

The Use of Motion Splints in the Follow-up Treatment of ACL Plasty

"controlled active motion" vs "continuous passive motion"

B. Friemert, C. Bach, W. Schwarz, H. Gerngross (Surgical Dept. of the Federal Armed Forces Hospital of Ulm)

THE PROBLEM

It is known that the rehabilitation after surgical operations on the knee joint in general and in case of a cruciate ligament replacement plasty in particular constitutes an important factor for restoring the normal function. It is one of the essential aims of rehabilitation to regain the normal range of movement of the knee joint, which is why "continuous passive motion" (CPM) forms an important component of the follow-up treatment.

It is further known that the recovery of proprioception (both the injury and the operation cause a proprioception deficit) within the framework of active remedial gymnastics also contributes decisively to the success of rehabilitation. For that purpose, there have been developed various therapeutic concepts of remedial gymnastics, such as proprioceptive neuromuscular fasciculation (PNF), coordination and muscle-building training that are subsumed under the term "active therapy". In view of that background, there was developed the "controlled active motion (CAM) splint" (CAMOped, of the firm OPED AG, Fig. 1). Here, the patient uses the sound leg for actively moving, through a device arrangement, his/her contralateral lower extremity, the device

allowing for a more and more active cotraining of the leg that the patient was operated on.

THE QUESTION

Does the utilization of the CAM splint, in direct comparison with the CPM splint, within the framework of the immediate postoperative follow-up treatment by remedial gymnastics to a significant improvement of proprioception?

MATERIALS AND METHOD

60 patients (30 in group I = CPM, 30 in group II = CAM) were included in this prospectively randomized study. Before that, there were examined 20 test persons with healthy knees in order to establish standard values for the measuring system. The proprioceptive abilities of the knee joint were measured with the help of an angle reproduction test. For that test, the leg to be examined of the lying patient is placed in a special splint. For each leg, there are defined three different reproduction angles so as to avoid a learning effect. The sequence of the angles is randomized (brief randomization) - left leg: 10°, 35°, 60°, - right leg: 15°, 30°, 50°. The main target value is the difference between the

sides in the range near extension (15° on the right) - (10° on the left). As a starting point of each measurement, there is assumed the 0°-position according to the neutral-zero method that has to be maintained for 3 seconds. It is also left to chance, which leg starts. The examiner shows the angles with the help of an electric goniometer (for 3 seconds each) and the test person tries to reproduce them passively. The difference between the actual angle and the reproduced angle is a value of the proprioceptive abilities. In order to compensate for interindividual deviations, the difference between the sides is indicated as the value of proprioceptive ability. The measurements were performed on the day before the operation (only ACL plasty) and on the 6th day after the operation. The analysis was made using the Wilcoxon test for an error probability of 5 % and a power of 80 %.

THE RESULTS

The groups did not differ with regard to age, height, weight as well as concomitant injuries (meniscus and cartilage damage). In the CPM group, the BTB/STG ratio was 16/14 and in the CAM group it was 17/13. The period between trauma and operation was 6.9 months (2 weeks - 18 months) in the CPM group and 11.9 months (3 weeks - 72 months) in the CAM group. The average duration of the therapy with the CPM splint was 19.3 hours (± 8.5) and with the CAM splint, it was 17.3 hours (± 5.5), with an average postoperative inpatient treatment of 6.6 days in both groups. Compared with the pre-operative condition, the range of movement on average decreased from 138° to 98°, without difference between the groups. In the control group, there resulted a difference between the sides of 1.8°. In groups I and II, the pre-operative test did not show a significant difference. (group I 5.9°, group II 5.7°) (Fig. 3). Altogether, the proprioception had improved significantly in the overall collective on the day of release (Fig. 4). Postoperatively, there was measured a difference between the sides of 4.2° in

group I and a value of 1.9° in group II (Fig. 5) With a $p < 0.001$, that result is highly relevant. That means, the patients using the CAM splint reached the normal values of the healthy control group.

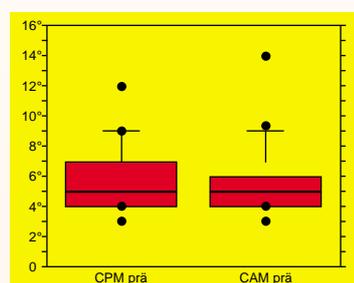


Fig. 2 - Side-differences in the range close to extension in the CPM and CAM groups before the operation

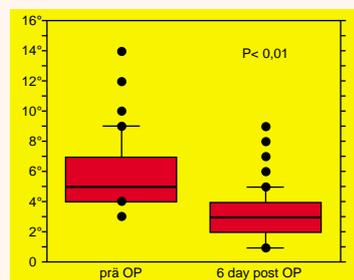


Fig. 3 - Side-differences in the range close to extension in the overall collective before the operation and on the day of discharge

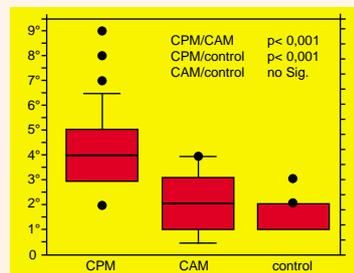


Fig. 4 - Side-differences in the range close to extension in the CPM and CAM groups on the day of discharge, in addition side-differences of the healthy control group (n = 20)

CONCLUSION

Compared to the CPM splint, the CAM splint effects a significantly better reduction of the proprioceptive deficit. For that reason, it should be preferred in the follow-up treatment of operations on the cruciate ligament of the knee.



Fig 1: CAMOped, firm OPED