

# No effect of continuous passive motion after arthroplasty of the knee

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We randomly allocated 54 patients to active physical therapy only or this combined with 2 hours of passive knee motion twice daily from 2-12 days after total knee arthroplasty. The range of knee motion was measured on the 14th postoperative day. We found no difference between the groups. We concluded that 4 hours' passive motion daily in addition to early, active physical therapy does not improve the range of knee motion or promote mobilization after arthroplasty.

Retrospective studies of continuous passive motion after knee arthroplasty (Goletz et al. 1986, Gose 1987) indicate that this treatment promotes knee motion and reduces length of the hospital stay. In a prospective, but not randomized, study, Coutts et al. (1984) found improvement of motion for patients receiving 20 hours of passive motion daily after knee arthroplasty.

We have assessed the efficacy of 4 hours of passive motion daily after total knee arthroplasty.

## Patients and methods

Criteria for participation was primary, uncemented AGC-2000 total knee arthroplasty for arthrosis. Patients with previous knee arthroplasty in the contralateral knee were excluded. In the preoperative knee evaluation, a 100-point scoring system was applied (Ranawat et al. 1976). Immediately after the operation, the patients were allocated to active physical therapy and continuous passive motion (Group A) or active physical therapy only (Group B). The physical therapy included quadriceps exercises and active knee motion with full weight bearing from the second postoperative day. Continuous passive motion was used 2 hours twice daily from the second postoperative day and continued through the 12th day, beginning with 25° flexion and 5-10° added daily. For pain relief, ketobemidon (Ketogan<sup>®</sup>) was administered intramuscularly

Table 1. Patients randomized to continuous passive motion (+) after knee arthroplasty. Median (range)

	+	-
	n 27	n 27
Sex (F+M)	19+8	19+8
Age	71 (40-83)	72 (37-83)
Knee score	61 (34-76)	63 (38-73)
Flexion	120 (60-140)	115 (75-140)
Range of motion	115 (50-135)	115 (60-140)
Extension lag	2 (0-25)	0 (0-30)

Table 2. Knee motion (degrees) on the 14th postoperative day. Median (range)

	+	-
	n 24	n 26
Flexion	71 (50-110)	71 (45-115)
Deterioration	39 (5-80)	42 (0-75)
Range of motion	65 (45-110)	67 (45-115)
Deterioration	44 (0-85)	41 (0-70)
Extension lag	5 (0-15)	4 (0-20)
No of patients with		
improvement	9	6
no change	3	5
deterioration	12	15

and ketobemidon and paracetamol orally. Wound complications were recorded.

Fifty-four patients were included in the study. The groups were comparable as regards sex, age, preoperative knee motion, and knee scores (Table 1). After allocation, 3 patients were excluded from Group A (2 because of cardiovascular complications, 1 because of the unavailability of a passive motion device) and 1 patient was excluded from Group B (cardiovascular complications).

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The evaluation was carried out on the 14th postoperative day by one examiner, a senior rheumatologist, who was uninformed about the treatment program, and thus was neutral. Knee motion was measured with a standard goniometer with 30-cm-long arms. After this, the patients indicated their pain on a verbal scale during knee-joint mobilization (Table 2).

The Mann-Whitney *U*-test was used for the statistical analysis.

## Results

Continuous passive motion did not cause more early wound complications (one superficial wound complication in Group A and four in Group B).

There was no difference in pain between the groups: in both groups, three quarters of the patients suffered during mobilization of the knee (Table 3).

At assessment on the 14th postoperative day, there was no difference between the groups regarding flexion, extension, or total range of motion. Further, there was no difference in the deterioration (preoperative minus postoperative value) of flexion or total range of motion. Nor did continuous passive motion reduce the risk of extension lag (Table 2).

## Discussion

In a retrospective comparison, Basso and Knapp

Table 3. Pain during knee mobilization after arthroplasty

	+	-
	n 24	n 26
Not painful	2	0
Moderate pain	3	6
Significant pain	15	15
Severe pain	4	5
The differences were not significant.		

(1987) found no difference in the range of motion following 5 or 20 hours of passive motion daily after total knee arthroplasty. Coutts et al. (1983) found improvement for patients receiving passive motion, which, however, was applied immediately after surgery, whereas their control group was immobilized with plaster splints for approximately 3 days or until the patient could actively raise the leg straight.

In the rabbit knee, O'Driscoll et al. (1983) demonstrated that the rate of clearance of hemarthrosis was twice as fast with continuous passive motion as it was with cast immobilization. This has probably no significance in knee arthroplasty if early, active mobilization is instituted and the suction drainage is maintained until bleeding has stopped.

As a consequence of our results, we no longer use continuous passive motion after primary knee arthroplasty.

## References

- Goletz T H, Henry J H. Continuous passive motion after total knee arthroplasty. *South Med J* 1986;79(9):1116-20.
- Gose J C. Continuous passive motion in the postoperative treatment of patients with total knee replacement. A retrospective study. *Phys Ther* 1987;67(1):39-42.
- Coutts R D, Toth C, Kaita J H. The role of continuous passive motion in the rehabilitation of the total knee patient. In: *Total Knee Arthroplasty. A comprehensive approach* (Eds. Hungerford D S, Krackow K A, Kenna R V.) Williams & Wilkins, Baltimore 1984:126-32.
- Ranawat C S, Insall J, Shine J. Duo-condylar knee arthroplasty: Hospital for Special Surgery design. *Clin Orthop* 1976; (120):76-82.
- Basso D M, Knapp L. Comparison of two continuous passive motion protocols for patients with total knee implants

(published erratum appears in *Phys Ther* 1987;67(6):979). *Phys Ther* 1987;67(3):360-3.

- O'Driscoll S W, Kumar A, Salter R B. The effect of continuous passive motion on the clearance of a hemarthrosis from a synovial joint. An experimental investigation in the rabbit. *Clin Orthop* 1983;(176):305-11.

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