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To Compare the Effect of Taping Techniques and Conventional Treatment on Gait Variables in Patent With Flat Foot

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ABSTRACT

Aim: To compare the effect of taping techniques and conventional treatment on gait variables in patients with flat foot.
Methods: 30 subjects recruited and divided into 2 groups each having 15 patients. Group A (N=15) received isometric exercises and Group B (N-15) received isometric exercise and taping technique. Pre and post measurement for step length, stride length, toe out were taken.
Result : Step length in both Group A (48.31 ± 8.64 vs. 53.70 ± 9.49, t=3.96) and Group B (47.53 ± 7.50 vs. 64.32 ± 6.03, t=12.55) increased significantly ($p<0.05$), Stride length improved significantly more in Group B than Group A., Toe out levels improved significantly more in Group B than Group A. level of significance ($p<0.05$).
Conclusion: taping techniques can be an effective manoeuvre which can help in improvement of gait variables in patients with flat foot.

KEYWORDS Step length, Stride length, toe out angle, taping technique

INTRODUCTION

The normal foot is composite of 26 bones of foot and ankles; it contains 23 joints, more than100 muscles, tendon ligament etc 1. Bony structure is designed to transmit body weight to the ground.. The arch of foot is demonstrates two extremes of anatomical structure position i.e. high arched and flat arch2. Pes planus is characterized by the decreasing or disappearing completely of the height of medial longitudinal of arch of the foot.3 The effect of flat foot is loss of spring in the foot leads to a clumsy shuffling gait, loss of shock absorbing function makes the foot more liable to trauma and osteoarthritis, loss of the concavity of the sole leads to compression of the nerves and vessels of the sole.

Flat foot can also develop as an adult ("adult acquired flatfoot") due to injury, illness, unusual or prolonged stress to the foot, faulty biomechanics, or as part of the normal aging process. This is most common in women over 40 years of age. Known risk factors include obesity, hypertension. However, if developed by adulthood, flat foot generally remain flat permanently. Methods to collect the foot arch shape include foot printing, X-ray, plantar pressure measurement, laser scanning measurement[7]. Among the foot defects which cause disability flat foot is one the commonest.

Gould et al. refuted the fat pad theory with radiographic evidence of actual flattening of the medial longitudinal arch. Vanderwilde et al[13]. confirmed these findings with the first comprehensive study on normative radiographic measurements of the foot in children. Persons with flat foot may also have a neutral or under pronating gait. Pronation is a natural form of shock absorption during running and walking, when the ankle rolls inward and the weight distribution in the foot shifts medially. Over pronation is excessive pronation; it disrupts the alignment of the leg and may result in injuries due to over-stressing of the knee and leg. The pronated (flat-arched) foot may be associated with excessive subtalar joint pronation. Abnormal compensatory foot pronation may cause passive instability and hyper mobility of the joints of the foot. Physiotherapy treatment is strengthening and endurance exercise to the intrinsic(warm water), corrective gait training with orthoses, bearing weight on lateral border of foot without orthoses, repetitive toe curling even with shoe on(it provide resistance).

METHODS

1. SAMPLE

Sample: 30 subjects with age 18 – 25 years.

Source: Santosh Medical and Dental College Hospital

Population: 150 students of Santosh College of Physiotherapy.

SELECTION CRITERIA:

Inclusion criteria[13]

- Foot comes in contact with the ground when they stand.
- Navicular drop test from(minimum) 3.6 to 8.1 mm(maximum)

Exclusion criteria [11, 12]

- Any deformity of foot and ankle.
- Tape allergies.
- Any neurological problem and peripheral vascular disease.
- History of fracture or trauma and surgery to lower limb.
- Subject having calcaneal spur and planter fascitis.

SAMPLING:

Convenient sampling.

INSTRUMENTATION

Tools: → Tray, ink, Tape (2 inch and 3 Ns Tex kinesiology), chart paper, scale

VARIABLES
Independent variables – taping techniques, exercises

Dependent variables – Stride length, Step length and angle of toe out

STUDY DESIGN: Experimental study design.
PROCEDURE
A 30 subjects with flat foot were recruited on the basis of inclusion and exclusion criteria and divided into two groups each having 15 subjects. (i.e. Group A and Group B). An informed consent was signed by all subjects before participation in the study. Pre measurements were taken for the step length, stride length and angle of toe out for both the groups. Then group A were undergone for isometric exercises and group B were undergone for isometric exercises and taping. The post measurements were taken for the same variables.

