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Original article

## Study comparing surgical therapy vs conservative therapy in chronic ankle instability

J.A. Romero-Cruz,\* C.U. Ramírez-Salgado,\* E. de la Cruz-Honorato,\* R. Acosta Rosales\*\*

Central Military Hospital

**SUMMARY.** Ankle ligament injuries are one of the problems most commonly seen in general practice and in the emergency room. The ligaments most commonly involved are the lateral ligaments. The forced inversion mechanism is the most common reason for these injuries. A study was conducted with 39 volunteers diagnosed with chronic mechanical instability. Twenty subjects were managed by ligament reconstruction using the Chrisman-Snook technique. The other 19 subjects were treated by rehabilitation exercises. All subjects were assessed using the AOFAS scale prior to their management and they were reassessed within a term ranging from 6 to 18 months with the same scale to see the results. The conclusion drawn was that ligament repair with the Chrisman-Snook technique has been more effective than rehabilitation based conservative management in chronic ankle instability.

**Key words:** ankle injury, lateral ligament, therapy, rehabilitation.

**RESUMEN.** Las lesiones ligamentarias del tobillo son uno de los problemas más comúnmente vistos en la consulta general y de urgencias. Los ligamentos más frecuentemente afectados son los ligamentos laterales del mismo, siendo el mecanismo de inversión forzada la forma más común de su producción. Se realizó el estudio en 39 voluntarios con diagnóstico de inestabilidad mecánica crónica. Veinte de ellos se manejaron mediante reconstrucción ligamentaria con la técnica de Chrisman-Snook y los 19 restantes mediante ejercicios de rehabilitación. Se realizó valoración a todos ellos aplicando la escala de la AOFAS previo a su manejo y en un plazo entre 6 y 18 meses se reevaluaron mediante la aplicación de esta misma escala, para la obtención de los resultados. Concluimos que la reparación ligamentaria con la técnica de Chrisman-Snook ha resultado más efectiva que el manejo conservador basado en rehabilitación en la inestabilidad crónica de tobillo.

**Palabras clave:** Lesion de tobillo, ligamentos laterales, tratamiento, rehabilitación.

### Introduction

Ankle ligament injury is one of the problems most commonly seen in the general practice office and in the emergency room. The incidence of injuries due to inversion has been estimated at 1 per 10,000 people every day.

Acute ankle sprain is frequently seen in certain types of sports with the following percentages reported: basketball, 45%; volleyball, 25%; soccer, 31%; and among military personnel, 30%. Eighty five per cent of all these sprains occur due to inversion.<sup>6,11</sup>

Ankle lateral ligament injuries caused by a forced inversion motion is the most common of injuries in this joint, and one of the most frequently seen by orthopedists. Usually these inversion injuries have a good prognosis with conservative therapy involving rest, ice packs, non steroid anti-inflammatory drugs (NSAIDS), bandaging the limb followed by the use of a splint, early motion, and physical therapy.

However, when these injuries are not properly managed, the main complication occurring in ankle lateral ligament injuries is the development of chronic ankle instability.<sup>6,7,20</sup>

\* Medical Student having completed his curriculum, Military Medical School.

\*\* Appointed to the Orthopedics Service at the Central Military Hospital.

Mailing address:

Dr. Román Acosta Rosales. Hospital Ángeles de las Lomas, Vialidad de la Barranca s/n, Col. Valle de las Palmas, Huixquilucan, Estado de México, CP 52763 – Consultorio 160.

A sprain is the set of anatomicopathological and clinical alterations of a joint as a result from a sudden movement forcing the joint to go beyond the normal limits of its mobility resulting in a ligament injury ranging from a simple stretch to a full rupture. Sprain is clinically determined by pain, swelling, ecchymosis, and effusion and may develop into a hematoma. The most frequent sprains are those of ankles and knees. The ligaments most affected in an ankle sprain are the lateral ligaments (anterior talofibular ligament, talocalcaneal ligament, and posterior talofibular ligament in order of frequency) due to a forced inversion motion.<sup>1</sup>

A chronically unstable ankle is associated to poorly diagnosed, and therefore poorly treated, ligament injuries. These patients suffer of major disabilities for long periods of time.

