

PROSTHETIC PROBLEMS OF TRANSTIBIAL AMPUTEE

Aziz Ahmad

Department of Prosthetics Pakistan Institute of Prosthetic and Orthotic Sciences (PIPOS) Hayatabad, Peshawar - Pakistan

ABSTRACT

Objective: To investigate the challenges faced by Prosthetist in the management of Transtibial amputees.

Material and Methods: This study was conducted at Department of Prosthesis and Orthosis Pakistan Institute of Prosthetic and Orthotic Sciences, Hayatabad, Peshawar, Pakistan in 2008. The data was collected via a survey questionnaire distributed among 26 Prosthetists and Orthotists. The collected data was analyzed with 95% confidence interval. Descriptive statistical analysis was used.

Results: Eighty five percent ($n=22/26$) of the questionnaires were received back within the given time of two weeks. Majority of the respondents agreed that they do face problems like volume fluctuation, fibula left longer than tibia, redundant tissues and phantom pain etc in a transtibial amputee (TTA). Furthermore, gender, cause of amputation, weight and age are the factors which makes the rehabilitation process difficult.

Conclusion: Along with the patient and his family, Prosthetist is also faced with difficulties in transtibial amputees during the process of rehabilitation with prosthetic fitting.

Key Words: Transtibial Amputees, Prosthetist, Prosthesis.

INTRODUCTION

Lower extremity amputation drastically changes the quality of life for both patient's and their families in a number of ways despite the advancements in prosthetic technologies and rehabilitation methods¹. Half of the lower limb amputations are performed at the transtibial level^{1,2}. Patients with transtibial amputation (TTA) experience the problems of pain, edema, knee flexion contractures, wound healing, reconstruction surgeries, limited return to function and a high rehabilitation cost¹. Volume fluctuation within the socket is the most problematic as it leads to other issues like decreased comfort, increased pressure on bony land marks and increased shear forces, pistoning and skin break down along with the poor gait pattern³. Successful resumption of daily activities with the prosthesis is accomplished by only 56% to 87% of potential prosthetic users, however the method of selecting patients plays a major role¹.

The aim of this study was to investigate the problems faced by Prosthetist in the

management of the transtibial amputees.

MATERIAL AND METHODS

The data was collected by survey questionnaire, distributed among the Prosthetists and Orthotists in Pakistan Institute of Prosthetic and Orthotic Sciences (PIPOS) (hard copy) and to the PRSP (PIPOS Rehabilitation Services Project) Centers (via email). The return time was 02 weeks. The questionnaire consisted of six main headings as Residual Limb Problems, Cause of amputation, Age, Health and Gender, Pre-prosthetic Treatment, Psychological and Socio-economic conditions. Each heading was then subdivided to more specific questions. The questionnaire was used with the Agree, Strongly Agree, Disagree and Strongly Disagree options. The data collected was analyzed with 95% confidence interval that is with alpha (σ) set at 0.05 as a level of significance. Descriptive statistical analysis was done with Microsoft Excel.

RESULTS

Eighty five percent (85%) that is 22 out of

RESPONSES RELATED TO THE PROBLEMS IN THE RESIDUAL LIMB

Residual Limb Problems	Strongly Agree	Agree	Disagree	Strongly Disagree
Volume fluctuations	11	11	0	0
Fibula Longer than Tibia	10	11	0	0
Unbevelled anterior distal end of tibia	12	9	0	0
Redundant Tissues	3	13	6	0
Blisters formation and Skin ruptures	5	14	0	0
Bone Spur	8	12	0	0
Bony stump end	12	9	1	0
Residual limb with increased distal circumferences	14	3	5	0
Myodesis and myoplastic stump	0	6	8	6
Stumps with good distal soft pads	0	4	8	6
Phantom Pain	11	9	1	1

Table 1

26 questionnaires were received back within the given time of 02 weeks. Total responses to the questions under the six prescribed headings were 735 which means that 57 questions were not answered. 82% of the respondents either agreed or strongly agreed with the fact that residual limb problems make difficulties in the rehabilitation of TTA. These includes volume fluctuations, fibula left longer than tibia, presence of redundant tissues, skin problems like blisters formation and tear off of the skin, bony spurs, residual limb with more distal end circumferences and phantom pain. 100% of the respondents either agreed or strongly agreed that volume fluctuations and blister or skin ruptures are the most problematic issues. This was followed by bony stump ends or if fibula is left longer than tibia i.e 95% agreement. 90% of the Prosthetist were not happy with the amputee who had phantom pain. However, 64% of respondents appreciated myodesis or myoplastic stumps and the one with good distal end soft tissue coverage. Table I shows the responses of the participants to the problems in the residual limb.

