



A telephone questionnaire in order to assess functional outcome after post-traumatic limb salvage surgery: Development and preliminary validation



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ABSTRACT

Background: Post-traumatic limb salvage surgery is challenging and evaluation of the results remains arduous. No questionnaire specifically assessing functional outcome after post-traumatic limb salvage surgery of the lower extremity exists. Due to regionalization of specialized care, the patients' travel time to the hospital increases. To overcome a higher patients' travel burden, patients' follow up by telephone is an option. We aimed to develop a telephone questionnaire in order to assess functional outcome after post-traumatic limb salvage surgery of the lower extremity.

Methods: From a review of scores of functional assessment of the lower limb surgery, we have developed a telephone questionnaire. A prospective study was performed to validate this telephone questionnaire. Twenty patients were included. The participants were called to complete the telephone questionnaire twice with an interval of a week. The Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) was completed during the second telephone call. The internal consistency was analyzed by the Cronbach's alpha (α). With the outcome scores of both completions, the test–retest reliability was analyzed by the interclass correlation coefficient (ICC) $2,k$ with a 95% confidence interval (95% CI). The outcome scores of the second telephone questionnaire and the WOMAC questionnaire were used for the construct validity analysis by the Spearman's rank correlation coefficient (r_s) with a 95% CI.

Results: The internal consistency analysis revealed a $\alpha = 0.62$ which improved to $\alpha = 0.92$ after removing one question from the telephone questionnaire. The final version of the telephone questionnaire comprises 32 questions, divided in 3 subscales: function, daily life and psychology. The total score varies between 0 and 86 points. The test–retest reliability was ICC $2,k = 0.93$ (95% CI: 0.82–0.97) and the construct validity was $r_s = 0.92$ (95% CI: 0.81–0.97).

Conclusions: We present a specific telephone questionnaire in order to assess functional outcomes after posttraumatic limb salvage surgery of the lower extremity. Further research on a large number of patients will be necessary to validate this newly developed questionnaire.

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Introduction

Limb salvage surgery for lower extremity conditions, such as trauma, infection or tumour, remains challenging for the orthopaedic surgeon despite of advancing surgical techniques [1]. The limb salvage procedures are long and difficult, and require

frequently multiple surgeries [2,3]. It is then critical to evaluate the functional outcome after such procedures.

Patient-reported outcome (PRO) measures, including self-reported questionnaires, have become the standard in order to assess functional outcomes [4,5]. The self-reported questionnaires in order to assess function of lower extremities were mainly developed for patients with musculoskeletal diseases. Others, the Toronto Extremity Salvage Score (TESS) and the Bone tumour – DUX (Bt-DUX), were developed for patients who underwent limb salvage surgery for malignant soft tissue or bone tumours of the lower extremity [6,7]. Recently, Krappinger et al. studied the

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functional outcome after limb salvage surgery among patients with large posttraumatic tibial bone defects. In this study, a custom-made, non-validated questionnaire and the Short Form (36) Health Survey (SF36) were used [8]. The use of reliable and validated questionnaires is recommended for clinical research [4]. Consequently, the use of a custom-made questionnaire limits the quality of this study substantially. To the best of our knowledge, a specific, reliable and validated questionnaire assessing subjective outcome after posttraumatic limb salvage surgery of lower extremity is still lacking.

Due to regionalization of specialized care, the travel time to the hospital increases for most of the patients, especially in highly congested urban areas [9–12]. Several questionnaires in order to assess function have a good agreement between completion by telephone and face-to-face or self-reported completion. This shows that function can be assessed by telephone [13–15]. Telephone assessment can spare the patients the travel burden of visiting the hospital [13].

From these considerations, we aimed to develop a specific telephone questionnaire in order to assess functional outcome among patients who underwent posttraumatic limb salvage surgery of the lower extremity. Our purposes were: (a) to design a specific telephone questionnaire, (b) to determine the reliability of this questionnaire, and (c) to validate this questionnaire by comparing it with the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) on a sample of patients.