Chronic ankle instability is defined as a clinical condition characterized by the presence of repeated sprains. It may be functional or mechanical. Functional instability is a motion beyond the voluntary control but does not go beyond the physiological range of motion. Mechanical instability goes beyond the physiological range of motion and is radiologically expressed with an anterior box larger than one centimeter and a lateral yawn greater than 10 degrees.<sup>5,12</sup>

Lateral chronic ankle instability is usually experienced with chronic lateral pain, repetitive chronic inflammation, a sense of instability making sports practice and daily activities difficult. Although the symptoms and signs are due to a ligament organic injury, the alteration in the proprioceptive ankle system accompanying nearly all ligament injuries contributes greatly to their occurrence.<sup>11,18</sup>

With established chronic instability, minimum movements may result in relapsing inversion injuries and consequently in chronic pain secondary to chondral or osteochondral damage. Because of this, it is necessary to perform and include in conservative therapy, functional ankle rehabilitation. This may possibly help the patient to return to his/her normal activities as soon as possible.

Mechanical ankle instability is confirmed by X-rays with inversion maneuvers and forced (stress) anterior box where an anterior 10 mm box or a 9 degree lateral yawn and more are indicative of mechanical instability.<sup>5</sup>

Although most of the time chronic instability is treated with conservative type therapy, surgical reconstruction is usually necessary especially in high performance athletes with overt ankle instability. Furthermore, when these injuries recur and result in chronic instability, surgical therapy will also be necessary. All kinds of surgical therapy require later physical rehabilitation and weight bearing with no support is achieved within no less than six weeks.<sup>7,15,19</sup>

One of the techniques used more often today is the Chrisman-Snook technique. With this technique, the medial half of the short lateral peroneal ligament is taken and introduced into the anterior calcaneal process, the lateral talar neck face, and finally into the tip of the peroneal malleolus. This procedure allows stabilizing the ankle effectively in over 80% of patients<sup>6</sup> (Swiss surgery 1996) showing equal efficacy as the Watson-Jones and Brostrom procedures.

## Material and methods

The study involved 39 volunteers recruited from the orthopedics outpatient service. All patients were diagnosed with chronic mechanical ankle instability confirmed clinically and radiologically. The patients were randomized to surgical therapy (20) and conservative management (19). Surgical therapy involved ligament reconstruction following the procedure described by Chrisman-Snook<sup>21</sup> and conservative therapy involved rehabilitation.

Volunteers were thoroughly asked about their general and orthopedic medical history including details on maneuvers and special orthopedic testing. All data were recorded as the ankle medical history and a 100 point clinical evaluation (AOFAS scale) was taken.<sup>16</sup>

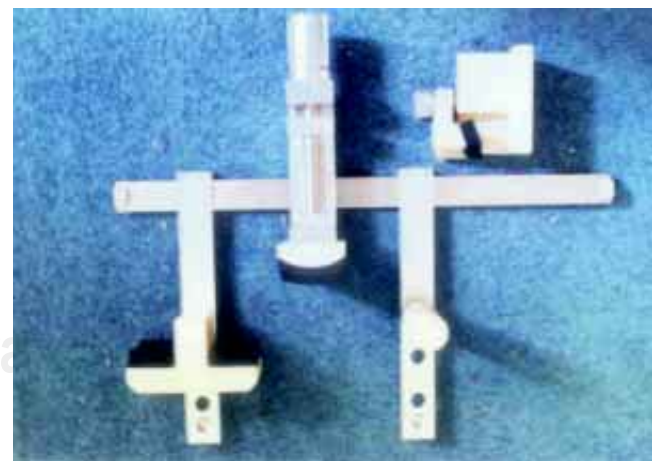
The first group had an average age of 31.05 years with a 10.30 standard deviation, minimum age being 17 and the maximum age 55, a 38 year range.

The second group had an average 31.63 years with a 13.19 standard deviation. The minimum age was 20 and the maximum age was 59 years with a 39 year range.

As for the gender distribution, females predominated in the first group with 11 female patients (55%) and 9 males (45%). On the other hand, males prevailed in the second group with 68% of males and 32%, 6, of females.

Regarding the number of sprains previously occurred in each patient the group undergoing conservative therapy had an average of 4.84 sprains with a 1.54 standard deviation while the surgery group had an average of 4.95 sprains and a 2.56 standard deviation.

