THE INFLUENCE OF SUBJECT CHARACTERISTICS AND JOINT KINEMATICS ON FUNCTION AND QUALITY OF LIFE IN PATIENTS WITH OSTEOARTHRITIS PRIOR TO TOTAL KNEE REPLACEMENT

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INTRODUCTION

Osteoarthritis (OA) is associated with increased age, with pain and with functional limitation in joints. The rising proportion of elderly in our society means that optimal management of pain and functional loss in OA is of increasing importance.
In this study the role of pre-operative patient characteristics such as passive knee flexion and muscle strength on knee motion during functional activities and common outcome measures of function were explored. Secondly, relationships between functional knee motion and quality of life measures and daily activity were investigated.

METHODS

Thirty patients with osteoarthritis were assessed an average of 6 weeks before surgery. Fourty age-matched controls were also included in this study. Knee angle was measured using an electrogoniometer during level, stair and slope walking, getting in and out of a chair and getting in and out of a bath. Maximum passive knee flexion was measured in sitting with a manual goniometer. Muscle strength was measured using the MIE Myometer [1] and was normalized for body mass.
Other outcome measures included the American Knee Society Score (AKS), the Western Ontario & McMaster University Osteoarthritis Index (WOMAC) and a quality of life questionnaire, the SF36. The patient's daily physical activity was recorded using an activity monitor (ActivPAL [2]). This monitor records the time spent lying/sitting, standing and stepping. In addition it will display the number of steps made.

RESULTS AND DISCUSSION

Table 1 summarizes the most important patient characteristics.
Except age and the SF36 mental score, all characteristics were significantly different between the most affected leg of the patients and the age matched controls ($p<0.01$). Knee flexion during all functional activities was significantly less ($p<0.01$) in the patient group. Further, the affected leg of the patients showed significantly less knee flexion than their contralateral leg in all functional activities except sitting and had significantly weaker knee extensor and flexor strength ($p<0.01$).
Knee flexion strength of the affected leg was relatively less reduced (42%) compared the normal group than knee extensor strength (52%) which corresponds to the findings by Hortobagyi [3].
Passive flexion correlated weakly to moderately ($r=0.41$ to 0.55) with the knee angle during most functional activities except sitting down and getting up from a chair and walking on a flat surface. A total score derived from the knee angle during the functional activities was moderately associated with the functional components of the AKS and the WOMAC ($r=0.56$ and $r= -0.49$ respectively) but less with the SF36 ($r=0.44$ and $r=0.33$ for the Mental and Physical score respectively). Knee extensor and flexor strength were associated with WOMAC function ($r=-0.51$ and $r=-0.54$ respectively) but not or weakly with the AKS function ($r=0.14$ and $r=0.32$ respectively)
The daily amount of steps as measured by the ActivPAL was only associated with age ($r=-0.51$) in the patient group. None of the measured characteristics in the control group showed correlations coefficients higher than 0.34 with any of the outcome measures of the ActivPAL. Interestingly, the mental component of the SF36 was more strongly associated with the function score of the WOMAC ($r=-0.75$) than the physical component of the SF36 ($r=-0.45$).

CONCLUSIONS

This study shows that a score derived from the knee motion during functional tasks as measured by an electrogoniometer is associated with traditional outcome measures of function such as the WOMAC and the AKS. However, this score derived from electrogoniometry is more objective and sensitive than the traditional questionnaire based outcome measures of function and may therefore be more appropriate for the assessment of outcome after knee replacement surgery.

REFERENCES

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Table 1 Average (std) subject characteristics

Knee	*Age (yrs)*	*BMI*	*Passive flexion°*	*Extensor strength (N/kg)*	*Flexor strength (N/kg)*	*Steps (nr)*	*Walking speed (m/s)*	*SF36 Physical*	*SF36 Mental*
Affected	68.4(10.1)	30.0 (5.6)	102(16)	1.49(0.88)	0.96(0.46)	7569(3961)	0.90(0.88)	36.7(4.35)	54.0(9.9)
Contralateral			110(14)	1.91(0.90)	1.21(0.57)				
Controls	69.6(6.1)	24.9(3.4)*	134(7)*	3.11(1.1)*	1.64(0.47)*	13203(5120)*	1.24(0.10)*	54.5(6.08)*	56.1(4.9)

*significant different $p<0.01$ between the patients (affected leg) and control group
BMI: Body Mass Index