Lower Limb Prosthetic Prescription in Jordan

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Abstract

Objective: This study examine if the criteria of prescribing prosthetic components in Jordan is based on the amputee's level of activity or other variables (e.g. gender). Findings could help in standardizing the approach used when prescribing lower limb prosthetic components and could help in identifying the agreement, if present, on the criteria used when prescribing prosthetic components.

Methods: The prosthetic components prescribed for 112 lower limb amputees (trans-femoral amputation, knee disarticulation, trans-tibial amputation, and syme amputation) from different rehabilitation centres in Amman/Jordan were recorded. For each amputee, the research team filled a form containing the amputees' information and prescribed prosthetic components as well as the Medicare Functional Classification Level (MFCL) mobility scale, which intends to evaluate the amputee's level of activity.

Results: A relationship between the level of activity and prosthetic components prescription was not found. The study shows that an agreement could not be found in the prescription criteria for any of the investigated prosthetic components. The lack of guidelines that indicate the criteria for prescribing each prosthetic component could be the sole reason for these findings.

Conclusions: The study raises the necessity to develop clinical guidelines that make prosthetic components prescription not only scientific evidence but also consistent between prescribers from different backgrounds. Given that prosthetic components keep developing and increase in alternatives, such clinical guidelines can be of vital importance.

Keywords: Prosthetic Prescription, Prosthetic Components, Lower Limb Amputees.

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Introduction

Lower limb amputation has long been a common surgical intervention for removing diseased tissues, or relieving pain in situations where irreversible damage has occurred to a limb[1 2]. Between the period of 1996 and 1998, the average frequency of major lower limb amputation in the capital of Jordan (Amman) per year was approximately 23.6 per 100.000 individual (2.7:1 male to female ratio and mean age of 59.6)[3]. Nonetheless, the frequency of lower limb amputations in the whole of Jordan (i.e. along the 12 main cities of Jordan) was not reported.

In a study by Al-worikat[4], the cause of lower limb amputation in 687 lower limb amputees, who were referred to the Royal Medial Services in Amman/Jordan, over a period of 7 years and 6 months, was reported. Approximately 47.3% of the amputees have had their amputation due to trauma (as the

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main cause of amputation), 33.3% due to Diabetes Mellitus (DM), and 19.4% due to Peripheral Vascular Disease (PVD), tumor, congenital and infections. Trans-tibial (TT) amputation was the primary level of amputation (51.02%). In another study[5], which was conducted in the northern part of Jordan for a total of 235 lower limb amputees over a 3 years period, it was found that the cause of 51% of lower limb amputation was trauma. Whereas DM was the cause of amputation in 32.3% of all amputees. PVD, tumor, congenital and infections was the cause of amputation in only 16.7% of all amputees. Yet again, TT was the primary level of amputation (59.1%) [5].

Unlike previously mentioned studies, and for the south of Jordan, 34% of 122 lower limb amputees have had their amputation due to DM, compared to trauma, which was the cause of amputation in 33% of all amputees. TT amputation was again the primary level of amputation (52%) [6].

After amputation, the amputee may experience psychological trauma, emotional discomfort and/or physical limitations[7]. The residual limb will present an area of mechanical instability due to the lost part of the limb, which is associated with general functional limitations (e.g. difficulty in walking)[7], whereby the more proximal the level of amputation is, the greater the limitations are[8]. In order to recover these limitations, the amputee is usually fitted with a prosthesis.

The walking (gait) of a prosthesis wearer is significantly influenced by the prosthetic components[9]. For example, Rietman et al.[10] in their review study concluded that the range of motion was increased with energy storing prosthetic feet in comparison to the basic prosthetic feet.

In Jordan, the prescriber of lower limb prosthetic components can be an orthopedic surgeon, a physical medicine physician or/and a prosthetist. Prosthetic components selection is; nonetheless, a difficult procedure due to the variety and technical complexity of prosthetic components[11] as well as the lack of guidelines on selecting the appropriate components to match the amputee's condition and needs[12,15,17].

Cortes et al.[18], have proposed that for appropriate lower limb prosthetic components prescription, the selection should match the prosthetic wearer's activity level. In this context, prosthetic wearer's activity level describes an amputee's functional status and is identified from the patients' self-report as well as the use of mobility scales. For example, the disability mobility grades [19] or the Medicare Functional Classification Level [MFCL][20], which was used in the current study.