To take X-rays with stress maneuvers, the PROESTO device (*Figure 1*) was placed over the X-ray equipment slab. The subject was asked to assume the decubitus lateral position on the side of the ankle involved, place the heel on the surface of the device specifically allocated for it to set the ankle fixed on this point. Later, the piece avoiding the leg displacement to a proximal third was placed and the central



**Figure 1.** "PROESTO" device assembled to take the "anterior box". On the side, see a piece to take the lateral yawn.

displacer of the device was set on the lower third of the leg, on its anterior portion. The wheel was gradually turned for the opposite end to put pressure by moving the leg in a posterior direction visualizing the joint by fluoroscopy. Once the joint was centered, the film was taken (*Figure 2*). To perform the inversion maneuver, the heel fixating piece was changed for the turning piece and the patient's heel was placed on it set on the posterior inferior surface of the calcaneus like the leg proximal portion while the central displacer is again placed on the distal third on the internal portion. The wheel is turned so that pressure is put on this area of the joint subject gradually to a forced inversion. Once the film is taken, the anterior box is measured by drawing a line over the posterior joint surface of the talus and a line parallel to this one to the posterior border of the tibia. To measure the ankle inversion, a line is drawn on the joint surface of the tibia and another on the joint surface of the talus. The angle made by these lines is the one measured (*Figure 3*).

Conservative therapy included 10 sessions with a single therapist at the rehabilitation and physical medicine service by immersing the leg in a water massage tub for 20 minutes, followed by muscle strengthening exercises of the lower limbs, involving the gluteus maximus, gluteus minimus, quadriceps, lateral peroneal muscles, and strengthening the proprioceptive ankle system of both limbs. After these 10 sessions, volunteers were told to continue with the same exercise program learned at the Physical Medicine and Rehabilitation Services and to do these exercises every day on a permanent basis at home.

Surgery involved repairing the ligaments following the Chrisman-Snook procedure as follows: after getting the lower limb involved aseptic and antiseptic, the patient is held in a decubitus supine position with a 10 cm diameter roll under the ipsilateral gluteus region and is given peridural anesthesia. A lateral incision is performed on the ankle from the tip of the peroneal malleolus to the anterior calcaneal process cutting subcutaneous cellular tissue, the superior extensor retinaculum and peroneal sheath. The short lateral peroneum is identified to get to its middle in order to cut its substance at half its thickness, as proximally as possible. The peroneal calcaneal and anterior talofibular ligaments are identified and cut to suture them with 0 vicryl. Tunnels are made with a 3.2 mm drill on the anterior process of the calcaneus, the lateral wall of the talus and the tip of the peroneal malleolus. Half of the short lateral peroneal tendon is passed through these tunnels. Once the tendon is introduced into the tunnel, it is strained and sutured on itself keeping the ankle in a neutral position. The wounds are washed, sutured by planes and a posterior cast is placed.<sup>21</sup>

After completing the surgical procedure, the patient was kept for three weeks on a cast with no weight bearing and three weeks with a short cast boot partially bearing weight and using crutches. By the sixth week the cast was removed.

The follow up time for patients undergoing both therapies ranged from a minimum 6 months to a maximum 2 years.

## Results

When using the AOFAS scale before and after therapy, the conservative therapy group showed an average pre-therapy 63.05 score with an 8.14 standard deviation and an average post-therapy 84.16 score with a 4.84 standard deviation. Also, the Student's t statistical technique was used for the same sample measured twice. A statistically significant difference was found ( $t = -11.194$ ; 18 gl;  $p < 0.05$ ) (*Chart 1*).

Moreover when using the AOFAS scale, the surgery group showed a pre-therapy 47.50 average score with a 14.21 standard deviation and an average 93.35 post-therapy score with a 7.72 standard deviation. Again, in estimating the Student's t test, a statistically significant difference was determined ( $t = -12.279$ , 19 gl;  $p < 0.05$ ) (*Chart 1*).

Both groups showed the same increasing trend in the AOFAS scale rate. However, the increase in the surgery group was less obvious.

At present, all patients undergoing surgery are able to carry out sports activities with no problem. Inversion and eversion motion in these patients decreased by 20 degrees.

Complications seen in the conservative therapy group were persistent pain and sense of instability in 4 patients while complications in the surgery group were infection of



**Figure 2.** Image showing an ankle with a preoperative 12 mm anterior box of a patient, taken by using the "PROESTO" device.



**Figure 3.** Patient with a preoperative 20 degree lateral yawn, taken by using the "PROESTO" device.



**Figure 4.** Postoperative control of patients subject to the Chrisman-Snook procedure with a residual anterior box taken by using the "PROESTO" device.

the surgical wound in one patient. The infection was managed with oral antibiotics and dressing changes three times a day. One patient presented neuroma of the sural nerve and cheloid scarring which was handled with plastic surgery and neurolysis. One patient had reflex sympathetic dystrophy and sural neuroma which was treated with two methylprednisolone acetate plus lidocaine infiltrations and rehabilitation.

