

Role of conventional assistive devices versus prosthesis in reducing dynamic plantar pressures during gait in Diabetic patients post trans-tibial amputation – An Observational study.

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ABSTRACT

Aims and objectives

Aim:

To compare the role of conventional assistive devices and prosthesis in reducing dynamic plantar pressures on precious limb, post transtibial amputation, during gait in diabetic patients.

Primary objective:

To compare plantar pressure points during gait in the precious limb while using axillary crutches or walkers and while using prosthesis.

Secondary objective:

To identify areas of high pressures and suggest appropriate modifications in the footwear or prosthesis so as to reduce pressure at those points and prevent ulcers and subsequent amputations.

Methods:

This was designed as an observational study, approved by the institutional review Board with a financial grant for the same. A total of 51 Diabetic patients, who had undergone emergency or elective below knee amputation, and had been rehabilitated with a below knee prosthesis were recruited for the study. The precious limb was the main focus of the study and dynamic plantar pressures were measured with and without the prosthesis once the patient ambulated. The tools used to measure plantar pressures were an in-house device, in the form of pressure sensing probes fitted into an insole which could be easily inserted into the patient footwear. The device was connected to a computer which showed waveforms suggestive of the plantar pressure distribution. The following parameters were also assessed:

- a) Sensory testing assessment
- b) Routine diabetic profile in the form of glycosylated hemoglobin
- c) Height, weight and Body Mass Index.

Results:

The dynamic plantar pressures were lower with prosthesis as compared to without prosthesis. The mean pressure difference was found to be about 6.8 kiloPascals.

($p < 0.001$)

The highest pressure difference amongst individual plantar points was found to be at the first metatarsal, with a mean difference of 24.3 kiloPascals. ($p < 0.001$)

The forefoot to rear-foot ratio was also found to be significant ($p < 0.001$) with prosthesis (0.9) as compared to without prosthesis (0.4). Body Mass Index and glycemic control did not contribute to pressure changes during gait while using prosthesis.

Hence this proves our hypothesis, that prosthesis are more effective in reduction of plantar pressures in the precious limb in Diabetics during gait, as compared to orthotic devices like crutches or walkers. Hence, it is recommended that Diabetic amputees be encouraged to undergo pre-prosthetic training and eventually use prosthesis for ambulation.

Also, even though the patient may have been rehabilitated with a prosthesis, it is imperative that regular inspection of the precious foot is done. This said, the device can be used as a standard, economic, diagnostic and therapeutic tool in detecting early

pressure changes and that plantar pressure distribution become a routine part during diabetic foot assessment.