Based on the above, the aims of conducting this study were: 1) present an approach to the prescription of lower limb prostheses in Jordan, 2) study the potential agreement of prosthetic components prescription criteria on amputees and 3) examining whether prosthetic prescription in Jordan is primarily based on the level of activity or other variables such as gender or age.

Methodology

Subjects

This study involved 112 lower limb amputees who were recruited from different rehabilitation centres in Amman/Jordan between September 2010 and May 2012. A centre was included if an experienced prosthetist and/or medical doctor (MD) was available to prescribe the prosthesis. Data were collected from inpatient and outpatient amputees with TF, knee disarticulation (KD), TT and Syme amputations. There were no restrictions with respect to age, gender, co-morbidity, nationality of amputee, side of amputation, date of amputation or the cause of

amputation. Amputees with primary as well as revision amputations were recruited.

After initial screening, 119 amputees fell within the inclusion criteria. However, only 112 were included because 3 amputees did not consent to participate and 4 were excluded because they did not complete the study and therefore were excluded from the databases. Ethical approval was obtained from all included centres, and each participant was given a participant information sheet and was made fully aware of the nature of the study.

Evaluation

For each amputee, a form was filled by the research team to record the amputees' information (e.g. age, gender, etc) and the prescribed prosthetic components during face-to-face interview. In addition, this form included the MFCL (MFCL primarily used by the US Department of Health and Human Services' Centers for Medicare and Medicaid Services (CMS) which originally adopted from the US Health Care Financing Administration(HCFA) to describe individuals with lower-limb amputation[20]).

MFCL coding system is also known as the K-levels and classifies the level of activity as follows:

- K0 (MFLC-0) — "amputee does not have the ability or potential to ambulate or transfer safely with or without assistance and a prosthesis does not enhance quality of life or mobility".
- K1 (MFLC-1) — "amputee has the ability or potential to use a prosthesis for transfers or ambulation on level surfaces at fixed cadence. Typical of the limited and unlimited household ambulatory".
- K2 (MFLC-2) — "amputee has the ability or potential for ambulation with the ability to traverse low-level environmental barriers such as curbs, stairs, or uneven surfaces. Typical of the limited community ambulatory".
- K3 (MFLC-3) — "amputee has the ability or potential for ambulation with variable cadence. Typical of the community ambulatory who has the ability to traverse most environmental barriers and may have vocational, therapeutic, or exercise activity that demands prosthetic utilization beyond simple locomotion".
- K4 (MFLC-4) — "amputee has the ability or potential for prosthetic ambulation that exceeds the basic ambulation skills, exhibiting high impact, stress, or energy levels, typical of the prosthetic demands of the child, active adult, or athlete".

Statistical Analysis

Data were analyzed using SPSS 16.0 (SPSS Inc., Chicago, 2007). The data were statistically analysed using Spearman correlations and multiple logistic regressions. The multiple logistic regression analysis was performed on amputee's activity level to find the any statistical relation between the level of activity and the prosthetic components prescription as well as the population characteristics (i.e. age, gender).

Frequency distribution was also performed for all categorized variables (i.e. age, gender, level of amputation, cause of amputation, date of amputation, number of the fitted prosthesis, and other physical limitations). Prosthetic prescription variables were coded in the categories: type of socket, weight-bearing site, suspension principle, type of prosthesis, knee mechanism and ankle-foot mechanism.

Results

Study population

Among the 112 amputees who had participated in this study, 72 were TT amputees (64.3%), 30 were TF amputees (26.8%), 4 were KD amputees (3.6%) and 6 were Syme amputees (5.4%). The majority of amputees (52) were within the age group of 50-65 year-olds (46.4%), followed by 18 (32.1%) within the

age group of 30-49 year-olds (32.1%) and 4 were within the age group 1-18 year-olds (3.6%) (Figure 1). Males counted for 66% (74) of all participants, whereby females counted for only 34% (38); a ratio of 1.95:1 (Figure 2).

