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# Atrophy of the Stump in Unilateral Lower Limb Amputees Using Prosthesis

**Dr. Sedegheh Malek Mohammadi**

*Verdun Saint Mihiel Hospital Center.*

***Corresponding Authors**

**Dr. Sedegheh Malek Mohammadi,**
Orthotics and Prosthetics Research Clinic, Tehran, Iran.

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**Abstract**

*It is accepted, muscle activity and muscle strength affect to move lower limb prosthesis (AalamiHarandi, 1987).*

*Muscle atrophy (decreasing of volume of the muscle) results in decreasing of the strength of the muscle (Jensen, 1869).*

*The objective of this research is to study the atrophy of the muscles of the stump (residual limb) in unilateral lower limb amputees using prosthesis.*

**Keywords:** Atrophy; Amputee; Lower Limb; Prosthesis; Stump; Unilateral.

## Method

In this research 127 unilateral lower limb amputees were studied, include of 8 women and 119men.The youngest was15 and the eldest was63 years old. The weight of them was from 43 Kg to 147 Kg. The age of amputation was from 6 to 59 years old.

Data was collected via questionnaire, file of amputee, evaluation of present and previous prosthesis and evaluation of the stump via X-ray. (Distance between the external border of the bone and the external border of the muscle, in three areas. Then mean was calculated. It was done in second X-ray at the same areas also; difference of means was equal to atrophy) (Hachisuka et al., 1999).

Analysis was done through Spss software, Version 10, and statistical tests as follows:

1. T test,
2. McNemar's Test,
3. Regression analysis,
4. Analysis of variance (ANOVA)
5. Chi-squared test,

## Introduction

To use lower limb prosthesis, stump is put inside the socket (proximal component of the prosthesis) (Smith, 2004). If the situation of the stump is changed, to move prosthesis will be affected. Amputated muscle is attached to another insertion, so muscle imbalance is important issue after amputation (Hall, 1995). Muscle strength, stability of the joint of the prosthesis and nerve_ muscle coordination, affect walking and stability of the amputee to use prosthesis. Nerve_ muscle coordination is visible in amputees making sport. Stability of the joint of the prosthesis is aligned through shifting weight bearing line.Thickness of the sciatic nerve depends on the time of amputation. If amputation is done at the time of adolescence, thickness of the sciatic nerve will increase. (Hypertrophy) If amputation is done at the time of aging, thickness of the sciatic nerve will decrease (Atrophy) (Hill et al., 1997). Additionally, aging affects strength of the muscle, also (Jensen, 1869).

As for, throughout the life of amputee, strength of the muscle and prevention of the atrophy of the muscles of the stump are essential factors to move prosthesis, it has been decided related factors are studied.

## Frequency and Percentage of Variables

Data was collected about amputee, stump, present and previous prosthesis who has used to walk, as follows:

Sex, age, level of education, cause and level of amputation, length of stump, uneven level in place of residence, stump contact with the inner wall of the socket of the present and previous prosthesis, suspension system , weight and socket type of the present and previous prosthesis, (Dastous,1983) perspiration of the stump inside the socket, blood circulation when using prosthesis, exercising the stump, bony appendage , wound, pain of the stump, components of the prosthesis, walking with prosthesis, losing weight, assessment of the sound side (Levangie & Norkin, 1990, Prsson & Liedberge,1983).

