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The impact of non weight bearing: A prospective cohort study

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ABSTRACT

Background: Patients with lower limb injuries are commonly advised to non weight bear (NWB) on their injured limb as part of treatment. Occasionally, patients complain that offloading one limb, associated with the use of crutches or other mobility aids, may lead to pain on one of the other supporting limbs. This has led to compensation claims (1) but has never been the subject of formal research.
Methods: A prospective cohort trial was undertaken to address this question. Patients were recruited from two Metropolitan Hospital Orthopaedic Fracture Clinics and Orthopaedic Wards. A survey was administered at two time points; the first at the point of definitive orthopaedic treatment and commencement of the NWB phase. The second after the NWB phase was completed. The surveys included a pain Visual Analogue Scale (VAS), Short Form (SF)12, a pain body chart and a health questionnaire.
Results: A total of 55 patients were enrolled in the study. Seven patients developed new joint pain after a period NWB. These patients scored significantly lower on the follow up SF12 when compared to those who did not develop new pain ($p = 0.045$). Follow up phone calls at least 6 months following completion of the second survey revealed that all initial and new pain areas in these participants had resolved. The main limitation of this study was the limited numbers.
Conclusion: This study supports the idea that crutches, prescribed in the short term to allow a limb to be NWB, achieve this aim with minimal impact. Their use may be associated with new other joint pain however it can be anticipated this will resolve after cessation of crutch use.

Introduction

The use of an aid to mobilise is often a necessary part of Orthopaedic management. Following surgery or acute fracture, a period of NWB is often recommended to facilitate healing. The prescribed duration of NWB varies, but prescriptions of between 6 and 12 weeks are most commonly noted in the hospitals of this study for lower limb bone and joint injuries. Shorter or longer episodes of NWB can be prescribed in varying clinical scenarios

Mobilising with the use of an aid necessitates a change in gait pattern and limb loading. It introduces a weight bearing load to the upper limbs. The type of aid chosen will reflect the weight bearing status required and the ability of the user to tolerate and accommodate its use. In most cases crutches, either Axillary or Canadian, are prescribed. Axillary crutches rest against the lateral chest wall with the handles situated directly underneath. Canadian crutches, also known as elbow crutches, use the elbow and the wrist to weight bear.

Anecdotally, there is a suggestion that the use of crutches leads to increased loading on the opposite lower limb, in addition to the weight bearing load on both upper limbs and may lead to damage and/or pain. There have been compensation claims made [1] by patients claiming that the use of crutches led to new joint pain. Biomechanical literature has suggested that there is an increase in both vertical and horizontal ground reaction forces (GRF) going through the knee joint with crutch assisted walking [2]. This may be offset however by a reduction in the speed of walking and the overall amount of walking undertaken when using crutches [3].

The purpose of this study was to quantify the impact that a period of NWB has on the musculoskeletal system.

Methods

This study was undertaken at two acute hospitals that treat a large amount of Orthopaedic Trauma. Patients were recruited from Outpatients clinic, at the first appointment after definitive management, or on the ward after operative management. Ethics approval was sought and granted by both hospitals Human Resource Ethics Committee's. Patients were eligible to be enrolled

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in the study if they met the inclusion criteria. These were: being over 16 years of age, having sustained a recent single traumatic lower limb injury requiring a period of at least six weeks of NWB, being able to read and write English sufficiently to complete the questionnaire and provide informed consent. Exclusion criteria were: any other injury sustained.

The questionnaire consisted of questions relating to the injury and its immediate management, a body chart on which to colour in the areas of current pain, a Visual Analogue Scale (VAS), to give a numerical value between 0 and 10 to their pain and a mental and physical health score, the SF12. The VAS was administered with the use of a faces scale. The SF 12 [4] is a questionnaire designed to determine the impact a health issue has on physical and mental health. It gives a physical composite score (PCS) and a mental health composite score (MCS) both of which range from 0 to 100 where 0 indicates lower possible level of health and 100 the highest. It only takes 2 min to complete and has been validated in this population [5]. Questions were also included to determine whether the participant had any other medical problems and to determine their medications. It was specifically asked whether they took corticosteroids, were anti-coagulated, had diabetes or smoked. It was also recorded whether physiotherapist assistance was given in the provision and use of crutches.

The survey was administered on two occasions; the first after definitive management of the fracture had been undertaken, the second after the period of NWB had been completed. The second survey was shorter than the first. A follow up phone call was also made to those participants who had increased pain on the VAS at the time of the second survey.