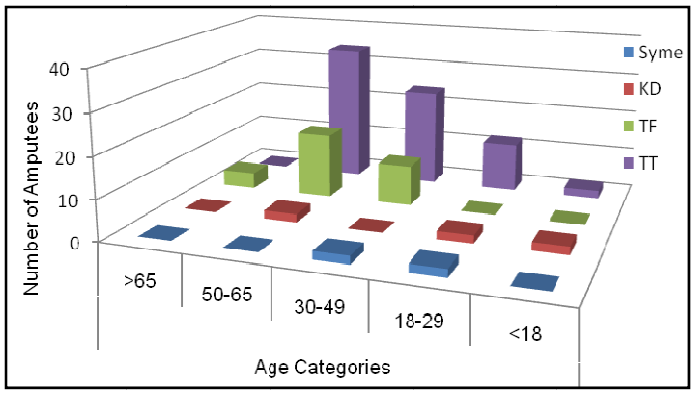

Figure 1. Number of amputees in relation to the age categories among different amputations levels. Syme: syme amputation, KD: knee disarticulation amputation, TF: trans-femoral amputation and TT: trans-tibial amputation

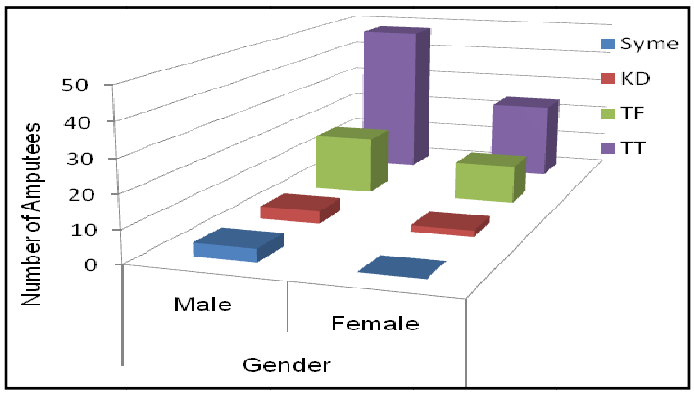

Figure 2. Number of amputees in relation to the gender among different amputations levels. Syme: syme amputation, KD: knee disarticulation amputation, TF: trans-femoral amputation and TT: trans-tibial amputation

The dominating cause of amputation was found to be DM, 39.3% of all amputees. Trauma due to car accidents or mines was the second cause of amputation, 30.4% of all amputees. Amputations due to infections accounted for 10.7%, whereby 10.7% of amputations were performed due to PVD and tumor. Amputation due to congenital limb deficiency accounted for only 8.9%.

The physical condition of 73.2% of all amputees was good except for the limitations associated with their amputation. In comparison 26.8% of all amputees suffered physical limitations other than their amputation such as knee flexor muscles contracture.

In regards to the amputees' level of activity, 42.9% of all amputees were graded the K3 (MFLC-3) level of activity, whereby 21.5 % of the amputees were graded the K1 (MFLC-1) level of activity. Activity level K2 (MFLC-2) was assigned for only 14.8% of all amputees. K0 (MFLC-0) and K4 (MFLC-4) levels of activity were given to 12.5% and 8.9 % of all amputees, respectively (Figure 3).

The amputees who were wearing their first fitted prosthesis accounted for 37.5%, while 12.5% were wearing their second fitted prosthesis. The rest of amputees 50% lost track as to what the number of prostheses they were wearing was.

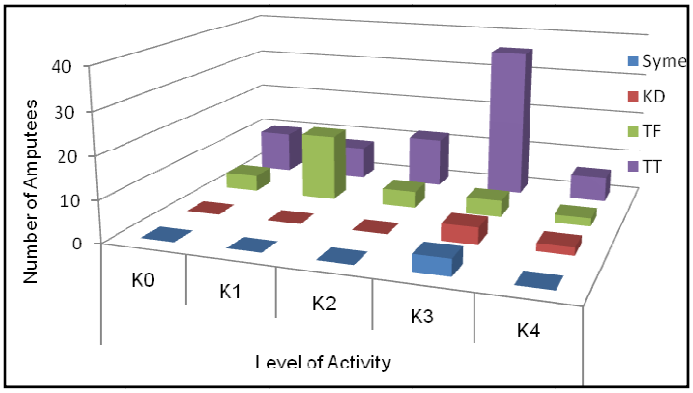

Figure 3. Number of amputees in relation to the level of activity among different amputations levels. Syme: syme amputation, KD: knee disarticulation amputation, TF: trans-femoral amputation and TT: trans-tibial amputation

Prosthetic components observations

The observations on the prosthetic components prescription for 112 amputees are shown in Tables 1 to 4. The tables are divided based on the activity level in relation to the prescribed prosthetic components where the prescribed prosthetic components has been subdivided to: 1) Prosthetic socket, 2) prosthetic ankle foot mechanism, 3) type of prosthesis and 4) prosthetic knee mechanism for AK and KD amputees only.