## Discussion

Chronic lateral ankle instability may be a severe disability especially in people having high levels of daily activities. Selecting the therapy should be based on the results expected and the needs of every patient.<sup>13</sup>

Evolvement to chronic ankle instability has been considered as the main complication of a poor treatment of ankle ligament injuries. Several authors have described that in reaching such a clinical situation, a positive history of pain, swelling, sense of instability and repeated sprains should be more significant than X-ray confirmation through stress maneuvers. However, we feel both evaluations (clinical and X-ray film) supplement each other as reported by the literature.<sup>8</sup>

We think that radiological diagnosis of chronic ankle instability has been established according to Karlsson and Lansinger who defined mechanical instability as an anterior box greater than 9 mm and a displacement on forced inversion of more than 8 degrees. This implies less resources spent than doing it as recommended by other authors who consider this diagnosis when the difference is of 3 mm or three degrees in measuring the anterior box or the forced inversion respectively compared to the healthy side.<sup>10,17</sup>

For the X-rays under strain required in this study, the design and manufacturing of a mechanical device (PROESTO) (Figure 1) was made to facilitate the positioning of the patient and allowed for less exposure of the medical team to radiation. Usually, they perform these procedures manually. In reviewing the national literature no references were found indicating a similar device is being used.

Given the existing controversy in the literature about handling chronic ankle mechanical instability between surgery and conservative therapy, it is important to make an appropriate clinical and radiological assessment to get the proper diagnosis of this pathological entity in order to provide the therapy giving the best results.<sup>3,9,22</sup>

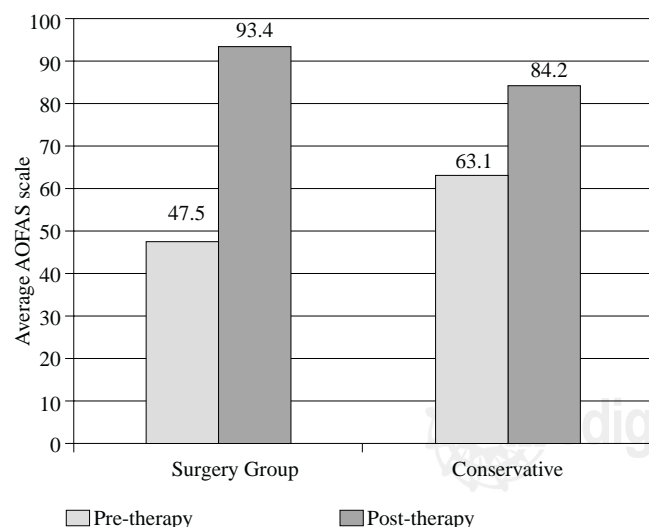
In this study, we assessed the clinical improvement by giving the AOFAS scale to assess clinical criteria such as



pain, function, maximum distance walked, surface, gait anomalies, sagittal motions, posterior ankle motions, stability, and alignment. A remarkable improvement was seen in the scores of all of these parameters especially in volunteers treated by the Chrisman-Snook ligament reconstruction pro-



**Figure 5.** Postoperative control of a patient operated with the Chrisman-Snook procedure having a residual 8 degree yawn.



**Chart 1.** Evaluation by using the AOFAS scale in patients of both study groups. Orthopedics Service.

cedure. Similar results were reported in previous studies about this procedure.<sup>10</sup> The same trend, albeit to a lesser degree, was shown in patients treated by rehabilitation with exercises to strengthen the lower limbs bilaterally unlike the reports by Karlsson who only used strengthening of the peroneal muscles considering that the main objective was to relieve the symptoms of patients.<sup>3,14</sup> However, the post-therapy outcome needs no correlation to radiology imaging. Patients improve clinically even if ligament instability data may persist radiologically (*Figure 4*).

In this study, this clinical problem was seen to be more common among males accounting for 56% of volunteers recruited in this study. This is consistent with the world literature reports.<sup>13,14</sup>

The improvement seen was statistically significant with both therapy modes. However, we see that in patients subject to surgery (Chrisman-Snook ligament repair) the therapy efficacy was more obvious.

Complications seen among patients in the surgery group were as expected for the surgical procedure and similar to those reported by the literature.<sup>10</sup>

## Conclusions

For a chronic ankle instability diagnosis, a device was manufactured to perform the stress maneuvers. This device helps when taking X-rays and the medical staff is less exposed to radiation.

Chrisman-Snook's ligament repair in chronic ankle instability is more effective than rehabilitation based conservative therapy.

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