Statistical analysis was conducted using IBM SPSS version 22 with a significance level set at $p = 0.05$. Differences between the participants who developed new pain areas after a period of non-weight bearing and those who did not were compared using a Pearson's chi square test (or a Fisher's exact test) for categorical variables and a Mann Whitney *U* test for continuous variables. Comparison over time between SF12 MCS, SF12 PCS and VAS pain scores were analysed using Wilcoxan signed ranks test.

Results

A total of 55 patients were recruited, and 50 completed the follow up study, giving a 90% response rate. The patients lost to follow up were unable to be contacted for the second survey. Demographic data (Table 1) for these patients shows no difference between those who completed the study and those lost to follow up. Of the patients included in the study the age range was 18–80 (IQR 28) with a median of 45, and 60% were male. The median time patients were NWB for was 6 weeks with a range of 6–12 (IQR 2.0). The median BMI of participants was 25.10 with a range of 19.1–37 (IQR 5.50). 50% of patients required surgical intervention. All patients had sustained a traumatic lower limb injury requiring a minimum period of six weeks NWB, as outlined by their treating orthopaedic surgeon. There were a variety of injuries. No patients who received operative management of their trauma suffered post operative complications.

Table 1
Demographics of patients lost to follow up.

	Cohort (n = 50)	Lost to follow up (n = 5)	P value
Gender	30 M; 20F	5 M; 0F	0.147[a]
Age (median years)	45	47	0.328[b]
Injury Type	12 Ligamentous 37 Bony	2 Ligamentous 3 Bony	0.592[a]
Management of injury	25 Operative 22 Non-operative	2 Operative 3 Non-operative	0.662†

[a]Pearson's chi square test.
[b]Mann Whitney *U* test.

Table 2
Distribution of new pain and pre and post NWB pain scores

T1 VAS	T2 VAS	T1 Pain Areas	T2 Pain Areas	Region	Same side
6	2	1	2	Hand	No
4	2	1	2	Foot	No
3	5	4	3	Shoulder, hand	Yes
3	7	1	3	Foot	No
2	6	3	4	Knee, wrist	No
2	2	1	1	Knee	Yes
9	4	2	2	Spine, shoulder	yes

Outcomes measured were pain score on the VAS, number of body areas affected by pain, physical component score (PCS) on the SF12 and mental health component score (MCS) on the SF12. Seven patients experienced new, other joint, pain at the time of the second survey. Four of these seven patients had physiotherapy input in the initial prescription of the aid. As a group, 26 of the 50 patients who completed the follow up survey had physiotherapy input. Four of the seven participants with new pain experienced pain on the opposite side and three on the same side. The new areas of pain were experienced in the upper limb, lower limb and spine (Table 2).

The SF 12 results showed that there was a significant difference in the follow up SF12 MCS scores, with patients who developed a new pain area scoring significantly lower compared to the cohort ($p = 0.045$) (Table 3). In addition, these seven patients had no significant change in their VAS ($p = 0.832$), SF12 PCS ($p = 0.128$) or SF12 MCS ($p = 0.735$) between the first and second surveys. At a follow up phone call, made to each of these participants six months after the second survey was completed, they all declared they no longer had any pain areas relating to the original trauma or the prescribed period of non weight bearing. The VAS was thought to be a valid measure, even administered over the phone, as the participants were visually familiar with score, having completed it twice previously.

Discussion

The results of this study indicate that the majority of patients improve in pain and function following treatment that includes a period of NWB for simple lower limb trauma. The heterogeneity of injuries sustained in our population adds to the generalisability of the results. Despite this, this study also found there is a chance that new joint pain may develop elsewhere in the body. In our population, there was complete resolution of this pain within six months. This is in contrast to much of the literature on simple orthopaedic trauma [6–9], which describes chronic pain and dysfunction to be common. Those patients that did suffer from the development of a new area of pain had an associated significant reduction in the mental component score of the SF12 and failure to improve on their VAS from initial survey to follow up.

The existing literature suggests that there is a correlation between a higher initial degree of pain experienced and poorer functional outcome [8] but no studies have prospectively analysed a change in VAS. It is of interest in this population that the VAS did not change in the new pain group, however the VAS was said to be 0 when patients were contacted six months post injury resolution.

The SF12, measured in this study, is designed to quantify the patient's physical and mental health. It has been reported that patient satisfaction following an injury is more strongly correlated with mental health than physical [10]. This study found that it was the MHC score of the SF12 that was significantly reduced in the new pain group. The SF12 was not repeated at the follow up phone call so we cannot make conclusions as to ongoing mental health in

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