Table 1. The number of trans-tibial (TT) amputees in relation to the prescribed prosthetic component where the number between brackets represents the percentage amongst all TT amputees.

Prosthetic components for trans-tibial prosthesis		Level of activity					
		K0	K1	K2	K3	K4	Total
Type of socket	Patellar tendon bearing	10 (13.9)	8 (11.1)	12 (16.7)	32 (44.4)	6 (8.3)	68 (94.4)
	Total surface bearing	0 (0)	0 (0)	0 (0)	4 (5.6)	0 (0)	4 (5.6)
Weight bearing site	Patellar tendon	10 (13.9)	8 (11.1)	12 (16.7)	32 (44.4)	6 (8.3)	68 (94.4)
	Total surface bearing	0 (0)	0 (0)	0 (0)	4 (5.6)	0 (0)	4 (5.6)
Suspension method	Cuff	0 (0)	0 (0)	0 (0)	2 (2.8)	0 (0)	2 (2.8)
	Sleeve	0 (0)	0 (0)	2 (2.8)	2 (2.8)	0 (0)	4 (5.6)
	Suprachondylar	4 (5.6)	6 (8.3)	4 (5.6)	24 (33.3)	6 (8.3)	44 (61.1)
	Silicone liner with pin shuttle	0 (0)	0 (0)	0 (0)	4 (5.6)	0 (0)	4 (5.6)
	Combination	6 (8.3)	2 (2.8)	6 (8.3)	4 (5.6)	0 (0)	18 (25)
Ankle\foot mechanism	SACH	10 (13.9)	6 (8.3)	12 (16.7)	30 (41.7)	4 (5.6)	62 (86.1)
	Single axis	0 (0)	2 (2.8)	0 (0)	4 (5.6)	2 (2.8)	8 (11.1)
	Energy storing	0 (0)	0 (0)	0 (0)	2 (2.8)	0 (0)	2 (2.8)
Type of prosthesis	Exoskeletal prosthesis	8 (11.1)	6 (8.3)	6 (8.3)	16 (22.2)	2 (2.8)	38 (52.8)
	Endoskeletal prosthesis	2 (2.8)	2 (2.8)	6 (8.3)	20 (27.8)	4 (5.6)	34 (47.2)

For prosthetic socket, three characteristics were observed including 1) the type of socket, 2) the suspension and 3) the weight bearing system. A clear relationship to the level of

activity was not found among these characteristics.

A variety of ankle-foot mechanisms were prescribed to the amputees (i.e. solid ankle (SACH, Syme), single-axis, and energy storing). The commonly prescribed prosthetic foot was the solid ankle foot, which was prescribed in 86.1% of TT amputees, 60% of TF amputees and the only prescribed feet for both KD and Syme amputees. A clear relationship between any of the prescribed ankle-foot types and the level of activity was not established.

Table 2. The number of trans-femoral (TF) amputees in relation to the prescribed prosthetic component where the number between brackets represents the percentage amongst all TF amputees.

Prosthetic components for trans-femoral prostheses		Level of activity					
		K0	K1	K2	K3	K4	Total
Type of socket	Quadrilateral	2 (6.7)	16 (53.3)	2 (6.7)	4 (13.3)	0 (0)	24 (80)
	Ischial containment	2 (6.7)	0 (0)	2 (6.7)	0 (0)	2 (6.7)	6 (20)
Suspension method	Vacuum	2 (6.7)	14 (46.7)	4 (13.3)	2 (6.7)	2 (6.7)	24 (80)
	Combination	2 (6.7)	2 (6.7)	0 (0)	2 (6.7)	0 (0)	6 (20)
Knee mechanism	No knee	2 (6.7)	2 (6.7)	0 (0)	0 (0)	0 (0)	4 (13.3)
	Single axis with lock	2 (6.7)	12 (40)	4 (13.3)	0 (0)	0 (0)	18 (60)
	Single axis without lock	0 (0)	2 (6.7)	0 (0)	4 (13.3)	2 (6.7)	8 (26.7)
Ankle\foot mechanism	SACH	2 (6.7)	10 (33.3)	0 (0)	4 (13.3)	2 (6.7)	18 (60)
	Single axis	2 (6.7)	6 (20)	4 (13.3)	0 (0)	0 (0)	12 (40)
Type of prosthesis	Exoskeletal prosthesis	4 (13.3)	10 (33.3)	2 (6.7)	4 (13.3)	0 (0)	20 (66.7)
	Endoskeletal prosthesis	0 (0)	6 (20)	2 (6.7)	0 (0)	2 (6.7)	10 (33.3)

Table 3. The number of syme amputees in relation to the prescribed prosthetic component where the number between brackets represents the percentage amongst all syme amputees.