Regarding problems faced by prosthetist, 85% of the respondents agreed or strongly agreed to the four options as shown in table 2, however diabetes mellitus (DM) was considered as the most

problematic and difficult amputee to be managed (95% strongly agreed and 5% agreed). It may also be due to the cognitive effects of the DM on the personality of the diabetics. This group was followed by amputees of tumors (54% agreed, 27% strongly agreed) and traumatic amputees as 54% agreed on difficulties during the rehabilitation process. However 27% strongly believed that tumor related amputees are more difficult to manage. From these results it is obvious that that prosthetist feels comfortable with the traumatic amputees as compared to the diseased ones.

In the 3rd category age, health and gender were tested as a source of problem during the process of rehabilitation. Astonishingly it was found that prosthetist are not feeling comfortable with the female patients as compared to the male (For female patients agreed = 27%, strongly agreed = 50% and for male patients agreed = 27%, strongly agreed = 5%) 63% believed that old aged amputees are difficult to handle while only 54% believed that young amputees are easy to be managed. Over weight patients were considered as more problematic (50% agreed and 27% strongly agreed), than those considered as healthy (13% each agree and strongly agree). Over all, 56% respondents either agreed or strongly agreed with

RESPONSES TO THE CAUSE OF AMPUTATION AS A PROBLEM

Cause of Amputation is problematic	Strongly Agree	Agree	Disagree	Strongly Disagree
Traumatic	1	12	7	1
Diabetic	21	1	0	0
Caused by Tumors	6	12	2	1
Caused by Vascular diseases	9	8	2	0

Table 2

Fig I and II shows a TT stump with redundant tissues. This patient used prosthesis for 20 years and was advised re-amputation when an orthopaedic surgeon was consulted for opinion.

Fig: III and IV shows a TT stump with anterior distal sharp tibial end, tension in the overlying skin is clearly visible.



Fig: I



Fig: II



Fig: III

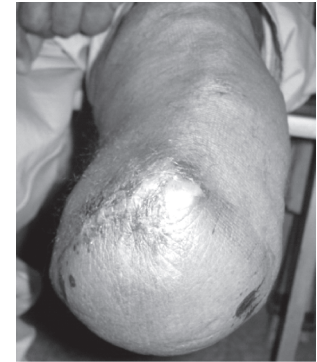


Fig: IV

Fig: V shows a TT stump with fibula left longer than tibia aswswaw



Fig: V

the fact that age, health and gender causes difficulties with the rehabilitation process, while 44% disagreed or strongly disagreed (table-3)

Most of the responses favored pre-prosthetic treatment of the amputee. All of the respondents were of the opinion that it is essential for the reduction of post operative problems, which ultimately helps the Prosthetist to manage the amputee effectively (9% agreed, 91% strongly

agreed). 97% agreed or strongly agreed that pre-prosthetic treatment makes the rehabilitation process faster as compared to no treatment (agreed = 32%, strongly agreed = 64%). 96% (agreed = 32%, strongly agreed = 64%) believed that post operative management (POM) is essential for the reduction of problems in a TTA which can be faced during prosthetic management. On the other hand 82% were of the opinion that total stay of patient can be shorter if the patient has been treated with post operative management (POM) therapies. The results of the survey to this scenario are shown in table 4.

In this study, 88% of the prosthetist believed that psychological issues or problems are mostly responsible for making the amputee's management difficult. Majority of the professionals have responded with to "agree" or "strongly agree" in this regard. Anxiety, depression (90%), no or less satisfaction over the treatment process (87%), along with the cognitive factors (90%) is the key determinants of the psychological difficulties. More than half of the professionals were of the opinion that patients with disabilities like amputees

RESPONSES TO THE AGE, HEALTH AND GENDER RELATED PROBLEMS

Age, Health and Gender problem	Strongly Agree	Agree	Disagree	Strongly Disagree
Male amputees	1	6	12	1
Female amputees	11	6	3	0
Old age (above 50 years)	14	5	0	1
Young and active (below 50 years)	2	1	12	6
Overweight patients according to the height and weight	6	11	4	0
Healthy patients according to the height and weight	3	3	10	5

Table 3

RESPONSES IN RELATION TO THE IMPORTANCE OF PRE-PROSTHETIC TREATMENT

Pre-prosthetic treatment	Strongly Agree	Agree	Disagree	Strongly Disagree
Is essential for reduction in problems	20	2	0	0
Has no effect in reduction of problems	1	2	4	15
Can make the rehabilitation process faster	14	7	1	0
Has no effect on the total length of stay during rehabilitation process	1	1	7	11

Table 4

are lacking the trust in the professional people involved in the rehabilitation process and it is difficult for them to follow instructions properly. Table 5 shows responses to the psychological issues of the amputees which make difficulties for the Prosthetists.