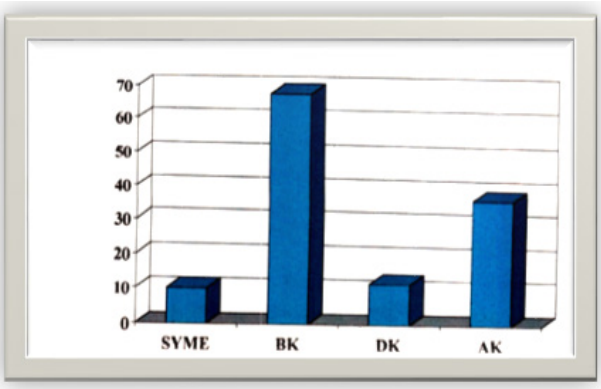


**Figure 1:** Level of amputation (Syme/Ankle disarticulation, Below Knee, Knee disarticulation, Above Knee)

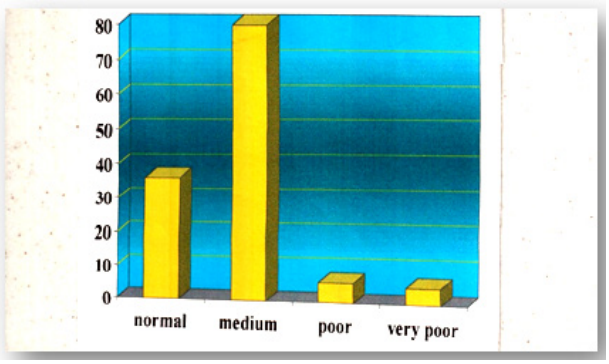


**Figure 2:** Strength of the muscles of the stump

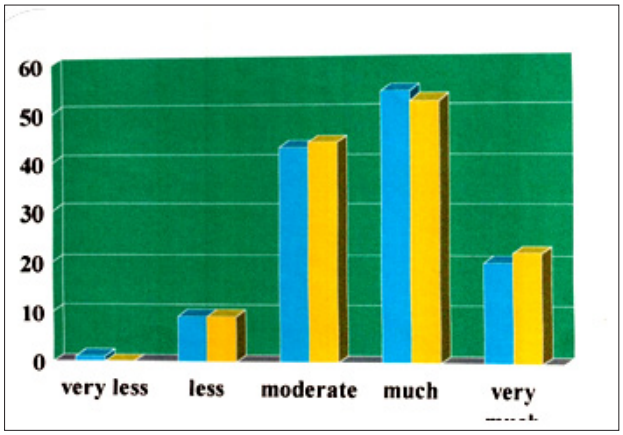


**Figure 3:** Stump perspiration inside the socket of present and previous prostheses (very less, less, moderate, much, very much), (blue=present, yellow=previous)

## Significant Difference between Previous and Present Prosthesis

In connection with collected data, significant difference between previous and present prostheses was studied via T test and McNemar's test.

## Analyzing factors affect atrophy of the stump

Factors affect atrophy of the stump, analyzed via Regression analysis, T test and ANOVA.

Contact between stump and inner wall of the socket, (Saders et al., 2000; Renstrom et al., 1983, Shem et al., 1998).
Suspension system of the prosthesis, (Smith et al., 2004).
Level of amputation, (Isakov et al., 1996).

Perspiration of the stump inside the socket.

## Result

There was no significant difference between present and previous prostheses in relation to:
stump contact with inner wall of the socket (P-value=1/000>0/05), suspension system of the prosthesis (P-value=1/000>0/05), perspiration of the stump inside the socket (P-value=0/302>0/05), blood circulation when using prosthesis (p-value=0/688>0/05), exercising the stump (P-value=0/375>0/05), painful weight bearing area of the stump (P-value=1/000>0/05), walking with prosthesis (P-value=1/000>0/05), alignment of knee joint prosthesis (P-value=0/727>0/05), alignment of foot of prosthesis (P-value=1/000>0/05), weight bearing on prosthesis and sound side (P-value=1/000>0/05).
There was significant difference between present and previous prostheses in relation to the foot of the prosthesis to go up and down stairs (P-value=0/022<0/05).

## Result

There was no significant difference between atrophy of the stump and full contact / incomplete contact socket. (P-value=0/222>0/05)

There was no significant difference between atrophy of the stump and prosthesis with or without suspension strape. (P-value=0/266>0/05)

There was significant difference between atrophy of the stump and level of amputation. (P- Value=0/000<0/05)

There was significant difference between atrophy of the stump and perspiration of the stump inside the socket (P-value= 0/0447<0/05)

## Conclusion / Recommendation

Proximal level amputation, results in more atrophy of the muscles of the stump and shortening of the length of the stump. It is recommended, conditions and adaptation of the amputee to use prosthesis are studied, precisely, before amputation surgery.