Prosthetic components for syme prostheses		Level of activity					
		K0	K1	K2	K3	K4	Total
Type of socket	Canadian	0 (0)	0 (0)	0 (0)	2 (50)	0 (0)	2 (50)
	Stove and pipe	0 (0)	0 (0)	0 (0)	2 (50)	0 (0)	2 (50)
Weight bearing site	End of the stump	0 (0)	0 (0)	0 (0)	2 (50)	0 (0)	2 (50)
	Total surface bearing	0 (0)	0 (0)	0 (0)	2 (50)	0 (0)	2 (50)
Suspension method	Leather belt	0 (0)	0 (0)	0 (0)	2 (50)	0 (0)	2 (50)
	Sleeve	0 (0)	0 (0)	0 (0)	2 (50)	0 (0)	2 (50)
Ankle\foot mechanism	Syme	0 (0)	0 (0)	0 (0)	3 (75)	0 (0)	3 (75)
	SACH	0 (0)	0 (0)	0 (0)	1 (25)	0 (0)	1 (25)
Type of prosthesis	Exoskeletal prosthesis	0 (0)	0 (0)	0 (0)	4 (100)	0 (0)	4 (100)
	Endoskeletal prosthesis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 4. The number of knee-disarticulation (KD) amputees in relation to the prescribed prosthetic component where the number between brackets represents the percentage amongst all KD amputees.

Prosthetic components for knee disarticulation prostheses		Level of activity					
		K0	K1	K2	K3	K4	Total
Type of socket	Quadrilateral	0 (0)	0 (0)	0 (0)	2 (33.3)	0 (0)	2 (33.3)
	Stove and pipe	0 (0)	0 (0)	0 (0)	2 (33.3)	2 (33.3)	4 (66.7)
Weight bearing site	End of the stump	0 (0)	0 (0)	0 (0)	2 (33.3)	2 (33.3)	4 (66.7)
	Combination between end of stump and ischial ramus	0 (0)	0 (0)	0 (0)	2 (33.3)	0 (0)	2 (33.3)
Suspension method	Leather belt	0 (0)	0 (0)	0 (0)	2 (33.3)	0 (0)	2 (33.3)
	SupraCondyler	0 (0)	0 (0)	0 (0)	0 (0)	2 (33.3)	2 (33.3)
	Combination	0 (0)	0 (0)	0 (0)	2 (33.3)	0 (0)	2 (33.3)
Knee mechanism	External hinge	0 (0)	0 (0)	0 (0)	2 (33.3)	0 (0)	4 (66.7)
	Polycentric	0 (0)	0 (0)	0 (0)	0 (0)	4 (66.7)	2 (33.3)
Ankle\foot mechanism	SACH	0 (0)	0 (0)	0 (0)	4 (66.7)	2 (33.3)	6 (100)
Type of prosthesis	Exoskeletal Prosthesis	0 (0)	0 (0)	0 (0)	0 (0)	2 (33.3)	2 (33.3)
	Endoskeletal Prosthesis	0 (0)	0 (0)	0 (0)	4 (66.7)	0 (0)	4 (66.7)

It was found that the type of prosthesis (endoskeletal, exoskeletal) was not uniformly prescribed for the various level of activity and the various amputations level. For example, 66.7% of KD amputees were prescribed endoskeletal prosthesis and graded as K3, whereby 33.3% of KD amputees were prescribed exoskeletal prosthesis and graded as K4. Also, exoskeletal prosthesis was the only prescribed prosthesis type for syme amputees. Yet again, a clear relationship between the prescribed type of prosthesis and the level of activity was not established.

The most prescribed knee mechanism for TF amputees was found to be the single axis with lock (60%), which was only prescribed for lower activity levels (K0, K1, K2). Surprisingly, although single axis without lock knee mechanism is an unstable highly movable joint, it was prescribed for K1 activity level (6.7%). Unexpectedly, 13.3% of TF amputees were prescribed a prosthesis without a knee mechanism. For KD amputees, not only a polycentric prosthetic knee mechanism was prescribed for amputees with high activity levels of K3 and K4 but also an external hinge joint was prescribed, which was odd considering the different mechanical advantages that a prosthetic knee would provide for KD amputees.