Among the Socio-Economic conditions, it was noticed that dependency over others (family members, health careers etc) and financial conditions are almost 100% responsible for the difficulties of the Prosthetist. Illiterate patients are more difficult to treat than the educated one (90% = agreed, 55% = disagreed). Components availability is also a major factor to contribute to the prosthetist problems in the management of the TTA. Results of the socio-economic conditions are shown in table 6.

DISCUSSION

Majority of the respondents did mention that they do face difficulties in the prosthetic management of the transtibial amputees in many ways. Volume fluctuation in the TT residual limb is the most problematic and can give rise to other issues like difficulty in fitting and piston movements etc.^{2,3} In this study 100% of the respondents either agreed or strongly agreed to this fact. Blisters formation, ulceration and skin ruptures are also potential problems making the prosthetic management of TTA difficult³. 74% of the respondents agreed while 26% strongly agreed to this idea.

Another problem is the over growth of the bone, which is common in tibia in both congenital as well as acquired conditions and is not liked by the Prosthetist⁴. Almost 94% of the respondents termed it as a problem for the good outcome of the prosthetic treatment.

Phantom limb pain is one of the most fascinating and complex clinical pain syndrome⁵. It is experienced by 50% of amputees classified as chronic or severe. 90% of the respondents in this survey believed that such amputees are difficult to manage with successful outcome of prosthetic treatment⁵. 95% respondents agreed or strongly agreed on the fact that they feel more comfortable during the process of rehabilitation, if fibula is shorter than tibia with the distal anterior end beveled and smoothed properly. Both these procedures, shorter fibula and beveled tibial distal end, helps in faster wound healing mainly due to decreased pressure over the soft tissues from sharp bony angles⁶.

For the Prosthetist it may be difficult to manage or to feel comfortable because of two reasons. One as mentioned by Collen and Devlin (2000)⁶ and another may be the negative pressure between the socket and the stump. This negative pressure leads to skin ruptures at the distal anterior sharp bony end of tibia. Research supports that too tight skin at the end of the residual limb causes problems in wound healing which leads to adherent scar and an increase risk of necrosis⁷.

RESPONSES IF THE PATIENT IS SUFFERING FROM PSYCHOLOGICAL ISSUES

Psychological problems	Strongly Agree	Agree	Disagree	Strongly Disagree
Anxiety and depression	9	11	0	0
Difficult to get satisfied	9	10	1	0
Difficulty in understanding of the treatment process	5	14	1	1
Difficult to trust the professionals	3	11	4	2
Difficult to follow instructions (Cognitive)	5	11	3	0

Table 5

RESPONSES IF THE PATIENTS ARE SUFFERING FROM SOCIO-ECONOMIC PROBLEMS

Socio - economic problems	Agree	Strongly Agree	Disagree	Strongly Disagree
Dependency on the family members	19	1	0	0
Financial Problems	6	14	0	0
Being grouped as disabled	9	5	2	1
Educated patient are more problematic	4	7	6	3
Illiterate patients are more problematic	14	4	2	0
Components availability	11	2	3	2

Table 6

Amputees with diabetes mellitus (DM) have comfortable functional limitations and the success rate for the rehabilitation of vascular amputees is low, only 5% will achieve satisfactory rehabilitation⁸. 95% of the respondents strongly agree that amputees with DM are difficult to manage effectively and it takes longer time to rehabilitate along with the difficulty in appropriate communication and selection of suitable materials like silicon and urethane liners.

To our knowledge no study was found to mention about gender wise difficulties, however in this survey majority of respondents (agree = 27%, strongly agree = 50%) were of the opinion that female patients are difficult in handling than male patients (agree = 27%, strongly agree = 50%). This may be due to the cultural values and restrictions on male and female relationships.

