are injured together (Chrisman and Snook, 1965; Trevino et al., 1994; Rodop et al., 2000).

Many procedures have been described for the lateral ligament instability. These procedures failed to show superiority to each other. Real indication for surgical intervention, despite conservative treatment is the presence of functional and mechanical instability together (Rodop and Kıral, 2000). Reconstruction methods are divided into two groups; non-anatomical and anatomical. Late-term ankle lateral ligaments are directly repaired in the anatomical methods. The advantages of these methods are repair of ligaments pursuant to normal anatomy, preservation of normal joint mechanics, protection of subtalar joint motion, absence of donor site problem seen in the reconstructions done by using tendon, and cosmetically the use of a smaller incision.

The disadvantages, on the other hand, are due to the fact that only weak local tissues are used, stability in sufficient power is not provided, calcaneofibular ligament is not repaired fully, and frequent encounter to the subtalar instability problem. It was reported 87-95% excellent and good results in the series of Broström published by applying direct repair method (Yetkin and Kanatlı, 2002). Chen et al. have followed up the operation performed on 56 patients with chronic lateral ankle instability for 3 years in average, which was done by placing periosteal flap reinforcement to the fibula distal, and lateral capsule and ligament complex to the edge of the fibula anterior, and have achieved very good results (Chen et al., 2004). Schmidt et al. (2005) have achieved successful results at the end of 36-month follow-up, in which they have applied anatomical repair on 19 patients with chronic lateral ankle instability.

Fig. 6. Measurements of talar tilt in anteroposterior graphy and talar shift in lateral graphy with Telos device (radiographs of Case no.6 in the third month of pre-operative)

Table 3. Chrisman and Snook classification system

Cases that were functioning well and stable, with no more than 20° loss of inversion on no permanent sensory defect	Excellent
Presence of a mild functional loss or permanent sural nerve symptoms	Good
Presence of instability (based on the grade)	Moderate or poor

In the non-anatomical methods, on the other hand, tendon grafts are used in the reconstruction. The commonly used non-anatomical procedures are Evans, Watson-Jones and Chrisman-Snook techniques, which use peroneus brevis tendon for reconstruction. The success rate in achieving stability in these techniques is around 80-90%. However, they have been criticized on the aspects that the graft passage sites are non-anatomical; and consequently, limitation and pain occur in the subtalar joint movements (Yetkin and Kanatlı, 2002). In the study of Hortsman et al. development of pain was reported in the post-surgery (Horstman et al., 1981) Moreover, it has been indicated that the lowest instability rate against the highest inversion loss was reported; ATFL is better repaired in Watson-Jones technique. It is causing the limitation of dorsiflexion and inversion. In long-term follow-ups, anterior draw test is positive in 66%. Although both ligaments are reconstructed with Evans technique, 4% neuroma, 83% pain and 30% inversion limitation were reported. In long-term follow-ups, the instability repeats in 40% of patients with Chrisman-Snook technique (Van der Rijit and Evans, 1984; Anderson, 1985)

As we observed in our study, with the Colville's technique that applied by passing the split peroneus brevis tendon through the anatomical attachment sites of the lateral ligaments of the ankle, stability is achieved almost in 100% while the subtalar joint motions were protected. Although in the literature it was mentioned that the pain gets in the way of the subtalar joint degeneration, there is not any sufficient findings yet. Long-term follow-up series are required to be able to say that.

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