Although no relations have been found between the activity level and the prosthetic components, a moderate relation between the activity level and 1) the age of the amputee, ((coefficient 0.415, $p<0.003$), (spearman's rho 0.621, $p<0.001$)), and 2) the date of amputation ((coefficient 0.867, $p<0.007$), (spearman's rho 0.645, $p<0.001$)) was found.

Discussion

Findings from this study were in agreement with another study that was conducted in the south of Jordan and identified DM as the main cause of lower limb amputation [6]. Also, results demonstrate that, prosthetic component prescription is not based on any clinical criteria or guidelines. Also, for the different studied levels of amputations and levels of activity, an agreement between prescribers in regards to prosthetic components could not be established. For example, in agreement with other studies[21 22], SACH foot mechanism was

the most prescribed one regardless of the level of amputation or the level of activity. Moreover, no clear relation could be established between the level of activity, the age or the gender and the prescribed prosthetic components.

For TT amputees, exoskeletal patellar tendon-bearing socket with supracondylar suspension were the most common prescribed components. This was not expected given that most TT amputees were assigned K3 level of activity, and thus were expected to have demands beyond simple locomotion. In particular, an endoskeletal total surface bearing prosthetic component would have provided the amputee with more freedom and ability to perform several tasks. The lack of specific criteria that govern prosthetic component prescription for TT amputees as shown in this study is in agreement with the findings from another study[21] that demonstrated suprcondylar sockets and suspension systems were prescribed equally for TT amputees in spite of the level the activity.

For TF amputees, an exoskeletal quadrilateral socket with vacuum suspension and single axis prosthetic knee were the most common prescribed components. In comparison to enoskeletal TF prosthesis, an exoskeletal one means extra weight (i.e. 4 to 5kg extra weight) due to the long wooden component, and thus the wearer may have trouble in carrying the prosthesis during walking[23 24]. Therefore, it seems that scientific-based reasoning behind prescribing endo or exoskeletal prosthesis for TF amputees is missing. This problem was also demonstrated in another investigation that found stump condition or suspension problems not an issue when prescribing prosthesis for TF amputees[21].

In regards to KD amputees, an exoskeletal stove and pipe socket with external hinge prosthetic knee were the most common prescribed components, whereby no preferences were documented for the suspension method (Table 4). Noticeably, and unlike other amputation levels, endoskeleton prosthesis was the most prescribed prosthesis for KD amputees. This is possibly because the mainly prescribed knee mechanism (polycentric knee) requires an endoskeletal prosthesis. Additionally, although all amputees had a high level of activity (K3 or K4), an external hinge knee mechanism; however, was prescribed. This could have a negative implication on the amputee as it could obstruct his/her activity rather than enhance or support his/her activity. This was in agreement with another study that found different knee mechanisms to be prescribed without a clear clinical basis[21].

Finally, in regards to syme amputees and as expected, an exoskeletal prosthesis was always prescribed. This is because the level of amputation is very low and thus fitting an endoskeletal prosthesis would not be possible. Also, syme ankle-foot mechanism was the most prescribed one because its height is lesser than other prosthetic foot mechanisms, and thus decreases the limb length discrepancy. However, SACH foot was prescribed for one amputee, which demonstrates the lack of gaudiness when prescribing prosthetic components. A possible rationale behind prescribing the SACH foot could be the unavailability of syme ankle-foot mechanism for that specific amputee or that the prescriber had no sufficient knowledge about the different ankle-foot mechanisms.

Overall, when prescribing prosthetic components, decision-making seems not to has a scientific-base and it is more or less based on the prescriber's experience and knowledge as well as the available prosthetic components. More importantly, it was stated that the prescription of prosthetic components should be mainly based on the functional ability of the amputee[25-28]. However, the findings from this

study, and in agreement with another study[21], show that the prescriptions are most likely not influenced by the amputee's level of activity which is an alarming sign that necessitate an overview into the clinical guidelines when it comes to prosthetic component prescription criteria.