It is found that functional abilities decreases after amputation and age seems to be a significant factor⁸. This finding is supported in our survey as 63% and 22% “strongly agreed” and “agreed” respectively that old age amputee's rehabilitation is not easy. In contrast to this large number of participants (54%) supported the young and healthy patients as easy to rehabilitate. It may be due to the fact that for young traumatic amputee, amputation may represent the loss of life opportunities⁷ that is why they want to be mobile as soon as possible to get to normal life⁷. However for the older patients, peripheral vascular diseased (PVD) amputations may offer decreased mobility⁷ and are difficult to get rehabilitated with prosthetic fitting.

Post operative management (POM) reduces edema and provides residual limb maturation^{9,10}. Due to this early shrinkage the patient will have fewer problems with the prosthetic fitting¹⁰. Furthermore, it helps in reduction of phantom pain and prevention of flexion contracture of the knee joint⁹. Due to these reasons all participants either “agree” or “strongly agree” (agreed = 91%,

strongly agreed = 9%) that POM reduces problems of Prosthetist. Furthermore, 64% “strongly agree” while 32% “agreed” that it makes the rehabilitation process faster.

Significant level of anxiety, grief, social isolation, depression, hopelessness, low self esteem and suicidal thoughts among people with amputation have also been reported^{7,11}. Majority of the respondents favored this condition.

Many authors have mentioned that rehabilitation of an amputee is very expensive and time consuming process⁽¹²⁾ but no one specifically addresses the socioeconomic problems which hinders Prosthetist from provision of quality treatment with best suitable components. Dependent patients with poor economical conditions and lower level of education were found as hinders for Prosthetist.

CONCLUSION

Problems in the residual limb like volume fluctuation, bony sharp ends, redundant tissues etc, cause of amputation as DM and trauma along with the age, health and gender difference can directly challenge Prosthetist professional abilities. Psychological issues like anxiety, depression etc with the socioeconomic conditions makes the rehabilitation process with prosthetic fitting more complicated and time consuming.

These potential problems can be minimized with standards surgical procedures such as posterior long flap and properly beveled anterior distal tibial end with shorter fibula than tibia in transtibial amputations⁸.

REFERENCES

- 1) Farrell RT, Pinzur MS. A Preliminary Comparison of Function and Outcome in Patients with Diabetic Dysvascular Diseases. J Prosthet Orthot 2003; 15(4):127-32.
- 2) Smith DG, McFarland LV, Sangeorzan BJ,

- Reiber GG, Czernieck JM. ADDENDUM Postoperative Dressing and Management Strategies for Transtibial Amputations. A Clinical Review. *J Prosthet Orthot* 2004;16(3S):15.
- 3) Backus BB. Problems in Lower Limb Socket Fit and Present Clinical Solutions. *The Academy TODAY* 2005; 1(2): available at: <http://www.oandp.org/AcademyTODAY/2005Jul/9.asp>
 - 4) Davids JR, Blackhurst DW. Operative treatment of bone growth in children who have an acquired or congenital amputation. *J Bone Joint Surg* 1995; 77: 1490-7.
 - 5) Price JB. Exploring the Phantom Phenomenon from a Psychophysiological Perspective. *J Prosthet Orthot* 2005;17(3): 87-95.
 - 6) Cullen N, Devlin M. Wound Healing in Transtibial Amputees related to Surgical Techniques. *J Prosthet Orthot* 2000; 12(2): 48-51.
 - 7) Lilja M, Johansson T. Adherent Cicatrix After Below Knee Amputation. *J Prosthet Orthot* 1993; 5(2): 65-6.
 - 8) Geertzen JHB, Martina JD, Rietman HS. Lower Limb Amputation Part 2: Rehabilitation a 10 years literature review. *Prosthet Orthot Internat* 2001; 25: 14-20.
 - 9) Walsh TL. Custom Removable Immediate Postoperative Prosthesis. *J Prosthet Orthot* 2003; 15(4): 158-61.
 - 10) Swanson MV. Below Knee polyethylene Semi Rigid Dressing. *J Prosthet Orthot* 1993; 5(1): 10-5.
 - 11) Demond D, MacLachlan M. (). Psychosocial Issues in the Field of Prosthetics and Orthotics. *J Prosthet Orthot* 2002; 14(1): 19-22.
 - 12) Stewart CPU, Jain AS. An epidemiological study of war amputees and the cost to society. *Prosthet Orthot Internat* 1999; 23:102-6.

Address for Correspondence:

Aziz Ahmad

Assistant Professor in Prosthetics,
PIPOS (Pakistan Institute of Prosthetic
and Orthotic Sciences),
Plot No 6B, Sector B3, Phase V,
Hayatabad, Peshawar – Pakistan.