Relation between Chronic Low Back Pain and Navicular drop: Cross-Sectional Study

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Background: Epidemiologic data showed that prevalence of chronic low back pain (CLBP) is increasing. Foot pronation and calcaneal eversion are said to cause LBP.

Objectives: The purpose of this study was to investigate the relation between CLBP, and navicular drop.

Methods: Seventy-Five patients with chronic low back pain (LBP more than 3 months) with their mean ± SD age, weight, height and BMI were 36.32 ± 10.61 years, 76.4 ± 14.63 kg, 164.94 ± 8.92 cm and 28.11 ± 5.23 kg/m². No previous surgery at spine or lower limb. Every patient reported his pain intensity number from 0 to 10 using NPRS while 0 means no pain and 10 means intolerable pain. The navicular drop difference was measured while the patient was sitting (unloaded) with his feet on the floor in mid position. The navicular tuberosity was marked and the distance from it to the floor was measured using a ruler, then the same distance was measured from standing position (loaded). Then the difference between the two positions was measured to determine the navicular drop.

Results: The relation between NPRS and right navicular drop of the study group was weak negative non-significant (r = -0.11, p = 0.31). The relation between NPRS and left navicular drop of the study group was very weak positive non-significant (r = 0.02, p = 0.85).

Conclusion: There was no relation between chronic low back pain and navicular drop.

Key Words: Chronic Low Back Pain; Flat Foot; LBP; Navicular Drop.

Introduction

It is interestingly to know that foot type such as pes-cavus or pes-planus is an important factor for anatomical alignment at the lower limb. It has a great influence on producing back pain or other lower extremity problem **(Dahle, 1991; Mei-Dan, 2005 and Gabel, 2012).**

Mechanical mal-alignment of the lower extremity may increase the incidence of injury, proprioceptive deficit, load distribution at joint surfaces, weight bearing and efficiency of

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muscle contraction. These factors will result in altering the neural signals affecting the control and function of the lower limb **(Loudon, 1996 and Shultz, 2006).**

(1)reported hypoactivity and changes in motor control of deep intrinsic spinal muscles with LBP. At 2011 reviewing literatures which studied the brain changes during a state of CLBP, using new technologies such as functional magnetic resonance imaging and electroencephalography they found structural, functional and neurochemical changes at the brain tissue. **(Benedict Martin Wand a, Luke Parkitny b, et.al., 2011)**

Low back pain (LBP) is one of the most common musculoskeletal disorders at our recent times affecting around 80% of people **(Cassidy, 1998; Walker, 2000).** LBP affected the daily living activities of suffering people, it limited their work abilities and decreased their performance **(Cassidy, 1998; Cassidy, 2005; Hincapie, 2010 ; Peter and O`sullivan, 2000).** It was commonly responsible for high rates of work absence **(Carey, 1995 and Carey, 1996).**

According to our knowledge till know there is evidence that Flat foot affects the lower limb mechanics and causes LBP, but the reverse is not. The purpose of this study was to know the relation between the chronic LBP and flat foot.

Methods

Subjects

Seventy-five patients with chronic low back pain were included in the study group. Their mean ± SD age, weight, height and BMI were 36.32 ± 10.61 years, 76.4 ± 14.63 kg, 164.94 ± 8.92 cm and 28.11 ± 5.23 kg/m² . As shown in table 1 and figure 1-4.

Table 1. ***Descriptive statistics for the age, weight, height and BMI of the study group.***

	$\bar{X}$ **±SD**	**Maximum**	**Minimum**	**Range**
Age (years)	36.32 ± 10.61	54	19	35
Weight (kg)	76.4 ± 14.63	125	47	78
Height (cm)	164.94 ± 8.92	186	147	39
BMI (kg/m²)	28.11 ± 5.23	43.43	18.59	24.84

$\bar{X}$ **: Mean** **SD: Standard deviation**

Patients have LBP for at least 3 months with or without leg pain. Patients with LBP at least 4/10 at Numerical pain Rating scale. According to the work of **(Smith et al. , 2014 and Shamsi et al, 2016).** With no previous back or lower limb surgeries, Recent or old fractures at lower limbs, Cognitive impairment and inability to understand the scale, Systemic inflammatory diseases (e.g. Rheumatoid arthritis) and Spinal deformities (e.g. Scoliosis). Before starting the procedures were explained to the patients and consent form have been taken.