Conclusion

This study was based on investigating the prescribers' consensus in Jordan when prescribing prosthetic components for lower limb amputees with different amputation and activity levels. The findings from this study revealed that for none of the four investigated prosthetic components was a consensus found. A relationship between the level of activity and prosthetic components prescription was also not found. The lack of guidelines that indicate the criteria for prescribing each prosthetic component could be the sole reason for these findings. This is particularly the case as several investigations concluded that the level of activity should always be a key factor when prescribing prosthetic components for an amputee[25-28]; however, no guidelines could be found in the literature for this purpose.

At the time being, it seems that prosthetic components prescription is dependent on the prescriber's expertise and the implementation of new products. This demonstrates the necessity of developing a clinical guidelines that make prosthetic components prescription more consistent between prescribers as well as supported by scientific evidence[17]. These guidelines can also be of much use given that prosthetic components keep developing and increase in available options constantly.

In addition to the above, statistical findings showed no relation between prosthetic component prescription and neither the level of activity nor the level of amputation, age or gender of the amputee.

References

1. Seymour R. Prosthetics and orthotics: lower limb and spinal. Philadelphia, Pa.; London: Lippincott Williams & Wilkins, 2002; 25-96.
2. Geertzen J, Martina J, Rietman H. Lower limb amputation Part 2: Rehabilitation-A 10 year literature review. J. Prosthet. Orthot. Int. 2001; 25: 14-20.
3. Salman KF, Laporte R. The Incidence Rate of Lower Extremity Amputation in Amman, Jordan. JMJ 2010; 44: 72-87.
4. Al-Worikat A. Amputees referred to The Royal Medical Services, Jordan. JCRPO J 1996; 2: 129-37.
5. Al-worikat AF. Lower limb amputation in north part of Jordan. JMJ 2003; 37: 59- 62.
6. Al-Thunaibat W, Al-worikat AF. Lower Limb Amputations in the Southern Part of Jordan. JMJ 2010;41: 221-224.
7. May BJ. Amputations and Prosthetics: A Case Study Approach 2 ed: FA Davis Company, 2002; 50-73.
8. Barth DG, Schumacher L, Thomas SS. Gait analysis and energy cost of below-knee amputees wearing six different prosthetic feet. JPO 1992; 4: 63-75.
9. Kevin C. Transtibial prosthetic design. In: Carrol Kevin, Edelstein J, editors. Prosthetics and patient management: A comprehansive clincal approach: SLACK Incorporated, 2006; 85- 92.
10. Rietman J, Postema K, Geertzen J. Gait analysis in prosthetics: opinions, ideas and conclusions. J. Prosthet. Orthot. Int. 2002; 26: 50-57.
11. Klute GK, Kallfelz CF, Czerniecki JM. Mechanical properties of prosthetic limbs: adapting to the patient. J Rehabil Res Dev 2001; 38: 299-308.
12. Michael J. Prosthetic suspensions and components. In: Smith DG, Michael JW, Rosemont IL, JH B, editors. Atlas of Amputations and Limb Deficiencies. Rosemont, IL. American Academy of Orthopaedic Surgeons, 2004; 27-409.
13. Hofstad C, Linde H, Limbeek J, Postema K. Prescription of prosthetic ankle-foot mechanisms after lower limb amputation. Syst Rev 2004; 41: 12-37.
14. Nelson VS, Flood KM, Bryant PR, Huang ME, Pasquina PF, Roberts TL. Limb deficiency and prosthetic management. 1. Decision making in prosthetic prescription and management. Arch Phys Med Rehabil 2006; 87: 3-9.
15. Rubin G, Fischer E, Dixon M. Prescription of above-knee and below-knee prostheses. J. Prosthet. Orthot. Int. 1986; 10: 117-124.