PROCEDURE RELIABILITY
Navicular drop test
Take a marking pen and a piece of 3"x5" card stock. With the patient sitting comfortably (foot on the floor, but non weight bearing), palpate the medial aspect of each foot and find the navicular prominence (the most prominent bony landmark found inferior and somewhat anterior to the medial malleolus). Using the pen, make a mark on the patient's skin at the point of the navicular prominence. Stand the card on the floor next to the medial arch of the foot and mark the card at the level of the navicular prominence. Ask the patient to stand, in a relaxed position. Once the arch is weight bearing, the navicular prominence will be somewhat lower. Make a second mark on the same side of the card at the new level of the navicular prominence. Repeat this procedure with the other foot. Now measure the difference between the two marks for each foot. if there is an obvious asymmetry from left to right, this is objective evidence of a functional foot problem.

RESULT
The data were summarized as Mean ± SD. The groups were compared by paired t test and independent Student's t test. A two-sided (α=2) $p<0.05$ was considered statistically significant. The age of both Group A and Group B ranged from 18-25 yrs with mean (± SD) 21.27 ± 2.12 yrs and 21.87 ± 2.33 yrs, respectively.

Outcome measures
I. Step length
The pre and post treatments Step length (cm) of two groups are summarized in Table 1 the mean Step length in both groups increased (improved) after the treatments and the increase (improvement) was evident higher in Group B than Group A.

Table 1: Pre and post treatments Step length (Mean ± SD) of two groups

Groups	Pre treatment (n=15)	Post treatment (n=15)	t value	p value
Group A	48.31 ± 8.64 (35-64)	53.70 ± 9.49 (41-68)	3.96	p<0.05
Group B	47.53 ± 7.50 (34-63)	64.32 ± 6.03 (56-79)	12.55	p<0.05
t value p value	0.79 p>0.05	3.66 p<0.05	-	-

Numbers in parenthesis represents the range (min-max)

Comparing the mean Step length within the groups (Table 1), the Step length in both Group A (48.31 ± 8.64 vs. 53.70 ± 9.49, t=3.96; p<0.05) and Group B (47.53 ± 7.50 vs. 64.32 ± 6.03, t=12.55; p<0.05) increased (improved) significantly (p<0.05)

For each period, comparative mean Step length between the groups (i.e. within periods).

Similarly, comparing the mean Step length between the group, the Step length of two groups not differed (p>0.05) at pre treatment (day 0) i.e. found to be statistically the same (p>0.05). In other words, Step length of two groups was comparable. However, the mean Step length of Group B was found significantly (p<0.05) as compared to Group A (53.70 ± 9.49 vs. 64.32 ± 6.03, t=3.66; p<0.05).

II. Stride length
The pre and post treatments Stride length (cm) of two groups are summarized in Table 2 showed that the mean Stride length in both groups increased after the treatments and the increase was evident higher in Group B than Group A.

Table 2: Pre and post treatments Stride length (Mean ± SD) of two groups

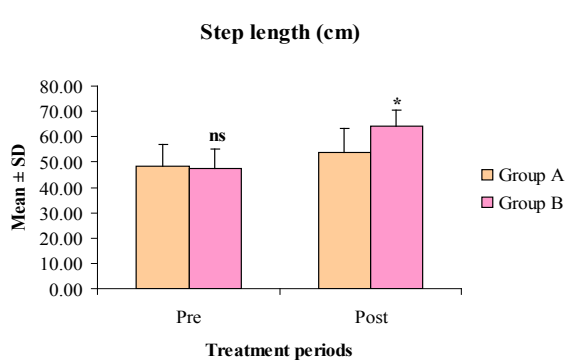
Groups	Pre treatment (n=15)	Post treatment (n=15)	t value	p value
Group A	93.84 ± 14.14 (71-129)	100.04 ± 15.85 (75-142)	6.57	p<0.05
Group B	94.28 ± 13.19 (65-121)	113.69 ± 13.43 (92-145)	19.12	p<0.05
t value p value	0.09 p>0.05	2.54 p<0.05	-	-

Numbers in parenthesis represents the range (min-max).

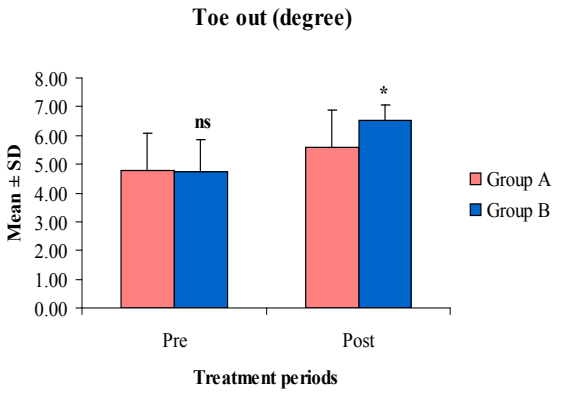
Similarly, In other words, Stride length of two groups was comparable. However, the mean Stride length of Group B at post treatment was found significantly (p<0.05) as compared to Group A (100.04 ± 15.85 vs. 113.69 ± 13.43, t=2.54; p<0.05). In other words, after treatments, Stride length improved significantly more in Group B than Group A.