Foot of the prosthesis is applied and aligned according to the characteristics of the body of the amputee. (DOI: https://doi.org/10.47485/2767-5416.1130).

It is recommended temperature of the stump is controlled with specific stockinet.

## References


1. Aalami-Harandi, B. (1987). Principels of orthopaedics and fractures. (3rd edition). Negarestan Press.
2. Jensen, C. R., Schultz, G. W., & Bangerter, B. L. (1869). Applied kinesiology and biomechanics. (3rd edition). McGraw-HiLL College. https://books.google.co.in/books/about/Applied_Kinesiology_and_Biomechanics.html?id=B3vHAAAACAAJ&redir_esc=y
3. Hachisuka, K., Umezu, Y., Ogata, H., Ohmine, S., Shinkoda, K., & Arizono, H. (1999).Subjective evaluations and objective measurements ischial-romal containment prosthesis. *J UOEH, 21*(2), 18-107. DOI: https://doi.org/10.7888/juoeh.21.107
4. Smith, D. G., Michael, J. W., & Bowker, J. H. (2004). Atlas of amputations and limb deficiencies: surgical, prosthetics, and rehabilitation principles. (3rd edition). American academy of orthopaedic surgeons. https://academic.oup.com/ptj/article-abstract/86/4/595/2805121
5. Hall, S. J. (1995). Basic Biomechanics. (2nd edition). Mosby. https://books.google.co.in/books/about/Basic_Biomechanics.html?hl=ms&id=4FNRAAAAMAAJ&redir_esc=y
6. Hill, S. C., Baker, A. R., Barton, N. W., Wexler, L. H., & Scott, L. J. (1997). Sciatic nerve: paradoxic hypertrophy after amputic young patients. *Radiology, 205*(2), 62-559. DOI: https://doi.org/10.1148/radiology.205.2.9356645
7. Dastous, J. (1983). Orthotics and prosthetics Digest: Reference Manual. (2nd edition). EDAHL PRODUCTIONS LTD.
8. Levangie, P., & Norkin, I. (1990). Joint structure & function: A comprehensive analysis. (5th edition). F.A Davis Company Philadelphia. https://books.google.co.in/books?id=JXb2AAAAQBAJ&lpg=PRI#v=onepage
9. Prsson, B. M., & Liedberge, E. (1983). A clinical standard of stump measurement and classification in lower limb amputees. *Prosthet orthot Int, 7*(1), 17-24. DOI: https://doi.org/10.3109/03093648309146710
10. Sanders, J. E., Greve, J. M., Clinton, C., & Hafner, B. J. (2000).Changes in interface pressure and stump shape over preliminary results from trans-tibial amputee subjects. *Prosthet orthot Int, 24*(2), 163-8. DOI: https://doi.org/10.1080/03093640008726539
11. Renstrom, P., Grimby, G., & Larsson, E. (1983). Thigh muscle strength in below knee amputees. *Scand J Rehabil Med suppl*, 9, 73-163. https://pubmed.ncbi.nlm.nih.gov/6585938/
12. Isakov, E., Burger, H., Gregoric, M., & Marincek, C. (1996). Stump length as related to atrophy and strength of the muscles in trans-tibial amputees. *Prosthet orthot, 20*(2), 96-100. DOI: https://doi.org/10.3109/03093649609164425
13. Shem, k. L., Breakey, J. W., Werner, P. C. (1998). Pressure at the residual-socket interface in transtibial amputees with thigh Lacer-side joints. *JPO, 10*(3), 51-55. https://journals.lww.com/jpojournal/abstract/1998/01030/pressures_at_the_residual_limb_socket_interface_in.3.aspx