16. Bowker J, Michael J. Critical choices: The art of prosthesis prescription. In:Atlas of Limb Prosthetics: Surgical, Prosthetic, and Rehabilitation Principles. 2nd ed. St. Louis: Mosby-Year Book 1992; 717-820.
17. Woolf SH, Grol R, Hutchinson A, Eccles M, Grimshaw J. Potential benefits, limitations, and harms of clinical guidelines. Bmj 1999; 318: 30-32.
18. Cortes A, Viosca E, Hoyos J, Prat J, Sanchez-Lacuesta J. Optimisation of the prescription for trans-tibial (TT) amputees. J. Prosthet. Orthot. Int. 1997; 21: 168-174.
19. Stewart C. Prescribing a lower limb prosthesis. CD-ROM/ Orthopaedic skills unit. UK, Dundee. 2000.
20. Medicare region C durable medical equipment prosthetics orthotic supplier (DMEPOS) manual. Columbia (SC): Palmetto GBA 2005; 53: 5-6.
21. Van der Linde H, Geertzen J, Hofstad C, Van Limbeek J, Postema K. Prosthetic prescription in the Netherlands: An observational study. J. Prosthet. Orthot. Int. 2003; 27: 170-178.
22. Shurr D. Clinical perspectives on the prescription of prosthetic foot-ankle mechanisms. JPO 2005; 17: S31-S32.
23. Selles RW, Bussmann JBJ, Wagenaar RC, Stam HJ. Effects of prosthetic mass and mass distribution on kinematics and energetics of prosthetic gait: a systematic review. Arch Phys Med Rehabil 1999; 80: 1593-1599.
24. Czerniecki JM, Gitter A, Weaver K. Effect of alterations in prosthetic shank mass on the metabolic costs of ambulation in above-knee amputees. AAPM&R 1994; 73: 348-352.
25. Bridgid Cunniffe M, Stephanie Licht M, Melanie Maguire M, Mark SN. The amputee mobility predictor: an instrument to assess determinants of the lower-limb amputee's ability to ambulate. Arch Phys Med Rehabil 2002; 83: 613-623.
26. Goh J, Solomonidis S, Spence W, Paul J. Biomechanical evaluation of SACH and uniaxial feet. J. Prosthet. Orthot. Int. 1984; 8: 147-154.
27. Menard MR, McBride ME, Sanderson D, Murray DD. Comparative biomechanical analysis of energy-storing prosthetic feet. Arch Phys Med Rehabil 1992; 73: 451-458.
28. Postema K, Hermens H, De Vries J, Koopman H, Eisma W. Energy storage and release of prosthetic feet Part 1: Biomechanical analysis related to user benefits. J. Prosthet. Orthot. Int. 1997;21(1):17-27.

الوصفة الطبية للطرف الاصطناعي السفلي في الأردن

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الملخص

الهدف: تناولت هذه الدراسة ما إذا كانت الوصفة الطبية لمكونات الأطراف الاصطناعية للطرف السفلي تعتمد على مستوى نشاط مرتدي الطرف الاصطناعي، أو أي متغيرات أخرى، مثل: الجنس، أو السن. الهدف من هذه الدراسة هو البحث عن أسس لوصف مكونات الأطراف الاصطناعية للطرف السفلي في الأردن من خلال تحديد التوافق في معايير وصف مكونات الأطراف الاصطناعية للطرف السفلي.

المواد والمناهج: تم تقيم الوصفة الطبية لمكونات الأطراف الاصطناعية للطرف السفلي على 112 من مبتوري الأطراف السفلية من مختلف مراكز التأهيل الطبي في عمان/ الأردن. جمعت البيانات من مبتوري الأطراف الذين لديهم بتر عبر الفخذ وبتر عبر الركبة وبتر عبر الساق وبتر سايم. وتمت تعبئة نموذج من فريق البحث، لتسجيل معلومات مبتوري الأطراف ومكونات وصفة الأطراف الاصطناعية المقررة، بالإضافة إلى ذلك، يحتوي النموذج على مستوى الرعاية الطبية للتصنيف الوظيفي (MFCL) الذي تم استخدامه لتقييم مستوى نشاط المبتورين المشاركين في الدراسة خلال مقابلات شخصية مباشرة.

النتائج: لم يتم العثور على علاقة بين الوصفة الطبية لمكونات الأطراف الاصطناعية للطرف السفلي ومستوى نشاط مرتدي الطرف الاصطناعي أو عمره أو جنسه. من الممكن أن يكون السبب الوحيد وراء هذه النتائج عدم وجود مبادئ توجيهية تشير إلى وصف مكونات الأطراف الاصطناعية للطرف السفلي.

الخلاصة: توصي الدراسة بضرورة تطوير مبادئ توجيهية سريرية تجعل وصف مكونات الأطراف الاصطناعية للطرف السفلي أكثر تناسقا بين الواصفين، وكذلك مرتكزة على الأدلة العلمية. وهذه المبادئ التوجيهية هي ذات أهمية بالغة، نظراً إلى أن مكونات الأطراف الاصطناعية تتطور خياراتها المتاحة وتزداد باستمرار.

الكلمات الدالة: الوصفة الطبية للأطراف الاصطناعية، مكونات الأطراف الاصطناعية، مبتوورو الأطراف السفلية.