Assessment tools and experimental methods:

Pain Assessment:

Pain intensity is measured by NPRSs (**Picture 1**) The patient was asked to give his pain intensity at that moment and the past 24 hours number from zero to ten where zero mean no pain and ten intolerable pain that may make him/her faint. We make a mark at the selected number. The scale is divided into 11 numbers from zero to ten where from 1 to 3 considered mild pain, from 4-6 considered moderate pain and from 7 to 10 considered severe pain. **(Childs JD, 2005).**

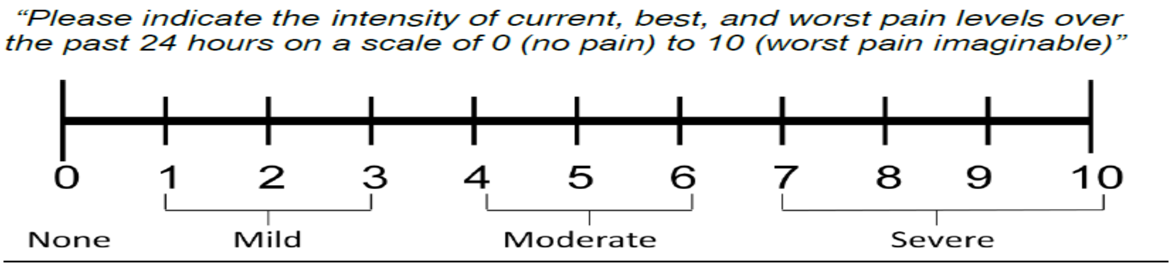


Figure 1 Numeric Pain Rating Scale. (4)

Navicular drop test:

The patient was asked to become bare foot and sit at the chair comfortable (unloaded position) while the feet at the floor. We adjust the feet position to become at mid position after mark the navicular tuberosity we put the ruler and measure the distance from the navicular tuberosity to the floor three times and calculate the mean. Then, the patient stands up at his comfortable standing (loaded position) and we measure the distance from the navicular tuberosity to the floor three times and calculate the mean. Then, we took the difference between sitting and standing measures. according to the work of (Nguyen, 2007 **;**Nguyen & Shultz, 2009**;** Mckeon and Hertel, 2009).

Figure 2 navicular drop test (unloaded position) sitting

Figure 3 navicular drop test from standing (loaded position)

Pearson Correlation Coefficient was conducted to determine the correlationbetween Numeric pain rating scale and navicular drop. The level of significance for all statistical tests was set at $p < 0.05$. All statistical tests were performed through the statistical package for social studies (SPSS) version 19 for windows. (IBM SPSS, Chicago, IL, USA.

Results

The mean ± SD NPRS of the study group was 6.85 ± 1.68 with minimum value of 4 and maximum value of 10.

The mean ± SD right navicular drop of the study group was 9.39 ± 4.05 mm with minimum value of 1.5 mm and maximum value of 20 mm. (table 2).

The mean ± SD left navicular drop of the study group was 9.95 ± 4.14 mm with minimum value of 1.5 mm and maximum value of 22 mm. (table 2).

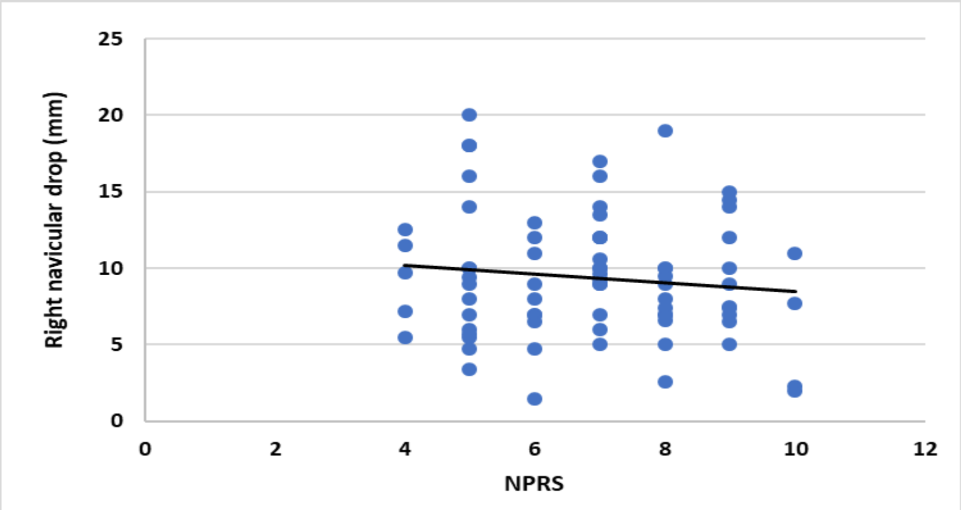
Table 2. ***Descriptive statistics of the navicular drop of the study group.***