III. Toe out
The pre and post treatments Toe out levels (degree) of two groups showed that the mean Toe out levels in both groups increased after the treatments and the increase was evident higher in Group B than Group A.

Similarly, comparing the mean Toe out levels between the groups, the Toe out levels of two groups not differed (p>0.05) at pre treatment (day 0) i.e. found to be statistically the same (4.80 ± 1.26 vs. 4.73 ± 1.10, t=0.15; p>0.05). In other words, Toe out levels of two groups was comparable. However, the mean Toe out levels of Group B at post treatment was found significantly (p<0.05) different and 1.9 fold higher as compared to Group A (5.60 ± 1.30 vs. 6.53 ± 0.52, t=2.59; p<0.05). In other words, after treatments, Toe out levels improved significantly more in Group B than Group A.



Graph 1: Comparative mean Step length between the groups (i.e. within periods).



Graph 2: Comparative mean Toe out levels between the groups (i.e. within periods).

DISCUSSION

In present study conventional treatment proved to effective in improving all three outcomes measure, however the taping was found to be more significant than convectional treatment in its ability to improve step length, stride length and toe out. As Medial longitudinal arch has been described as a critical structure of the foot that contributes to shock absorption and the attenuation of forces transmitted to the body during gait. Many structures may contribute to varying degrees to support the medial longitudinal arch including the plantar fascia, ligaments such as the plantar calcaneo-navicular ligament, extrinsic foot muscles such as the tibialis posterior muscle and the intrinsic foot muscles. The intrinsic foot muscles may have a functional role for stabilizing the foot[13]. According to Previous research Tibilias posterior tendon which is the main stabilises of the foot arch. The structure and composition of tendon specimens had changed and found evidence of increased activity of some photolytic enzyme[15]. The enzyme can break down the constituents of the tibilis posterior tendon and weaken it – causing to the foot arch to fall[9]. Increases in navicular height after application of tape, there was a significant 19.3% reduction in MLA, after application of the tape there is measurable change to medial arch height and amount of arch height deformation during gait[14]

A description of weight- bearing foot pronation while the foot is flat on the ground may be made as follows, when the subtalar joints pronates, the calcanes everts, plantar flexes and internally rotates. This results in dorsiflexion and abduction of the midtrasal joint on its oblique axis and inversion of the midtarsal joint along its longitudinal axis. but most studies on the mechanical effect of taping have demonstrated[11], Excessive pronation is associated with weakness in the plantar flexor muscle and decreased ability to push off. Not having an arch would make push-off less effective, since the foot does not become the needed "rigid lever" at toe-off. This, therefore, would make walking more inefficient and more energy-consuming[8].

Taping technique to support the medial longitudinal arch and reduce. Excessive pronation. The tape on the bottom of the foot is pulled from a lateral to a medial direction of support the medial longitudinal arch of the foot. The medial support may reduce excessive subtalar joint pronation that accompanies the covering of the medial longitudinal Taping effect on Gait; the application of taping would appear to increase the individual gait patterns. Relieves pain support muscles in movement, removes lymphatic fluid congestion, and corrects joint misalignment assist in positioning a muscle or joint into proper position for rehabilitation. Study said that may be the extremes of pronation range that lead to injury of the soft tissue structures that control pronation. They proposed that antipronation taping may prevent excursion into the extremes of range and thus prevent injury. The antipronation techniques may prevent deformation of the soft tissue beyond the elastic region of the load deformation curve. People with sever and chronic pes planus often have inadequate push off.[14]

Effects of proprioception training is joint position sense and strength development Taping may perform a role in providing a sense of mechanical stability taping may provide superior benefits with regard to deceleration of inversion velocity and facilitation of dynamic neuromuscular protective mechanisms. Taping significantly improved the ability of subjects to actively reproduce a specific plantar-flexion joint angle. Because taping also significantly enhanced inversion position sense, they suggested that taping may be more effective for improving proprioception. The ability of these techniques to control pronation during weight bearing exercise indicates that they may be useful in correcting abnormal pronation as part of the clinical assessment and treatment of overuse injuries[13].

FUTURE RESEARCH

- Future study can be done by using EMG with same protocol
- Validation may also be checked across gender and age

CONCLUSION

The study concluded that taping techniques can be an effective therapeutic manoeuvre which can help in the improvement of gait variables in the patients with flat foot. So null hypothesis is rejected.

LIMITATIONS

- Sample size was small.
- Procedure error could not be control
- Difficulty in walking on platform without looking at it

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