

## NORMATIVE VALUES OF NAVICULAR DROP TEST IN OLDER PEOPLE

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**Abstract :** Normal values of Navicular drop test (NDT) have not yet been established in older Indian population. Therefore the aim of the study is to find the normative values of Navicular drop test in older people. 100 elderly (50 Males & 50 Females) in the age group of 60-85 years were incorporated in the study. Navicular drop test was performed and demographic data was collected. The normative values of NDT are 0.77 cm and 0.97 cm for males and 0.86 cm for females on right and left foot respectively.

**Keywords:** Navicular Drop Test, Medial Longitudinal Arch, Elderly, BMI.

**Introduction :** Senescence induces anatomical modifications in all body segments. Postural modifications occur in the feet, and, in the study of Scott et al<sup>(1)</sup>, pes planus and pronated feet were more commonly observed in older adults than in a group of young adults.

Navicular drop is a clinical measure of foot pronation<sup>(2)</sup>, defined as the change in height of the navicular bone when the foot moves from subtalar neutral to a relaxed weightbearing stance<sup>(3)</sup>. The medial longitudinal arch (MLA) plays an important role in shock absorbance and energy transfer during walking<sup>(4,5)</sup>. Arch function depends on the shape of the foot<sup>(5)</sup>, bony structure<sup>(6)</sup>, ligamentous stability

<sup>(7,8)</sup> and muscular fatigue<sup>(9)</sup> while factors like race<sup>(10,11)</sup> footwear<sup>(12,13)</sup>, age, and gender<sup>(14)</sup> are found to influence the formation of MLA. Height of navicular bone forms a keystone in maintaining the integrity of medial longitudinal arch. It is situated at the medial side of the tarsus, between the talus behind and the cuneiform bones in front. Brody<sup>(15)</sup> introduced the static navicular drop test (NDT) as a measure to evaluate MLA.

Navicular drop test is a valid predictor of navicular height in non weight bearing and weight bearing position, however normative values has not been provided. In previous studies, mean values among healthy adults range from 3.6 to 8.1 mm in the original version of the test<sup>(16-20,15,23,18)</sup> and from 7.3 to 9.0 mm in modified versions<sup>(21,22)</sup>. Brody<sup>(15)</sup>, Beckett 23, and Mueller<sup>(18)</sup> suggested 15, 13, and 10 mm, respectively, as the upper limit for a normal navicular drop 2. It has shown moderate to good reliability<sup>(17,18,24)</sup>, also when compared with x-ray examination<sup>(25)</sup>.

No studies were found on normative values of navicular drop test exclusively in older people in Indian population which thus became the interest of our study.

**Materials And Methods :** This Cross sectional study was conducted in Hospital's Physiotherapy OPD and Matoshree old age home. The study was approved by the Institutional Review Board. Under convenience sampling, 100 subjects (50 male and 50 females) in the age group of 60-85 years were recruited in the study. Materials required were a Business card, measuring scale, pencil. Subjects who can stand and walk independently were included in the study. Subjects using an assistive device, any neuromuscular disease, foot deformities, recent injury to the foot (6 months) were excluded from the study. Written consent was obtained from all the subjects fitting into the inclusion and exclusion criteria. Procedure and purpose of the study was explained to all the subjects.

**Procedure :** The Navicular Drop Test was first measured in the non weight bearing position. For this the patient is in sitting position on an arm rest chair with feet resting on the ground. The navicular bone is palpated and is marked with a pen, the height of the navicular bone was measured from the supporting surface with a card (Fig 1)



Figure-1

Then NDT was then measured in standing i.e. weight bearing position. The navicular bone was palpated and its distance was measured from the supporting surface with the help of a card (Fig 2).



Figure-2

Then the navicular drop is calculated as the difference between navicular height in weight bearing and non weight bearing position.

## RESULT

**Table 1: Normative values of Navicular Drop Test on right and left foot**

NDT	RIGHT	P value	LEFT	P value
Males	0.77±0.37	0.0002	0.97±0.43	0.004
Females	0.86±0.43	0.016	0.86±0.46	0.0002

Normative values of NDT for males were found to be 0.77 cm and 0.97 cm and for females 0.86 cm on right and left foot respectively (Table 1).

**Discussion :** In the current study the age group included was older population between 60-85 years. It included 100 participants of which 50 were male and 50 were female. The Normal values of NDT are 0.77 cm and 0.97 cm in males and 0.86 cm for females on right and left foot respectively. This study found that the overall normative mean value for male and female showed a minimal difference of 0.11 cm whereas the difference between male and female, right and left foot showed 0.20 cm and no difference respectively.<sup>(23)</sup>

Brody reported value of NDT under 10 mm as normal and value over 15 mm as abnormal. Another study on individuals with and without lower extremity injuries concluded that a NDT of 6-9 mm was considered within normal range and that of NDT greater than 10 mm was considered abnormal (Loudon et al. 1996). Our study supports Brody and Loudon's borderline values. Previous studies undertaken did not include older population.<sup>(24,25)</sup>

As our sample size was small, future studies may include a larger sample size.

**Conclusion :** The normative value of NDT for males is 0.77 cm and 0.97 cm and for females 0.86 cm on right and left foot respectively.

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