Navicular drop (mm)	$\bar{X}$ ±SD	Minimum	Maximum	Range
Right	9.39 ± 4.05	1.5	20	18.5
Left	9.95 ± 4.14	1.5	22	20.5

$\bar{X}$: Mean SD: Standard deviation

The correlation between NPRS and right navicular drop of the study group was weak negative non-significant correlations (r = -0.11, p = 0.31). (figure 4).

The correlation between NPRS and left navicular drop of the study group was very weak positive non-significant correlations (r = 0.02, p = 0.85). (figure 5).



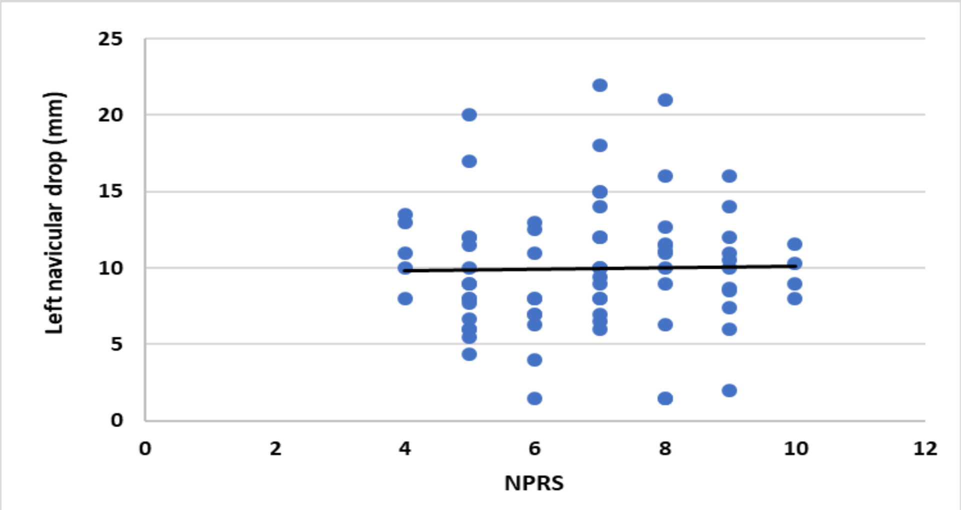


Figure 5 Correlation between NPRS and left navicular drop

Discussion

We are of the opinion that foot over pronation affects the lower limb mechanics and spinal mechanics. Although our statistical results found no significant relation between chronic low back pain and navicular drop, more than half of subjects represented with navicular drop.

A study on healthy subjects to see the changes in mechanical chain after placing a several sized wedges on the lateral side of the foot for 20 seconds, they found immediate lower limb substitution including internal rotation tibia , internal rotation femur and anterior pelvic tilt (8,9).

(10)found significant relation between foot overpronation and incidence of LBP. It is interesting to note that feet over pronation affects the whole-body mechanics not only the back. It increased the pelvic inclination, the sacral slope, lumbar lordosis and thoracic kyphosis (11,12).

In patients with combined LBP and feet pronation the ankle shock absorption decreased. Those patients also had internal rotation of the femur (13). This supports findings of previous studies on the mechanical changes of the lower limb with pronated feet.

It is recommended to see the prevalence of flat feet in chronic low back pain patients. The difference in the relation between right and left sides suggested seeing the causes of this difference. Taking in to consideration muscle chain affection is as much important as joint kinetic and kinematic changes.

Funding:

Authors did not receive any financial support for this study.

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