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Long-term donor-site morbidity after vascularized free fibula flap harvesting: Clinical and gait analysis

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Summary The aim of this study was to determine the clinical morbidity and changes in gait temporal spatial parameters after harvesting of a vascularized free fibula flap. This study included 11 patients (mean age: 52 ± 17 years) and 11 healthy controls (mean age: 50 ± 14 years). The patients were assessed between 5 and 104 months post surgery. The study consisted of a subjective functional evaluation with two validated clinical scores (Kitaoka Score and Point Evaluation System (PES) score), clinical and neurological examination of the legs, and evaluation of gait temporal spatial parameters while walking at a comfortable speed. The mean functional Kitaoka score was 78/100, and the mean PES score of 12.18 was considered average. At the time of the review, five patients had sensory disorders, two had toe deformities, and eight had pain at the donor site. The gait analysis showed that the patient's comfortable walking speed was significantly lower in comparison to that of the controls, and that stride length and cadence were reduced. In addition, most of the gait-specific parameters were significantly different. The donor leg displayed greater variability during walking. To reduce the risk of falling, this study revealed that the patients' gait pattern had changed as

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they took a more cautious approach during walking. Early rehabilitation is expected to help improve and/or restore the physical abilities of patients after harvesting of the vascularized free fibula flap.

Introduction

The vascularized free fibula flap (VFFF), first described by Taylor in 1975[1] and popularized by Hidalgo in 1989,[2] is currently used to reconstruct bone defects, particularly during limb reconstruction or maxillofacial surgery (e.g., mandibular reconstruction). This technique has several advantages: ready availability of bone stock, possibility of composite flap, and good-quality vascular pedicle.[3,4]

Evaluations of VFFF technique have focused mainly on its unique advantages and the host-site benefits. However, the harvesting procedure may lead to a disruption of the lower limb's function.

Indeed, the muscles in the anterolateral and posterior (lower) leg play an important role during gait, as their main function is to control the joint stabilization within the foot from the compressions created by the tendon's abrupt change in alignment.[5] The timing and intensity of fibular brevis and longus are very similar with their actions beginning at mid stance (15% of gait cycle) and finishing at early pre-swing (51—55% of gait cycle).[5]

A few studies have evaluated the functional consequences of VFFF harvesting through questionnaires or a simple clinical examination. In general, these studies found the donor-site morbidity to be low for most patients.[6—9] In the early post operative period, the primary concern of the patient may be the success of the harvested flap; as a consequence, patients may only feel slight discomfort at the donor site. The functional impact of the harvest may be visible only at a later stage when patients are discharged home and can walk without technical aids. In addition, the methods used to evaluate potential problems (subjective questionnaires) may not be precise enough to detect minimal perturbations.

Although general gait parameters (speed, cadence, stride length) have been analyzed in previous studies,[10,11] specific gait parameters such as walking variability have not been studied in detail. As VFFF may affect muscles concerning the stabilization of the ankle joint during the gait, these specific parameters can be used for a more detailed and comprehensive gait analysis after VFFF harvesting.

The aim of this study was to explore the functional gait deficits, which appear to have been previously underestimated by the clinical scores or general gait parameters occurring after a VFFF harvest. While walking, it was hypothesized that patients would have reduced walking ability and greater variability in the donor leg.

Materials and methods

Study population

This study recruited eleven patients (seven men, four women) (Table 1). Patients were included if they had

Table 1 Mean (SD) for the various characteristics of the study population and comparisons.

Parameters	VFFF group (n = 11)	Control group (n = 11)	p
Age (years)	52.64 (16.97)	50.27 (14.28)	0.09
Men/Women	7 (64%)/4 (36%)	7 (64%)/4 (36%)	NA
Mass (kg)	72.18 (15.00)	70.54 (13.57)	0.55
Height (m)	1.71 (0.07)	1.70 (0.05)	0.31
Time after surgery (months)	28.09 (31.54)	NA	NA
Type of reconstruction			
Humerus	2 (18%)	NA	NA
Mandible	9 (82%)	NA	NA
Type of Flap			
Bone	1 (9%)	NA	NA
Bone—skin	6 (55%)	NA	NA
Bone—muscle—skin	4 (36%)		
Type of closure			
Direct	3 (27%)	NA	NA
Thin skin graft	8 (73%)	NA	NA
Mean fibula length			
Remaining proximally (cm)	7.89 (1.57)	NA	NA
Harvested (cm)	21.73 (3.74)	NA	NA
Remaining distally (cm)	8.65 (1.26)	NA	NA

NA: Not Applicable.