Materials and methods

Questionnaire development

An initial peer review between local experts was organized to design a first sketched telephone questionnaire selecting important aspects of subjective outcome. Subsequently, a literature study on any existing lower extremity function questionnaire was executed using the Pubmed database and the following entry terms: “questionnaire AND lower extremity AND function AND (trauma OR musculoskeletal diseases)”. The items of the revealed questionnaires were analyzed using the first sketched questionnaire. Items concerning the important aspects were classified in categories. Items not concerning one of the aspects were discussed between two of the authors (JCA and TB) and the relevant ones were included. The categorized items were eventually pooled into covering questions, from which the items for the telephone questionnaire were selected. A simple response format “yes/only with help/no” was designed for most of the questions. If this format was not applicable to a question, other simple response formats (3–5 options scale, 0–10 rating scale, percentage) were used.

Questionnaire assessment

After approval of the local medical ethical committee, patients who underwent posttraumatic limb salvage surgery of the lower extremity between 2010 and 2012 were included. Inclusion criteria for participation were: patients who underwent limb salvage surgery at the department, with an age of 18 years or older, with regular consultations at the department, with a follow up since last surgery of at least two months, and with informed consent. Patients who had functional impairment before the accident or had concomitant conditions affecting the functional capabilities were excluded. After inclusion, the participants were called twice with an interval of 2–10 days to complete the telephone questionnaire. During this interval, improvement of the subjective outcome was not expected. The telephone calls were performed by three researchers (JCA, NM and TB). Each patient was

called twice by the same researcher. In addition, the WOMAC questionnaire was completed during the second telephone call. The WOMAC questionnaire was chosen because it is a validated, self-reported lower extremity function questionnaire originally developed for patients with hip and knee osteoarthritis. This questionnaire consists of 24 questions in three indices: pain, function and stiffness. The amount of pain, stiffness and disability, the patient experience, is scored on a 5-point-Likert-scale (0–4/none-mild-moderate-severe-extreme). The total score varies between 0 and 96 points. The sub-scores vary between 0 and 20 for the pain index, 0 and 68 for the function index, and 0 and 8 for the stiffness index. The WOMAC questionnaire has an excellent agreement between self-administrated completion and telephone completion. So, the WOMAC questionnaire is validated for telephone use [13].

Participants' demographics

Thirty-five patients were eligible for the study. Twenty of them (57.1%) replied to the solicitation and accepted to participate to the study. The participants' demographics are presented in Table 1. Altogether, the participants had 29 fractures. Six participants had a bifocal fracture (12 fractures) and 3 participants had a fracture of both lower extremities (6 fractures). The mean duration of the limb salvage procedure, calculated from the trauma date up to the date of the last surgery, was 39.2 weeks (range: 0–233). The mean follow-up time, the time from the last surgery up to the start of the study was 66.6 weeks (range: 10–157).

Table 1
Participants' demographics.

Participants' demographics	
No. of participants (%)	20/35 (57.1)
Age (y), \bar{x} (range)	45.9 (22–82)
Sex (%)	
Male	15 (75)
Female	5 (25)
Affected site (%)	
Right	7 (35)
Left	10 (50)
Both	3 (15)
No. of fractures ^a	29
Fracture type (%)	
Tibial plateau fracture	3 (10.3)
Proximal tibial fracture	2 (6.9)
Diaphyseal tibial fracture	1 (3.4)
Distal tibial fracture	8 (30.8)
Pilon fracture	3 (10.3)
Bifocal tibial fracture	6 (41.4)
Flap reconstruction (%)	
Yes	11 (55)
No	9 (45)
Accident type (%)	
Motor accident	6 (30)
Other traffic accident	5 (25)
Fall from a height	3 (15)
Crush injury	4 (20)
Ski accident	1 (5)
Data missing	1 (5)
Limb salvage procedure ^b	
Duration (w), \bar{x} (range)	39.8 (0–233)
Data missing (%)	2 (10)
Follow up ^c	
Duration (w), \bar{x} (range)	66.6 (10–157)
Data missing (%)	1 (5)

^a The bifocal tibial fracture counts for two fractures.

^b The limb salvage procedure is the time from the trauma date up to the date of the last surgery.

^c The follow-up is the time from the date of the last surgery.

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